A COMPARATIVE ASSESSMENT OF THE EFFECT OF AUDITORY, AUDIOVISUAL AND VIRTUAL REALITY DISTRACTION TECHNIQUES ON DENTAL ANXIETY OF 5-TO 10-YEAR-OLD INDIAN CHILDREN

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Abstract

Background: Distraction is a behavior management technique of diverting the child’s attention from what may be perceived as an unpleasant procedure. Creating positive memories is an important aspect of the dental restorative process for children. The ideal distractor ought to include visual, auditory and kinesthetic modalities in order to fully harness the child's attention and thereby, minimize anxiety.

Aim: To access and to compare the effect of auditory, audiovisual and virtual reality distraction techniques on dental anxiety of 5- to 10- year-old Indian children.

Design: A total of 300 children aged between 5 to 10 years were divided into anxious (group I) and non-anxious (group II) groups based on Corah’s Dental Anxiety Scale. Parents and children were first counseled and the restorative procedure explained using the Tell-Show-do method. The 2 groups were further divided into 3 sub-groups each i.e. audio, audiovisual and virtual reality. Children were randomly assigned to these 3 sub-groups to receive the auditory, audiovisual and virtual reality distraction during the restorative treatment. Anxiety was assessed using the Faces Version of Modified Dental Anxiety Scale during the procedure. The child’s heart rate was also monitored with a pulse oximeter, just before, during and after completion of the procedure in both the groups. Anxiety rating and pulse rate of all groups are expressed as mean as well as inter and intra group comparisons were done.

Result: The study showed that anxiety scale was significantly decreased using the virtual reality eyeglasses distraction technique in both the groups, followed by audiovisual technique. Auditory method was found to be the least effective out of the three techniques.

Conclusion: Virtual reality eyeglasses have not been used much as a distraction technique for behavior management of children. Virtual reality immersion has been shown to be more effective than audio visual distraction because it augments detachment from viewing and hearing what is happening in the environment hence there is a need to bring about a mass practice in the field globally for a comfortable experience of the child.
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Abstract

**Background:** The foundation for practicing dentistry with children is built on the ability to guide them through their dental experience. Treating children is different from treating adults, that is, it usually relies on a one- to -two relationship, dentist, child patient and family; where the communication is reciprocal. For a successful pediatric dental practice effective behavior management through communication plays a pivotal role. To avoid legal entanglements, probably one of the best defensive strategies is to establish good rapport and proper communication with parents. Communication is a balancing act and when and how you impart information is significant. This balancing act is at its most difficult when children are involved, as any information needs to be delivered to the child and to the parent as well.

**Design:** The paper describes the use of basic behavior management fundamentals with special emphasis on specific ways to communicate with the parents first and then the child patient in order to aquire best behavior outcome and successful Pediatric dental practice.

**Result:** There is no mystique or magic formula for child management and hence practice management. Successful handling of children is based on knowledge, common sense and experience. Including business management skills and learning better methods of communication helps the Pediatric dental practitioner to build his/her confidence in management of children and having a successful pediatric dental practice.

**Key word:** Communication, Behavior management, Practice management

OC-03 Oral health-related quality of life among children (3-6 yrs.) with dental anxiety before and after treatment under general anesthesia

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Abstract

**Aim:** To evaluate the impact of Severe Early Childhood Caries(S-ECC) on Oral Health-Related Quality of Life (OHRQoL) among 3-6 year-old children with dental anxiety before and after dental treatment under general anesthesia.

**METHOD:** Ninety three S-ECC children aged 3 to 6 years with dental fear were received dental treatment under general anesthesia (GA). A Chinese version of the Early Childhood Oral Health Impact Scale (ECOHIS) was used to evaluate S-ECC children’s OHRQoL before and after treatment. Socio- demographics information was also collected. Spearmen’s rank correlation coefficient was used to evaluate the association between the severity of caries with the ECOHIS score in S-ECC group; ECOHIS scores before and after treatment in S-ECC group were compared.

**Result:** The ECOHIS score of S-ECC group was positively correlated to the values of decayed-missing-filled tooth surface (dmfs) score, that is, the higher the dmfs score, the higher
the ECOHIS score. Before treatment, ECOHIS scores in S-ECC group were significantly higher than that of CF group (p <0.01). After treatment, ECOHIS in S-ECC group was significantly lower than before treatment (p <0.01).

**Conclusion:** The OHRQoL of S-ECC children with dental anxiety was poor and was significantly improved after the treatment under GA.

**Keywords:** Severe early childhood caries, oral health-related quality of life, early childhood oral health impact scale, dental anxiety, general anesthesia

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**OC-04 Near-Infrared Light Transillumination (NILT) for detection of incipient proximal caries in primary molars**

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**Abstract**

**Objective:** To evaluate the practical value of Near-Infrared Light Transillumination (NILT) DIAGNOcam on detection of incipient proximal caries in primary molars.

**METHODS:** 4-9 year-old children with suspicious proximal lesions in primary molars were recruited in this study. The target teeth were examined with clinical examination, bitewing radiograph and DIAGNOcam. And caries index were rated as 0(no caries), 1(caries reaching outer 1/2 enamel), 2(caries reaching inner 1/2 enamel), 3(dentine caries). Those primary molars with at least one of the adjacent molars according with criteria of invasive treatment, i.e. teeth were diagnosed as caries reaching inner 1/2 enamel or dentine with at least two detection methods, were included. Target teeth with caries index ≥ 2 accept invasive treatment. And the caries status of the adjacent teeth was observed under direct vision with those teeth of caries index was ≥ 2 would also accept invasive treatment. The relationship of lesions to enamel-dentine junction (EDJ) were recorded and used as reference standard to compare the sensitivity, specificity and accuracy of those three methods in detection the incipient proximal caries in primary molars.

**Results:** 36 children with 104 suspicious proximal lesions in primary molars were recruited in this study, of which 5 were diagnosed as no caries, 20 were diagnosed as superficial enamel caries, 79 accepted invasive treatment, 22 of which were diagnosed as EDJ caries, 57 of which were diagnosed as dentine caries. The sensitivity, specificity and accuracy of clinical examine, bitewing radiograph and DIAGNOcam were 68.69%, 81.82%, 78.79% and 100.00%, 100.00%, 80.00% and 75.96%, 85.65%, 78.85%. As for superficial enamel caries, the sensitivity of clinical examine was lowest, only 10%, while DIAGNOcam was 60%, higher than 40% of bitewing radiograph. As for EDJ caries, the sensitivity of bitewing radiograph was highest as 86.36%, followed by DIAGNOcam 72.73% and clinical examine 68.18%. As for dentine caries, the sensitivity of three detection methods were higher than 85%, of which bitewing radiograph was the highest as 94.74%.

**Conclusions:** The accuracy of DIAGNOcam on detection incipient proximal caries in primary...
molars was comparable to bitewing radiograph. And it was safe, convenient and no exposure to radiation, which was applicable to be used in pediatric dentistry.

**Key words:** primary tooth, proximal caries, transillumination, diagnosis

**OC-05 Cytotoxic evaluation of Uncaria Gambir extracts:**

**An in vitro study**

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**Abstract**

**Background:** Uncaria Gambir extract constitutes of catechin group, which has been shown to have anti-inflammatory and antibacterial properties. Traditionally, it has been used as astringent medicine and for treatment of toothache and spongy gum. Hence, the extracts of Uncaria Gambir may have some potential in dentistry. However, the cytotoxicity of this extract has never been investigated.

**Aim:** To determine the cytotoxicity of Uncaria Gambir extracts toward fibroblast cell lines in vitro using Alamar blue assay.

**Design:** Freeze-dried Uncaria Gambir extract were dissolved in 5% DMSO. Then, it was diluted into two fold dilutions with culture media into eight different concentrations, ranging from 100% to 0.78%. After an initial incubation of 24 hours in the 96-well plates, c3T3 fibroblast cell lines were treated with various concentrations of the extracts and incubated for 24 hours in triplicates. 100% DMSO and culture media were used as positive and negative controls respectively. Cell viability was measured using Alamar blue assay. Any significant difference (p<0.05) between the extracts and positive control solution were determined using t-test. IC50 of the extracts were also determined.

**Result:** The results showed an increase in cell viability as the concentration of the extract decreases. The mean cell viability for 100% and 50% concentration of the extracts were 18.26% and 56.08% respectively, with no statistically significant difference (p>0.05) when compared to positive control. The mean cell viability for the concentration of 25%, 12.5%, 6.25%, 3.13%, 1.56% and 0.78% were 73.48%, 78.43%, 85.30%, 87.45%, 90.89% and 98.84% respectively. There was a statistically significant difference (p<0.05) between the extracts at concentration below 25% when compared against the positive control. The half maximal inhibitory concentration (IC50) of the extract was 568.2μg/ml.

**Conclusion:** There is no cytotoxic effect of the Uncaria Gambir extract at concentration below 25% against c3T3 fibroblast cell lines when tested in vitro.

**KEYWORDS:** cytotoxicity, Uncaria Gambir, fibroblast cell line.
OC-06 A case report of Incontinentia Pigmenti: oral manifestation, oral microbial and exome sequencing analysis

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Abstract:

Background: Incontinentia Pigmenti (IP, Bloch-Sulzberger syndrome, OMIM 308300) is a rare multisystem ectodermal disorder characterized by an inherited X-linked dominant disorder. And it is usually lethal in males.

Case description: This article reports a male IP patient whose chief complaint was congenital multiple tooth loss and dental caries. The boy was diagnosed IP without typical Xq28 gene change by NEMO/IKKγ gene examination. He presented with short and thin stature. A plurality of cord-like hypopigmented patches distributed along trunk and limbs. The malformations of eyes, skeletal and central nervous system was not found. Primary teeth B, D, E, F, G, I, L, N, O, P, Q, S, and T were missing, and L was residual root. The plaque and saliva of the child and his parents were collected and processed for oral microbial and exome sequencing analysis. Microbiome analysis showed that the caries related genus Streptococcus in the child’s dental plaque and saliva was 1.3-1.9 times higher than that in his parents’. Lactobacillus, another dental caries related bacteria in children, in child’s dental plaque was 1.5-2 times more than that of his parents, Lautropia in the child’s plaque was 115 times more than that in his father’s. Neisseria in the child’s plaque was 37 times more than that in his father’s. While Fusobacterium, Porphyromonas, Prevotella and Selenomonas in child’s dental plaque was far less than that in parents’. Actinomycyes and Veillonella in parents’ saliva was as 10-25 times as that in child’s saliva. Among the eight recessive genes linked to X, the frameshift mutation RBMX gene, which is related to brain development, may affects the development of intelligence and be related to pathogenesis of IP. Among the ten genes found in autosomal recessive genes, HADH gene is related to lipid metabolism, this may be correlated with the occurrence of the disease.

Conclusion: Children suffering IP are more susceptible to dental caries. To study their oral microbiome helps to understand and to control dental caries in IP patients.

KEY WORDS: Incontinentia Pigmenti, dental caries, oral microbiome analysis, exome sequencing analysis

OC-07 Study on the function of the differential genes screened in the micro environment of stem cells from apical papilla
Abstract

Background: In dental tissue engineering, stem cells usually combine with the scaffold and growth factors to regenerate the dental tissues. The niche is an important factor for cells behavior and teeth formation. And has complex gene regulation, which largely affects the function of stem cells.

Objective: In this study, we focus on the differential gene expression between SCAP and apical papilla tissues in attempt to identify the genes that are crucial for inducing SCAP. Furthermore, we investigate the SCAP differentiation properties with the treatments of candidate gene products.

Methods: With patients’ informed consent, SCAP and apical papilla tissue were collected separately from third molar of five female patients aged 18-22 years old. SCAP were isolated and cultured as previously described. Cell and tissue samples were subjected to Trizol to extract RNA for genechip analysis, the results were further verified by Real-time RT-PCR. And screening two differential genes-BMP6/IGF2. SCAP were cultured in osteogenic medium with growth factor BMP6/IGF2 at different concentrations and then tested for ALP activity to evaluate mineralization (n=5).CCK-8, CFSE and flow cytometry experiment were used to evaluate SCAP proliferation (n=6). Alizarin red staining, calcium concentration test and Real Time RT-PCR were performed to evaluate osteo-/dentinogenic differentiation potential of SCAP (n=6).

Results: Gene chip data reveals that 2325 genes that were differently expressed, genes-S1004A, FOXM1, FGF5 were up-regulated, whereas genes-CXCL14, IGF2, BMP6 were down-regulated. The genechip results for these six genes were further verified by RT-PCR analysis. Growth factors-IGF2 and BMP6 were selected to proceed functional study. ALP activity assay to evaluate SCAP mineralization potential showed that BMP6 or IGF2 treatment at three concentrations of 5, 20, 50ng/ml had increased ALP activity. However, BMP6 at 20ng/ml or IGF2 at 5ng/ml increased ALP activity most (P<0.05). CCK-8, CFSE and flow cytometry assays to evaluate SCAP proliferation showed that 20ng/ml BMP6 and 5ng/ml IGF2 treatment can increase the proliferation ability of SCAP compared to the control groups without treatments (P<0.05). Alizarin red staining, calcium concentration tests and the expressions of differentiation markers of BSP, OPN, OCN, DSPP, DMP-1, OSX, RUNX2 revealed that 20ng/ml BMP6 and 5ng/ml IGF2 treatments can significantly enhance the osteo-/dentinogenic differentiation potential of SCAP compared to the control groups without treatments (P<0.05).

Conclusion: Genes were differently expressed between apical papilla tissues and SCAP suggesting the importance of micro environment for SCAP to proliferate and differentiate. BMP6 and IGF2 as the major players in micro environment promote SCAP to differentiate into functional odotoblasts. Our data may be an indication of possible artificial micro environment that is useful for tooth regeneration.

Key words: SCAPs, tooth regeneration, micro environment , growth factor
regeneration of regenerative endodontic treatment:
from an immunomodulatory perspective

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This work was supported by National Natural Science Foundation of China (81771059 to X. Chen)

Abstract

Background: Regenerative endodontic treatment (RET) is a favorable biological option for immature permanent teeth with pulp necrosis based on the concept of tissue engineering. Stem cells from apical papilla (SCAP) represent one of the most important cell source for tissue regeneration in RET. Local microenvironment in the apical area, especially the immune components, also play important roles in tissue regeneration. CD4+CD25+Foxp3+ regulatory T cells (Treg) is a vital part of CD4+ T cells and the increase ratio of Treg helps to create an immune microenvironment contributing to tissue regeneration. MSCs can regulate the local or systemic inflammation response via up-regulating Treg to promote tissue regeneration. In our previous animal study, it was noticed that a large number of lymphocytes were present in some root canals together with the apical closure and new tissue formation after RET in immature permanent teeth suffered from apical periodontitis in beagle dogs.

Aim: To investigate the underlying biological mechanisms of regenerative endodontic treatment (RET) from an immunomodulatory perspective. To evaluate the expression of Foxp3 positive cells around the newly formed tissue in vivo and the effects of SCAP on CD4+CD25- T cells conversion to Treg in vitro.

Design: Three 6-month-old beagle dogs with 9 double root canals premolars were assigned to the RET group and the control group. RET was performed after the experimental immature teeth suffered from apical periodontitis. Three months later, the animals were sacrificed and the histological sections were stained with hematoxylin and eosin (HE). The immunofluorescent staining was used for detecting the expression of Foxp3. Human SCAP and CD4+CD25- T cells from mouse spleen (1:1 and 1:5) were co-cultured in cell-cell contact and transwell manner respectively for 24h and 72h in vitro. Single cultured CD4+CD25- T cells were used as control. The percentage of Treg stained with CD4/CD25/Foxp3 were evaluated by flow cytometery. In animal experiment, samples with lymphocytes infiltration were statistically analyzed with the Fisher exact test. In the experiment of cells co-cultured in vitro, ANOVA and LSD-t test were used to compare the difference among the groups. SPSS 17.0 was used for statistical analysis. P < 0.05 was regarded as statistically significant.

Results: In animal experiment, inflammatory cells were present with tissue regeneration in RET and Foxp3 positive T cells enriched around the newly formed tissue. In the experiment of SCAP and CD4+CD25- T cells co-cultured in vitro, SCAP could promote Treg conversion after 72h. Cell-cell contact play an important role after co-cultured for 24h, while soluble factors were also involved after 72h.
Conclusions: SCAP could promote CD4+CD25- T cells conversion to Treg in vitro. MSCs could create immune-microenvironment in the root canal which benefit the tissue regeneration in RET.

KEYWORDS: regenerative endodontic treatment (RET), stem cells from apical papilla (SCAP), regulatory T cell (Treg)

**OC-09 Abnormalties of Teeth-Alveolar Bone Complex in BMP9-Knockout Mice**

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**Abstract**

**Background:** Tooth development is regulated by sequential and reciprocal epithelium-mesenchymal interactions and their related molecular signaling. Bone morphogenetic proteins (BMPs) family, especially BMP2,4,7, is essential for tooth formation. However, the role of BMP9 during tooth development remains unclear. It has been demonstrated that BMP9 could induce the immortalized mouse stem cells of apical papilla (iSCAP) differentiated into odontoblast in vitro, but there were few studies in vivo. Dentin sialophosphoprotein (Dspp) and Dentin matrix protein 1 (Dmp1) are highly expressed in odontoblasts, and essential for the development of dentine formation.

**Aim:** This study is intended to examine the characteristics of teeth-alveolar bone complex in BMP9-KO mice compared to wild-type.

**Methods:** BMP9 knockout mice (BMP9-KO mice) model was established. Combinations of gross morphological, micro-CT, three-dimensional reconstruction, semiquantitative RT-PCR, HE and immunohistochemistry staining methods were used to analyze the characteristics of teeth and alveolar bone in these BMP9-KO and wild-type mice.

**Results:** BMP9 knockout mice model was established successfully which was confirmed by immunohistochemistry. Gross morphological analysis revealed the teeth cusps of BMP9-KO mice were wearing. Micro-CT and three-dimensional reconstruction analysis of the mutant mice teeth showed reduced thickness dentine, enlarged pulp chambers and shorter roots. The BMP9 mutants presented lower quality of alveolar bone compared to the wild-type. Moreover, the HE stain showed the odontoblasts were disorganized. By semiquantitative RT-PCR analysis displayed when silencing the BMP9 expression in iSCAP, the expression of odontoblastic makers, Dspp and Dmp1, was downregulated.

**Conclusion:** In summary, in this study we found some abnormalities in teeth-alveolar bone complex in BMP9-KO mice. Our findings suggest that BMP9 may play an important role in proper tooth development by regulating the expression of Dmp1 and Dspp to affect the function of odontoblast. However, the accurate molecular mechanism of BMP9 signaling affecting tooth development is still unknown, we will further elucidate it in future study.

**Key words:** BMP9, tooth development, Dspp, Dmp1
OC-10 Osteogenic Potential of Different Hydroxyapatite Scaffold from Nacre Layer for Bone Engineering

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Abstract

Background: Current practice of using autologous bone from iliac crest for cleft palate patient brings together few disadvantages to the patient. With the advancement of tissue engineering, this shed a new light for both clinicians and patients involved. Hydroxyapatite is one of the preferred scaffolds due to its similar composition and structure with the natural human bone. It can be obtained from natural sources such as mollusc species.

Aim: This study was conducted to compare the morphology of pure (non-sinter) and thermally prepared (sinter) marine-based hydroxyapatite scaffold. The osteogenic potential of both groups were also examined and compared after seeded with pre-osteoblast cells.

Design: Two types of spherical-shaped hydroxyapatite (HA) scaffold from nacre layer of mollusc species were obtained from Department of Physics, Faculty of Science, Universiti Putra Malaysia (UPM). Scaffolds were divided accordingly into sinter and non-sinter group. 50,000 of MC3T3-E1 murine pre-osteoblast cells were seeded onto each group of scaffolds in 6-well culture plates. Media for cells cultured on both scaffolds were changed every 3 days and kept in incubators for 21 days. Observation was made on day 7, 14 and 21 using Field Emission Scanning Electron Microscopy (FESEM) to observe morphology of the preosteoblast cells and Alkaline Phosphatase (ALP) activity was measured using colometric assay.

Results: Morphological observation from SEM images revealed larger interconnected micropores in sintered HA group compared to non-sinter group. This former group also has better cell attachment and proliferation on the surface of scaffold with increase of ALP assay compared to pure scaffold.

Conclusion: Attachment and proliferation of pre-osteoblast cells are more optimum in thermally treated HA scaffold. This scaffold is postulated to have larger interconnected micropores which may allow better cell adhesion and proliferation. Hence, our findings suggest that thermally prepared HA scaffold provides a favourable environment for cell attachment and proliferation in bone engineering.

Keywords: hydroxyapatite, nacre, marine scaffold, bone engineering

OC-11 Exosomes derived from stem cells from apical papilla promote odontogenic differentiation of rat bone
marrow mesenchymal stem cells

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This work was supported by National Natural Science Foundation of China (81771059 to X. Chen)

Abstract

Background: Regenerative endodontics treatment (RET) has become a new alternative treatment for immature tooth with dental pulp or periapical diseases. Formation of ideal pulp dentin complex is the goal of RET. However, histological findings observed that the newly-formed hard tissue were more like bone- or cementum-like tissue in the canal. Recently, strategies of regenerative medicine utilizing exosomes derived from MSCs (MSC-Exo) have gained considerable attention, because MSC-Exo have the similar function of MSCs in tissue regeneration and can avoid problems associated with clinical application of stem cells (i.e. medical ethics, the selection of stem cell sources and related technology for cell culture). MSC-Exo, one type of microvesicles with double-membrane structure and a size of 30-120 nm in diameter, contain rich bioactive lipids, proteins and RNAs. MSC-Exo can be endocytosed by cells and transfer biological information to the recipient cells to regulate their function. Stem cells involved in RET include residual dental pulp stem cells (DPSCs), stem cells from apical papilla (SCAP), periodontal ligament stem cells (PDLSCs) and bone marrow-derived mesenchymal stem cells (BMMSCs) from jaw bone, while SCAP is a promising stem cell source for dental pulp regeneration.

Aim: To test if SCAP-Exo could be endocytosed by rat BMMSCs and the impact on the proliferation and odontogenic differentiation of BMMSCs in vitro. To provide experiment basis for the application of exosomes derived from dental stem cells to promote dentin deposition in RET.

Design: Endocytosis experiment was used to observe whether rat BMMSCs could endocytose SCAP-Exo. CCK-8 assay was used to assess the proliferation of BMMSCs cultured in conditional medium containing different concentration of SCAP-Exo (0, 5, 20, 80 µg/mL). To observe the odontogenic differentiation of BMMSCs, the protein expression of DSPP were evaluated by Western blotting and the ability of formation of mineralized nodules was examined by alizarin red S staining. The data were analyzed by one-way analysis of variance (ANOVA) followed by Tukey's post hoc test. P values less than 0.05 were considered statistically significant.

Results: Under fluorescence microscope, red PKH26-labeled SCAP-Exo were observed in the cytoplasm of BMMSCs. SCAP-Exo exerted no obvious effect on the morphology and proliferation of BMMSCs. The protein expression of DSPP was significantly increased in 80 µg/mL group compared to the other three groups. Moreover, alizarin red S staining revealed that SCAP-Exo increased mineralized nodules formation.

Conclusions: SCAP-Exo could be internalized by BMMSCs and was able to promote specific odontogenic differentiation of BMMSCs. These findings suggested that cell-free exosomes-based therapy could have a prospect in future application in dental pulp regeneration.

Keywords: exosomes, stem cells from apical papilla, bone marrow mesenchymal stem cells,
OC-12 Upper Airway in Children with Skeletal Class III Malocclusion: Three-Dimensional Evaluation using CBCT

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Abstract

Background: The relationship between the craniofacial pattern and respiratory function has been investigated since the 19th century.
Aim: The present study was aimed to explore the relationship between the upper airway size and craniofacial structures in growing children with skeletal Class III malocclusion.

Material and Methods: The included children were selected from the patient pool in the Department of Orthodontics, Peking University School and Hospital of Stomatology from December 2010 to June 2012. Forty-seven children (19 boys and 28 girls, 9.6±1.3 years of age, range 8.0-12.4 years, BMI 16.4±2.1 kg/m2) with skeletal Class III malocclusion were selected. Twenty-three children with normal vertical development were divided into groups of insufficient maxilla (n=9) and overdeveloped mandible (n=14) for the airway comparison between different sagittal skeletal patterns. Thirty-two children with the same sagittal development were divided into groups of low angle (n=12), normal angle (n=11), and high angle (n=9) for the comparison between different vertical skeletal developments. Pre treatment cone beam computed tomography images were used to evaluate the upper airway and craniofacial development. The upper airway and craniofacial structures were measured using DOLPHIN 11.7 software. Mann–Whitney U test and Kruskal–Wallis test were used to analyze the airway differences between groups in sagittal and vertical directions. Spearman correlated analysis was done between the upper airway size and the craniofacial pattern in the transverse dimension.

Results: The results showed that the nasopharynx was the only affected airway part between groups of insufficient maxilla and overdeveloped mandible. The volume and mean cross-sectional area of nasopharynx in group of insufficient maxilla were significantly smaller than those in group of overdeveloped mandible (P<0.05). The airway size was significantly different in three groups of low angle, normal angle, and high angle (P<0.05) except for the height of nasopharynx and velopharynx. The high angle group showed smaller upper airway compared with the groups of normal angle and low angle (P<0.05). The skeletal transverse dimension was correlated with the height of velopharynx, hypopharynx, and total airway with small gender differences.

Conclusion: The size of the upper airway was associated with the craniofacial pattern in three directions in growing children with skeletal Class III malocclusion. The upper airway was significantly smaller in high-angle group of children with skeletal Class III than that in normal-angle or low-angle group, while the nasopharynx was the only affected airway part by the sagittal skeletal pattern. The height of the upper airway was found to be correlated with the skeletal transverse dimension.

Key Words: CBCT, growing children, skeletal pattern, upper airway size
OC-13 Case Report: Eruption Guidance of four impacted maxillary incisors

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OC-14 Periodontitis in a 5 year old with Hyperimmunoglobulin E Syndrome

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Abstract

Introduction: Hyperimmunoglobulin E syndrome (HIES) also known as Job’s syndrome or Buckley syndrome is a rare immunodeficiency disorder characterised by markedly elevated serum immunoglobulin (Ig) E, recurrent cutaneous and pulmonary infections and chronic eczema. Incidence of HIES is about 1:1 000 000, autosomal dominant and recessive transmission patterns have been described, with no gender predilection. Aetiology for HIES has been identified as mis-sense or in-frame deletion in transcription factor STAT 3 and signalling abnormalities of cytokines, in which are thought to cause dental, skeletal, and immunological disorders. Other
common manifestations described are characteristics facies (prominent forehead, deep – set eyes, broad nasal bridge facial asymmetry), skeletal abnormalities (osteopenia, minimal trauma fractures, scoliosis and craniosynostosis) and dental manifestations (delayed exfoliation of primary teeth, delayed eruption of permanent teeth, periodontitis, supernumeraries, microdontia, and high arched palate)

Case report: A 5 year old Malay girl was referred to the Department of Paediatric Dentistry, Hospital Kuala Lumpur from the primary care due to bleeding during brushing and mobile teeth. There was no history of gum or facial swelling. Parents revealed that patient suffered from multiple episodes of eczema and skin infection requiring admission. However, they had defaulted their medical reviews. Intra - oral examination showed poor oral hygiene with generalised plaque, calculus and hypomineralised teeth, and generalised gingival recession with multiple grade III mobility. Gingiva appeared red and edematous with spontaneous bleeding upon palpation. Orthopantomogram revealed widespread advanced horizontal alveolar bone loss, involving the inter-radicular region of primary molars. We suspected patient has underlying immunodeficiency condition and referred her to our medical counterpart for further evaluation. Based on medical records, she had multiple admissions due to bronchitis, infection of right hand and forearm and candida sepsis and was also diagnosed with eczema, otitis media, and microcytic hypochromic anaemia. Laboratory investigations were performed to rule out underlying immune deficiency syndrome. She was diagnosed with HIES due to her elevated total serum IgE of 270 iu/mL (normal value 60 iu/mL for children 1 – 5 years). Diagnosis of periodontitis in a patient with HIES was made and treatment plan was to institute strict oral hygiene for good plaque control.

Comments: HIES is a multi – system disorder with a wide range of clinical manifestation, affecting the immune system, connective tissue, skeleton and dentition. A HIES scoring system developed at the National Institutes of Health (NIH) can be used to reach the diagnosis. However, it does not allow diagnostic certainty in infants as some manifestations may not be present in very young patients. Paediatric dentists play a vital role in recognising oral manifestations in patients with underlying medical conditions. Thus in this case, it shows the importance of an early diagnosis and periodical reviews to treat the periodontal disease in providing a better quality of life to patient.

Keywords: hyperimmunoglobulin E syndrome, periodontitis, children


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Abstract

Aims: To test if dental rehabilitation can be initiated during active chemotherapy and if it can
affect the oral health related quality of life (OHRQoL).

**Methods:** The prospective study’s sample consisted of 22 pediatric oncology patients who were aged 6 years or younger and had active dental caries. Dental rehabilitation under general anesthesia (DRGA) was performed between chemotherapy cycles at King Abdulaziz University Hospital between November 2015 and July 2017. Parents self-completed the Early Childhood Oral Health Impact Scale (ECOHIS) before and one month after DRGA. The parents also rated the overall oral health status of their children by answering a global question before and after DRGA.

**Results:** At baseline, the children had significantly worse OHRQoL for the child 31.9 (7.8) and family 11.2 (3.5) domains. The OHRQoL significantly improved postoperatively (p-value = 0.005, Wilcoxon rank sum test). The effect size of the improvement was +1.8. All parents reported better oral health status on the global question after DRGA. There were no complications from the intervention other than mild pain at extraction sites.

**Conclusion:** DRGA markedly improved OHRQoL in pediatric oncology patients aged six years or younger, who were under chemotherapy. With close collaboration with the pediatric oncology team, DRGA can be safely initiated during chemotherapy.

**Key words:** Chemotherapy, dental rehabilitation, pediatric dentistry, pediatric oncology

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**OC-16 Mutation Survey of the PHEX Gene and Oral Manifestation in a Chinese Family with X-linked Dominant Hypophosphatemic Rickets**

**Wang Yuanyuan**

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**Abstract**

**Introduction:** X-linked dominant hypophosphatemic rickets (XLHOMIM#307800) is the most common genetic disorder of renal phosphate wasting with an approximate prevalence of 1 in 20,000 in humans. The main characteristics of hypophosphatemic rickets are defective renal phosphate re-absorption and abnormal bone mineralization. Until now, no more than 15 mutations in the PHEX gene have been reported in Chinese patients with familial XLH among all the 338 PHEX mutations (http://www.phexdb.mcgill.ca; Thu August 4 02:45:45 2016).

**Aim:** The aim of this study is to describe the oral manifestation of a Chinese XLH family, analyze the dentin structure alteration and gene mutation. Methods: In this XLH family, the oral manifestation was described by panoramic tomograph and oral photographs, dentin structure alteration was studied by both tooth section and 3D morphology measurement laser microscope, the gene mutation was detected by PCR technique. A comparison of the tooth structure between the patient and the health population was also studied in this research.

**Results:** Pulp infection and teeth loss were facilitated in XLH patients due to the anatomy change, hypophosphatemic dentin alterations in deciduous teeth displayed as large interglobular spaces between the unmerged calcospherites, while continuous dentin tubules regularly crossed a homogeneous dentin in control teeth. Radiographic examination revealed large pulp chambers
Conclusions: We reported a Chinese XLH family in this study, the dentin structure and gene mutation were studied. A PHEX gene mutation in this XLH Chinese family was reported, the 3D dentin structure in XLH patient was first described in this study, more studies will be needed in future for analyzing the phenotype-genotype relationship in Chinese population and compared it to the cases in other races. Our findings are useful for understanding the oral manifestation, dentin alteration and genetic basis of Chinese patients with XLH.

**OC-17 Revascularization Vs Apexification in the treatment of periapical periodontitis in young permanent teeth with central cusp deformity: a prospective randomized controlled trial**

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**Abstract**

**Background:** Periapical periodontitis caused by central cusp deformity, which is common in mandibular second molars, usually damage dental papilla, resulting in pulp necrosis and arrested root development. In these cases, the apical foramens stay open with short root and thin root canal wall, accompanied with apical cyst, apical abscess, root fracture or even osteomyelitis, eventually lead to loss of the young permanent teeth. Conventional, Apexification is used in these cases but few cases after apexification could achieve abnormal root morphology. Regenerative endodontic treatment (RET) provides a new treatment modality for the previously described cases, which has been proven by case series.

**Design:** 76 patients from 8 to 13 years old with apical periodontitis caused by abnormal central cusp were enrolled in the study. The patients were randomly assigned to RET and apexification groups with a ratio of 2 to 1, obtaining standard operation procedure of these two methods. X-ray and CBCT were used to measure the size of periapical lesions, root length, root thickness, and apical foramen size before and after treatments. Clinical performance was also observed.

**Results:** All the teeth were asymptomatic in two groups at one-year follow-up. Root development modalities in the study were divided into 4 type: ① Type I, increased root length and apex closure. ② Type II, increased root length but no change in apical foramen size. ③ Type III, no increased root length but a decrease in the size of the apical foramen. ④ Type IV, no significant root length increase or decrease in the size of the apical foramen. Among the 48 cases with revascularization treatment, 44 cases were found being Type I, 3 cases being Type II, 1 case being Type IV. Among all the 21 apexification cases, 4 cases were found with Type I, 2 cases with Type II, 14 cases with Type III, and only 1 case with Type IV. There was significant difference between these two groups in Type I.
Conclusion: compared with apexification, revascularization effectively promote the root morphology with closure of apical foramen, increased of wall thickness, and prolonged the root length in young permanent teeth with apical periodontitis.

Keywords: Revascularization; Apexification; Apical foramen; Root morphology

OC-18 The Analysis of the parotid saliva microbiome in Juvenile Recurrent Parotitis (JRP)

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Abstract

Background: Juvenile Recurrent Parotitis (JRP) is an infectious disease that occurs in children's parotid glands. It has the second most morbidity besides Mumps. There is no targeted anti-inflammatory drug for the clinical treatment at present, especially during the acute period, but the adopting broad-spectrum antibiotics. The pathogenesis of JRP is not very clear. Bacterial infection is one of the main reasons. Culture is the traditional bacteriological method, but some bacterials are difficult or cannot be obtained. In recent years, the 16SrRNA cloning sequencing method has provided a new method for the identification and analysis of the unknown microorganism without culturing. The technology has been gradually introduced into the analysis of oral microbial system, such as periodontal diseases and bacterial analysis of infected root canals. However, it has rare been reported in bacteriological examination of JRP by this method. It could help to understand the etiology and pathogenesis of the JRP by the microbiological examination of parotid fluid and to analysis the differences with normal children in this study.

Objective We aimed to investigate the characteristics of the oral microbiome in JRP individuals. It will provide a new direction for the etiology research and clinical treatment of the patients with JRP.

Method: The parotid saliva specimens were obtained from Juvenile Recurrent Parotitis and normal children (7 specimens from acute Juvenile Recurrent Parotitis(AJRP);27 specimens from chronic Juvenile Recurrent Parotitis(CJRP);16 specimens from normal children(NC)). We examined the gene sequencing of 16SrRNA of the microbiome by using Illumina Hiseq2500 PE250 high throughput sequencing platform. And the biological analysis were generated. The 3 groups of data were statistically compared.

Results: (1) In the three groups, there were statistically significant differences in chao1, Abundance Coverage Estimator(ACE) and shannon index (P<0.05), and no statistical differences in Simpson index. NC had the highest richness and diversity index, followed by CJRP and AJRP was the lowest. (2) The bacterial distribution within the different groups was analyzed. The results are shown at the genus level. We compared the percentages of the top 15 bacteria in the three groups and found the difference reached statistical significance of four bacterials: Streptococcus, Moraxella, Lautropia, Fusobacterium. (3) In the PCOA diagram, NC was relatively dispersed, while CJRP and AJRP were relatively concentrated. (4) In the heatmap diagram, NC and CJRP were clustered together. AJRP group was significantly different from those of the two groups.
Conclusion: Significant changes were shown in the richness and diversity of parotid microbiome in JRP.

Key words: Juvenile Recurrent Parotitis (JRP); parotid saliva; microbiome; diversity; richness

OC-19 MOTHER TO CHILD TRANSMISSION OF MUTANS STREPTOCOCCI IN EXTENDED FAMILY

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Abstract

Background: Mutans Streptococci (MS) bacteria are reported as the main bacteria causing dental caries in human that can be transmitted either vertically or horizontally. Caregiving habit plays crucial role in MS transmission, both by direct and indirect contact. In Indonesia, most of families are extended families, in which mother is not the only caregiver in the family. Mutans Streptococci (MS) is not oral indigenous bacteria because it is acquired by transmitted from people around the child during eruption of deciduous teeth. The detection of this bacteria can be used as a prevention of dental caries through microbiology approach.

Aim: The purposes of study were to identified the MS; and to determine the vertical transmission of MS in mother-child pairs of extended families using Matrix Assisted Laser Desorption Ionization - Time of Flight Mass Spectrometry (MALDI TOF-MS) and Polymerase Chain Reaction (PCR) methods.

Design: Plaque samples were collected from eight pairs of mother and child, and then cultured in BHIB and MSB media to obtain MS isolates. Next, the MS isolates were titrated with NaCl 0.45%, then placed on target plates and mixed with matrix liquid. The matrix liquid used consisted of water and acetonitrile, siano 4 hydroxycinnamic acid (CHCA), 2,5 dihydroxybenzoic acid (DHB), and 3 5 dimethoxy 4 hydroxycinnamic. The isolates colony of MS were put on the target plate of MALDITOF-MS (Vitex) and ionized to become Peptide Mass Fingerprint (PMF), then the colony was detected by database software. The DNA of detected MS was extracted by using conventional PCR with primer serotype C on 727 bp.

Results: Six (6) strains of MS were detected by MALDITOF-MS methode: 5 samples of S.mutans UA159, 2 samples of S.mutans 3SN1, 2 samples of S.mutans NFSM1, 2 samples of S.mutans 11A1, 2 samples of S.mutans U138, 2 samples of S.mutans 4SM1 and 1 sampel of other bacteria; while by PCR on 3 samples of MS were detected as serotype C. Mothers with moderate DMFT and high level of MS were detected to inherit similar strains to their child with the high level of probability, above 90% in extended family.

Conclusion: The study found 6 strains of S. mutans UA159, 3SN1, NFSM1, 11A1, U138, 4SM1 and
OC-20 The association between TNF gene polymorphism and different caries status in primary dentition

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Abstract

Background: Dental caries remains a significant issue in paediatric health and quality of life in modern society. It is related to oral hygiene and host susceptibility. Candidate genes encompass four main types of genes, i.e. enamel development, saliva composition, the immune response, and taste perception. Tumor necrosis factor alpha (TNF-α) is a pleiotropic cytokine involved in immune response to cariogenic bacteria, and rs1800629 causes the modification of transcriptional regulation and influences the serum level of TNF-α; however, the role of the TNF gene in caries susceptibility is unclear.

Objective: Previous researches reported an association of host gene polymorphisms with caries susceptibility; and these polymorphisms can serve as risk factors or confer protection, even when oral habits are included as covariates in the analyses. In this study, we investigated the association between TNF rs1800629 polymorphism and the severity of caries.

Design: Our study included 997 healthy paediatric subjects (aged 24-48 months) and categorised them into three groups: 497 with no caries or white-spot lesions; 227 with moderate caries (4 ≤ dmft ≤ 12); and 273 with severe caries (13 ≤ dmft ≤ 20). Data regarding the subjects’ basic information and oral habits were gathered by questionnaires. The TNF rs1800629 polymorphism alleles were genotyped by Sanger sequencing. The genotype distribution of the TNF SNP was tested by chi-squared test among the three groups. The associations of gene and behavioural factors with caries susceptibility were assessed by the regression test.

Results: The genotype frequency of rs1800629 showed significant difference between the caries-free and severe caries groups (p = 0.04), but showed no significant difference between the caries-free group and moderate caries group. Multiple regression analysis showed that the long duration of breastfeeding night feeding, bedtime feeding, and high frequency of sweet food intake increased the severity of caries (all p < 0.05); however, no interaction effects were detected between the TNF rs1800629 and oral habits in terms of caries susceptibility.

OC-21 Title: Is professional topical fluoride application effective in prevention and reversal of enamel white spot
Abstract

**Background:** Enamel White Spot Lesions (EWSLs) are a frequent side effect of multi-bracketed fixed orthodontic therapy with a reported prevalence of 50-70% after treatment. Self-applied topical fluorides in the form of mouth-rinses and dentifrices have been used widely against EWSLs but these agents depend mainly on the patient compliance with regards to frequency of brushing/rinsing and amount used. In contrast, professionally applied fluoride agents do not depend on patient compliance but have some other disadvantages. With the widespread use of self-applied fluoride agents, it is pertinent to think whether professional applied topical fluoride agents are effective against EWSLs occurring during or as a result of multi-bracketed fixed orthodontic therapy.

**Aim:** To systematically review the current literature on effectiveness of professionally applied topical fluorides (gels, foams and varnishes) in prevention and reversal of enamel white spot lesions (EWSLs) occurring during or after multi-bracketed fixed orthodontic therapy.

**Design:** A systematic literature search of relevant studies was conducted in 4 electronic databases viz. Cochrane library, Embase (via Ovid), Medline (via Ovid) and Scopus in addition to hand searching and searching of the grey literature. Two reviewers independently selected studies, extracted data, assessed risk of bias using Cochrane Risk of bias tool (RoB 2.0). For binary outcomes (presence or absence of EWSLs or studies assessing the difference in incidence), relative risks (RR) was computed and for continuous variables (change in mean QLF scores or mean DIAGNOdent scores), difference in means was calculated at a 95% confidence interval (CI). Sensitivity analysis by excluding high risk studies and sub-group analysis by pooling the data from similar studies were performed whenever feasible.

**Results:** Only 11 studies could fulfil the inclusion criteria as defined by PICO schema, out of which 7 studies assessed reversal of EWSLs and 4 assessed prevention of EWSLs during multi-bracketed fixed orthodontic therapy. Finally, 6 studies could be included in quantitative synthesis: 3 assessing reversal and 3 assessing prevention of EWSLs. Using Mantel-Haenszel fixed-effect method to analyze the effect of professional topical fluoride application on EWSLs, the risk ratio (RR) was found to be 0.39 with a 95% CI of 0.26 and 0.59. This could be interpreted as that professional topical fluoride agents decreases the risk of EWSLs in patients undergoing multi-bracketed fixed orthodontic therapy by at least 40% to at most 75%. Standardized mean difference was found to be 0.57 less in professional topical fluoride group than the control group (95% CI of -0.23 to -0.91).

**Conclusions:** Based on the present review and meta-analysis, it can be concluded that professional topical fluoride application brought about 25-30% reduction in incidence of EWSLs after debonding. Due to limited number of clinical trials, further research is warranted to identify the type of fluoride agent (varnish, gel or foam), the concentration of fluoride and the frequency of applications in patients undergoing multi-bracketed fixed orthodontic treatment. Owing to
difficulties in assessing the reversal of EWSLs and mineral content, it is still unclear that whether professional topical fluorides are effective in reversing EWSLs after multi-bracketed fixed orthodontic treatment.

**Keywords:** fluorides, dental caries, orthodontics, tooth demineralization

## OC-22 Change of Oral Hygiene Habits and Microbiome in SECC Children after General Anesthesia Therapy

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**Abstract**

**Background:** Caries in 2- to 4-year-old children are very prevalent in a subset of children. Because of their young age and the extensive and rampant form of caries they often develop, children frequently need to be treated under general anesthesia. However, despite thorough treatment under general anesthesia, the relapse rate is very high globally, ranging from 37% to 79%.

**Aim:** To figure out the relapse rate and study the shifts in supragingival microbiome after dental general anesthesia for childhood caries and make an investigation on caries relapse related factors.

**Design:** 83 Children aged 2-4 years who underwent one caries treatment session under general anesthesia participated in this study. Demographic, clinical characteristics, dietary habits and supragingival plaque of participants were collected before therapy, 1 month, 7 months and 13 months after therapy. Demographic, clinical characteristics and dietary habits were then analyzed to find out whether they related to caries relapse. Supragingival plaque from relapse-free and relapse children 13 months after therapy was sequenced using the 16S rRNA gene high-throughput approach.

**Results:** Relapse rate was 58.57% after 13 months of investigation. There were no significant differences in the children's demographic and clinical characteristics between the two groups. Patients in the relapse group had higher sugar intake frequencies than those in the relapse-free group during follow-up. The bacterial community diversity and relative abundance of bacterial taxa in relapse-free group 13 months after therapy has more significant shift compared with relapse group. Interactions between the microbiome and sugar intake frequency were found through co-occurrence networks.

**Conclusions:** Relapse rate was high after 13 months of investigation. Relapse group had higher sugar intake frequencies than the relapse-free group. Furthermore, the correlation between sugar intake frequency and microbiome is associated with the relapse.

**Keywords:** Childhood caries, Recurrence, High-throughput nucleotide sequencing, Microbiome, Diet

## OC-23 An Herbal Lollipop Inducing Salivary
Streptococcus mutans Levels Reduction in Chinese Preschool Children: An Effective Caries Preventive Method

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Abstract

Background: ECC (Early childhood caries) arose widely concern in mainland China due to its negative impact on children’s total health and well-being. Streptococcus mutans is considered as the principle causative organism in the initiation and progression of dental caries. Being an important traditional Chinese herbal medicine, licorice is widely used as sweetening agents. The compound Glycyrrhizol A, an ethanolic extract from licorice, exhibited strong antibacterial activity against S. mutans.

Aim: The purpose of this study was to determine the efficacy of an herbal lollipop containing Glycyrrhizol A for reducing salivary S. mutans levels in Chinese preschool children at high caries risk, and its effects on the entire oral microbiome.

Materials and methods: Saliva sampling and oral examination on preschool children (aged 3-6) were conducted in a hospital setting. Monoclonal antibody-based identification and quantification of S. mutans was performed on saliva samples taken from each subject. Children with salivary S.mutans levels >5x10^5 cells/ml were considered as high caries-risk.

Included children who were distributed in the study group followed a protocol of daily use of 2 lollipops. Their salivary S. mutans levels were assessed at baseline, 1, 2, 3 weeks after starting the study and a follow-up visit. Saliva samples from children in the control group were also collected and assessed at the same time without lollipops uptake.

To further investigate the effects of the lollipop on the entire oral microbiome, we performed 16S rDNA sequencing on baseline and 3-week samples from 5 subjects selected from each group, and analyzed the changes in microbiome.

Results: A total of 37 children were enrolled in the study. 23 high-risk children in the study group received lollipops and oral health care counseling. 14 children in the control group received oral health care counseling only. Due to insufficient saliva collection, medication use during the study, or inability to follow the study protocol, data from 6 participants in the study group and 5 from the control group were excluded from subsequent analysis. Significant decrease in a pooled salivary S. mutans level was observed in the study group and the level remained stable in the follow-up visit (percentage: 100.0%-90.6%-56.2%-14.1%-10.3%, shown in Fig. 1). No decrease was detected in the control group (percentage: 100.0%-73.0%-83.4%-128.3%, shown in Fig. 2).

After sequencing on selected subjects, data from 1 subject from the study group had to be excluded due to insufficient DNA. The Average change in alpha diversity in the study group increased by 7.3 (12.5%) while in the control group it decreased by 5.3 (5.8%).
Conclusion: The daily use of 2 herbal lollipops for 3 weeks significantly reduced the salivary S. mutans levels in Chinese preschool children. Sequencing results suggested that licorice extract in the lollipops does not have widespread killing activity and can preserve the diversity of the oral microbiome. This lollipop may serve as a safe, simple and effective caries preventive method.

Keywords: Early childhood caries, caries prevention, Streptococcus mutans, antibacterial agent

OC-24 OUTCOME OF REVASCULARIZATION OF 61 NON VITAL IMMATURE PERMANENT TEETH WITH FOLLOW UP PERIOD OF 32 MONTHS

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Abstract

Background: Management of thin, fragile dentinal wall and wide open apex of non vital immature permanent teeth is a great challenge especially in cases which less than half root has formed. Revascularization is an alternative approach to conventional method of apexification in the management of immature permanent teeth with compromised structural integrity.

Aim: To evaluate the treatment outcome of revascularization procedure on NVIPT. To investigate the association between root formation stage of NVIPT and treatment outcome.

Design: All NVIPT of healthy children which were treated by means of a standardized revascularization protocol from year 2013 to 2017 and had been periodically followed up for a minimum of 24 months were included in the study. All teeth were assessed clinically and radiographically. A mixture of triple antibiotic (Ciprofloxacin, Metronidazole and Minocycline) and copious irrigation (Normal saline, 0.2% Chlorhexidine and 0.5% Sodium Hypochloride) were used to disinfect the canal completely in all cases. Following this overinstrumentation was carried out to induce bleeding in order to create scaffold for the ingrowth of new tissue. Mineral Trioxide Aggregate was used as coronal restorative material in order to achieve a tight coronal seal. Romexis radiographic system was used to carry out quantitative analysis of the radiographs (degree of changes in root length and dentinal wall thickness). The data obtained were analyzed.
statistically using descriptive analysis and Chi-square test.

**Result:** Out of 82 cases, 61 NVIPT of 53 children with the mean age of 11 (SD ± 2.3) fulfilled the inclusion criteria. Etiology of vitality loss were delayed presentation of traumatized tooth (n=26), acute dental trauma (n=18), sequelae of untreated pulpal exposure of Leong’s premolar (n=14) and dental caries (n=3). 59% of teeth were presented with 2/3rd root formed (Nolla’s method). They were monitored closely for an average of 32 months (range of 24 to 48 months). 43 (70.5%) cases showed complete success with signs of resolution of periapical radiolucency, thickening of dentinal wall, continuation of root growth, apical closure and positive response to sensibility test. 14 (23.0%) cases demonstrated acceptable success with absence of signs and symptoms but lacking in any criteria of complete success. 4 (6.6%) cases had signs of treatment failure, needing further treatment which reduces the survival rate to 98.4%. Signs of failure can be observed at the minimum of 18 months review. There was significant association of treatment outcome and root formation stage of NVIPT (p<0.05). 75% of all 2/3rd formed teeth that undergone revascularization achieved success and 25% achieved partial success in the treatment outcome.

**Conclusion:** This study confirmed that revascularization is an effective treatment modality in treating NVIPT with favorable clinical outcome of thickening of dentinal wall, root growth and achieving apical closure. More than 2/3rd root development will result in higher success rate for revascularization treated tooth.

**Keywords:** Regenerative endodontics, Revascularization, Non vital immature permanent tooth

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**OC-25 In Situ Minimally Invasive Transitional Treatment for Incomplete Complicated Crown-root Fracture of Young Permanent Tooth**

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**Abstract**

**Introduction:** Complicated crown-root fracture is one of the most challenging types of dental trauma, usually requires extensive treatment and impacts the long-term life quality of patients. Recently a series of cases of incomplete complicated crown-root fracture of young permanent teeth were managed by transitional restoration following an in situ minimally invasive strategy to reduce the additional trauma and achieve an esthetic restoration with satisfied prognosis.

**Case reports:** A 9 years old girl came to the pediatric emergency dental clinic with a chief complaint of a left anterior tooth fracture by accident 4 hours ago. Her medical history was unremarkable. Clinical examination revealed a crown-root fracture of left maxillary central incisor with the pulp exposure, and the oblique fracture line of which extending from the middle third of the labial surface of crown to about 2mm subgingivally on the palatal side. The fracture was incomplete since the fragment was still attached to the palatal tissues and no on-going
hemorrhage. The periapical radiograph revealed an immature root. In order to gain a better environment for further root development, periodontal tissue healing and esthetic restoration, an in situ fragment reattachment by flowable composite resin and subsequent calcium hydroxide pulpotomy below the fracture line was processed. This case is followed up for three months and presented continuous root development without adverse symptoms. Unfortunately, the patient was hit at the same tooth again and re-fracture happened. The second fracture was at the previous attachment site and the sealing of the pulp was still complete. The second reattachment was done and followed up for another 6 months without adverse signs.

Beside this case, a case of 11 years old boy with similar oblique incomplete crown-root fracture and a case of 9 years old girl with vertical incomplete crown-root fracture were treated with the similar strategy and under satisfied follow-up.

**Comments:** Instead of extracting the fragment before the reattachment, preparing the tooth and reattachment of the fragment directly before the pulpectomy were done. Hence through this in situ and minimally invasive strategy, an esthetic and satisfied transitional restoration could be achieved while causing less possible trauma to the periodontal tissue, cementum or alveolar bone. After the root development has finished, further root canal therapy and post-crown restoration can be considered. However, there are risks of fragment re-fracture and micro-leakage. Long term follow-up and careful evaluation are in need.

**Keywords:** Minimally invasive treatment, In situ reattachment, Crown-root fracture, Young permanent teeth, Transitional restoration
PC-01 Double base (LCH&LGIC) and single base (LGIC) indirect pulp treatment in human primary molars: a randomized controlled trial

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Abstract

Background: Vital pulp therapy is important to the pediatric dentist in the preservation of cariously involved primary teeth in which deep decay extends across one or more surfaces of the tooth and closely approximates the pulp. Traditionally, the preferred therapeutic approach for treatment of such lesions is the pulpotomy or root canal therapy. Indirect pulp treatment (IPT) has been advocated as an alternative treatment approach. Studies on IPT show varying success rates of 73-97%. The necessity of re-opening the cavity and the question of the optimal capping material is still under debate. The simplicity of operator is also important to the pediatric dentist.

Purpose: the aim of this prospective in vivo study was to compare the clinical outcomes of indirect pulp treatment (IPT) with two rebasing way in large carious lesions in primary molars.

Methods: selection criteria: pairs of asymptomatic, contralateral primary molars treatment planned for IPT. Teeth were randomly selected capping with either light-cured calcium hydroxide and light-cured glass ionomer cement double base or light-cured glass ionomer cement single base.

Thirty-seven patients (42 pairs of teeth) were followed clinically and radiographically for 1 year.

Results: No clinical pathology was observed at 1 year. Radiographic findings indicated: no change in 32 teeth IPT use of single base LGIC and 29 teeth IPT use of double base (LCH&LGIC); calcific metamorphosis in 5 teeth IPT use of single base LGIC and 8 teeth IPT use of double base (LCH&LGIC); pathologic changes requiring observation in 5 teeth IPT use of single base LGIC and 5 teeth use of double base (LCH&LGIC); no extraction required teeth in both groups.

Conclusions: There was no significant difference between primary molars. Indirect pulp treatment is a successful technique and should be considered as an alternative pulp therapy procedure in deeply carious primary teeth. There was no significant different success rate of IPT between use of double base (LCH&LGIC) and single base (LGIC).

Key words: Indirect pulp therapy; primary molars; deep caries; randomized controlled trial

PC-02 Two Years Outcomes of Pulpotomy in Primary Molars with Mineral Trioxide Aggregate under General Anesthesia
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**Background:** Pulpotomy is the most widely used vital pulp therapy technique for treatment of deciduous teeth with carious pulp exposure, and its aims are to retain a functional tooth in the oral cavity until its exfoliation through the preservation of the radicular pulp. The choice of agent affects the success rate of pulpotomy mostly, an ideal pulpotomy agent must be bactericidal, promote healing of the radicular pulp, be biocompatible, offer the dentine–pulp complex a relative stable environment, support the regeneration of dentine–pulp complex and not interfere with the physiological process of root resorption. Nowadays, mineral trioxide aggregate (MTA) is developed as a bioactive and biocompatible cement for the purposes of direct pulp capping, apexification in immature teeth.

**Objective:** The objective of this retrospective study was to evaluate the clinical results of using MTA as pulp-dressing agents on cariously exposed vital pulps of primary molars coronal pulpotomy under general anesthesia.

**Methods:** The clinical and radiographic data of 118 primary molars were collected during 2013-2015. All teeth were restored with a glass ionomer cement base and stainless steel crowns after MTA coronal pulpotomy. Clinical and radiographic examinations were undertaken at the 1, 3, 6, 12, 18 and 24 months follow-up, furthermore, dentin bridge, pulp canal obliteration and internal root resorption, and external root resorption were observed during the recall visits.

**Results:** A total of 53 children was finally included in our study, with the mean age of 4.2 years. Both the clinical and radiographic success rate were 99.1% at the 6-month recall visit. After 12 months, the clinical success rate was 98.1%, and 97.8% for radiographic success. After 18 months, clinical success rate was 96.7%, and 94.5% for radiographic success. At 24 months follow-up, the success rates are 94.3% and 90.7% in clinics and radiography respectively. As well, after 24 months, 12.3% primary molars were observed dentin bridge, 15.3% exhibited pulp canal obliteration, the incidence rate of internal pulp canal root resorption and external pulp canal root resorption were 12.3% and 6.1% separately.

**Conclusions** The clinical effectiveness of coronal pulpotomy employing mineral trioxide aggregate on primary molars with deep caries under general anesthesia were very well. However, longer follow-up studies are required to confirm our findings.

**Key words:** primary molar; deep caries; MTA; pulpotomy; general anesthesia

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**PC-03 Evaluation of Microleakage and Shear Bond Strength of Biodentine™ to Composit resin at different**
Abstract

**Background:** In the case of pulp exposure due to traumatic injury, deep caries or developmental disturbances such as MIH (Molar incisor hypomineralization), a diagnosis of the pulp viability should be made first.

If the pulp is vital or in the state of reversible pulpitis, it is recommended to preserve the pulp through direct pulp capping or partial pulpotomy. Especially in the case of immature permanent teeth, it is important to preserve the vital pulp.

The conditions of the successful vital pulp therapy are the accurate diagnosis of the pulp state, proper caries removal, and aseptic procedure, but what is more important is to choose the right pulp capping material.

Calcium hydroxide has been used traditionally for the pulp capping material, but it causes microleakage due to dissolution of the material over time. Recently, mineral trioxide aggregate (MTA) has emerged as a substitute for this, but there is a disadvantage due to long setting time. Several pulp capping materials have been developed to overcome these limitations, and recently biodentine (Septodont, France) has been developed as a dentin substitute.

**Aim:** The purpose of this study is to evaluate the microleakage of Biodentine™ as pulp capping materials and to compare the shear bone strength between composite resin and biodentine with the different setting time.

**Design:** For microleakage evaluation, 70 bovine teeth were used. Cavity was formed on the labial surface, then filled with Biodentine™. The teeth were divided into 7 groups, each group consisted of 10 teeth. After different setting time (12 minutes, 45 minutes, 24 hours, 48 hours, 1 week, 2 weeks, and 1 month), Composite resin were applied on the upper side of Biodentine™. For microleakage evaluation, the specimens were immersed in a 0.5% fuchsin solution for 24 hours, then rinsed and dried. Each specimen was cut in half and observed with a electron microscope.

To evaluate shear bond strength, 210 pieces of acrylic resin blocks with a central groove were prepared, and the groove filled with Biodentine™. The acrylic resin blocks divided into 7 groups of 30 specimens each, and After different setting time (12 minutes, 45 minutes, 24 hours, 48 hours, 1 week, 2 weeks, and 1 month), composite resin were applied on the upper side of Biodentine™. The shear bond strength was measured with a universal testing machine.

**Results:** In microleakage there was significant difference that the 12minutes setting time group with the other experimental groups.

In the case of shear bond strength, the 12 minutes and 45 minutes setting time groups showed significant difference with the other experimental groups. Moreover the 12 minutes setting time group showed lower shear bond strength than the other experimental groups. More than 24 hours setting time groups showed high shear bond strength that offset polymerization shrinkage of the composite resin.

**Conclusions:** Considering the shear bond strengths and the microleakage in this experiment, it is desirable to restore the composite resin after a Biodentine™ setting time of at least 24 hours.

**Key word:** Biodentine, Microleakage, Pulp capping material, Setting time, Shear bond strength
PC-04 Effect of Doxycycline on Pulp and Periodontal Regeneration of Replanted Rat Molars

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Abstract

Background: Tooth avulsion refers to the complete displacement of the tooth from its alveolar socket by traumatic dental injury. Because of the severe damages to the PDL and the loss of blood supply to the pulp tissue that follows the avulsion, pulp necrosis and root resorption are usually expected after the tooth replantation. Doxycycline has been used to promote pulp and periodontal regeneration of replantation during replantation of avulsed teeth. However, the effect of doxycycline on an avulsed tooth that was preserved in a storage medium has not been fully evaluated yet.

Aim: The purpose of the present study was to evaluate regenerative effect of doxycycline on delayed replantation of rat molars that were preserved in storage media.

Design: Sixty maxillary first molars in Sprague Dawley rats, aged 6 to 8 weeks and approximately 150–200g in weight, were extracted, stored for different durations (5 min, 30 min, and 60 min) and then replanted. The rats were divided into two groups according to root surface treatment modality; root surface treatment with doxycycline and no doxycycline treatment. The avulsed teeth in the doxycycline group were treated with the following regimen: doxycycline (Hana Pharm Co., Seoul, Korea) 1 mg per 20 ml of saline for a 5-min soaking prior to replantation. At 8 weeks after the replantation, the animals were sacrificed and evaluated using micro-computed tomography (micro-CT) and histological analysis.

Results: Root surface treatment with doxycycline improved pulp revascularization and inhibited pulp inflammation after replantation of avulsed rat teeth. Also, root surface treatment with doxycycline improved periodontal regeneration and decreased root resorption and inflammatory response in periodontal tissue. However, no significant differences in pulp revascularization and periodontal regeneration were found between the groups of root surface treatment with doxycycline according to storage time in HBSS.

Conclusions: Within the limits of the present study, doxycycline has shown promising results as a root surface treatment agent in avulsed tooth replantation after preservation in a storage medium.

Key words: Dental Trauma; Doxycycline; Regeneration; Tooth injury

PC-05 S11-346: Periodontal Prognosis of 100 Traumatically Intruded Permanent Teeth in Children
and Adolescents -A Retrospective Study

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Abstract

Background: The periodontal prognosis of permanent teeth traumatically intrusion is poor and complications include inflammatory root resorption and replacement resorption.

Objective: This study aims to analyze teeth spontaneous eruption and root resorption and figure out the related factors.

Design: Clinical data of intrusive luxation cases in 6 to 18 years old during 2007–2016 was recorded, including: demographic information, clinical examination, root development, the extent of intrusion, pulp vitality, treatment and periodontal prognosis. The rate of spontaneous eruption teeth and periodontal complications was calculated and relationships between factors and prognosis were analyzed by Fischer’s exact test and chi-squared test. Cox regression analysis and Kaplan–Meier survival analysis were used to illustrate the occurrence time of re-eruption and root resorption.

Results: Seventy-one patients (mean aged 9.03±2.27 years) with 100 teeth were recruited. Observation time ranged from 3 to 87 months with median was 10 months. The main reason for tooth injury was falling down to ground (43.7%). In 66 teeth which were allowed eruption without intervention, forty-five (68.2%) erupted. Immature teeth had higher eruption rate (Exp(B)=2.25) than mature teeth. Mean eruption time of immature teeth was 10.7 months while mature teeth meanly erupted in 23.5 months. In 52 teeth whose follow-up period was up to 12 months, replacement resorption and inflammatory resorption occurred in 8 teeth (15.4%) and 14 teeth (26.9%) respectively. In addition, teeth with severe intrusive depth (>7mm), mature root, infected pulp, alveolar process fracture or active treatment (orthodontic and surgical repositioning) exhibited root resorption earlier than others.

Conclusion: Spontaneous eruption of intruded teeth was significantly dependent on root development. Severe intrusive depth (>7mm), mature root, infected pulp, alveolar process fracture or active treatment (orthodontic and surgical repositioning) might accelerate replacement or inflammatory resorption in young permanent teeth.

Keywords: Children and adolescents, Traumatically intrusion, Spontaneous eruption, Root resorption

PC-06 Use of laser Doppler flowmetry to estimate vitality of immaturate maxillary incisor teeth with crown fractures and subluxations

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Abstract

The purpose of this study was to evaluate the relevance between the pulpal condition and LDF tests, determining the accuracy of such tests after traumatic dental injuries, and to provide the clinician a LDF pulp testing methods and allow greater insight into the interpretation of pulp testing results, especially in young patients.

Materials and methods: The sample comprised 89 patients (63 boys, 26 girls) with 268 immature maxillary incisor teeth with crown fractures and subluxations, either isolated or associated, which were treated at the Department of Pediatric Dentistry, PKU school and hospital of stomatology in Beijing, China from 2013 to 2017. The subjects’ ages at the time of injury ranged from 6.5 to 14.5 years (mean 9.65). The following clinical data concerning the pulpal condition were collected at the initial visit and during the follow-up appointments: tooth color, response to pulp sensibility tests, tenderness to percussion and the presence of swelling or fistula. Periapical radiographs were taken in the first visit and during the follow-up examination, with the parallelisation technique, that was used to estimate the developing of root or to find periapical diseases. The pulp prognosis was categorized as pulp survival, pulp necrosis or pulp obliteration. Then, Laser Doppler Flowmetry (LDF) was used to test the pulp, and PU, CMBC and velocity were read. Patients were first seen up to 1 month after the trauma and were followed for at least 6 months or until teeth became necrotic.

Results: Statistical analysis was performed using independent samples test. Measurement unit of PU, Pulp survival is 10.36±0.28, Pulp necrosis is 5.54±0.80, and Pulp obliteration is 8.41±3.80 (p=0.000). Measurement unit of CMBC, Pulp survival is 29.23±1.50, Pulp necrosis is 9.80±1.33, and Pulp obliteration is 49.21±19.99 (p=0.018). Measurement unit of Velocity, Pulp survival is 71.09±2.18, Pulp necrosis is 92.46±14.48, and Pulp obliteration is 41.02±25.59 (p=0.112). ROC curve analysis shows that (95 percent confidence interval): AUC for digital PU, 0.688±0.054; AUC for digital CMBC, 0.694±0.061; AUC for digital velocity, 0.492±0.054. Conclusions: Laser Doppler flowmetry can objectively record the condition of pulp. The measured values of pulp vitality in different situations are basically stable in a corresponding range. PU and CMBC were more closely related to pulp status.

PC-07 Factors Influencing Elapsed Time to Dental Care in Children and Adolescents with Traumatic Dental Injuries

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Abstract

Background: When traumatic dental injuries (TDIs) occur, prompt emergency care is a critical factor for better prognosis. There have been a lot of retrospective studies of TDIs. However, previous studies have focused on various factors such as the prevalence, cause, types, location,
gender and age distribution of TDIs. In spite of importance of time factors, there are not many studies on them.

**Aim:** The aim of this study was to retrospectively investigate the environmental factors influencing time factors and to provide dental trauma guide for teachers and parents of children and adolescents.

**Design:** This study investigated 1272 patients who visited the department of pediatric dentistry and emergency room of Kyung Hee University dental hospital (KHDH) with a chief complaint of TDIs. Of the 1272 patients, 949 patients who met the inclusion criteria were selected. Medical records and radiographs of 949 were reviewed and age, gender, occurrence time of TDIs, type of TDIs and the elapsed time to dental care were collected. The collected data was statistically analyzed.

**Results:** The mean age of all the patients was 4.4 years (52 months) and boys were 2.08 times more likely to experience TDIs than girls. There was no monthly difference in the occurrence time of TDIs, but TDIs occurred later in the summer or holiday \((p<0.05)\). There was no difference in the elapsed time according to the occurrence time, month and season, but the elapsed time was shorter when soft tissue injuries were involved \((p<0.05)\). Regarding the place of TDIs, the elapsed time was shorter when TDIs occurred in the educational institutions. Patients who visited the dental clinic within 1 hour after TDIs accounted for 39.9% of all patients. And about half of all patients visited dental clinic within 1.5 hours after TDIs. Besides, 90.6% of patients visited dental care services within 24 hours.

**Conclusions:** Based on the finding of present study, the educational or training program regarding emergency dental management should be provided for child and adolescent parents. Furthermore, these finding can also be used as a fundamental data for statistical surveys of dental emergency treatment.

**Keywords:** Tooth Injuries, Time Factors, Emergency Treatment

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**PC-08 Relationship Between Premature loss of Mandibular Primary Canine and Lateral Craniofacial Morphology in the Early Mixed Dentition**

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**Abstract**

**Background:** The premature loss of primary canine on mandible is relatively frequent in early mixed dentition. In situations in which there is crowding and inadequate arch length, it is common for permanent lateral incisors to resorb the mesial portion of deciduous canines upon eruption causing their premature loss. However, several factors can be assumed to affect premature loss of mandibular primary canine, such as direction of mandibular growth, the oral and perioral musculature, skeletal characteristics.

**Aim:** The purpose of this study was to investigate for dentofacial factor that might be associated...
with premature loss of primary canine in early mixed dentition.

**Design:** Lateral cephalographs, panoramic radiographs and dental casts of children who attended the Pediatric Dental Clinic of Pusan National University Dental Hospital were retrospectively evaluated. 39 patients (18 boys, 21 girls) with premature loss of primary canine were selected. Dental casts were measured size of maxillary and mandibular incisor, arch length discrepancy (ALD). Lateral cephalometric radiographs were also evaluated for skeletal characteristics. These are compared with Korean standard values.

**Results:** The mean age of patients was $8.02 \pm 0.79$ years ($8.19 \pm 0.88$ years for boys and $7.88 \pm 0.69$ years for girls) and there is no significant difference according to gender ($p > 0.05$). The arch length discrepancy was $-0.26 \pm 3.17$ mm in mandible. The mean value of mesiodistal length on central incisor was $8.74 \pm 0.49$ mm ($8.94 \pm 0.45$ mm for boys and $8.57 \pm 0.46$ mm for girls) in the maxilla and $5.54 \pm 0.34$ mm ($5.66 \pm 0.35$ mm for boys and $5.44 \pm 0.30$ mm for girls) in the mandible. Both boys and girls had greater size when compared with normal value ($p < 0.05$). It was determined that patients with premature loss of primary canine on mandible had smaller APDI, ANB, SNB, Wits appraisal, A-N perpend, Pog-N perpend ($p < 0.05$).

**Conclusions:** The premature loss of primary canine on mandible is not only a tooth-arch size discrepancy. Antero-posterior skeletal morphology also contribute to this phenomenon.

**Keywords:** Premature tooth loss, Mandibular primary canine, Skeletal morphology, Lateral cephalometric radiographs

PC-09 Oral health, caries risk profiles, and oral microbiome of pediatric patients with leukemia submitted to chemotherapy

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**Abstract**

**Background:** Chemotherapy is the primary treatment modality used for patients with acute lymphoblastic leukemia (ALL), but inevitably causes microbiota-related oral complications.

**Aim.** To investigate the effects of high-dose methotrexate (HDMTX) on oral health status, caries risk, and oral microbiome in pediatric patients with ALL.

**Design:** Thirty-nine children with ALL of post-HDMTX therapy and thirty-nine control children were enrolled. Demographic information and overall health condition were obtained through filling out a questionnaire or consulting medical records. Oral examination was performed to assess caries status, gingival health, mucosa health, and plaque index. Salivary flow rate, salivary
buffer capacity, and Plaque pH were also investigated. Cariogram was used to assess the overall caries risk. Supragingival samples of thirteen ALL subjects and thirteen healthy control subjects were randomly selected to perform a 16S ribosomal RNA gene 454 pyrosequencing, using PCR primers targeting the V1- V3 hypervariable 16S rRNA gene regions. Raw sequence data were screened, trimmed, and filtered using Seqcln and MOTHUR.

Results: The prevalence of gingivitis and oral mucositis in ALL group was significantly higher than that of control group (p < 0.05). Children with ALL demonstrated higher caries risk compared with healthy controls based upon Cariogram (p < 0.05). We found significantly lower salivary secretion rate and poorer oral hygiene in ALL group (p < 0.05). We also observed less alpha diversity and significant differences in the composition of the oral microbiome compared to healthy controls.

Conclusions: ALL patients of post-HDMTX therapy demonstrated compromised oral health, high caries risk, and oral microbial dybiosis. These findings may possibly be of clinical importance in developing better strategies for personalized preventive management.

Key words: acute lymphoblastic leukemia, oral health, caries risk, oral microbiome

Financial support: This study was supported by National Natural Science Foundation of China (81600864) and Scientific Research Foundation for Young Teachers of Sichuan University (2017SCU11007)

Potential conflicts of interest: None.

PC-10 Clinical observation of immature permanent teeth with apical periodontitis after pulp revascularization procedures

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Abstract

Background: Pulpitis and periapical diseases of young permanent teeth are common diseases in children, and have always been difficult to treat. In clinic, apexification is often used to make root development or form a apical closure, or use one-step technique to form a apical barrier by using MTA. These two methods have some drawbacks, which can not thicken the weak root canal wall, and may have bad prognosis such as root fracture. Therefore these two methods can not achieve the ideal treatment effect. Regenerative endodontic therapies can promote the deposition of dentin in the root canal walls of young permanent teeth with dental pulp necrosis, so as to enhance their root strength. Pulp revascularization is one of the easiest regenerative pulp therapies. Objective  To observe the immature permanent teeth with apical periodontitis after pulp revascularization procedures and evaluate the clinical effect .

Methods: 16 immature permanent teeth with apical periodontitis were selected and performed pulp revascularization procedures. These immature permanent teeth were followed up for two years. The clinical effect was evaluated through clinical and radiographic examination.
**Results:** Continuation of root development was observed in most of these teeth, although their responses to pulp revascularization procedures were various. The results of the electric pulp vitality test were positive in 13 teeth of these 16 teeth. All these 16 revascularized immature permanent teeth showed the radiographic evidence of periapical wound healing and clinical evidence of resolution of signs and symptoms. The average healing time of the periapical wound was 4.1 months; and the healing time was different depending on the severity of the apical periodontitis. The smaller periapical wounds generally disappeared at the revisit 3 months after revascularization, and the larger ones commonly needed 6 – 9 months. The result of clinical effect evaluation was comparatively satisfactory. 12 of 16 teeth were success, 4 teeth were improvement, and 0 teeth was failure.

**Conclusions:** The clinical effect of the immature permanent teeth with apical periodontitis after pulp revascularization procedures was comparatively satisfactory, however, the outcome of continued root development was not as predictable as normal teeth.

**Key words:** pulp revascularization; immature permanent teeth; apical periodontitis

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**PC-11 A novel 4q25 microdeletion encompassing PITX2 associated with Rieger syndrome**

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**Tohoku University**

**Abstract**

**BACKGROUND:** Axenfeld-Rieger syndrome (ARS) is a rare autosomal dominant disorder mainly characterized by specific anterior segment abnormalities of the eye with or without systemic manifestations. Rieger syndrome (RS) is the most severe form of ARS, affecting the eye, teeth, and umbilicus. It is also one of the most serious causes of tooth agenesis. And the paired like homeodomain 2 (PITX2) gene is often implicated in its pathogenesis. The protein product of the PITX2 gene is a developmental transcription factor that regulates the expression of downstream target genes. It plays an important role in normal embryonic development. Both mutations and copy number variations (CNVs) of PITX2 cause RS.

**OBJECTIVE:** The present study aimed to characterize clinical features and identify the underlying genetic defect in a Chinese patient with RS.

**SUBJECTS AND METHODS:** A Chinese family affected with RS was enrolled. Clinical examinations were performed to determine the phenotypic characteristics. DNA samples were screened for PITX2 gene mutations and CNVs using Sanger sequencing and quantitative genomic PCR analysis (qPCR). Chromosomal microarray analysis (CMA) was performed to fine-map the CNVs. Single nucleotide polymorphism (SNP) analysis was developed to find clues about gene deletion.

**RESULTS:** The proband suffered with severe hypodontia and conical teeth in her permanent dentition. A midface deficiency and prominent forehead were also presented. No PITX2 point mutations were found in this Chinese family, but a heterozygous deletion involving PITX2 was suspected and verified by the SNPs analysis and qPCR in the proband. An approximately 0.47 Mb (chr4: 111, 334, 313–111, 799, 327, GRCh37/hg19) deletion including PITX2 was finally
determined by CMA.

**CONCLUSIONS:** To our knowledge, this is the first reported case of RS caused by a CNV of the *PITX2* gene in a Chinese patient. CNV screening must be considered if point mutation screens yield negative results in these patients. The distribution of SNP genotypes among family members may also provide clues about gene deletion.

**Keywords:** Rieger syndrome; hypodontia; eye manifestations; microdeletion; transcription factor

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**PC-12 Salivary amino acids profile of children with severe early childhood caries**

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**Abstract**

**Background:** Saliva is an important factor in the development of dental caries. In general, saliva consists in a mixture of proteins, electrolytes and small organic compounds. Although infection of cariogenic bacteria, inappropriate feeding and diet habits, and poor oral hygiene are all causal factors; but endogenous factors, such as characteristics of saliva, may explain why some children are more susceptible to caries.

**Aim:** This study aimed to detect the contents of twenty major free amino acids in saliva of both caries-free and SECC children, in order to investigate the possible relationship of saliva amino acid composition and caries.

**Design:** Unstimulated saliva was collected from 15 3-to-5-year-old children with severe caries (CA group) and 15 caries-free children of the same age (CF group). Amino acid composition was determined by high-performance liquid chromatography – tandem mass spectrometry.

**Results:** Concentrations of twenty amino acids were measured. Eight of these twenty amino acids exhibited significantly different concentrations between CA and CF group, including alanine, methionine, leucine, tryptophan, serine, threonine, valine, and isoleucine. In addition, their concentrations were all significantly higher in the CA group. Glycine and proline had the highest concentrations in unstimulated saliva of both groups.

**Conclusions:** This study provided new insights about the saliva amino acids amount and composition. Understanding the saliva amino acid profile may give important information about several biological and sensory processes during caries development.

**Keywords:** amino acid, saliva, caries

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**PC-13 Knockout of Axin1 in Osterix-expressing cells causes fusion of cranial suture defect and enamel**
hypoplasia

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Abstract

Background: Axin1, a member of the β-catenin destruction complex, plays a critical role in embryonic development. Disrupting Axin1 causes pathogenesis of various inflammatory diseases. Stabilization of Axin1 leads to impairment of β-catenin activation in osteoblasts, suggesting a potential link between Axin1 and bone developmental disorders.

Objective: To further investigate whether Axin1 regulates skeletogenesis of craniofacial bone. We have generated mice with conditional knockout of Axin1 driven by the osterix promoter (Axin1(fl/fl) Osx-cre transgenic mice) and determined if knockout of Axin1 in osterix-expressing cells could affect the homeostasis of bone tissue.

Methods: Osx-Cre mice were crossed with Axin1(fl/fl) mice to generate Axin1(fl/+) Osx-Cre mice. And Axin1(fl/fl) mice were then crossed with Axin1(fl/+) Osx-Cre mice to generate Axin1(fl/fl) Osx-cre mice. Craniofacial bones were harvested when the mice were at 1- and 2-month-old. Changes in bone mass and teeth morphology were examined by imaging analysis.

Results: The Axin1Cko mice revealed developmental defects of the cranial skull at postnatal stage. The mutant mice were born without any noticeable distinctions. A reduced growth of the body and head became obvious within the first 1 month after birth. This phenotypic defects prompted us to examine the cranial sutures, which are critical for calvarial osteogenesis. The metopic sutures were delay fused in the Axin1Cko mice. Unilateral or bilateral fusion of the anterior metopic suture was observed in wild-type mice. The changes were similar in the sagittal sutures. The overlaying of cranial bones and endocranial bridging normally does not occur or delayed on the Axin1Cko mice at 1 and 2 months. Deletion of Axin1 caused a 35% and 45% reduction in bone volume of both cranial neural crest-derived skeletal elements and mesoderm-derived skeletal elements. Imaging analysis of mandibular incisor from Axin1(fl/fl) Osx-Cre mice showed hypoplasia of the enamel and malocclusion. Axin1(fl/fl) Osx-Cre mice exhibit thinner enamel. The gross morphology of the molars was similar in wild-type and mutant mice.

Conclusion: Taken together, these data demonstrated that Axin1 regulates the homeostasis of mineralized tissues of the craniofacial complex.

Keywords: Axin1; cranial sutures; mineralization; Osx-Cre

PC-14 Iontophoretic administration of bisphosphonates: a trial for establishing a method to prevent their side effects and to retain their potent anti-bone resorptive
Abstract

BACKGROUND: Bisphosphonates (BPs) containing nitrogen (N-BPs) exhibit far stronger anti-bone-resorptive effects than non-nitrogen-containing BPs. However, N-BPs have inflammatory/necrotic side effects. For preventing such side effects and retain their potent anti-bone resorptive effects, they can be administered under limited condition. When orally administered to many osteoporotic patients, the patients must take them at the time of rising, together with 180 ml or more water, without lying (for 30 min or more), eating, drinking, and taking other drugs. Nevertheless, due to the lesions of esophagus and/or stomach, many patients (mostly aged) drop out from the therapy. When intravenously given, N-BPs must be diluted with a lot of saline (e.g., at least 100 ml), and the diluted solution must be dripped into patients very slowly, taking 15 min or more. Even so, in addition to inflammatory side effects (such as fever and pain in muscles and joints) and many cases of osteonecrosis of jaws (well-known as BRONJ) have been reported. N-BPs are also given to children with osteogenesis imperfecta. Thus, safe, reliable and simple drug-delivery systems are needed for therapies using N-BPs.

Aim: Iontophoresis (IOP) is a method of transdermal delivery of ionic drugs put on the skin as a solution by giving a voltage gradient on the skin. It does not utilize a syringe and needle. Therefore, IOP is painless and noninvasive. Moreover, it has a merit to avoid first-pass metabolism (hepatic drug metabolism). Zoledronate (as well as other N-BPs) is a negatively charged drug in neutral environment, has the most potent anti-bone resorptive effect, and is the N-BP cited to exhibit the most frequent inflammatory side effects, including BRONJ. Here, we examined the effects of IOP of zoledronate on both its anti-bone resorptive and inflammatory effects in mice.

MATERIALS AND METHODS: IOP was conducted in BALB/c male mice (6 weeks old), using a commercially available iontophoresis machine (Phoresor II Auto; Iomed, Inc., Salt Lake City, UT, U.S.A.). Collodion electrode units for electroencephalography were retained on ear-pinnas by a self-made adapter. Inflammatory effects were evaluated and compared with those caused by intradermally injected zoledronate into ear-pinnas as described previously. We have reported that a clear sclerotic band (called “BP band”) is detectable in tibias by radiography a few weeks after a single administration of a BP to mice, reflecting its inhibition of bone resorption. Therefore, the anti-bone-resorptive effect of zoledronate was evaluated by the ability to produce BP band.

RESULTS AND CONCLUSION: We found an appropriate condition of IOP, under which zoledronate is taken through ear-pinna skins and exhibits its potent anti-bone-resorptive effect without producing lesions in ear-pinnas. This finding suggests that IOP delivery of N-BPs might be an attractive method as a strategy for the safe administration of N-BPs to aged as well as pediatric
PC-15 Effect of xylitol toothpaste on preventing dental caries: a systematic review

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Abstract

Background: Dental caries remains a serious oral health problem affecting people’s quality of life. Xylitol is introduced in toothpaste to prevent dental caries, but the evidence of xylitol toothpaste for caries prevention is still not specified.

Aim: This study aimed to systematically review and evaluate the effectiveness of xylitol toothpaste to prevent dental caries with comparison to placebo or other toothpaste in children or adult.

Design: Pubmed, Web of Science, Cochrane library, Medline via Ovid, Scopus and Embase database via Ovid were searched using the keywords of “xylitol”, “dental caries”, “tooth decay” and “toothpaste” or “dentifrices” to the date of December 2017. Randomized or controlled clinical trials with restriction to human using xylitol-containing toothpaste for at least one month were included. Two independent reviewers went through the electronic results searched in the databases and assessed the articles which met the criteria. Relevant data were extracted from the included studies to perform meta-analysis. Risk and bias of the studies were assessed independently. The primary endpoints were measured by the mean index of decayed, missing, filled surfaces or teeth (DFS score) and S. mutans level (MS level) in plaque or saliva.

Results: Nine studies with 4734 participants were included. Five of them were categorized as unclear risk of bias, and four were of high risk of bias. Two studies showed a significant reduction (P=0.017) in the DFS score for participants using xylitol toothpaste (10%) in addition to fluoride when compared to those using fluoride only toothpaste for 2.5-3 years study period. The overall WMD (Weighted Mean Difference) was -0.28 (95%CI: -0.42, -0.14). For MS level in plaque, two studies showed a significant reduction (P=0. 019) in the number of MS using xylitol toothpaste (10%) versus placebo toothpaste within 3-6 months. The overall WMD (log CFU) was -0.64 (95%CI: -0.94, -0.34). For MS level in saliva, three studies showed a significant reduction (P<0.001) in the number of MS using xylitol toothpaste (5%, 9.9% and 10%) versus placebo toothpaste within 3-6 months. The overall WMD (log CFU) was -0.28 (95%CI: -0.45, -0.12). Four of the nine studies showed that xylitol toothpaste had no significant difference in reducing dental caries or the number of MS, however their data were different and could not be combined for analysis.

Conclusions: There is weak evidence showing daily use of xylitol toothpaste in addition to fluoride helped reducing dental caries and the use of xylitol toothpaste could reduce the MS level in plaque/saliva. However, there is also no direct comparison between xylitol toothpaste and fluoride toothpaste. More proper well-designed clinical trials and evidence are needed.
PC-16 Antibacterial Effects of Virgin Olive Oil and Virgin Coconut Oil on *Streptococcus Sobrinus* and *Lactobacillus Casei*

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**Abstract**

**Background:** In pharmaceutical industry, new discovery in the usage of plant extracts as an alternative to synthetically derived compounds has always garnered some attention. In Malaysia, virgin olive and virgin coconut oils are two readily edible oils which are extracted from natural sources due to several beneficial effects on health such as anti-hypertensive, anti-diabetic, anticarcinogenic, antiatherosclerotic, antiinflammatory and antibacterial activities. The use of an extract from natural plant is a good alternative to chemical therapy compounds due to fewer adverse side effects, better patient tolerance, renewability and biodegradability. Hence, these oils may have potential in dentistry as an alternative to conventional treatments. However, to date there is no study on antibacterial effects of these oils against *Streptococcus sobrinus* and *Lactobacillus casei*.

**Aim:** To investigate antibacterial effects of virgin olive and virgin coconut oils against *Streptococcus sobrinus* ATCC 33478 and *Lactobacillus casei* ATCC393.

**Design:** *In-vitro* antibacterial activities of the oils in terms of its minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) against the two bacteria were examined using two-fold broth microdilution methods. One percent ethanol was used to solubilize the two oils in the BHI and MRS broth for respective bacteria. Chlorhexidine 0.12% and broth were serve as positive and negative controls, respectively.

**Results:** Virgin coconut oil exhibited significantly higher antibacterial activities against *Streptococcus sobrinus* and *Lactobacillus casei*, with minimum inhibitory concentration values of 1.56 and 3.13%, respectively. While, virgin olive oil showed antibacterial activities at 6.25% for *Streptococcus sobrinus* and 12.5% for *Lactobacillus casei*. Both oils are only showed bactericidal activities at 100% concentration.

**Conclusions:** This study was a preliminary evaluation of antibacterial activity of the virgin olive and virgin coconut oils. The use of these oils against *Streptococcus sobrinus* and *Lactobacillus casei* could be used as alternative to chemical antibacterial agents or mouthwash as these are effective in controlling bacteria responsible for oral infections.

**Keywords:** Antibacterial activity, Virgin coconut oil, Virgin olive oil, Minimum inhibitory concentration
PC-17 Label-Free Protein Profiling of SHED-Derived neural cells

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Abstract

Background: In the previous study, we have confirmed that stem cells from exfoliated deciduous teeth (SHED) have potential to differentiate into neural sensory-like cells and be applied in neural regeneration. However, we still lack a comprehensive view of the biological changes on molecule level of SHED after neural differentiation. Mass spectrometry (MS) based proteomics technology provides a powerful tool to gain a global insight of proteins expressed in the SHED-derived neural cells.

Object: This research aimed to explore the protein profile of SHED both before and after neural induction using lable-free proteomic technology, and further analyze the biological and functional changes of neural induced SHED, thus finally gain better understanding on biological characteristics of neural differentiated SHED which are to be used in stem cell therapy.

Method: SHED were induced towards neural cells with a cocktail of growth factors in vitro for 24 days. Protein samples of both control (non-induced SHED) and induced group (induced SHED, iSHED) were prepared in triplicate. The samples were processed according to the filter-aided sample preparation (FASP) method, and then separated by high pH reverse phase chromatography. Digested proteins were loaded and separated by nano-LC-MS/MS. The MS/MS spectra raw data were extracted, searched against Uniprot Human database and generated label-free quantitation with MaxQuant software. Significantly differential proteins in two groups were selected out using Perseus software (FDR=0.05, t test p-values< 0.05). Bioinformatics analysis were performed using Uniprot, Panther and Metascape resources.

Results: A total of 4601 individual proteins were identified with 4553 detected in all 6 samples, 37 proteins only detected in control group and 11 proteins only detected in induced cells. We screened out 46 downregulated proteins and 25 upregulated proteins in iSHED (including those expressed in only one group) with statistical significance. GO analysis in biological-process domain discovered that after neural differentiation, proteins promoting cell proliferation and inhibiting apoptosis (such as Hepatocyte growth factor, HGF; family molecular chaperone regulator 1, BAG1) were downregulated, and inhibiting cell proliferation and initiating apoptosis (such as Cyclin-dependent kinase inhibitor 2A, CDKN2A; Phosphatidylinositol 3,4,5-trisphosphate-dependent Rac exchanger 1 protein, PREX1) were upregulated. Proteins matched to immune system process and inflammation were similar in two groups; metabolic process and cellular process functions were decreased in iSHED, suggesting that the induced cells proliferated slowly and maintained in a relative quiescent state. From the sight of molecular-function annotation category, the receptor, structural and catalytic activity were relatively competent in SHED-derived neurons, indicating complex, balanced yet good vitality of iSHED.
**Conclusion:** Protein profile of neural induced SHED reveals that iSHED maintains in slow growth yet good vitality. SHED may be a promising stem cell source for neural diseases therapy.

**Figure 1:** heat map of proteins detected only in SHED or iSHED

**Figure 2:** heat map and volcano plot of upregulated or downregulated proteins
Figure 3: Bar chart about GO annotation of biological process of SHED and iSHED.

Figure 4: Bar chart about GO annotation of molecular process of SHED and iSHED.
Abstract

**Background:** Early childhood caries (ECC) is one of the most prevalent dental diseases afflicting a large proportion of children worldwide, which affect physical and psychological health of the children. Therefore, the preventive intervention of and early diagnosis of ECC showed particularly clinical importance. As an important host factor of caries susceptibility, saliva, especially saliva proteins, may serve as useful biomarkers in predicting caries occurrence and prognosis. The relationship between salivary proteins and dental caries is yet to be well defined, and the biomarker information remains unclear.

**Objective:** The aim of the present study was to characterize the oral healthy and caries related salivary proteome and determine the differences in salivary protein expression of children without and with ECC. The most specifically salivary proteins will be determined which may be further used as biomarker for ECC.

**Methods:** In this study, whole unstimulated saliva samples were collected from 64 preschool children (age 3-5 years) with ECC (32) and caries-free (CF = 32). The samples were further established salivary proteome profiles by using SDS-PAGE stained by silver nitrate. Nano-liquid chromatography-tandem mass spectrometry (LC-MS/MS) was used for the proteomic analysis in selected SDS-PAGE gel bands. Western blotting of specific antibodies for Alpha-1-Acid Glycoprotein (AGP), Anti-Cysteine-rich secretory proteins 3 (CRISP3), Cystatin A, Lactoperoxidase (LPO), GAPDH (glyceraldehyde-3-phosphate dehydrogenase) was used to identify and quantify the proteins. Label free quantification method was used to measure the relative amount of proteins from different samples. The samples were digested by trypsin and peptides were directly analyzed by nano LC-MS/MS without isotope labeling, and then bioinformatics analysis of the data were finished by GO annotation, biological pathway analysis, hierarchical clustering analysis, and protein-protein interaction analysis. Data was normalized based on the total spectrum count of all the proteins in the most abundant sample and compare the peak area to determine the relative expression of protein in different samples.

**Results:** Mean concentration of salivary protein in CF group was 848.12 ± 351.92 ug/mL and 834.14 ± 349.91 ug/mL in ECC group. The t-test showed that there is no statistically significant difference between the amount of protein and dental caries experience (p =0.88). In mixed saliva samples, variability was represented by the bands of 131, 28, 26, 23, 18, 17, 13, 12, and 11 KDa in SDS-PAGE gel, respectively. Label free proteomic analysis revealed differences in the protein expression profiles between saliva of two groups. Specifically, some key screened proteins, such as protein S100 A2, cystatin SA, cystatin SN, serum albumin, immunoglobulins, small PRPs and complement C4-B, which may be related with ECC.

**Conclusion:** The presence of ECC didn’t influence the total concentrations of salivary proteins. The SDS-PAGE gel pattern of whole salivary protein in mixed saliva samples of each group are
similar, except at the MW 28 kDa, 17 kDa, 134 kDa, 12kDa and 11 kDa, which might include potential markers for ECC. Some key screened proteins, such as protein S100 A2, cystatin SA, cystatin SN, serum albumin, immunoglobulin, small PRPs and complement C4-B may be competent to be biomarkers for ECC.

**Key words:** saliva, early childhood caries, biomarkers, proteomics.

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**PC-19 Randomized clinical trial of one-visit and two-visit indirect pulp treatment in primary teeth**

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**Abstract**

**Background:** One- or two-visit indirect pulp treatment have been suggested in treating deep caries of primary teeth in order to avoid pulp exposures. However, the necessity of re-opening the cavity is still under debate, especially for the children diagnosed as Severe-Early Child Caries.

**Objectives:** The aim of this in vivo study was to examine whether one-visit or two-visit indirect pulp treatment is more successful for the children diagnosed as Severe-Early Child Caries.

**Materials and methods:** Eighty deep carious lesions in 61 patients aged 3-5 years (59% boys; 41% girls; age 4.37±1.33 year; dmft 9.81±3.26) were treated with incomplete caries removal, Lime-Lite light cavity liner (Pulpdent Corporation) capping and composite resin restoration. These deep carious lesions involved 75% or more of the dentin but lacked the preoperative signs and symptoms of irreversible pulp. 37 teeth were randomly allocated to two-visit indirect pulp treatment group. After 6 months, two patients with three teeth in two-visit indirect pulp treatment group dropped out. Four patients with four teeth were not willing to reopen the cavity. Only 30 cavities were re-opened to complete caries removal, capped with Lime-Lite light cavity liner and restored again with composite resin. 43 teeth were in one-visit indirect pulp treatment with no further treatment. The follow-up examination was conducted over two years.

**Results:** The pulp was exposed in three teeth during re-opening treatment of two-visit indirect pulp treatment. During the follow-up period of six months to two years, the pulp was necrosis in six teeth of one-visit indirect pulp treatment and in one tooth of two-visit indirect pulp treatment. At two year follow-up, the success rates of one-visit and two-visit indirect pulp treatment were 85.0% (34/40) and 85.2% (23/27) respectively, according to success being defined as an unexposed pulp with sustained pulp vitality without apical radiolucency. There was no statistically significant difference in success rate between two treatment groups.

**Conclusions:** Indirect pulp therapy in the primary teeth of the children diagnosed as Severe-Early Child Caries can be used successfully with a one- or two-visit approach.

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**PC-20 Effect of silver diamine fluoride application on**
Streptococcus mutans and Streptococcus sobrinus counts in children with severe early childhood caries

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Abstract

Background: Early childhood caries is a disease of multi-factorial origin. One of the causes of severe early childhood caries (S-ECC) is bacteria, namely Streptococcus mutans (S. mutans) and Streptococcus sobrinus (S. sobrinus). Silver diamine fluoride (SDF) is a topical agent that has been used to arrest cavitated carious lesions in young children with S-ECC. Previously, various methods have been used to detect and quantify the bacteria involved with S-ECC. One of the more advantageous methods, quantitative real time polymerase chain reaction (qRT-PCR) was used in this study to assess the effect of SDF on Streptococcus mutans (S. mutans) and Streptococcus sobrinus (S. sobrinus) counts.

Aim: To determine the effect of topical application of 38% silver diamine fluoride (SDF) on Streptococcus mutans and Streptococcus sobrinus counts in children with severe early childhood caries (S-ECC).

Design: A 6-month longitudinal study was conducted on preschool children with S-ECC. Quantitative real-time PCR was carried out on baseline and 6-month plaque samples of the children to identify the changes in Streptococcus mutans and Streptococcus sobrinus counts after SDF application. The dmft, visible plaque index (VPI), oral health behaviors and dietary habits of the children were recorded at baseline and 6 months. The dental caries and oral hygiene status at the two time points were compared using paired-sample t-test and Wilcoxon Signed Rank test; while the oral health behaviors and dietary habits of the children were compared using McNemar test. The change in bacterial counts in the plaque samples between the two time points was examined using Wilcoxon Signed Rank test; while the difference between Streptococcus mutans and Streptococcus sobrinus counts at each time point was assessed using Mann Whitney U-test.

Results: Twenty-eight children enrolled in the study. There was a significant increase in the dmft of the children at 6 months (p < 0.05). No significant change in VPI, oral health behaviors and dietary habits was observed between the two time periods. Streptococcus mutans count was significantly higher than Streptococcus sobrinus count at both baseline and 6 months (p < 0.05). No significant change in Streptococcus mutans and Streptococcus sobrinus counts was observed between the two time periods (p > 0.05).
Conclusion: The application of 38% SDF did not have a significant effect on the bacterial counts after 6 months; while the dmft of children continued to increase during the same time period. This shows that SDF application alone is not enough to halt the caries process and must be supplemented with a comprehensive and age-appropriate preventive program. This study was supported by HKU Seed Fund for Basic Research 201611159177.

Key words: Early childhood caries, silver diamine fluoride, Streptococcus mutans, Streptococcus sobrinus, in vivo study.
P-01 Aspiration of Mobile Deciduous Tooth into Airway in a Disabled Patient

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Abstract

Introduction: Aspiration of tooth can occur not only during dental treatment, but also due to external factors like trauma or physiologic exfoliation of deciduous tooth. If this occurs, complications such as fever, cough, dyspnea, pain, and bronchitis can be appeared. The risk is high in children and elderly people, especially disabled patients have a increased risk of aspiration because they are less able to control their behavior and lack the ability to cope when a foreign body falls into the oral cavity. Therefore, if the mobility of tooth of disabled patient is detected, active treatment is necessary to prevent aspiration of tooth.

Case report: A 9-year-old girl who was hospitalized with Quadriplegia, Lennox-Gastaut syndrome and Hypoxic ischemic encephalopathy visited our Pediatric Dentistry with chief complaint of tooth mobility. The clinical results showed moderate mobility of primary canines and primary first molars. The special finding was that among the primary first molars, the maxillary left primary first molar was uniquely absence. In medical history, the patient was admitted to the Department of Pediatrics via the emergency room due to pneumonia and diarrhea symptoms on February 12, 2016. On the CXR taken at the time of admission, there was foreign body on lung and chest CT scan revealed pneumonia in left lower lobe of lung with bronchiectasis and suspicious broncholithiasis. The foreign body was seen as a tooth and based on the result of the oral examination of the patient, the tooth was thought that the maxillary left primary first molar. General condition has been observed and surgical treatment is needed. Prophylactic extraction of mobile primary tooth were performed to eliminate the risk of aspiration.

Comments: Patients with disabilities are more at risk of aspiration due to lack of coping with foreign body in oral cavity than non-disabled patients. When aspiration occurs, complications occur and surgical treatment is needed. In normal patient, the risk of aspiration of tooth with a high degree of mobility is not considered seriously. However, it is necessary to reduce the risk of aspiration in patient with disabilities by performing active treatment like prophylactic extraction.

key words: aspiration, prophylactic extraction, tooth mobility

P-02 Association between Body Mass Index and Dental Caries in Korean Children and Adolescents

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Abstract
**Background:** Many previous researches have been conducted about the association between dental caries and body mass index (BMI) in children, but it is still inconclusive.

**Aim:** The purpose of this study was to evaluate the relationship between BMI and dental caries by considering related factors in Korean children and adolescents.

**Design:** A total of 2,874 children, aged from 2 to 18, who participated in the Korea National Health and Nutrition Examination Survey (2013–2015) were included. BMI (kg/m²) was calculated, and participants were categorized into 4 groups using age and gender specific criteria. Decayed and filled teeth index were obtained.

**Results:** Seventy-four percent of children were classified as normal weight, 9.6% were overweight, 8.8% were obese, and 7.3% were underweight. There were statistically significant differences in DMFT index between normal group and other groups except obese group (p < 0.05). Underweight group present the highest mean DMFT index compared to other groups.

**Conclusion:** There is a mild correlation between BMI and dental caries. Children in the obese and underweight group tend to have more caries than normal group in this study.

**Key words:** Body mass index, Dental caries, Korea national health and nutrition examination survey

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**P-03 Effectiveness of pit and fissure sealants for preventing and arresting occlusal caries in primary molars – A systematic review and meta-analysis**

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**Abstract**

**Background:** Dental caries is a significant global public health problem that can lead to substantial prolonged harm to children, compromising their general health and oral health-related quality of life (OHRQoL). High quality systematic reviews support the use of sealants to prevent and arrest caries on occlusal pit and fissure surfaces of permanent teeth. However, no concrete evidence was available to support this procedure in primary molars.

**Aim:** To systematically review the literature and summarize all current available evidence on the effectiveness of different sealants in prevention and arrest of pit-and-fissure occlusal caries in primary molars of children and adolescents; compared with a control (with no sealants), other types of caries preventive measures, such as professionally applied topical fluoride agents and any other type of sealants.

**Design:** A systematic literature search was conducted in 4 electronic databases (Cochrane Central Register of Controlled Trials (CENTRAL), Ovid MEDLINE, Ovid Embase, and Web of Science) and via handsearching, to identify relevant randomized or quasi-randomized controlled trials of at least 12 month’s duration. Two reviewers independently selected studies, extracted data, assessed risk of bias, and rated the quality of evidence assessed by adopting the GRADE approach.
Results: Seven studies were found eligible out of a total of 1678 records that were retrieved and screened. This review identified (1) No evidence comparing conventional resin-based sealant (RBS) or new types of sealants versus no sealant in primary molars, and fissure sealants versus minimal invasive treatments like resin-infiltration; (2) Very low quality and inconclusive evidence for effectiveness of glass ionomer sealant (GIS) with no sealants; (3) Low quality of evidence for no difference between conventional RBS with amorphous calcium phosphate (ACP)-containing or fluoride-containing RBS, auto-polymerizing and light-curing RBS, resin-filtration versus sealants in preventing progression of occlusal caries in primary molars, and RBS together with fluoride varnish application in caries prevention and arrest over fluoride varnish application alone in 1 year and 2-3 years' follow-up. The mean retention rates of RBS and GIS on primary molars over 18 months period were 85.94% and 23.18% respectively. Due to limited relevant studies, the results could not be pooled for data synthesis and meta-analysis in multiple outcomes. Additionally, heterogeneity of the study designs, differences in the participants, clinical settings, treatment modalities for comparison and evaluation time points also prevented the pooling of results for meta-analysis. Confounders like individual caries risks and severities which might have influenced the magnitude of preventive and arrest fraction of sealants were not clearly identified and analyzed. Conclusion: There is currently no available evidence to support the use of pit-and-fissure sealants to prevent occlusal caries or arrest non-cavitated occlusal carious lesions in primary molars. However, the high risks of bias associated with all identified studies placed the validity of the current findings uncertain. Further high-quality research is strongly encouraged to establish more definitive evidence related to the effectiveness of pit-and-fissure sealants in preventing and arresting occlusal caries in primary molars. Key Words: Pit and fissure sealant, primary molars, caries prevention, caries arrest, systematic review

P-04 Analysis of risk factors for dental caries in deciduous teeth among preschool children

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Abstract

Background: Dental caries in deciduous teeth is a common chronic disease, which has a negative impact on oral, mental, and general health. According to the Fourth National Oral Epidemiological Survey, the prevalence rate of primary teeth caries around 5-year-old children is 70.9%, which rise 5.8% compared to the data of ten years ago. Risk factors related to deciduous dental caries may be various in children from different backgrounds. Oral health behavior has also been changing as the society and economy develops.
Objective: To investigate the caries risk factors of preschool children in Chengdu, so as to provide a scientific basis for primary teeth caries prevention and treatment.

Design: A random sampling survey on caries status among 183 children aged 3 ~ 6 was conducted in the Department of Pediatric Dentistry, West China Hospital of Stomatology, Sichuan university and a questionnaire for their guardians were collected. Risk factors of primary teeth caries were analyzed by SPSS21.0 software.

Result: The mean dmft value of these subjects was 9.91±5.12. 78.14% children have more than 5 dmft. There was no statistical difference in caries prevalence between boys and girls (P>0.05). Four factors, including oral cleaning mode, time of brushing teeth, frequency of dental visits and frequency of sugar intake, have been found statistically significant different between severe-caries group (dmft>5) and mild-caries group (dmft<5). Time of brushing teeth and frequency of sugar intake showed significant relation to the primary teeth caries (P<0.05).

Conclusion: Time of brushing teeth and frequency of sugar intake are the major risk factors of deciduous caries. More attention should be paid to cleaning mode of infants by parent. More high quality researches should be done to clarify the relationship between nursing mode and Childhood caries. More work should be done by dental professionals to emphasize and regulate the caries prevention. Developing good oral health habit is very important for preschool children.

Key words: Dental caries; Deciduous teeth; Risk factors; preschool children

P-05 A Comparative Detection on Caries progression among 3-4-years old children with WHO criteria and ICDAS

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Abstract

Background: The increase of the prevalence of early childhood caries (ECC) is a serious public health concern. The severity of the lesions, especially initial lesions, is crucial for controlling ECC. Traditionally epidemiologic studies measuring the prevalence and severity of caries have used decayed, missing, and filled (DMF), called WHO criteria, which does not differentiate children or teeth by severity status. However , International Caries Detection and Assessment System (ICDAS), which uses visual surface characteristics to measure surface changes and potential histologic depths of caries lesions. ICDAS may have some advantage on record progression rates by the severity stages of the caries process.

Objective: To compare the differences and sensitivity between ICDAS-II and WHO criteria when they are applied in detection of the ECC.

Methods: A total of 430 children from four kindergartens of Beijing aged 3 to 4 years were
enrolled. Both ICDAS-Ⅱ and WHO criteria were used to detect early childhood caries (baseline), and then reviewed after one year (follow-up). According to different procession of caries, ICDAS-Ⅱ system was divided into sound and decayed at four cut-offs: D1 (0 as sound, code 1-6 caries); D2 (0 ~ 1 sound, 2 - 6 caries); D3 (0 ~ 2 sound, 3 ~ 6 caries) and D4 (0 ~ 3 sound, 4 ~ 6 caries). The caries prevalence and mean dmft were calculated and analyze as caries progression after one year of follow-up.

**Results:** After one year of follow-up, the caries prevalence and mean dmft were both increased. In the WHO criteria, the caries prevalence increased from 48.8% to 55.1%, while mean dmft increased from 2.27 to 2.54, but both of them had no significant differences (p>0.01). Meanwhile the caries prevalence in the anterior and the posterior teeth increased from 35.7% to 39%, 32.1% to 37.9% respectively, and both had no significant differences (p>0.01). The highest caries prevalence was found in in the maxillary anterior area and then the mandibular molar area was followed. In the ICDAS-Ⅱ system, the caries prevalence of D1, D2, D3, D4 increased from 77.6% to 82.7%, 71.3% to 79.6%, 52.8% to 61.7% and 46.1% to 53.3%, respectively. while mean dmft of D1, D2, D3, D4 improved from 7.45 to 8.16, 6.74 to 7.56, 4.19 to 4.76 and 3.42 to 4.12, respectively. The highest caries prevalence were found in Mandibular molar occlusal surfaces at D1, D2, however, it was highest in maxillary anterior proximal surfaces at D3, D4. The caries prevalence in WHO is located between D3 and D4.

**Conclusion:** Compared with the traditional WHO criteria, ICDAS-Ⅱ system could be sufficient in early detection of incipient caries and may be of some value for prevention of early childhood caries. And the WHO criteria might be as an instructive way to the clinical treatment of dental caries.

**Keywords:** ECC (Early childhood caries), ICDAS-Ⅱ caries assessment system, WHO criteria, caries prevalence

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**P-06 Remineralization Effect of Silver Diamine Fluoride(SDF) on Enamel by time progression**

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**Abstract**

**Background:** The aim of modern dentistry is to manage non-invasive lesions through remineralization. For this purpose, balancing of demineralization and remineralization is considered as the key point of caries prevention. It has been known that saliva control, mineralization by using fluoride, and antibacterial action are required for this purpose, and various formulations for remineralization and antibacterial effect have been developed. Silver fluoride, which has been developed to achieve both antibacterial and remineralization effects, has a long history. However, there are disadvantages such as instability of the product and possibility of inducing fluorosis in pediatric patients due to high concentration of fluoride. So, Silver diamine fluoride (SDF) has been proposed to increase stability by adding ammonia as a solvent to silver fluoride.
Aim: The purpose of this study was to compare the remineralization effect of fluoride varnish and Silver Diamine Fluoride (SDF) on demineralized enamel over time.

Design: The specimens, for the extracted bovine teeth with no fractures and sound enamel surface, were prepared. Artificial early enamel caries were formed by using demineralization solution and divided them into 3 groups of 35 each. Group 1 (control): saline, Group 2: MI Varnish™ (5% NaF), Group 3: Advantage Arrest™ (38% SDF). They were stored in artificial saliva for remineralization for 24 hours, 3 days, 1 week, 2 weeks, and 3 weeks. Then, remineralization effect was compared using Micro-CT, scanning electron microscope (SEM) and Energy-Dispersive X-ray Spectroscopy (EDS).

Results: The volume and density of remineralization sites were significantly higher in the experimental group treated with MI Varnish™ than in the control group. And the volume and density increase of the remineralization sites in the Advantage Arrest™ treated group were significantly higher than in the control and MI Varnish™ treated groups. The longer the remineralization time in artificial saliva was, the more the remineralization degree increased and the increase rate of remineralization degree was significantly higher in the experimental group treated with Advantage Arrest™. The difference in the increase rate of remineralization decreased with time in all groups. According to SEM analysis, the surface roughness decreased in the order of Group 1: Control group, Group 2: MI Varnish™ and Group 3: Advantage Arrest™. In addition, Energy-Dispersive X-ray Spectroscopy (EDS) analysis showed that Ag⁺ ion was contained in the enamel surface of the Advantage Arrest™ group.

Conclusions: The degree of remineralization increased with longer remineralization time, and volume and density changes of demineralized area were significantly higher in the order of Advantage Arrest™, MI Varnish™ and control. SDF is a simple, rapid and safe way to prevent new caries and to stop existing caries. These results suggest that SDF is useful for patients with young age and systemic diseases who have difficulty in dental treatment.

Key word: Silver Diamine Fluoride (SDF), Remineralization, Micro-CT, Scanning Electron Microscope (SEM), Energy-Dispersive X-ray Spectroscopy (EDS)

P-07 Clinical effects of CAD/CAM Resin Nano Ceramic Inlay/Onlay restoration on massive destruction in first permanent molar of children

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Abstract

Objective: To observe the effectiveness of using CAD/CAM Resin Nano Ceramic inlay/onlay in restoration of the massive destruction first permanent molar in children.

Methods: The clinical effects of CAD/CAM Nano resin ceramic inlay/onlay in 15 badly broken-down first permanent molars were evaluated in USPHS criterion 6~12 months later.

Result: 6~12 months after treatment, every composite inlay restoration for the first permanem
molar of children had a satisfactory clinical performance, except one case fractured a part of restoration with caries, one case had a crack and one case had gingivitis.

**Conclusion:** The CAD/CAM nano resin ceramic inlay/onlay is a new alternative to the restoration of children's permanent molars, especially for the teeth had root canal therapy.

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**P-08 A Pilot Survey on Parental Satisfaction on the use of Silver Diamine Fluoride**

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**Abstract**

**Background:** Silver Diamine Fluoride (SDF) has been used as a caries arresting agent for decades. Its efficacy in caries prevention and arrest have been proven in primary and permanent dentition. SDF was recently made available in Singapore in 2016 and has been used by many Paediatric Dentists in Singapore. The acceptance and satisfaction of SDF by the local population is unknown.

**Aim:** This is a pilot survey to examine parental satisfaction of the use of Silver Diamine Fluoride. A future clinical study will be planned to look at child and parental acceptance.

**Design:** This is a descriptive, retrospective, clinical study of paediatric patients who had received SDF treatment at least 6 months before their recall examination. 20 patients were recruited when they presented at the Paediatric Dentistry Clinic for their recall visit. Only existing patients who had SDF applied on their teeth for at least 6 months were recruited. Parental satisfaction was evaluated by a self-administered questionnaire.

**Results:** There were 20 responses, 10 females and 10 males. The average age was 3.5 years old. The ages of the children at the date of the first SDF application ranged from 1.3 to 6.1 years old. There were 7 children who were under the age of 3 years old. The average DMFT score was 9.2. Each child made an average of 3 clinical visits for SDF application. There were 9 parents (45%) who felt indifferent about the appearance of their child’s teeth after SDF application. There were 5 parents (25%) who felt dissatisfied about their child’s appearance and 6 parents (30%) said they were satisfied. Most parents (95%) found that the price of SDF treatment was reasonable, while 1 (5%) thought it was priced too cheap.

**Conclusion:** It appears that most parents were at least neutral about the aesthetics of SDF. All parents thought that the cost of SDF was reasonable. The results of this pilot study are promising as it shows a positive response towards the treatment. Additional research will be conducted to examine child and parental acceptance. The research findings will have an impact on the continual availability of SDF in Singapore.

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**P-09 FIBER REINFORCED COMPOSITE RESIN SPACE MAINTAINER: TWO CASE REPORTS**
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Abstract

Introduction: Premature loss of deciduous tooth will interfere the tooth harmony resulting in crowding, malocclusion and lack of space for successor permanent tooth to erupt. Space loss can be anticipated using space maintainer appliance as it functions in maintaining the existing space. There are several factors need to be considered before using space maintainer, such as the stage of tooth development, oral hygiene, the number of missing tooth, occlusion, length of arch, patient age, psychological condition and patient’s cooperative level. Fiber reinforced composite resin is currently superior to stainless steel space maintainer as it is easy to manipulate and may be finished in single visit without laboratory procedures.

Case Reports: Case#1: A seven-year-old girl was diagnosed with a premature loss of tooth #75 and a fiber reinforced loop composite resin, which was semi-fixed space maintainer, was applied to prevent space loss. Moyers probability analysis showed an excess space of 1.2 mm. Case#2: A premature loss of tooth #85 in 8-year-old girl was replaced using fiber reinforced composite resin, which was fixed space maintainer as it was attached on the buccal and lingual surface of the adjacent teeth. Moyers probability analysis showed an excess space of 1.8 mm. Radiographic examination showed the successor permanent tooth has not erupted yet in both cases.

Comments: Two types of fiber reinforced composite resin space maintainer were used in this case report, including semi-fixed in case#1 and fixed in case#2. Fiber reinforced composite resin space maintainer consists of woven polyethylene fibers with high molecular weight, thus the material is resistant to strain, distortion and masticatory force. The polyethylene fibers distribute the occlusal force evenly into the tooth surfaces as well as increase the mechanical strength of fibers. Furthermore, this material is biocompatible, non-corrosive, transparent, has a good aesthetic, chemically and mechanically bond to the tooth. Fiber reinforced composite resin space maintainer may be an acceptable and expedient alternative to conventional band and loop appliance.

Keywords: Fiber reinforced composite resin, space maintainer, premature loss

P-10 Clinical evaluation of stainless steel crowns placed in primary molars: a retrospective pilot study.

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Abstract
Dental caries is the most prevalent oral diseases in children. According to the data of WHO, 60%–90% of worldwide school children have dental caries. In China, the dental caries of primary teeth has a high incidence and low rate of visits. Without timely treatment, child caries may cause a lot of follow-up problems, such as teeth defect, pulpitis, apical periodontitis and maxillofacial space infection, the premature loss of primary teeth can even cause malocclusion and eruption disorder of subsequent permanent teeth, these conditions all have great impacts on children's oral health, physical and mental development. Compared with conventional restoration treatment, stainless steel crowns(SSCs) restore the shape and function of primary molars more effectively, meanwhile reducing microleakage and secondary caries. Because of these advantages, SSCs have been widely used in Europe and America, but in China they are far from being popularized.

**Objective:** This retrospective pilot study is designed to evaluate the clinical efficacy of SSCs and related influencing factors, thus provide foundation for their further popularization.

**Method:** A total of 208 cases utilizing SSCs restoration were collected according to the inclusion criteria. Clinical parameters of SSCs restoration were recorded and collected at baseline, 1 year and 3 years follow-up respectively. The efficacy of SSCs restoration were evaluated and analyzed statistically.

**Results:** SSCs have good contact with adjacent teeth, well adaptability and extensibility of crown edge at 1 year and 3 years follow-up. The clinical success rates at these two time point were 88.7% and 86.0% respectively with no significant difference. The clinical success rates of SSCs on teeth with or without pulp therapy were 86.4% and 87.6%, respectively. There was no significant correlation between the clinical success rate and dental pulp therapy. **Conclusion:** The cases included in this study showed that SSCs technique can obtain qualified restoration and high clinical success rate. Thus primary molars with dental caries or pulp therapy can achieve satisfactory prognosis through SSCs restoration.

**Key words:** Dental caries; primary teeth; stainless steel crowns;

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**P-11 Management of carious primary molars using a biological approach: A case series**

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**Abstract**

**Background:** Management of dental caries in young children often poses challenges to the dentist due to the behavioural issues and treatment complexity. For decades, conventional treatment of caries removal and restoration using a suitable material has been the treatment of choice. Recently, this has been challenged by the use of biological approaches such as placement of stainless steel crown using the Hall technique. This technique is considered to be less invasive with high success rate and more accepted by patients and parents.

**Case report:** The four cases discuss the management of carious primary molar using the Hall technique in young patients ranging from 4-7 years old. Two of these patients were healthy and
the other two patients were medically compromised. The patients were potentially cooperative
with Frankl behaviour rating scale of 2 and 3. All of the teeth restored with stainless steel crown
using the Hall technique were asymptomatic and no evidence of periapical pathology clinically
and radiographically at the initial visit. The caries lesions were confined to enamel and dentine
without any pulpal involvement. All of the patients showed a positive attitude during the
treatment and their cooperation level improved subsequently. The patients were followed up for
at least 6 months and all of the teeth remained free of signs and symptoms and the treatment
was regarded as successful.

**Comments:** The cases reported have shown that placement of stainless steel crown has a
successful outcome, tolerated well by the patients, and can be used as an approach to
acclimatising patients to dental treatment. This technique may be used as an alternative to the
conventional restorations in young patients who are dentally anxious with a low level of
cooperation. However, it may not be a suitable restorative option for all carious primary molars,
therefore a careful selection of cases is crucial.

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**P-12 SINGLE VISIT MANAGEMENT OF MULTIPLE CASES
OF ANTERIOR PRIMARY TEETH IN PRE-COOPERATIVE
PATIENT**

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**Abstract**

**Introduction:** Destruction of anterior primary teeth due to dental caries and trauma is most likely
to occur in pediatric patients. Early treatment of anterior primary teeth in patients with
precooperative age often poses a challenge to the pediatric dentist. In order to achieve a
successful treatment, the dentist is required to set a comprehensive treatment plan and has the
ability to perform effective and efficient care in a short amount and visit time. Quadrant dentistry
modification principle can be applied for multiple dental cases in pediatric patients.

**Case Reports:** A two-year old girl has diagnosed with complicated crown fracture of tooth #51,
dentin fractures of tooth #52 and #61, and dentin caries of tooth 62. Pulpotomy procedure was
done on tooth #51. Final composite crown restoration was done in tooth #52,#51,#61,#62 at the
same day. Physical restraint was used as the child was emotionally immature and lacking
cooperative behaviour. The time length of all the treatment was one hour.

**Comments:** In this case, the treatment was done immediately to four anterior teeth until final
restoration in single visit. This is a modification of the quadrant dentistry technique in which
treatment is completed in one region in single visit. Operators should be able to work effectively
and efficiently for the success of treatment in pre-cooperative ages. The management of
complicated crown fracture in tooth #51 should be done immediately to prevent the occurrence of necrosis and periapical tissue abnormalities that may affect permanent dentition. Dentin fractures in tooth #52, #61, and dentin caries in tooth #62 were also required rapid management to close the exposed dentinal tubules as the tubular structure of dentine is highly porous and allows bacterial penetration into the dentin pulp complex. Final restoration using composite resin crowns was chosen as it has greater mechanical strength and esthetic consideration. Single visit treatment in multiple cases in pre-cooperative patients could be beneficial to achieve effective and efficient care in pediatric patients.

**Keywords:** single visit management, multiple cases of anterior primary teeth, precooperative patient

**P-13 Shear bond strength of resin sealant in acid-etched and Er:YAG treated enamel**

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**Abstract**

**Background:** Modern dentistry requires new prevention options to decrease the incidence of caries. Pit and fissure sealants are one of the best prevention methods against caries in susceptible teeth, mainly on occlusal surface. Nowadays, more effective techniques have been preferred, which are precise and minimally invasive, to prepare hard dental tissue. In order to improve the effectiveness of sealants, the use of Er:YAG laser may be beneficial due to its properties.

**Objectives:** The aim of this in vitro study was to evaluate shear bond strength and mode of failure of sealant material to teeth obtained after enamel using either 37% phosphoric acid or Er:YAG laser etching setting modes.

**Materials and methods:** 120 permanent maxillary premolars were randomly divided into 4 groups (gr.1 using 37% phosphoric acid, gr.2 using Er:YAG laser setting of 80mJ/2Hz without water, gr.3 Er:YAG laser setting of 120mJ/10Hz with water and gr.4 Er:YAG laser setting of 140mJ/2Hz with water). The application of each sealant followed manufacturer's instruction. All teeth were thermocycled for 500 cycles between 5c and 55c. After thermocycling all teeth were tested in shear bond strength and mode of failure.

**Results:** The mean shear bond strength for acid-etched enamel (11.029±4.069 MPa) was significantly higher (p<0.05) than for laser-irradiated enamel at 80mJ (5.079±2.111 MPa), 120mJ (6.183±2.542MPa) and 140mJ (5.132±2.654MPa). The mean shear bond strength in laser-irradiated group were not significantly different (p>0.05). Fracture patterns of sealant materials bonded to all group of treatment revealed a high incidence of adhesive and mixed failures.

**Conclusion:** The finding from this study was that treating the enamel surface with Er:YAG laser
results in significantly lower shear bond strength than traditional acid etching.

P-14 Abnormal Growing Tip from the Main Root in Immature Teeth treated using Apexification treatment: A Case Report

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Abstract

Introduction: Abnormal root tip was reported in a developing necrotic tooth, which may be caused by physical trauma or pulp infection. Because very few cases have been reported, the underlying mechanism and effect are still unclear. The following report describes one case that showed the possible initiation and effect on the main developing root.

Case: A 6-year-old boy tripped to the ground and fractured his upper left permanent central incisor, and contacted the Pediatric Department of Jinan Stomatology Hospital for emergency care. The tooth #9 erupted 1/3 and the medial angle was fractured with exposed pulp. Except for a small contusion to the gingiva surrounding the incisor, there were no other soft tissue injuries. A periapical radiograph showed the tooth had an incompletely developed apex without apparent signs of a root fracture or damage to the adjacent teeth and bone structures (Fig. A). The tooth was treated with partial pulpotomy and the access cavity was closed with glass ionomer cement.

At 3-month recall, the boy had experienced intermittent spontaneous pain in that area for previous one month. A clinical examination revealed tooth #9 to be moderate sensitivity to percussion and palpation, the mobility was +1. A radiographic examination revealed that tooth #9 had a periradicular radiolucency (Fig. B). A diagnosis of pulp necrosis and apical periodontitis was made. The tooth was treated with apexification using Metapex (Fig. C). At 20-month recall, a clinical examination revealed tooth #9 to be mildly sensitive to percussion and palpation. And a labial sinus tract had pus over flow with palpation. The mobility was +1. A radiograph showed Metapex was absorbed and a periradicular radiolucency of tooth #9, and an abnormal root tip had developed near the main root end (Fig. D). The root canal was disinfected with calcium hydroxide and was filled with vitapex (Fig. E). At 34-month recall, the patient was asymptomatic. An apical calcified barrier had formed in the open apex canal and the abnormal root tip continued development (Fig. F). At 42-month recall, the patient was still asymptomatic, but the abnormal root tip was smaller than at 34-month recall (Fig. G) and it was absolutely absorbed at 54-month.

Discussion: Abnormal root tip was reported in a developing necrotic tooth, which may be caused by physical trauma or pulp infection. But in this case, root tip formed after apexification treatment, like Jung, Arrow and Yang’s case reports, which implied the doctor’s operation to the root canal may be another factor for the root tip formation.

No report mentioned the effect of root tip formation on the main developing root. In this case, the tooth formed a calcification barrier in root canal, had no obviously developed in root
length and thickness, like Jung. Arrow’s case reports. In Yang’s case report, the tooth root fractured and was extracted. The development of the main root was not very ideal, either treated with the apexification protocol or the revascularization protocol. Formation of the separated tip may be a sign of the dysplastic development of main root. In addition, the abnormal root tip was found at 20-month recall, and surprisingly at 42-month, the root tip was absorbed and became smaller, and absolutely absorbed in 54-month recall, which was not seen in other reports. The reason for this absorption is not clear.

Key Words: Immature teeth; open apex; revascularization; separated root tip; abnormal growing tip

P-15 Title: Effect of different storage media on the biological properties of hPDLCs

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Abstract

Background/Aim: Maintaining the tooth in proper storage media that can preserve the vitality of the periodontal ligament cells (hPDLCs) is critical to successful replantation. Current storage media can preserve the viability of hPDLCs. However, little is known about the effect of storage media on preserving the osteogenic potential of hPDLCs as well as their effect on anti-inflammatory cytokines expression, which are important aspects in predicting the complication after delayed replantation. Propolis has been suggested as a storage medium for avulsed tooth. The objective of this study was to compare the effectiveness of Brazilian propolis (BP), Shan Dong propolis (SP), Ji Lin propolis (JP), Hanks balanced salt solution (HBSS) and milk in maintaining the biological properties of hPDLCs.
Design: Cell Counting Kit 8 (CCK-8) assay was performed to test the viability of hPDLCs in different storage media. The preservative effect of osteogenic differentiation capacity was evaluated by alkaline phosphatase (ALP) staining, ALP activity assay, Alizarin Red S staining, Real-time PCR and Western-Blot. The gene expression of pro-inflammatory cytokines was detected by Real-time PCR.

Results: The highest cell viability was observed in milk group. No significant difference of cell viability was found between BP, SP, JP and HBSS groups. ALP staining showed that hPDLCs cultured in BP and HBSS showed higher ALP activity than SP and JP. Alizarin Red S staining showed that the number of calcium nodules produced by hPDLCs was higher in milk group. BP was comparable to HBSS in calcium deposition and mineralization nodule formation. There was no statistically significant difference of osteogenic marker gene expression in all experiment groups. BP, HBSS and milk had no effect on ALP and OSX protein expression. However, ALP protein production was decreased in SP and JP groups. Furthermore, mRNA expression of IL-1β, IL-6 and IL-8 decreased significantly after treated with BP and SP. The gene expression of pro-inflammatory cytokines in milk group were higher than propolis. TNF-α gene expression was higher in experiment groups.

Conclusion: Compared with HBSS and milk, except similar effect on maintaining the viability of hPDLCs and preserving osteogenic differentiation ability, BP and SP presented better anti-inflammatory effect in hPDLCs, proving that BP and SP can be used as alternative storage media for avulsed tooth.

Key Words: Periodontal ligament cells, Propolis, Storage media, Osteogenic differentiation, Inflammatory cytokines

P-16 Outcome of avulsed short root incisor replantation in Rubinstein–Taybi syndrome

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Abstract

Introduction: Rubinstein–Taybi syndrome is a multiple congenital anomaly syndrome with a prevalence of 1:100,000–1:125,000 in the general population. This syndrome is characterized by distinctive facial features, a short stature, broad thumbs and halluces, highly arched eyebrows, a beaked nose with low hanging columella, and mental retardation. The characteristic oral features of Rubenstein–Taybi syndrome include a high palate and talon cusps. Additionally, the patient in our case exhibited short roots.

Here, we report on the progress after 1 year of a case involving a traumatically avulsed upper permanent central incisor with a short root that was replanted after an approximately 2-hour extra-alveolar period.

Case Report: The male patient was aged 8 years, 9 months. He fell at a day-care center and
avulsed his upper right central incisor. He was transported to the emergency room of our center and referred to our department without neurological symptoms or extra-oral injury. The alveolar socket of the avulsed incisor had thrombosed. No other oral injury was detected via inspection or radiography. The ambulance staff had wrapped the avulsed tooth in saline-soaked gauze and brought it and the patient to our hospital. Upon arrival at the hospital, the avulsed tooth was soaked in saline containing heparin and ampicillin until treatment. An examination of the incisor revealed that the tooth was intact; although the root surface was covered with the moist remnants of periodontal tissue, the root itself was short. We explained the risks and benefits of the available treatment options to his mother, who decided upon replantation. Accordingly, the avulsed permanent tooth was replanted following immediate extra-oral endodontic treatment and preventive root canal filling with mineral trioxide aggregate. We fixed the replanted incisor using twisted orthodontic ligature wire and Superbond (Sun Medical, Japan). Postoperative drugs (amoxicillin, acetaminophen, and povidone iodine liquid) were prescribed. Radiography performed 71 days after the initial visit demonstrated nearly normal anatomical structure aspects. The fixation was removed.

Seventy-four days after the initial visit, the patient fell on the floor of his house. His mother brought him to the primary care dental clinic. The primary care dentist diagnosed subluxation, which was fixed with a mesh plate and adhesive resin.

The mother contacted us with concerns regarding international travel and maintenance of the avulsion fixation over a 2-month period. We explained the risks associated with prolonged fixation, which she accepted.

The patient revisited our clinic at 154 days after the initial visit. A metallic sound detected via percussion testing and the disappearance of the periodontal ligament on a radiograph suggested ankylosis of the tooth.

After 170 days from the initial visit, the fixation was removed at the primary dental care clinic. One year later, the tooth remains ankylosed in place with no marked negative symptoms (e.g., replacement root resorption).

Comments: A short tooth root leads to hypermobility and a high risk of avulsion; therefore, ankylosis might be a favorable clinical result. However, continuous follow up is required to evaluate potential replacement resorption caused by ankylosis.

Key Words: Rubinstein-Taybi syndrome, short root, avulsion, replantation, ankylosis

P-17 The survival analysis of avulsed immature teeth or mature teeth after replantation in children

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Abstract

Background/Aims: Tooth avulsion was the most serious dental trauma. The prompt and proper treatment was significantly important for the prognosis of the replanted avulsed teeth. The aim...
of this study was to analyze the survival of avulsed immature teeth or mature teeth after replantation in children.

**Methods:** The avulsed teeth treated in the department of pediatric dentistry, PKUSS from January 1, 2000 to December 31, 2016, with complete dental records were collected in the study. The dental records were included gender and age of the patients, information of the avulsed teeth such as total extra oral time, dry storage period, stage of root development, with crown fracture, gingival laceration, and alveolar fracture or not. The therapeutic process was obtained, including usage of antibiotics, type and period of splint, strategy of pulp treatment. Periodontal healing was evaluated in X-ray and classified as functional healing (FH), infection-related (inflammatory) resorption (IRR) and replacement resorption (RR). The follow-up period was one year or longer, unless early complications lead to extraction before that time. Kaplan-Meier, Cox regression and Chi-square were used to analyze the risk factors related to the prognosis of the replanted avulsed teeth ($P<0.05$).

**Results:** The study collected 402 avulsed teeth but 76 teeth were not replanted, 4 teeth suffered from second trauma, 4 teeth occurred root resorption due to ectopic eruption of canine, 5 teeth had early loss within 3 months, 122 teeth follow up period less than 1 year and 196 teeth (155 patients, 93 males and 62 females) got into final statistical analysis. FH was observed in 56/196, IRR in 31/196 and RR in 109/196 teeth. Thirty-eight teeth were extracted during the observation. The dry storage of period more than 30 min exhibited significantly more IRR and RR complications in comparison with teeth with dry storage of period less than 30 min ($P=0.011$). The teeth with gingival laceration had a significant effect on periodontal healing ($P=0.003$). The mature teeth had a longer survival time compared to immature teeth (odds ratio= 5.199, $P=0.001$). Five out of 33 (15.15%) immature teeth had pulp revascularization while two of the five teeth had inner and outer resorption 694 days later and were extracted at last.

**Conclusion:** The teeth in the dry storage for more than 30 min would increase the risk of failure of periodontal healing. The avulsed teeth with gingival laceration could not be ignored and the immature teeth had a lower survival compared to the mature teeth.

**Key words:** avulsed teeth; survival factors; children

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**P-18 A Case of Supernumerary Tooth in the Mandibular Anterior Region – Report on a Rare Case of Five Mandibular Incisors**

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**Abstract**

**Introduction:** Supernumerary tooth is an abnormality in the number of teeth that is occasionally observed in clinical pediatric dentistry. Supernumerary teeth may cause abnormal tooth eruption or malalignment. They are usually observed in the maxillary anterior region, and rarely in the anterior mandibular region. We report on a patient who had five incisors including one impacted
tooth in the mandibular anterior region. We extracted one of the five teeth to assure the eruption of the impacted tooth within the dentition.

**Case Report:** The patient was a boy aged 7 years and 9 months. He was referred to our hospital by his local dentist due to the presence of a supernumerary impacted tooth in the anterior mandibular region. Dental findings indicated that he was in the early mixed dentition period. Dental radiographs showed that a tooth with the same morphology as an incisor was impacted distally from the mandibular right incisor region. As four incisors had erupted in the anterior mandibular region, the patient had a total of five incisors, indicating the presence of a supernumerary tooth. We could not determine whether the tooth that had erupted in the mandibular right lateral incisor region (L1) or the impacted tooth (L2) was the supernumerary tooth. We performed computed tomography (CT) to confirm impacted tooth shape and tooth root state. CT images indicated that L1 and L2 had almost the same shape, and the degree of tooth root formation was also similar. It was necessary that either L1 or L2 would be extracted. Since there was no space for five incisors in the anterior mandibular region. Although L1 had already erupted with in the mandibular incisor region, the extraction of L2, which was impacted close to the root of L1, held a certain risk harming the immature root of L1, and also had a risk of damage to the pediatric patient because of the significant surgical invasion of the extraction of an impacted tooth. It was thought that L1 extraction and L2 preservation could be easily performed at lower risk. Although L2 was impacted, we considered that eruption could be induced into the space created by extracting L1 due to its immature root. L1 was extracted with the patient under local anesthesia. No morphological abnormalities were noted while the immature root of the extracted tooth was short. Dental radiographs taken 4 months later confirmed that L2 was erupting toward the space created by the extracted tooth. At 11 months later, it had erupted almost within the dentition.

**Comments:** We were able to induce the eruption of an unerupted tooth into the dentition by extracting an erupted incisor in a patient with five incisors including one unerupted incisor in the anterior mandibular region. Our result showed that hyperdontia cases with five incisors should be treated in the early mixed dentition period.

**Key words:** Supernumerary Tooth, Mandibular Incisors, Computed Tomography, Early Mixed Dentition Period

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**P-19 A novel 4q25 microdeletion encompassing PITX2 associated with Rieger syndrome**

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**Abstract**

**BACKGROUND:** Axenfeld-Rieger syndrome (ARS) is a rare autosomal dominant disorder mainly characterized by specific anterior segment abnormalities of the eye with or without systemic manifestations. Rieger syndrome (RS) is the most severe form of ARS, affecting the eye, teeth, and umbilicus. It is also one of the most serious causes of tooth agenesis. And the paired like
Homeodomain 2 (PITX2) gene is often implicated in its pathogenesis. The protein product of the PITX2 gene is a developmental transcription factor that regulates the expression of downstream target genes. It plays an important role in normal embryonic development. Both mutations and copy number variations (CNVs) of PITX2 cause RS.

**OBJECTIVE:** The present study aimed to characterize clinical features and identify the underlying genetic defect in a Chinese patient with RS.

**SUBJECTS AND METHODS:** A Chinese family affected with RS was enrolled. Clinical examinations were performed to determine the phenotypic characteristics. DNA samples were screened for PITX2 gene mutations and CNVs using Sanger sequencing and quantitative genomic PCR analysis (qPCR). Chromosomal microarray analysis (CMA) was performed to fine-map the CNVs. Single nucleotide polymorphism (SNP) analysis was developed to find clues about gene deletion.

**RESULTS:** The proband suffered with severe hypodontia and conical teeth in her permanent dentition. A midface deficiency and prominent forehead were also presented. No PITX2 point mutations were found in this Chinese family, but a heterozygous deletion involving PITX2 was suspected and verified by the SNPs analysis and qPCR in the proband. An approximately 0.47 Mb (chr4: 111,334,313–111,799,327, GRCh37/hg19) deletion including PITX2 was finally determined by CMA.

**CONCLUSIONS:** To our knowledge, this is the first reported case of RS caused by a CNV of the PITX2 gene in a Chinese patient. CNV screening must be considered if point mutation screens yield negative results in these patients. The distribution of SNP genotypes among family members may also provide clues about gene deletion.

**Keywords:** Rieger syndrome; hypodontia; eye manifestations; microdeletion; transcription factor

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**P-21 Dental Characteristics of a Patient with McCune-Albright Syndrome**

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**Abstract**

**Introduction:** McCune-Albright syndrome (MAS) is a rare disease characterized by fibrous dysplasia (FD), Cafe-au-lait spots, and endocrine disorder. This syndrome is caused by genetic mutation of somatic cells without a specific cause in the developmental stage of the embryo. This case report shows dental characteristics and expected complications in child with MAS.

**Case report:** 4-year-old girl with MAS was referred from the department of pediatric endocrinology with a chief complaint of facial asymmetry and bruxism without any pain. She is taking medications from the department of pediatric endocrinology due to precocious puberty, regularly visits the department of pediatric orthopedics due to polyostotic fibrous dysplasia, coxa vara. Also, she underwent the V-tube insertion operation twice from the ENT clinic because of recurrent exudative otitis media. Cafe-au-lait spots were observed as well. Through clinical and radiological examination, facial asymmetry and many dental problems, such
as midline deviation, "ground glass appearance" on the entire jaw, thinned cortical bone, loss of lamina dura and ectopic impacted teeth were found. The tooth germ of right maxillary 2nd premolar, canine and right mandibular 1st premolar were severely displaced. Because of severe displaced tooth germs and affected jaw, there is a high possibility of malocclusion after the eruption. It is necessary to observe the eruption pattern periodically. However, patients with fibrous dysplasia have a decreased healing potential of bone. Also the movement of the teeth might be difficult within the lesion. Therefore the orthodontic treatment for this patient takes longer and should be less aggressive than that for others. It should also be noted that relapse would occur easily in this patient.

Comments: The patient with MAS is scheduled for a periodic check-up. If there are clinical symptoms, appropriate interventions such as orthodontic treatment or patient education are required. Surgical methods should be considered when there is an aesthetic demand after completion of growth. Long term follow-up will expand the understanding of MAS and improve treatment outcomes.

key words: McCune-Albright syndrome, Fibrous dysplasia, Delayed eruption

P-21 Dental management of a patient with congenital insensitivity to pain with anhidrosis: A case report

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Abstract

Congenital insensitivity to pain with anhidrosis (CIPA, or hereditary sensory and autonomic neuropathy type IV) is an autosomal recessive genetic disorder and its prevalence is estimated to be 1/600,000 – 1/950,000. Patients are characterized by inability to feel pain and sweating over the entire body while tactile sensation, lacrimation and salivation are intact. Disease itself does not fatal, however, in a clinical aspect, CIPA is a serious illness. Recurrent unexplained hyperthermia in early ages and self-mutilated reactions and unrecognized damages without autonomic response to painful stimuli threaten these patients. Because almost many threats could be decreased with cautious behaviors, unfortunately, however, low intelligence that is usually accompanied in this type of disease make patient education difficult.

In this presentation, we present follow-up of 7-year-old girl with CIPA who was initially referred to our hospital at 7-month-old age because of oral bleeding which was suspected from self-mutilations. Despite of regular treatment, recurrent laceration was retained and progressed to ulcer. Some of tongue lesions should had been sutured and tongue-tip was missed due to self-biting. After the diagnosis of CIPA at 3-year-old age, dental treatment was focused more on prevention and gentle handling. During transition of primary to mixed dentition, fluoride was regularly applicated and caries and pulp treatment was done under local anesthesia while self-luxated mandibular permanent incisor was extracted despite of splinting treatment. Besides of these intra-oral damages, she has encountered many dangerous situations from self-mutilated and/or un-recognized damages such as bone fracture and burn which were followed by local and
systemic infection including osteomyelitis and cellulitis.

Based on the findings summarized above, dental clinicians should be aware of early signs of CIPA and consider many aspects of this disease related with clinical procedures including short chair time, stress relief and preventive treatment for caring this type of delicate patients.

P-22 An Anatomical Study of Dens in Dente with the Apical Periodontitis: Case report


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Abstract

Introduction: Dens in dente is a rare type of tooth malformation induced by a developmental anomaly. In some cases, it can cause infection even without the presence of dental caries. For treatment, tooth extraction is sometimes necessary, as an endodontic procedure is difficult due to the complex shape of the malformed tooth. Here, we report a case of Oehler’s type III dens in dente in a patient diagnosed with acute purulent apical periodontitis.

Case report: A 12-year-old boy came to our hospital with gingival swelling of the maxillary left lateral incisor. Based on dental X-ray findings, dens in dente was suspected. The lateral incisor was given a diagnosis of chronic purulent apical periodontitis. Root canal treatment for the infected tooth was considered to be difficult, as its shape was complicated. Although tooth extraction was necessary, the patient did not return for further examinations and it was not performed. Seven months later, he returned to our clinic with severe pain, gingival swelling, and facial puffiness, and was diagnosed with acute purulent apical periodontitis associated with a periodontal abscess. Incision of the tumefaction was performed as well as an anti-inflammation procedure with administration of an antibacterial agent. After acute inflammation was reduced, the affected tooth was extracted under local anesthesia. The course following extraction was favorable and orthodontic treatment is planned for the future.

Using Micro-focus CT System, we examined the extracted tooth to observe the anatomical internal structure. Furthermore, following decalcification, longitudinal thin slices were cut and stained with hematoxylin and eosin, then a histopathological examination was performed.

Comments: In CT images, a lumen was confirmed to pass from the invaginated area to the apex. In histopathological findings, dental enamel with an irregular thickness and a cement-like structure was observed in the inner wall of the invaginated area. In the present case, an intricately curved root canal was found to be pressed and flattened by the invaginated area, thus confirming the difficulty of root canal treatment.

Our findings confirmed that root canal treatment would be difficult in the present case because of the complex shape and structure of the affected tooth. For patients with dens in dente, not only early detection, but also treatment appropriate for the morphological defect and regular dental checkup examinations are considered to be important.
P-59 The Treatment of Impacted Central Incisor Caused by Malformed Upper Lateral Incisor

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Abstract

Introduction: The maxillary central incisor erupts, affecting the development of occlusion and the mental health of children. Guided by physiological occlusal prosthesis, clear diagnosis was made and referred to fixed orthodontic treatment. The purpose of diagnosis and treatment is to achieve stable occlusion and balanced facial profile.

Case report: A girl aged 8 years and 6 months, whose front teeth has not been erupted for a year. Check (figure 1). Diagnosis: Angle I, 21, 22 unerupted, 22 small deformed teeth. Treatment (figure 2) Effect: facial profile, physiological occlusion.

Pic1: Preoperative examination: face type; 21, 22 unerupted, molar relationship: neutral, over jet II °, Disordered dentition; overdevelopment of the upper and lower jaw (SNA 85.4 °, SNB write 80.8 °), low Angle (FH - MP left 22.1 °) protruded upper incisors (U1 - SN ° Write 111)
Pic2: The treatment process. A. After the extraction of 61, 21 erupted; Maxillary 2*4 fixation is used to correct the alignment of the Central incisor. B. After 12 months of wearing the occlusal guide appliance at night, the device will guide 23 to 22 positions; The mandibular lingual arch maintains the length of the dental arch. C. At 24 months after surgery, the teeth was aligned and the median line was aligned, and the physiological dental union was preliminarily established. D. At 30 months after surgery, permanent dentition is stable.
Comments: The facial shape determines the treatment design. The child's jaw is slightly protruding. The method of removing the deformed lateral incisor and guiding the proximal displacement of the canine to replace the lateral incisor improves or maintains the original straight face type. At the same time, the upper midline and the face are adjusted. The midline is consistent, this is the joint link of this case.

Keyword: Replacement period; eruption of central incisor obstruction; small tooth malformation; guided occlusion

P-24 Three-dimensional analysis of the early correction of anterior crossbite using eruption guidance appliance

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Abstract

ABSTRACT Objective: To investigate the clinical effect of eruption guidance appliance in the treatment of anterior crossbite in mixed-dentition children.

Methods: 10 mixed-dentition children with anterior crossbite, totally 12 incisors, were selected. Using alginate to take upper and lower dentition impression and made a hard plaster model, sand the model out to make the eruption guidance appliance, and used the appliance for treatment. The pre- and post-operative dental casts were digitized with SmartOptics Activity 880 scanner, and the three-dimensional overlapping models were got by reverse engineering software, Geomagic Studio 2012, then the three-dimensional movements of the upper and lower incisors were analyzed using Imageware 13.2 software. The overbite and overjet were analyzed using the same methods. Measurement with copper wire was used to analyze the upper and lower arch length. Space analysis was the result by the sum of crown width minus the arch length. The crown width of unerupted permanent teeth was according to X-ray method to predict. The SPSS17.0 software was used to analyze the pre- and post-operative measurements of the same child. The normality test of the measured data showed that it conformed to the normal distribution. Therefore, the t test was used, double side test and the significance level was 0.05.

Results: The course of treatment was (5.6±2.7) months. During orthodontic treatment, the upper incisors moved mainly labially (P=0.000) in three-dimensional displacement, and the lower incisors moved mainly the same direction (P=0.025). During the treatment of eruption guidance appliance, average overbite decreased (1.01±0.9)mm (t=-3.531, P=0.006), the difference was statistically significant. There was no statistically significant difference between the pre- and post-operative average overjet (t=0.771, P=0.460). The severity of crowding in upper arch
decreased \((1.9 \pm 0.99)\) mm \((t=-6.042, \ P=0.000)\), and the one in lower arch decreased \((1.9 \pm 0.74)\) mm \((t=-8.143, \ P=0.000)\), both of the differences were statistically significant. **Conclusion:** The anterior crossbite in mixed dentition could be corrected by eruption guidance appliance, at the same time, the normal overjet and overbite were established, and the teeth were aligned.

**P-25  Multidisciplinary Synergy Treatment of Preschool Children with Class III Skeletal Malocclusion**

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**Abstract**

Class III skeletal malocclusion accompanied with premature loss of multiple primary teeth is rare in preschool children. It’s very difficult to treat for its physiological characteristics in this phase. As a result, there are a number of potential considerations including jaw development, aesthetic, space maintain, mastication, eruption of the permanent successors, speech development, quality of life and development of oral habits, et al. To better release patients from existing or potential dysfunctions, multidisciplinary synergy treatment needs to be offered. We diagnosed a 5 year-old child with Class III skeletal malocclusion, accompanying severe early childhood caries(S-ECC) and premature loss of multiple primary teeth. Clinical findings indicated concave profile, maxillary hypodevelopment, anterior primary teeth loss, premolar space loss, low self-esteem and so on. In period of treatment the patient was given oral hygiene instruction. Filling treatment or pulp treatment was done for caries, pulpitis and periapical periodontitis. A casting appliance made of chromium-cobalt alloy was bonded and used to early protract maxilla for correction of skeletal class III deformity. Meanwhile, anterior artificial teeth were fabricated to satisfy functional and esthetic requirements. Resin base of the appliance was designed for premolar space maintain. The patient complied well and didn’t complaints of obvious discomfort. At the end of treatment, a class I skeletal relationship was acheived without obvious posterior teeth mesialization. Appearance was improved and straight profile were obtained. Premolar spaces were keeped and permanent successors erupted normally. Excellent oral hygiene habits and healthy oral condition were established. After all treatments were completed, fluoride topical, and fissure sealants, recall check up after three months were scheduled. The multidisciplinary approach was successful in improving function, aesthetics, phonation and self-esteem in this
patient. This case provides a comprehensive knowledge of multidisciplinary synergy treatment of skeletal malocclusion accompanied with complex caires-associated disease in children.

Key words: Class III, maxillary protraction, S-ECC, artificial teeth

P-26 The Treatment Timing of the impacted anterior teeth affects root development

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Abstract

INTRODUCTION: Permanent maxillary incisors impaction is a rare condition which would influences the oral esthetic and function. Even after traction and treatment, the root sometimes is not as good as contralateral tooth. The aim of this study was to discuss whether treatment timing affects the impacted maxillary root development and to seek the best timing for impacted teeth traction.

METHOD: The records of 102 treated impacted anterior teeth which have closed apical foramina after 1-3 years of follow up were evaluated, and the contralateral tooth of the impacted one was selected as control group. Cone-beam computed tomography images were taken before treatment and after following up, and Nolla developmental (ND) stage, root length before and after treatment were measured using Dolphin Imaging software. The influence of the treatment timing on root development was evaluated using t test and Spearman's rank correlation analysis.

RESULTS: 57 males and 45 females had an average age of 9.1±2.0 years. The ND stages of the impacted anterior teeth were significantly lower than the normal control group (P<0.05). The length of the impacted teeth before and after treatment were significantly shorter than the control group (P<0.05). The smaller the ND stage of the contralateral teeth at initial diagnosis, the greater the growth of the impacted teeth root (P<0.05, Spearman correlation r=-0.81), and the patient would get longer length of the root when treatment finished (P<0.05, Spearman correlation r=-0.37), especially when ND stage of the contralateral teeth is around 7.

CONCLUSIONS: Impacted anterior teeth should be discovered and treated as early as possible to gain an ideal root length.

P-27 Measuring agreement between Cervical Vertebrae and Hand-wrist analysis in determining Skeletal maturity according to BMI percentile

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Abstract

Background: Recent studies have shown that the weight status of children and adolescents can affect bone and tooth maturation. Although there is a correlation between the maturation of the cervical vertebrae and the hand wrist bone, no study has yet been conducted on how such correlation can vary according to the weight status of children and adolescents.

Aim: The aim of this study was to examine measuring agreement between cervical vertebrae and hand-wrist analysis for assessing skeletal maturity in children and adolescent patients according to body mass index (BMI) percentile.

Design: A retrospective chart view was used to select patients with BMI data, lateral cephalograms, and hand-wrist radiographs of same day. The patients were divided into 4 groups by age & sex specific BMI percentile. The lateral cephalograms were categorized according to the method of Bacetti and the hand-wrist radiographs were analyzed using the Rajgopal and Kansal method. The degree of agreement between the 2 methods of analyzing skeletal maturation was measured by calculating weighted kappa statistic according to BMI percentile group.

Results: There was a good agreement between the 2 methods for assessing skeletal maturity in the entire BMI percentile group. In general, girls had better agreements than boys. According to the BMI percentile group, the agreement was found to be different, and the pattern was different between boys and girls. Boys showed the best agreement in the overweight group without any specific pattern according to BMI percentile, but girls showed a tendency to increase in agreement as BMI percentile increased. There was a tendency for the agreement to increase as the age & sex specific height or weight percentile increased. Patients who were treated with growth hormone showed the lowest agreement.

Conclusions: Pediatric dentist should consider sex and weight status when evaluating the skeletal maturation of growing children and adolescents because they can affect the agreement of 2 methods of analyzing skeletal maturation.

Keywords: BMI, Skeletal maturation, Hand-wrist, Cervical vertebrae

P-28 Evaluation of the Children with Congenitally Missed or Developmentally Delayed Maxillary First Molars

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Abstract

Background: Tooth agenesis or developmental delay could influence maxillofacial growth as well as dentoalveolar growth, so it might be though being related with skeletal malocclusion.

Aim: This study was performed for the purpose of evaluating features that accompanied by skeletal class III malocclusion with maxillary undergrowth type on the cases of absence or under-development of maxillary permanent first molars.
Design: Panoramic radiographs and lateral cephalographs of children who attended the Pediatric Dental Clinic of Pusan National University Dental Hospital from 2006 to 2016 were retrospectively assessed. 34 patients (12 males and 22 females) whose maxillary first molars were missed or developmentally delayed unilaterally or bilaterally were selected. Eruption disorders caused by local factors and systemic disease were excluded. Panoramic radiographs were used for Demirjian’s method to figure out dental ages of maxillary and mandibular teeth. Maxillary and mandibular dental age was compared to chronologic age of each patient. By lateral cephalometric analysis, parameters expressing skeletal and dentoalveolar disharmony were checked and compared with normal value.

Results: Mean chronologic age of patients was 7.54 ± 1.01 years (7.50 ± 1.13 years for male and 7.56 ± 0.95 years for female) and mean dental age of maxilla and mandible was 6.58 ± 1.04 years and 7.43 ± 0.99 years respectively. Maxillary dental age was significantly delayed compared to chronologic age (p < 0.05). Several parameters showing skeletal disharmony were statistically significant (p < 0.05); Values of AB to mandibular plane, palatal length (ANS-PNS), SNA, ANB difference, wits, U1 to SN, and IMPA were lower, whereas values of Sum, FMA, interincisal angle were higher in patient group than normal. There was no statistical significance in value of Sum, FMA, Interincisal angle between patient and normal group.

Conclusions: Congenitally missed or developmentally delayed maxillary first molars were considered inherent indicators of skeletal class III malocclusion with maxillary undergrowth type and could be valuable for early diagnosis.

Keywords: maxillary first molar, congenital missing, under-development, skeletal class III malocclusion

P-29 Individualized Thermoplastic Oral Appliance (ETA) Intervention In Children’s Mouth Breathing
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Abstract

Introduction: Children's mouth breathing is often caused by habitual or pathological factors, causing craniofacial related muscles to adaptively reconstruct, resulting in malocclusion. The effect of Individualized Thermoplastic Oral Appliance(ETA) was evaluated.

Case report: A 11-year-old boy presented for orthodontic treatment with a chief symptom of a ‘mouth breathing, snoring, protruding’. Clinical examination(Fig.1). Diagnosis: Angle’s class I malocclusion with irregular anterior tooth alignment and oral breathing. Treatment (Fig.2): ETA oral appliance interferes with oral breathing and is treated every night for 8 hours (when sleeping). Results (Fig. 3): 11 months after operation, the facial shape improved, anterior arch widened, anterior crowding improved, and adenoids decreased (Fig. 4).
Figure 1: preoperative examination: protrusion, irregular anterior tooth alignment, narrow dental arch; 10 years of dental age and replacement of lateral teeth; overdevelopment of the mandible (SNB 81.6) (III class) (ANB 1.3), low angle (FH-MP 24.1), and protruded upper incisors (U1-SN 110.4).

Figure 2: customized ETA oral appliance, night treatment, 8 hours per day, lip patch assisted fixation.

Effection (Fig. 3): 11 months after treatment, the facial shape was improved, the anterior
segment of the dental arch was widened, and the anterior tooth congestion was improved.

Preoperative examination:
Adenoid-nasopharyngeal ratio A/N: 0.54

Preoperative examination:
Adenoid-nasopharyngeal ratio A/N: 0.40

Fig 4: Postoperative adenoid size decreased.

Evaluation: ETA oral appliance interferes with children's oral breathing, establishes a good oral functional environment, recovers and reshapes the normal anterior width of the upper dental arch in time, and reduces the severity of misalignment deformity. At the same time, the decrease of adenoid volume is expected to be a new method to prevent sleep and respiratory disorders in children.

Key Words: Mouth Breathing; Mixed Dentition; Malocclusion; Individualized Thermoplastic Oral Appliance (ETA)

P-30 Reposition Splint Treatment of Skeletal Class III Malocclusion in Primary Dentition

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Abstract

Introduction: Children jaws express differently in growth rule, skeletal class III malocclusion after rectification, considered easy to relapse when mixed dentition. The reposition splint was used to improve the effect of intervention and guidance of the tongue spring and FRIII appliance and effectively prevent recurrence.

Case report: A boy, 4 years 7 months old, for negative overjet to treatment. His mother is with similar facial profile. Examination (Fig. 1). Diagnosis: Angle's class III malocclusion; deciduous crossbite; skeletal class III malocclusion; Sagittal facial type III; vertical high-Angle. Treatment (Fig. 2): reposition splint to improve intervention and guidance of tongue spring and FRIII appliance. Results (Fig. 3 and 4): After 60 months, to mixed dentition, there was no recurrence, the growth in vertical was effectively controlled, the facial profile was coordinated, and no abnormalities were observed in the temporomandibular joint.
Figure 1: examination: concave type of facial profile; deciduous crossbite; mesioclusion, insufficient growth of maxillary (SNA° 78.6 ↓), excessive growth of mandibular (SNB° 79.9 ↑), skeletal class III malocclusion (ANB° -1.3 ↓), high Angle of inclination (FH-MP° 33.6), upper and lower anterior teeth incline to tongue (U1-SN° 84.2 ↓, L1-MP° 66.3 ↓).

Figure 2: treatment A. reposition splint + tongue spring in maxillary for intervention, 24 hours per day. B. After six months, the crossbite relieved and the splint was adjusted. After 10 months, the molar was combined. C. D. repositioned the splint in FRIII appliance for 12 hours per day.
Figure 3: effect: after 5 years, normal overbite and overjet, neutral molar relationship and the facial profile was coordinated.

Figure 4: after 5 years, X-ray suggested improvement of sagittal facial profile, effective control of vertical growth and compensation of upper and lower anterior teeth

Comment: Repositioned the splint so that the mandibular retreating position, effectively control the sagittal growth of the mandibular; Improved tongue spring to remove the front teeth rejoining; The improved FRIII appliance can effectively control the vertical growth of the mandibular. At the same time the labial muscle training facial profile coordination.

key words: Deciduous Dentition, Skeletal Class III Malocclusion, Reposition Splint, X-ray Cephalogram Analysis

P-31 The respiratory effects of sevoflurane in the disabled

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Abstract

Background: The induction procedure is the most important step of the whole anesthetics process for patients with disabilities. This is because not only the respiratory dynamics but the development of respiratory control can be different between patients without and with disabilities due to the difference in the degree of brain development. This study’s purpose is to evaluate the difference in respiratory depression between patients without and with disabilities,
both induced using sevoflurane.

**Methods**: This study collected medical records of 378 patients who underwent general anesthesia using sevoflurane induction, from January 1, 2016 to December 31, 2016. The patients’ age, sex, and disabilities were analyzed retrospectively.

**Results**: The average value of pH among the patients without disabilities was 7.35 ± 0.05, and that among the patients with disabilities was 7.34 ± 0.41. The average value of HCO₃⁻ was 26.4 ± 2.10 mmol/L among the patients without disabilities, and that among the patients with disabilities was 27.2 ± 2.96 mmol/L. The average value of PCO₂ among the patients without disabilities was 47.7 ± 7.12 mmHg, and that among the patients with disabilities was 48.9 ± 8.72 mmHg. The groups showed no significant difference in the measured value of PCO₂ (P > 0.05)

**Conclusion**: It is considered that there is no significant difference in the degree of respiratory depression under sevoflurane induction through voluntary respiration between patients with brain injuries, intellectual disabilities, and autistic disorders and patients without disabilities.

**key words** : Disabled people; Sevoflurane induction; General anesthesia; Respiratory depression.

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**P-32 Effects of caries treatment under general anesthesia on oral health behavior and growth development in children**

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**Abstract**

**BACKGROUND**: Caries treatment under general anesthesia (GA) has to be applied when all common behavior management methods are ruled out. More and more medical personnel and parents pay attention to GA for its superiority.

**PURPOSE**: To study changes of children caries activity after treatment under general anesthesia, and to analyze effects of caries treatment under general anesthesia on oral health behavior and growth index of children.

**METHODS**: Patients who met criteria and were treated under general anesthesia were included in this study. Informed consent for this study was obtained from parents. Before and after the treatment, children’s oral health conditions were examined; height, weight and the degree of dental fear were recorded; the caries activity was evaluated. In addition, questionnaires related to oral health behavior and early childhood oral health impact scales were fulfilled by parents. The patients were followed for 6 months after the treatment. All the data were analyzed using SPSS version 25.0

**RESULTS**: The average dmft of children before the treatment was 14.02. Patients with supplemental feeding during sleep and additional bottle feeding in the first six months have higher dmft. The incidence of caries relapse was 25.67% after 3 months and was 50% after 6 months. The Caries activity decreased dramatically after the treatment. Among three follow-up results, the Cariostat scores at the 3rd month were the lowest. After general anesthesia, the
eating frequency and sweets intake decreased obviously, and the time for tooth-brushing was longer, while the children’s mealtime was significantly shorter. The number of children in normal BMI range significantly increased after dental general anesthesia. The dental fear level and oral health-related quality of life after dental general anesthesia were obviously changed. The Venham Grading reduced from 3.54±1.46 to 1.73±1.46 after 6 months, and the total ECOHIS scores reduced by 44.3% after 6 months.

**CONCLUSION:** Dental general anesthesia can reduce children's dental fear level, and improve their oral health behavior, nutritional status and life quality of their families in short-term. However, a large proportion of children were in a high risk of caries relapse after treatment.

**Key Words:** General Anesthesia; Caries activity; BMI; Dental Fear; Oral health-related quality of life

**P-33 The Application of Intravenous Deep Sedation in Dental Treatment for Uncooperative Children**

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**Abstract**

**Objective:** To evaluate the safety and effectiveness of application of intravenous deep sedation in dental treatment for uncooperative children.

**Methods:** This study involved a review of uncooperative children (more than 3 years of age), who underwent dental treatment using propofol IV sedation between November 2015 and April 2017 in Department of Pediatric Dentistry, Peking University School and Hospital of Stomatology. The sedative process is performed by anesthesiologist. First, Dexmedetomidine was administered by nasal spray to perform preoperative sedation, and the lidocaine gel was applied to the venipuncture site. Then After venipuncture, Propofol was infused using a target controlled infusion (TCI) pump. Vital signs, Bis (bispectral Index) value, exhaled carbon dioxide value, as well as the occurrence of body movement, cough, hypoxia (SPO2<90 %) during the treatment, postoperative complications such as vomiting, aspiration, airway obstruction were observed and recorded. All the treatments were performed under a rubber dam to avoid the water or dust entering the respiratory tract.

**Results:** 116 children were enrolled in, including 11 children with intellectual disability. The average age of all the patients is 5.33 ± 1.90, average body weight is 21.68 ± 5.44kg. 100% of the children successfully completed the dental treatment, but 37.24% of the children need inhalation sevoflurane before intravenous puncture. The average preoperative sedation time was 21.48 ± 4.84 minutes, the average oral treatment time was 69.72 ± 24.53 minutes, the average number of teeth was 5.60 ± 3.55, and the average waking time was 79±26.31 minutes. The probability of the body motion which affects operation is 15.52%, the probability of the body movement without affecting the operation is 39.66%, the probability of cough occurring is 15.52%, and the probability of pulse oxygen saturation (SPO2) decrease (spo2<90%) is 12.93%. Only 1 patients
(0.86%) had severe restlessness after operation. There were no case of vomiting, aspiration, respiratory obstruction and other severe complications during and after operation.

**Conclusions:** Intravenous deep sedation technique can be used safely and effectively in children's oral cavity treatment, avoid the physical and mental effects of fear during treatment with Papoose board, improve the comfortableness and safety of children's dental treatment.

**P-34 Post-operative complications following dental therapy under general anesthesia in children**

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**Abstract**

**Background:** Dental general anesthesia (DGA) is a treatment option for children who require extensive dental treatment, exhibit severe dental phobia and emotional or cognitive immaturity. There are several advantages of DGA, including safety, efficiency, and high-quality restorative and preventive dental treatment. Post-operative complications following a DGA were widely reported, but the studies of related factors showed a great variation. Moreover, there are few studies focusing on post-operative complications in Chinese children.

**Objective:** This study was to evaluate the post-operative complications undergoing DGA in systemically healthy children via oral intubation in the first 72 hours after discharge, and analyze the prevalence and related factors in order to provide suggestions for pre-operative, intra-operative and post-operative management.

**Methods:** This prospective study involved 246 systematically healthy children (19 to 116 months old) who received extensive dental treatment under DGA because of severe caries and high dental fear problems. The children had to be fit for DGA administration according to the American Society of Anesthesiologists physical status I and without associated mental health or communication problems. Data about patients' histories, characteristics, dental procedure and anesthesia procedure were collected. Parents or caregivers were interviewed face to face pre-operation and through the telephone 3 days post-operation. Data were analyzed using logistic regression.

**Results:** The average value of treated teeth was 16.48, and the mean dental therapeutic time was 127.34 min. The mean number of teeth receiving extraction, pulp therapy, and stainless steel crown (SSC) was 1.85, 7.44, and 6.72 respectively. Approximately 96.3% of the enrolled children reported one or more complications. The most prevalent complication is post-operative pain (66.67%) in the three days after the treatment, followed by weariness(57.32%), drowsiness (48.48%), agitation (41.46%), problems in eating (39.43%), bleeding (30.49%), fever (25.20%), cough (17.89%), sore throat (9.35%), nausea (8.54%), vomiting (6.10%), epistaxis (4.07%), diarrhea (2.44%), constipation (7.72%), and excitement (0.81%). Nutrition status lower than the WHO Child Growth standards was the factors that showed a significant association with postoperative dental fever. The increase of total number of treated
teeth resulted in the increase of post-operative pain. The increase of number of extracted primary molars and SSCs resulted in the increase of problem in eating.

**Conclusions:** Post-operative pain was the most prevalent complication in this study, and excitement was the least. Nutrition status was the factor probably in association with fever. The total number of treated teeth was related to the post-operative pain. And the number of extracted primary molars and SSCs might be associated with problem in eating.

**P-35 Dental treatment in a Di George syndrome patient under general anesthesia**

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**Abstract**

**Introduction:** Di George syndrome (DGS), also known as CATCH22 syndrome, is a primary immunodeficiency disease caused by abnormal migration and development of certain cells and tissues during fetal development. Approximately 90% of patients with DGS have a small segment deletion in chromosome number 22 at position 22q11.2. While the symptoms can be variable, they often include congenital heart diseases, specific facial features, frequent infections, delayed development with behavioral and emotional problems, learning disabilities, poor immune system function, complications related to low levels of calcium in the blood and cleft palate. As a part of the developmental defect, the thymus gland may be affected and T-lymphocyte production may be impaired, resulting in low T-lymphocyte numbers and frequent infections.

**Case Report:** A 3-year-2-month old, 11.5 kg girl with DGS was referred to the Seoul National University Dental Hospital for dental evaluation and treatment. Patient was diagnosed with DGS, due to the deletion in chromosome number 22 at position 22q11.2 detected on array comparative genomic hybridization (aCGH) test. On clinical test, some features of DGS face, such as small eyes, bulbous nose and small mouth were shown but normal morphology of palate was noticed. Delayed speech development was observed.

The patient had a low T-cell count compared to normal range, thus having the high risk of infection. In addition, the patient underwent a cardiovascular surgery three years ago due to ventricular septal defect, persistent pulmonary hypertension and atrial septal defect. To prevent infection, preventive antibiotic was provided to the patient an hour before dental treatment. A number of dental caries in primary dentition were identified during clinical and radiographic oral examination. Due to the multiple caries and poor cooperation, dental procedure under general anesthesia was planned. The dental procedure was successfully performed under general anesthesia via sevoflurane, nitrous oxide and oxygen. No complication was observed during or after the operation.

**Comments:** In conclusion, this case suggests that the dental procedure under general anesthesia is a safe component for the uncooperative, delayed developmental patients with DGS, since
Immune suppression may exacerbate the risk of bleeding and infection during dental treatment.

**key words**: Di George Syndrome, CATCH22 syndrome, dental treatment, General anesthesia

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**P-36 Dental treatment in a patient with Edwards syndrome under general anesthesia**

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**Abstract**

**Introduction:** Edwards syndrome, also known as trisomy 18, is a genetic disorder caused by the presence of a third copy of chromosome 18. Patients are often born small and have heart defects. Other features include a small head, small jaw, rocker-bottom feet, clenched fists with overlapping fingers and severe intellectual disability. Edwards syndrome occurs in around one in 5,000 live births. Most cases of Edwards syndrome occur due to problems during the formation of the reproductive cells or during early development. The rate of disease increases with the mother’s age. Rarely cases may be inherited from person’s parents. Some studies suggest that more babies that survive to birth are female. Many of those affected die before birth and 90% die within 12 months. Occasionally not all cells have the extra chromosome, known as mosaic trisomy, and symptoms in these cases may be less severe.

**Case report:** A 4-year-8-month old, 11 kg uncooperative girl with Edwards syndrome (mosaic trisomy) was referred to Seoul National University Dental Hospital for multiple caries on primary posterior teeth from local dental clinic. The patient had small head, small jaw, rocker-bottom feet, mental retardation and dietary disorder. She had multiple caries requiring dental caries treatment. The patient underwent adenoidectomy one year ago under general anesthesia. Due to small ventricular septal defect and right ventricular outflow tract obstruction, she had been following-up at pediatric cardiac departments. After consultation with medical doctor, the patient received prophylactic antibiotic an hour before the general anesthesia. The patient had history about decreasing oxygen saturation to 40 after taking Pocral(Sedative drug) and injection of 2% Lidocaine with 1:100,000 epinephrine for local anesthesia in local dental clinic. Moreover, the patient’s mother had Lidocaine allergy. Lidocaine allergy test was performed before the treatment with 1:1, 1:10 and 1:100 diluted Lidocaine injected to skin. The patient showed positive response to undiluted Lidocaine only. Dental treatment was done without local anesthesia and Ketrarolac was injected after treatment. The dental procedure was successfully performed under general anesthesia via Sevoflurane, nitrous oxide and oxygen. No complication was observed during or after the operation.

**Comments:** In conclusion, this case suggests that general anesthesia can be effectively used to treat dental problem for the uncooperative patients with Edwards syndrome. General anesthesia also can be more helpful to the patient with lidocaine allergy.

**key words**: Edwards syndrome, trisomy 18, Lidocaine allergy, dental treatment, general anesthesia
P-37 Spontaneous Regression of a Congenital Epulis of the Newborn

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Abstract

Introduction: Edwards syndrome, also known as trisomy 18, is a genetic disorder caused by the presence of a third copy of chromosome 18. Patients are often born small and have heart defects. Other features include a small head, small jaw, rocker-bottom feet, clenched fists with overlapping fingers and severe intellectual disability. Edwards syndrome occurs in around one in 5,000 live births. Most cases of Edwards syndrome occur due to problems during the formation of the reproductive cells or during early development. The rate of disease increases with the mother's age. Rarely cases may be inherited from person's parents. Some studies suggest that more babies that survive to birth are female. Many of those affected die before birth and 90% die within 12 months. Occasionally not all cells have the extra chromosome, known as mosaic trisomy, and symptoms in these cases may be less severe.

Case report: A 4-year-8-month old, 11 kg uncooperative girl with Edwards syndrome (mosaic trisomy) was referred to Seoul National University Dental Hospital for multiple caries on primary posterior teeth from local dental clinic. The patient had small head, small jaw, rocker-bottom feet, mental retardation and dietary disorder. She had multiple caries requiring dental caries treatment. The patient underwent adenoidectomy one year ago under general anesthesia. Due to small ventricular septal defect and right ventricular outflow tract obstruction, she had been following-up at pediatric cardiac departments. After consultation with medical doctor, the patient received prophylactic antibiotic an hour before the general anesthesia. The patient had history about decreasing oxygen saturation to 40 after taking Pocral (Sedative drug) and injection of 2% Lidocaine with 1:100,000 epinephrine for local anesthesia in local dental clinic. Moreover, the patient’s mother had Lidocaine allergy. Lidocaine allergy test was performed before the treatment with 1:1, 1:10 and 1:100 diluted Lidocaine injected to skin. The patient showed positive response to undiluted Lidocaine only. Dental treatment was done without local anesthesia and Ketorolac was injected after treatment. The dental procedure was successfully performed under general anesthesia via Sevoflurane, nitrous oxide and oxygen. No complication was observed during or after the operation.

Comments: In conclusion, this case suggests that general anesthesia can be effectively used to treat dental problem for the uncooperative patients with Edwards syndrome. General anesthesia also can be more helpful to the patient with lidocaine allergy.

key words: Edwards syndrome, trisomy 18, Lidocaine allergy, dental treatment, general anesthesia

P-38 MANAGEMENT OF CHRONIC PERIODONTITIS IN
24-YEAR-OLD MENTAL RETARDED PATIENT WITH CURETTAGE AND BONE GRAFT

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Abstract

**Introduction:** Chronic periodontitis is an infectious disease caused by inflammation of the dental supporting tissues that is clinically characterized by the loss of periodontal attachment and the loss of alveolar bone. Chronic periodontitis is a painless and slow progressing disease. Mental retardation is a significant decrease in intellectual quotient and directly leads to social adaptation disorders. Treatment of chronic periodontitis in patients with mental retardation is very challenging but not impossible to do with the selection of appropriate treatments such as curettage and bone graft. Dentists and parents cooperation in oral hygiene care greatly supports the success of treatment.

**Case report:** The 24-year-old boy with mild mental retardation (IQ 70) came to Dental Hospital, Faculty of Dentistry, Universitas Indonesia escorted by his mother complained about mobility of lower anterior teeth. Intraoral examination was found calculus and grade III mobility of tooth 32, grade II mobility of teeth 31,41,42, extrusion of tooth 47, and dentin caries of teeth 37 and 48. Panoramic radiograph showed horizontal bone destruction in almost all of teeth. Periapical radiographs showed bone destruction in apical third of the teeth 31,32,41,42 and bone destruction in the middle third of roots of the teeth 11 and 21. Patients were diagnosed with localized chronic periodontitis. Treatment was done in 3 stages. First, initial therapy with dental health education and oral prophylaxis (including scaling and root planning), composite resin restoration in teeth 37 and 48, extraction of tooth 47, splinting using bracket and orthodontic wire, and using chlorhexidine mouthwash 0,2% three times a day. Second, the surgical phase with curettage on teeth 11,21,31,32,41,42 and bone graft on the teeth 31,32,41,42. Third, maintenance phase by establishing cooperation with parents for the maintenance of oral hygiene.

**Comments:** In this case, curettage was performed to reduce the pockets, fixing attachments or creating new periodontal attachments. Bone graft aims to help the bone regeneration process. The combination of curettage and bone graft aims to improve bone destruction due to chronic periodontitis. The management of chronic periodontitis in mental retarded patient can provide good results with appropriate treatment selection.

**Key words:** Chronic periodontitis, Mental retardation, Curettage, Bone graft

P-39 Study on Upper Airway Width and Sleep Disordered Breathing in Children with Mouth Breathing Using Portable Sleep Monitoring
Abstract

**Background:** The most common cause of mouth breathing is obstacles caused by mechanical factors in upper airway. Mouth breathing could be consequently pathological cause of sleep disordered breathing. Sleep disordered breathing in children can cause growth disorders and behavioral disorders. Also, it affects the overall quality of life.

**Aim:** The purpose of this study was to investigate relationship between upper airway and sleep-disordered breathing in children with mouth breathing using portable sleep monitoring.

**Design:** 20 boys between 7-9 years old who reported to have mouth breathing in questionnaire were evaluated with clinical examination, questionnaires, lateral cephalometric radiographs, and portable sleep monitoring (Embletta® MPR, Natus Medical Inc.). This study assessed apnea-hypopnea index (AHI) and oxygen desaturation index (ODI) for the evaluation of sleep disordered breathing and was done to investigate the correlation between these values and the upper airway width measured by lateral cephalometric radiographs.

**Results:** There was no significant correlation with the size of the tonsils ($p = 0.92$), but the adenoid hypertrophy was higher in the abnormal group than in the normal group ($p < 0.01$). In the classification according to AHI and ODI, retropalatal and retroglossal distance showed a statistically significant decrease in the abnormal group compared to the normal group ($p < 0.01$). As AHI and ODI increased, upper airway width tended to be narrower.

**Conclusions:** This indicates that mouth breathing could affect the upper airway, which is related to sleep quality. Pediatric dentists should be aware of children’s sleep disordered breathing and ensure that patients are treated early enough for normal growth.

**Keyword:** Mouth breathing, Sleep disordered breathing, Upper airway

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**P-40 Clinical and Histological Analysis of Regional Odontodysplasia: A Case report of “Ghost teeth”**

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**Abstract**

**Introduction:** Regional odontodysplasia (ROD) is a rare developmental anomaly of the teeth that affects enamel and dentin. Although the etiology of the ROD is uncertain, the most accepted theory refers to circulatory disorders associated with vascular nevi. A 3-year-old girl was referred to the authors' institution with hypoplasia as her major symptom. She had no relevant medical or family history. Radiographically, the affected teeth presented the pathognomonic image of “ghost teeth”. The purpose of this report is to provide valuable information to pediatric dentists about the current diagnosis for ROD.
Case report: A 3-year-old girl presented with severe hypoplasia of the maxillary left deciduous molars. There was no history of genetic or dental disorders or anomalies in the family history. In all maxillary left deciduous molars, the pulp chambers and root canals were so large and a very thin hard tissue was seen around the root canals and pulp chambers with panoramic radiographs. In addition, the maxillary left first molar exhibited the same configuration. The remaining dentition was caries free and had developed normally and the soft tissues showed normal color and texture. Based on clinical and radiographic findings, the problem was diagnosed as ROD. We consider the deciduous molars and first molar to need extraction, and then we extracted these teeth under general anesthesia. The extracted tooth was histologically examined under an optical microscope in the decalcified section. Based on the histopathological features, the provisional diagnosis of ROD was confirmed.

Comments: ROD can be easily mistaken for grossly carious teeth. However, early and correct diagnosis of this disease is important for appropriate treatment. The report of this case is valuable information for pediatric dentists to discuss the clinical, radiographic and histological features of ROD. Although a lot of cases have been reported, the mechanism about this disease has not been investigated in detail. Further research including epidemiological and experimental studies is required.

Key word: Regional odontodysplasia, Ghost teeth, Tooth development

P-41 Dentofacial features and management of patient with Sanjad Sakati Syndrome

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Abstract

Introduction: Sanjad-Sakati Syndrome (SSS) is a rare autosomal recessive genetic disorder which is predominantly found in the Middle Eastern children. Usually patients have hypoparathyroidism retardation- dysmorphism condition characterized by intrauterine growth retardation as well hypocalcaemic convulsion, typical facial dysmorphic features, developmental delay, congenital hypoparathyroidism and sever growth retardation. Oral findings include microdontia, hypodontia, enamel hypoplasia and severely carious teeth.

Case Report: Here, we report oral/facial findings and management of a 5-year old girl born to consanguineous parents -2nd degree cousins- presented with hypoparathyroidism with dysmorphic features of SSS which is referred to pediatric dental clinic at Sultan Qaboos University Hospital due to dental pain. Her weight was 7.5kg and 73cm height when she was first seen in our clinic. The child has asthma, recurrent pneumonia, lower respiratory tract infection, hypermetropia, pseudopapilledema, hypocalcemia convulsion with history of multiple admissions. She is in multiple regular medications such as alfacalcidiol, calcium carbonate and multivitamins. Upon examination, she has micrognathic retrognathic maxilla and mandible, small deep set eyes eye, narrow intercanthal distance with narrow nasal bridge, beaked nose, lower set ears, microcephaly, small fingers and grossly carious primary teeth. The patient is living far away, as
well having poor cooperation and mental retardation. The treatment options were discussed with the patient's parents and agreed plan was comprehensive dental care under general anaesthesia as in- patient. The Patient recovery post dental care was uneventful and she was discharged the following day with follow up appointment.

**Comments:** This rare disorder has many dental features and many implications which involve multidisciplinary specialties when it comes in providing the needed dental care. Patients with multiple systematic conditions are prone to dental health neglect. Therefore, early detection of this disorder helps in commencing preventive dental therapy and effective health education at the optimum time with the appropriate management.

**Keywords:** Sanjad-Sakati Syndrome, dental, Oman

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**P-42 Comprehensive dental treatment to a patient with insufficient sex hormone and maxillofacial skeletal dysplasia: a case report**

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**Abstract**

**Introduction:** Multiple factors may contribute to craniofacial dysplasia, including genetic factor, endocrine factor, systemic disease, deleterious oral habit and so on. Endocrine system plays a critical role in the skeleton development, in which sex hormone have significant impacts on the normal development of maxillofacial bone. Sex hormone deficiency can cause oral and craniofacial diseases. Early childhood caries and deleterious oral habits not only reduce the masticatory function, but also aggravate the maxillofacial bone dysplasia. This is a case report of comprehensive dental treatment to a patient with insufficient sex hormone production and maxillofacial skeletal dysplasia.

**Case Report:** A 4-year-old boy presented with a chief complaint of swelling and pain of several teeth for 3 years. Deleterious oral habits included mouth breathing and unilateral chew. Clinical oral examination revealed that the left maxillary second primary molar (#65) with a deep caries lesion, the right maxillary second primary molar and mandibular second primary molars (#55, #75, #85) with pulp exposure, and other teeth (the total number is 16) are residual roots. Abnormality of occlusal relationship included open bite, dental midline discrepancies and posterior crossbite. Radiographic examination showed that one permanent tooth #35 was absent, and one supernumerary tooth was found between #11 and #21. CBCT examination showed that the mandibular condylar, middle of maxilla, nasal bone and orbital bone are dysplasia. Medical examination revealed that the levels of testosterone and luteinizing hormone were significantly below the normal levels. The patient was diagnosed as severe early childhood caries, congenital hypodontia (#35), supernumerary tooth, maxillofacial skeletal dysplasia and sex hormone deficiency. A comprehensive treatment plan included restoration for #65, root canal therapy for #55, #75, #85, extraction of residual roots, and design of removable space maintainer. The
maxillary space maintainer was designed firstly to correct the posterior crossbite. After one month, the mandibular space maintainer was designed. In following-up, the space change of dental arch will be observed carefully and the space maintainer need to be changed termly. The development of the maxillofacial bone and mandibular condylar will be inspected regularly, and surgical and orthodontic combined treatment should be considered when necessary.

**Comments:** The sex hormones modulate bone cell function by binding with the sex hormone receptor, for maintaining the normal development of skeleton and craniofacial bone. In this case report, we presented a patient with maxillofacial skeletal dysplasia, that might be closely related to sex hormone deficiency. For a patient with mandibular condylar dysplasia, it is important to avoid further damage of mandibular condylar in clinical treatment. In this case, we firstly designed the maxillary space maintainer to correct the posterior crossbite. After verified the adaptability and stability of temporomandibular joint, the maxillary space maintainer was used one month later. Furthermore, Pediatric dentists should also pay attention to the impacts of systemic diseases on the occlusal relationship and the development of craniofacial bone. Multidisciplinary cooperation should be carried out to achieve accurate diagnosis and comprehensive treatment to improve the quality of children’s life.

**Keywords:** abnormal jaw development, sex hormone, deleterious oral habits, severe early childhood caries, comprehensive dental care

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**P-43 Maternal Exposure to BPA Disrupts Enamel Formation via EZH2-mediated H3K27 Trimethylation**

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**Abstract**

**Background:** Molar-incisor Hypomineralisation (MIH) are becoming public health concerns because of severely negative impact on oral health and maxillofacial development. Endocrine-disrupting chemicals (EDCs), such as bisphenol A (BPA), is confirmed as potential causative agent of MIH. Although a number of transcription factors and pathways have been implicated in controlling specific steps along dental epithelial cells differentiation hierarchy, the role of epigenome in regulating cell-fate decisions and differentiation within this epithelial compartment remains unclear.

**Objectives:** The aim of this study was to analyze how BPA disrupts amelogenesis process, and to identify the epigenetic regulator involved in this process to determine the epigenetic mechanisms involved in MIH.

**Methods:** Experimental animal model that replicates MIH were induced by maternal BPA exposure. Incisor labial cervical loop and dental epithelial stem cells (DESCs) were harvested. Genome-wide mRNA and histone modification (H3K27me3) profiles were established with high-throughput sequencing. The key H3K27 methyltransferase EZH2 and one of amelogenesis regulators E-cadherin were selected. qRT-PCR and Western blot were tested to map their
Expression patterns in vivo. In vitro, gain and loss of function analyses were conducted to explore their roles in regulating DESCs fate choice and differentiation. ChIP-qPCR was performed to establish histone modification profiles within E-cadherin and EZH2 promoter region.

**Results:** BPA exposure significantly suppressed enamel formation but increased DESCs proliferation and self-renewal in offspring. Remarkably, the epigenome underwent highly specific changes with BPA exposure, with a profound change being observed in the global H3K27me3 map of DESCs during amelogenesis. 3649 genes were significantly enriched for H3K27me3 in BPA-treated compared to the control dams. Furthermore, correlating the global H3K27me3 modification maps with gene expression signatures indicated that the epigenome has an important role in directing cell-fate changes from DESCs to ameloblasts. Most noticeably, a strong reverse relationship was apparent between H3K27me3 marking and the expression of specific genes, such as Bmi1, Sox2, Gli1 and E-Cad, in DESCs. We therefore examined the role of the key H3K27 methyltransferase EZH2 in BPA induced MIH. Its expression coincided with H3K27me3 modifications, driven in part by ERα. Depletion of EZH2 by siRNA attenuated BPA-induced decreases of E-Cad and increases of H3K27me3. Besides, ChIP-qPCR demonstrated that EZH2 and H3K27me3 are enriched at the E-Cadherin promoter in DESCs exposed to BPA, indicating that EZH2 mediates epigenetic silencing of E-cadherin via histone methylation.

**Conclusions:** Our study identifies that epigenetic silencing of E-cadherin via EZH2-mediated H3K27 trimethylation is involved in increased proliferation and self-renewal of DESCs induced by BPA and thereby contributes to the BPA induced abnormal enamel formation in MIH.

**Key words:** Dental Enamel; Bisphenol A (BPA); epigenetics; EZH2

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**P-44 Researches on the IL-1α participating in tooth eruption through JNK and p38 MAPK pathways**

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**Abstract**

**Background:** Bacteria in endodontic and periodontal lesions can induce expression of IL-1α. Whether the up-regulation of IL-1α in the apical area of primary teeth influences the eruption process of successors mediated by dental follicle cells (DFCs) needs further study.

**Objective:** To investigate the effects of IL-1α on physical tooth eruption and its mechanism.

**Material and methods:** (1) Rat dental follicle cells were cultured and identified. IL-1α was applied at a concentration of 5ng/ml for 3, 6, 12 and 24h in the experimental groups. qPCR and Western blot were performed to analyze the expression of mRNA and proteins related to osteogenesis and osteoclastogenesis; DFC–bone marrow cell co-cultures, osteogenic differentiation and transwell matrigel invasion assay were used to determine the effect of IL-1α on DFCs further. (2) Phosphorylation of JNK, ERK, p65 and p38 were evaluated in the IL-1α-treated group compared to the control group; (3) IL-Ra was injected subcutaneously into neonatal SD rats (postnatal day 1) at a dose of 500ng every other day. Rats were sacrificed on day 14 for histologic staining and day 19 for micro-computed tomography (CT) analysis.
**Results:** (1) IL-1α decreased the expression of RUNX2, OPN, OCN, and increased the expression of MMP9 and ratios of RANKL/RANK, RANKL/OPG. DFCs cultured with IL-1α showed weaker osteogenic capacity visualized by alizarin red staining, higher osteoclastogenic capacity demonstrated by TRAP staining and stronger invasive ability measured by invasion assays. (2) Phosphorylation of JNK and p38 were up-regulated in experimental groups, while p-ERK and p-p65 showed no obvious change. (3) The osteoclasts around dental follicles were significantly decreased in the IL-1Ra-treated group and the eruption distance of the first molar on the lingual side was reduced compared with controls.

**Conclusions:** IL-1α led to disturbed osteogenic and osteoclastic process involving reduced RUNX2, OPN, OCN and upregulated MMP9, RANKL/RANK, and RANKL/OPG. JNK and p38 signaling pathways were involved in the mediation of IL-1α on tooth eruption via DFCs. IL-1Ra delayed teeth eruption in rats.

**Keywords:** IL-1α; tooth eruption; dental sac

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**P-45 Dentists’ knowledge and practice of regenerative endodontotics in China: a cross-sectional study**

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**Abstract**

**Introduction:** Recent research demonstrates that the application of regenerative endodontics can significantly improve clinical and radiographic outcomes of pulpitis immature teeth. The purpose of this study was to survey dentists’ knowledge and practice of regenerative endodontics in China, to identify any obstacles that may exist in application.

**Methods:** A paper-based or online survey was sent to dentists (n=488) who were pediatric specialists in priority, as well as endodontists and general dentists from 32 public hospitals located in 22 provinces of China. Data were analyzed using descriptive statistics and chi-square analysis. Level of significance was set at 0.05.

**Results:** A 77% response rate (n=376) was achieved in this survey, primarily from pediatric specialists (64.3%). Majority of dentists (97.6%) reported that they were aware of the regenerative endodontics technique, but only 59.7% of them had practiced this therapy. The rate of applying regenerative endodontics increased with age (P<0.05) and working experience (P=0.06). In addition, those who read the academic journals more frequently had a higher chance of practicing regenerative endodontics (P<0.05). The significant difference between the regions in practicing this therapy was the practicing type. A higher percentage of pediatric dentists working in the eastern regions had regenerative endodontics practicing (P<0.05). Our survey showed that continuing education courses were the leading source for dentists to learn about the knowledge of regenerative endodontics (35.4%), and 87.7% of the dentists participated...
in this survey were interested in regenerative endodontics. The primary reason to adopt this procedure in clinical practice was based on the observation of continuing root development (86.8%), and the most notable obstacles to practicing regenerative endodontics were the lack of apparent long-term effect (45.5%). Geographically, compared to the dentists in eastern regions, senior dentists with more than 20 years working experience in mid-west regions were less familiar with the practice protocol (P<0.05).

Conclusions: The results of this study indicated that the benefit of regenerative endodontics was widely recognized among dentists in China; however, its adoption is not prevailing. There were clear obstacles in practice that need to be addressed. Lots of the geographical difference were intriguing but not significant.

Key Words: Regenerative endodontics; Dentist; Survey;

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**P-46 Bactericidal effect and morphological analysis of dentin contaminated by cariogenic bacteria after Er:YAG laser irradiation**

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**Abstract**

The purpose of this in vitro study was to determine the influence of subablative Er:YAG laser irradiation on bactericidal effect and morphological changes on dentin contaminated by cariogenic bacteria.

**Method:** First incisors of freshly slaughtered bovines were used. Dentin discs of 1mm thickness (average area was 15*10mm²) were cut from the middle part of the crown. *S. mutans* (UA 159) was chosen as standard cariogenic bacteria. Dentin disc and bacteria liquid were co-culture for 7 days. A commercially available pulsed Er:YAG laser (Lite touch, Syneron, Israel) was used in this study imitating the clinical conditions. The laser energy density ranged from 6.37 to 25.47J/cm². The specimens were irradiated from the surface in close contact mode under constant scanning movement (1mm/s) with water spray level at 8. A straight sapphire tip of 1mm in diameter was used and the laser tip was at 15° angle between the laser tip and the vertical axis of the slab.

After irradiation, the dentin slabs were stained with LIVE/DEAD® stain following the manufacturer’s instruction and observed in the confocal laser scanning microscope (CLSM). The morphology of the surfaces at dentin was observed with a scanning electron microscope (SEM).

**Result:** After Er:YAG laser irradiation, the green fluorescent bacteria were significantly decreased and red fluorescent bacteria were increased. Measurement of red/green fluorescence density with ZEN Blue software showed that output power at 1.5w and 2w (G3 and G4) were significant higher than 0.5w and 1w (G1 and G2) (P<0.05). Compared to control group, laser irradiated dentin in G2-G4 showed clean surface and debris free with open orifice. The orifice was widened and intertubular dentin was ablated while peritubular dentin was protrusion. In G1, surface melted...
and fusion areas with less opened dentinal tubules were observed.

**Conclusion:** Under the condition used in this study: (1) Er:YAG laser had bactericidal effect on cariogenic bacteria with clean surface and debris free with open orifice after irradiation. (2) Under the lower energy (0.5w), dentin-melting can facilitates an asymptomatic postoperative course.

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**P-47 Platelet-rich fibrin improves the properties of stem cells from apical papilla via extracellular signal-regulated protein kinase signaling pathway**

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**Abstract**

**Background:** Blood clot is routinely used as the scaffold of regenerative endodontic treatment (RET). However, there are available case reports consistently show the ideal efficacy of platelet-rich fibrin (PRF) as a scaffold in RET. The molecular mechanisms of PRF promote the process of RET remain unclear. The extracellular signal-regulated protein kinase (ERK) signaling pathway is one of the mitogen-activated kinase cascades and plays important roles in the regulation of stem cell growth and differentiation. Stem cells from apical papilla (SCAP) are thought to be one of the most important stem cells involved in RET. Thus, we assume that PRF may promote the properties of SCAP via ERK pathway to achieve the pulp regeneration.

**Aim:** 1. To investigate the cytobiological effects of PRF on SCAP *in vitro*. 2. To evaluate the potential efficacy of combination use of PRF and SCAP *in vivo*. 3. To explore molecular mechanisms of the roles of ERK in the effects of PRF on SCAP.

**Design:** 1. Different concentrations conditioned media were prepared: 1/8, 1/4 and 1/2 PRF groups. After treated with PRF, the proliferation rate and cell cycle were analyzed by CCK-8 and flow cytometric assay; the expression of Runx2 and DMP-1 and the capacity of forming mineralization nodules of SCAP were evaluated with Real-time PCR, Western blot analysis and alizarin red S staining. 2. A dorsal regions of nude mice transplantation model was established to observe the potential efficacy of pulp-dentin-like tissues in root canal transplanting with cell-sheet fragments of SCAP and PRF granules. After 8 weeks, the mice were sacrificed and tooth fragments were removed for histological analysis. 3. Western blot was used to detect the expression of ERK and ERK phosphorylation of SCAP. After treated with ERK inhibitor, the properties of SCAP were evaluated correspondingly.

**Results:** 1. PRF improved the proliferation rate, the expression of Runx2 and DMP-1, and the capacity of forming mineralization nodules of SCAP. Cell cycle analysis showed that the G1 phases of SCAP treated with PRF were higher than the control group. 2. Transplantation of the SCAP/PRF construct led to form well-organized and vascularized pulp-like tissues, and deposit dentin-like tissues in the root canal. 3. PRF induced activation of ERK phosphorylation and pretreatment with the ERK inhibitor abolished the PRF induced osteo-/odontogenic of SCAP.

**Conclusions:** PRF improved the properties of SCAP by activating the ERK pathway. The favorable
cytobiological effects of PRF on SCAP laid a theoretical foundation for the application of PRF in RET.

**Keywords:** regenerative endodontic treatment, platelet-rich fibrin, stem cells from apical papilla

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**P-48 Roles of Msx1 on regulating murine tooth germ development at late bell stage**

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**Abstract**

**Background/Objectives:** Tooth germ development regulation is specific spatial and temporal, with different stages exhibiting their specific regulation mechanisms. Homeobox gene Msx1 plays a vital role on regulating early tooth development. Previously we demonstrated that the roles of Msx1 on regulating cap and early bell stage were different with bud stage, and hypothesized that MSX1 prevented odontoblast differentiation by inhibiting Bmp2 and Bmp4 expression at cap and early bell stage. However, as the mesenchyme at cap and early bell stage are undifferentiated, it is difficult to directly confirm our hypothesis. The late bell stage is a distinct time point as cytodifferentiation is initiated, which is ideal for examining whether MSX1 prevents tooth germ mesenchyme. Thus, the objectives of this study were conducted to explore whether Msx1 inhibits odontoblast differentiation at late bell stage and the underlying mechanisms, and also investigated the roles of Msx1 on regulating late bell stage.

**Materials and methods:** Mouse mandibular first molar tooth germs were harvested from E18.5 (late bell stage) pregnant mice, and dental mesenchymal cells were isolated and cultured in vitro. Msx1 specific-siRNA and plasmid were transfected into dental mesenchymal cells to knockdown and overexpress Msx1 expression, respectively.

1. **Wnt/β-catenin signaling pathway and downstream genes regulation**  
   Firstly, Msx1 siRNA and plasmid were transfected to detect the expression levels of β-catenin, Bmp2, Bmp4, and Lef1 to investigate how Msx1 regulates Wnt/β-catenin signaling and the downstream gene expression. Secondly, when Msx1 siRNA or plasmid transfection conducted, WNT/β-catenin inhibitor or activator was added into the medium to inhibit or activate β-catenin expression, respectively, in order to explore whether WNT/β-catenin signaling pathway participates in regulating Bmp2, Bmp4, and Lef1 expression. Twenty-four and 48 hours after transfection, Real-time PCR and western blot were employed to detect mRNA and protein expression levels, respectively.

2. **Odontoblast differentiation**  
   The odontogenic induction medium was employed when transfection were conducted, aiming to find how Msx1 regulates odontoblast differentiation of mesenchyme at late bell stage. Furthermore, in order to determine whether the aberrantly increased odontoblast differentiation was a result of elevated Lef1, Bmp2, and Bmp4 expression after knockdown of Msx1, we used Lef1 siRNA and NOGGIN recombinant protein, to block Lef1, Bmp2, and Bmp4 expression, along with Msx1 siRNA transfection. After 7 d induction, Real-time PCR was employed to determine the mRNA expression levels of the odontoblast differentiation related genes: Alkaline phosphatase (Alp), type I collagen (Col1), osteocalcin (Ocn), runt related
transcription factor 2 (Runx2), dentin sialophosphoprotein (Dspp), and dentin matrix protein 1 (Dmp1). And Alizarin Red staining methods were used to detect mineralized nodules formation.

3. **Cell proliferation** After Msx1 siRNA and plasmid transfection for 24 h, EdU assay was employed to directly detect cell proliferation rate at 24, 48, and 72 h; and CCK8 assay was used to indirectly detect cell proliferation from 24 to 96 h;

4. **Cell cycle** After Msx1 siRNA and plasmid transfection for 24 h, flow cytometer detected cell cycle distribution; and Real-time PCR detected S phase related genes—Cyclin A and CDK2 after Msx1 siRNA transfecion, or G1 phase related genes—Cyclin D1, Cyclin E and CDK4 after plasmid transfection.

**Results:** Msx1 regulates Wnt/β-catenin signaling pathway regulation The expression levels of β-catenin, Bmp2, Bmp4, and Lef1 were significantly increased after Msx1 downregulation, while significantly increased after Msx1 overexpression. We found that Wnt/β-catenin signaling pathway participated in regulating Bmp2, Bmp4, and Lef1 when Wnt/β-catenin was activated or inhibited along with Msx1 siRNA transfection.

1. **Msx1 prevents odontoblast differentiation by inhibiting Bmp2, Bmp4 and Lef1 expression** Msx1 downregulation significantly promoted the expression of odontogenic related genes—Alp, type I collagen, OCN, Runx2, Dspp and Dmp1, and increased mineralized nodules formation, while Msx1 overexpression significantly inhibited these actions. Blocking Bmp2, Bmp4, and Lef1 expression could rescue the aberrant elevated odontoblast differentiation resulted by Msx1 downregulation.

2. **Msx1 regulates cell proliferation** Cell proliferation rate was decreased with either knockdown or overexpress Msx1;

3. **Msx1 regulates cell cycle transition** Msx1 downregulation slowed down S-phase progression, and decreased expression levels of S phase related genes—Cyclin A and CDK2. While Msx1 overexpression prolonged G1-phase progression, and decreased expression levels of G1 phase related genes—Cyclin D1, Cyclin E and CDK4.

**Conclusions:** At late bell stage, the regulation of Msx1 to Bmp2, Bmp4, and Lef1 was mediated by Wnt/β-catenin signaling pathway, thus inhibits odontoblast differentiation. MSX1 maintains cell proliferation by regulating G1-S phase transition and prevents odontoblast differentiation by inhibiting Bmp2, Bmp4, and Lef1 expression at late bell stage via Wnt/β-catenin signaling pathway.

**Keywords:** Msx1; tooth development; late bell stage; Wnt signaling pathway; differentiation

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**P-49 Two separated chronic periapical abscesses in one deciduous first molar: a case report**

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**Abstract**

**Introduction:** Chronic periapical periodontitis are related to the infection and pathogen stimulus...
in the root canal. Basing on the special characterization of dental pulp and alveolar bone for the deciduous tooth, furcation area infection, soft tissue swelling and tooth root resorption are liable to be involved in periapical disease of deciduous tooth. This report presented two separated chronic periapical abscesses in one deciduous first molar.

**Case report:** A 10-year-old patient presented with a chief complaint of swelling in the right mandibular deciduous molar region for 2 days. Clinical examination revealed that the occlusal surface and distal surface of right mandibular first deciduous molar (#84) were decayed and its dental pulp was exposed. There was a fistula of on the buccal gingiva of #84. In addition, a gingival polyp (0.8×0.5cm) could be seen on the libial gingiva of #83 which had no caries. Radiographic examination showed that 1/2 distal root of #84 and 2/3 root of #83 were absorbed and periapical radiolucency of two teeth could be seen clearly. Chronic periapical periodontitics of #84 and root resorption and gingival polyp of #83 were diagnosed. A treatment plan involved extraction of #83 and #84 and gingival polypectomy for pathological examination. The pathological diagnosis of gingival polyp was chronic periapical abscess indicated by HE staining.

**Comments:** The root resorption of #84 was due to the periapical periodontitis caused by the caries dental pulp infection, but the abnormal root resorption of #83 probably caused by the infection spread of #84. Interestingly, the infection of #84 focused on the distal root and furcation area from X-ray examination, but gingival polyp of #83 existed in the liable mucosa between #83 and #82. The loose alveolar bone structure probably made the distal apical inflammation of #84 spread to the periapical area of #83 and form polyp in its mesial area. Another possibility was that the infectious dental pulp in the mesial root canal of #84 which went deep into periapical area of #83 led to periapical periodontitis of #83.

**Keywords:** chronic periapical periodontitics, tooth root resorption, histological analysis

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**P-50 Distinct expression of Lin28/let-7 axis in epithelium and mesenchyme during tooth development**

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**Abstract**

**Background:** Pediatric dentists are frequently asked by new parents why the arrival of my baby’s teeth is delayed and whether it is something to worry about. Although for most children with no teeth, a delay is simply an opportunity for parents to enjoy their gummy smile a little longer. Nevertheless, tooth developmental timing coordination and the molecular mechanisms involved remains largely unknown. Many growth factors and transcription factors are involved in the complex process of epithelial-mesenchymal interactions during tooth development. MicroRNAs (miRNAs) represent one type of regulators. They exist endogenously, function by orchestrating multiple targets, and can have profound effects on developmental cell fate decisions. The let-7 family comprises one of the evolutionarily most conserved families of miRNAs. Let-7 exists in negative feedback loop with the RNA binding proteins Lin28, but can also function independent
of Lin28.

**Aim:** To further probe the role of Lin28/let-7 axis in tooth development, expression pattern of Lin28/let-7 axis members are first characterized.

**Design:** Murine first molar is employed as the model for odontogenesis. Immunofluorescent staining and qRT-PCR were performed to depict the spatial and temporal expression pattern of Lin28/let-7 axis during tooth development. E11.5, E13.5, E15.5, E16.5 and E18.5 tooth germ samples were collected for profiling.

**Results:** In epithelium, let-7 kept elevating during tooth development all the way from E11.5 to E18.5; while in mesenchyme, let-7 expression boosted from initiation stage (E11.5), peaked at early bell stage (E15.5) and shrunk afterwards. Lin28 expression was found to be anti-correlated with let-7 in mesenchyme but not in epithelium. In both epithelium and mesenchyme, Lin28 dropped drastically from E13.5 and to some extent restored after E16.5. Hmga2, which has been shown to promote organismal growth and stemness in other systems. Similar to Lin28, Hmga2 harbor let-7 binding sites in their 3’UTRs and are negatively regulated by let-7 family. Hmga2 expression exhibited a negative relationship with let-7 in both epithelium and mesenchyme.

**Conclusion:** It is implicated that Lin28/let-7 axis not only participated in tooth developmental coordination but played distinct roles in epithelium and mesenchyme via different mechanisms as well.

**Key words:** Lin28/let-7 axis, tooth development, epithelium, mesenchyme

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**P-51 Recipient T lymphocytes inhibit SHED-based bone regeneration via IFN-γ**

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**Abstract**

**Background:** Stem cells from human exfoliated deciduous teeth (SHED) possess excellent properties of mesenchymal stem cell (MSCs), including high proliferation, unique differentiation. SHED represent an easily accessible and promising resource for craniofacial bone regeneration. Recipient immune microenvironment, which governs stem cell function, modulates the process of tissue repair and regeneration majorly. It is well known that as important immune cells, peripheral T lymphocytes play a key role in tissue regeneration by secreting pro-inflammatory cytokines. However, the role of recipient T lymphocytes in SHED-based bone regeneration is still not understood.

**Aim:** To clarify the role of recipient T lymphocytes in SHED-based bone regeneration and further explore the underlying mechanisms. The project was to provide the experimental evidence for revealing the process of tissue repair and regeneration, and explore a new target to improve the MSC-based tissue regeneration.

**Design:** 1. SHED mixed with HA/TCP were implanted into immunocompromised mice subcutaneously, and CD4⁺ T cells were infused intravenously via tail vein. The samples were...
harvested 7 days, 8 weeks after operation, the levels of pro-inflammatory cytokines in implantations were examined by ELISA analysis, and new bone formation was evaluated by HE staining. 2. CD4+ T cells and SHED were co-cultured in cell-cell contact manner, and inflammatory cytokine treatment was added in different dose course. The ratio of SHED apoptosis was examined by flow cytometric analysis and toluidine blue O staining. Osteogenic differentiation of SHED was evaluated by the protein levels of RunX2, ALP and alizarin red S staining. 3. SPSS 17.0 was used to perform the statistical analysis, P values less than 0.05 were considered statistically significant.

**Results:** 1. Compared with PBS infusion group, the levels of IFN-γ, TNF-α, IL17 in the implantation were increased in different extent in T cell infusion group, especially the IFN-γ level was significantly increased. The area of new bone formation of the implantation was markedly decreased in T cell infusion group. 2. Compared with single culture group, the ratio of SHED apoptosis was significantly elevated in co-culture group. IFN-γ treatment improved the ratio of SHED apoptosis in dose-dependent manner in co-culture group. Furthermore, the levels of RunX2, ALP and the mineralized nodule formation of IFN-γ treated SHED were significantly reduced compared with untreated SHED.

**Conclusions:** T lymphocytes induced SHED apoptosis and inhibited SHED osteogenesis via IFN-γ, which resulted in the inhibition of SHED-based bone regeneration. These findings verified that recipient immune microenvironment had important impacts on SHED-based tissue regeneration, and regulating recipient immune status could be a promising target for improving tissue regeneration.

**Keywords:** immune microenvironment, stem cells from human exfoliated deciduous teeth, bone regeneration, IFN-γ

### P-52 Pharmacological Behavior Management: Inhalation Sedation in Young Children

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**Abstract**

**Introduction:** Anxiety in child patients is common encounters in the clinical situation. Nitrous oxide is recognized as the most effective sedation to reduce anxiety.

**Aim & Objectives:** The aim of this study was to determine the effectiveness of nitrous oxide inhalation sedation (IS) in young children attending for dental procedures. The objectives of the study were to assess patients/parents perceptions of the way they were treated on the day of the treatment and to determine how patients/parents reported quality of life (QOL) had changed after the treatment done.

**Methods:** This study involved a sample of 3-11 year-old healthy patients came for dental treatment using IS at Department of Paediatric Dental Clinic, USIM, Pandan Indah. A questionnaire was designed to collect the data on QOL of the patients and IS experience. This 36-item questionnaire were divided into two parts; pre-operative on the same day before the
treatment and post-operative which been filled in three different time points; on the day after the treatment, one day after the treatment (via phone) and 10 days after the treatment (via phone).

**Results:** Data was available for 40 patients with a mean age of 7 years. The treatments comprised of 92.5% dental extractions and 7.5% restorations. Pre-operatively, 85% patients were anxious and 78% patients believed they would feel worse if having the treatment without IS. Post-operatively, only 5 patients reported of dizziness on the day of the treatment. Overall, 90% patients successfully completed treatment using IS and 99% patients were satisfied with the treatment. The study revealed 70% patients were not anxious having the treatment again and they believed IS helps relieve the anxiety on the day of the treatment.

**Conclusion:** IS helps reduce anxiety in child patients and allow them to receive dental treatment needed successfully.

**P-53 GREM1 regulate the function of the stem cell from apical papilla**

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**Abstract**

**Objective:** Microenvironment of dental derived stem cells, which supplies special signals for adjusting the function of stem cells and maintaining the homeostasis of stem cells, is indispensable for cells to live on. So it is essential to find out the key genes in microenvironment which could regulate the function of dental derived stem cells. In our previous study, we had compared the gene expression of the stem cell from apical papilla(SCAP) and the apical papilla tissue, and found that the expression of BMPs was obviously down-regulated, while GREM1 (antagonist of BMPs) was up-regulated in SCAPs than which in the apical papilla tissue. Further study indicates that BMP6 might regulated the osteogenic / odontogenic differentiation and proliferation ability of SCAPs. However, the function of GREM1 on SCAPs is not clear. This study is going to investigate the role of GREM1 on the regulation of SCAPs.

**Material and Methods:** 1. We designed a shRNA to target GREM1 and introduced it into SCAPs with lentiviral infection to knock-down the GREM1. Alkaline phosphatase activity assay, Alizarin red staining were used to study the mineralization potentials of SCAPs. Real Time RT-PCR was used to detect osteogenic marker genes including BSP, OCN, OPN and the dentinogenic markers including DSPP and DMP1. CCK-8, CFSE were used to evaluate proliferation ability.

**Results:** Real Time RT-PCR and western blot showed that GREM1 was knocked down steadily. After osteogenic induction, the results indicated that knock-down GREM1 enhanced ALP activities; Accordingly, mineralization was decreased in SCAP-GREM1sh cells compared to control group, as determined by alizarin red staining. However, Real Time RT-PCR analysis revealed that
the osteogenic marker gene BSP, OPN, OCN and dentinogenic markers DSPP and DMP1 were significantly increased after induction in SCAP-GREM1sh cells compared to the control group. The CCK-8, CFSE results showed that proliferation ability was decreased in SCAP-GREM1sh cells compared to the control group.

**Conclusions:** Our results suggested that Knock down of GREM1 enhanced the osteo/dentinogenic differentiation potentials in vitro, and decreased the proliferation ability of SCAPs.

**Keywords:** GREM1; BMP; osteogenic / odontogenic differentiation; SCAPs

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**P-54 Indirect pulp capping versus pulpotomy in treating deep caries in primary teeth**

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**Abstract**

Deep carious lesions are the most common disease in primary teeth, which makes dentists often caught in a dilemma. Whether to remove the pulp or try to retain it when the carious lesions approach the pulp, it’s a question. In the past decades, most of the pediatric dentists tend to perform pulpotomy or pulpectomy to lessen the opportunity of postoperative pain or retreatment. However, more and more research indicates the considerable success rates of indirect pulp capping via pulpotomy, as the development of new biocompatible materials, which aim to reduce the stimulation to the pulp. The first mentioned of two is more conservative in preserving the vitality of coronal and radicular pulp by keeping the deepest layer dentin without exposure of the pulp.

Besides, an increasing number of failing cases of pulpotomy and pulpectomy are reported in clinical job, such as dentigerous cyst and delayed eruption of permanent teeth. The new developed viewpoint about the goal of caries treatment is to terminate the progress of caries through coronal sealing instead of removing all the carious lesions.

The good news is that indirect pulp capping shows the advantages over other methods in saving time, reducing the discomfort after surgery, long-term success rates and better exfoliation pattern according to the present clinical research. But there is no research leading to the definite conclusion about the optimal pulp capping material. The key to the success of indirect pulp capping is that practitioners should accurately confirm the pulp vitality based on the chief complain, oral examination and radiological examination. However, it’s the very difficulty to test the vitality because of the uncertain recall and report of the pain by children.

In conclusion, indirect pulp capping displays high success rates and will probably replace pulpotomy in treating deep caries in primary teeth. Before that, further research need to be done to support the extensive use of the technique.
computer-controlled system during non-surgical periodontal therapy (root planing): Two case reports

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Abstract

Local anesthesia is administered to control pain, but it may induce fear and anxiety. Root planing is a non-surgical periodontal therapy; however, when it is performed in an extensive manner, some tissue removal is inevitable. Notably, this removal may be so painful that local anesthesia is required to be administered to the area scheduled for the treatment. Although patients tend to accept root planing easily, they frequently express a fear of local anesthesia. Intraosseous anesthesia (IA) is an intraosseous injection technique, whereby local anesthetic is injected into the cancellous bone supporting the teeth. A computer-controlled IA system (CIAS) exhibits multiple benefits, such as less painful anesthesia, reduced soft tissue numbness, and the provision of palatal or lingual, as well as buccal, anesthesia via single needle penetration. In this report, we present two cases of root planing that were performed under local anesthesia, using a CIAS. IA using Quicksleeper5® (DHT, Cholet, France) was performed within the buccal area; a 2% lidocaine solution with 1:100,000 epinephrine was injected using a 27-gauge (0.4-mm diameter) 16-mm Aiguilles® (DHT, Cholet, France) needle. CIAS-based induction of local anesthesia during non-surgical periodontal therapy was more comfortable, relative to CLIA, for both patients, who had previously undergone CLIA. Pain during the CIAS significantly decreased for both patients, and they were satisfied with the treatment. Moreover, the patients in this report did not experience soft tissue paralysis beyond the surgically-necessary paralysis of the teeth and gums. CIAS-based injection of anesthetic agents from the buccal side can anesthetize all regions up to and including the palatal region. In the presently reported cases, the strengths of the intraosseous injection were less painful anesthesia, reduced soft tissue numbness, and small numbers of needle penetration. Induction of local anesthesia using the CIAS during a non-surgical periodontal therapy significantly reduced anxiety and pain. More detailed studies involving larger sample sizes are warranted to establish the use of the CIAS in actual clinical settings for various purposes.

P-56 Dental Management of Children with Hemophilia

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Abstract

Hemophilia is an X-linked hereditary disorder. Hemophilia A is a deficiency of factor VIII and hemophilia B (Christmas disease) is a deficiency of factor IX. The most widely used classification is based on plasma procoagulant levels, with people <1% factor defined as severe; 1-5% or 1-8% as moderately severe; and >5% or >7% as mild. Mild hemophilia A often occurs without either
familial or medical history. It is often first detected by dental trauma. Since bleeding after dental treatment may cause severe or even fatal complications, people with hemophilia must be given special dental care. The treatment of the patients with either hemophilia A or hemophilia B involves the intravenous infusion to either control or prevent bleeding.

A 7 years old boy referred from local clinic for surgical extraction of supernumerary tooth. This boy had moderate hemophilia A, and aPTT was 57.4 (normal 26.8~40.6). With the preparation of Advate injection, surgical extraction was done safely under general anesthesia. A 5 years old boy visited our clinic with chief complaint of dental caries. This boy had severe hemophilia A, with aPTT 78.0. With the previous Advate injection and factor VIII replacement, dental treatment was successfully done. A 9 years old boy referred from local clinic for dental caries treatment. This boy had severe hemophilia B, with aPTT 45.2. With the preparation of Benefix injection, dental treatment was done successfully under general anesthesia.

Hemophilia with hereditary hemostatic disorders constitute a serious challenge in the dental practice. Several aspects relating to the care of such patients must be recognized and taken into consideration when dental treatment is planned. The management of such patients cannot be based on a single protocol. Replacement of deficient coagulation factors ensures that safe dental treatment will be carried out. For the management of prolonged bleeding in hemophilia patient, not only local hemostatic measures, but factor VIII or IX replacement therapy, antifibrinolytics, and Desmopressin are also available.

P-57 The Antimicrobial Ability of polypeptide Against Cariogenic Streptococcus mutans

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ABSTRACT

Background: Streptococcus mutans is one of the early colonizers of the tooth surface. The growth and metabolism of the pioneer species changed local environmental conditions enabling more fastidious organisms to further colonization and forming dental plaque. S. mutans could metabolize sucrose to lactic acid. The acidic oral environment created by this process causing the highly mineralized tooth enamel to be vulnerable to decay.

Aim: The aim of this study was to investigate the effect of a natural polypeptide product, which is produced by bacterial fermentation, against cariogenic Streptococcus mutans (SM). Meanwhile, the effects of the natural polypeptide product accelerate the natural mechanisms of occlusion by depositing a dentin-like mineral was analyzed.

Methods: Our study mixed 1%, 2%, 3%, 4%, 5% (w/w) polypeptide with five kinds of saturated calcium salt solutions: DCPD, MPCM, TTCP, Calcium Carbonate and Calcium Chloride. The mixed solutions were centrifuged and the precipitates were examined with XRD analysis and the antimicrobial ability on S. mutans of each treatment solution was tested with agar disc diffusion.
method.

Results: DCPD and MCPM may be dissolved in 0.001M H₃PO₄ Solution, but CaCO₃ need higher concentration of phosphoric acid to dissolve. The concentration of polypeptide need to higher than 5%, then we may find proper antimicrobial activity by agar diffusion test. The preliminary results showed that the DCPD+ 0.1 M H₃PO₄ + 5% polypeptide group have had fair antimicrobial ability and the greatest amount of calcium Phosphate precipitation. CaCl₂ may inhibit the antimicrobial effectivity of the polypeptide.

Conclusion: The polypeptide is a natural and safe antimicrobial product, showing great potential in caries prevention. Combine the polypeptide with calcium and phosphate rich solution maybe an answer for both caries control and remineralization repair. Further antimicrobial tests and applications on the human enamel disks in vivo are needed.

P-58 CO₂ laser therapy accelerates the healing of ulcers in the oral mucosa by inducing the expressions of heat shock protein-70 and tenascin C

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Abstract

Background: The treatment of ulceration or stomatitis with laser therapy is known to accelerate healing and relieve pain, but the underlying biological mechanism is not fully understood.

Aim: The present study used a mouse model of ulceration to investigate the molecular mechanisms by which CO₂ laser therapy accelerated the wound healing process.

Design: An ulcer was experimentally created in the palatal mucosa of the mouse and irradiated with light from a CO₂ laser. Epithelial cells and fibroblasts were exposed to heated culture medium or laser irradiation to establish whether hyperthermia mimicked the effect of laser irradiation.

Results: Compared with controls (no irradiation), laser irradiation induced the proliferation of epithelial cells and faster re-epithelialization of the wound area. Immunohistochemistry experiments showed that heat shock protein-70 (HSP70) was expressed mainly in the epithelium of normal palatal tissue, whereas there was little tenascin C (TnC) expression in the epithelium and mesenchyme under normal conditions. Laser irradiation induced HSP70 mRNA and protein expression in the lamina propria as well as TnC expression in the mesenchyme underlying the renewing epithelium. Culture of fibroblasts in heated medium increased the expressions of both TnC and TGF-β1, whereas laser irradiation induced only TnC expression.

Conclusion: The present study indicates that CO₂ laser irradiation exerts a photobiogenic effect to up-regulate TnC expression without inducing TGF-β1 expression. We suggest that CO₂ laser therapy has an advantage over thermal stimulation.

Key words: CO₂ laser, wound healing, tenascin C, heat shock protein-70, temperature