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Oral Session O21 – Growth and Development

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Oral Session O21/Growth and Development

O21–152

SEL1L may cross-talk with Notch and Tgf-beta signaling in tooth development

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Introduction: In a previous study it has been shown that the Sel1l gene is a key signal molecul in tooth root initiation. The aim of this study was to study its expression feature and functions in vitro.
Materials and methods: The Sel1L's expression pattern was studied in the rat tooth development and in vitro cultured rats tooth germ cells (TGCs) using a monoclone antibody of Sel1L (a gift of Dr. Orlandi). A BS/U6/sel1l vector was constructed which can specifically knock out the Sel1L's expression by an RNAi effect (Double-stranded RNA-mediated interference). After transfection, the phenotype and genotype of TGCs was detected.
Results: The immunohistochemistry results proved that Sel1L had a dynamic expression pattern in the tooth development. In the early stage, it was only a weak expression in the dental epithelial and neighbouring mesenchyme., but in the embryonic day 19, it was mainly located in the differentiated cells, such as ameoblasts and odontoblasts, and in the incisor, only the cervical loop marginal cells were positive and the inner epithelia stem cells were not positive which inferred the Sel1L might related with cells' differentiation. After RNAi, TGCs had an enhanced proliferation and less apoptosis; the Hes1 gene were up-regulated after RNAi; Smad4 were down-regulated. Western blot results also showed DSPP, the chief differentiation marker of odontoblasts, signaling molecular had no change after RNAi.
Conclusion: The Sel1L might play its role in root development by inhibiting Notch signaling and enhancing the TGFβ signaling, which had directly effects on cell proliferation, cell apoptosis and cell differentiation.

O21–153

Expression and Localization of Connexin 43 in odontoblast-like cells

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Introduction: Connexin 43 is a protein that forms the intercellular membrane channels of gap junction; it plays an essential role in growth, cytodifferentiation and morphogenesis. This research was aimed to detect the expression, subcellular localization of connexin 43 in an odontoblast-like cell line M2H4, and explore its possible function.
Materials and methods: M2H4 cells were cultured in? alpha MEM with 10% fetal calf serum. Cells were seeded in 10 cm culture disks and 24-well culture plate which was previously placed with coverslips. Cells on coverslips were prepared for morphological examination after immunocytochemical staining. From the remaining cells total RNA and protein were extracted, and RT-PCR and Westernblot for connexin 43 were carried out.
Results: Immunocytochemically, there was green fluorescence in the membrane and cytoplasm of M2H4 cells. Electrophoresis of RT-PCR showed specific amplification product of connexin 43 mRNA, and Westernblot detected a sole clear band of 43KD, coinciding with the molecular weight of connexin 43 proteins.
Conclusions: Connexin 43 is expressed in M2H4 odontoblast-like cells; it is located in the membrane and cytoplasm. These results indicate that M2H4 cells might be used as an odontoblast in vitro model to study further the function of connexin 43 in odontoblast differentiation, matrix secretion, dentin mineralization, and reparative dentin formation.

O21–154

The relationship between bite force and body mass index (BMI) in adolescents

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Introduction: The purpose of this study was to describe the relationship between maximum bite force and body mass index (BMI) in adolescents.
Materials and methods: The general and dental health status of 576 adolescent students aged 13–16 years were measured for height, weight, triceps skinfolds (TSF), waist, handgrip force and maximum bite force. Body mass index (BMI) was calculated as kg/m^2. The dental health was evaluated by malocclusion and caries numbers. All measurements were compared with population reference values. This study was approved by the Institutional Review Board of the China Medical University Hospital. The SAS was used for data analysis.
Results: Using BMI centiles, 11.1% were identified as being obese, 25.7% as being overweight, and 27.2% as being underweight. In the obese group, the handgrip force was significantly higher than other groups, but the bite force was not significantly higher. In the overweight group, the bite force and handgrip force were both significantly higher. The bite force and handgrip force were both significantly lower in the underweight group. The caries numbers had no differences in the obese and overweight groups, but it increased significantly in the underweight group.
Conclusion: Bite force didn't increase proportionally with body weight in the obese group due to many factors such as decreased ratio of muscle to fat.

O21–155

Space changes following pre-mature loss of a primary maxillary first molar: a 12-month study

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Introduction: The aim of this study was to investigate the numerous aspects of dental-arch space problems arising as a result of premature loss of a primary maxillary first molar.

Materials and methods: Thirteen children (age range from 4.1–7.1 years; mean age 5.9 ± 0.74 years) with unilateral pre-mature loss of the maxillary primary first molar were selected for this study. Maxillary dental study casts were obtained from subjects two or three days after the tooth was removed, as well as at a follow-up appointment 12 months later. Six reference lines were measured on the study cast including D + E space (primary molar space), arch width, arch length, intercanine width, intercanine length, and arch perimeter. The D + E space of intact primary molars served as a control. Paired *t*-test was used to compare the cast measurement differences between initial examination and 12-month follow-up. Student's t test was used to compare D + E space changes with the control.
Results: The D + E space of the extraction side after 12 months was significantly shorter than the control side ($P < 0.05$) and the initial D + E space ($P < 0.05$). A significantly wider arch perimeter, intercanine width and intercanine length were found after 12 months when comparing with the initial parameters. However, there were no significant differences on arch width, arch length between the initial examination and the 12-month follow-up ($P > 0.05$).
Conclusions: The early space changes of the maxillary dental arch after pre-mature loss of the maxillary primary first molars are mostly distal drift of the primary cuspids toward the extraction space. A wider arch perimeter was found due to increased intercanine width and length.

O21–156

The developing apical foramen in permanent incisors

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Introduction: The developing apical foramen of permanent incisors is important to assess healing or response to treatment after traumatic injury and is also used to estimate age. The aim of this study was to compare permanent incisor root stage from radiographs with direct observation of the same teeth.
Materials and methods: Archaeological specimens ($n = 27$) in the mixed dentition were selected and maxilla or mandible x-rayed using an x-ray machine with focal length 1 m. Some specimens were fragmentary and whole mandibles were x-rayed in the mid anterior region. Root stage and apex width were assessed from radiographs of 77 incisors. These teeth were removed from the jaws and the shape and dimensions of the apical foramen was directly observed. Root stage was compared between radiographs and direct vision using Cohen's Kappa.
Results: Kappa for agreement of root stage between radiograph and specimen was 0.51, suggesting moderate agreement. The stage 'root length complete' and 'apex half closed' was more easily seen after direct observation. The shape of the developing apical foramen differed between incisors. The apex width at 'Rc' in maxillary incisors was around 1 mm, the shape was round in the central and oval in the lateral. Apex width in the mandibular incisors at this stage was similar but long oval in shape with the bucco-lingual dimension as great as 3mm. This decreased with maturation but could still be as much as 2mm at 'A1/2'. This stage was characterised by the apical walls having sharp, distinct edges.
Conclusion: Visualising the developing apical foramen from radiographs shows only moderate agreement with direct observation, suggesting a need for better descriptive criteria of apical stages of maturation.

O21–157

Apoptosis and proliferation approach of human primary teeth with physiological root resorption

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Introduction: The aim of this investigation was to explore the biological potential of the pulp and the periodontal ligament of deciduous teeth during physiological root resorption.
Materials and methods: Eleven monoradicular primary teeth free of caries, with radicular resorption and permanent successors were obtained from healthy children requiring routine dental extraction for mobility or orthodontic purpose. These teeth were decalcified, sectioned and stained with haematoxylin and eosin for histological examination or processed for immuno-histochemical detection of apoptosis and proliferation using respectively p53 and PCNA antibodies.
Results: Mesenchymal structures, nervous terminations and rests of Malassez showed marked apoptotic signals in the periodontal ligament of the teeth. In contrast, no relevant apoptotic signs but proliferative endothelial cells were detected in the pulp. While odontoblasts disappeared with no detected sign of apoptosis, multinucleated odontoclasts were noticed in resorptive lacunas of dentine in three cases of advanced root resorption. These odontoclasts exhibit either several proliferative and few apoptotic nuclei respectively near and far away the dentine surface. In these teeth, apoptotic nuclei and several macrophagic structures are detected in the parenchymal vessels.
Conclusion: During physiological root resorption of deciduous teeth, the periodontal ligament structures undergo apoptosis, whereas less signs of apoptosis were detected in the pulp. The advanced stages of tooth resorption are remarkable with the appearance of newly formed multinucleated odontoclasts presenting few apoptotic nuclei while the odontoblasts disappear.

O21–158

The effect of pulpectomy on root resorption of deciduous teeth without successors

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Introduction: The shedding of deciduous tooth depends on odontoclasts. Previous studies have shown that the dental follicle of the permanent tooth might play an important role in the recruitment, development and activation of odontoclasts. This study was aimed to examine the mechanisms of root resorption of deciduous tooth in the absence of permanent successors.
Materials and methods: Four 10-week-old male Beagles were used in this study. Unilateral mandibular second, third and forth permanent tooth germs in one Beagle were surgically removed, and root resorption of their corresponding deciduous molars were compared with contralateral deciduous molars which successors were present. The expression of odontoclast marker genes and odontoclast-inducing cytokines were analyzed by immunohistochemistry. For the other three Beagles, bilateral mandibular second, third and forth permanent tooth germs were removed. Early pulpectomy was performed in the primary molars on one side. Root canals were filled with Vitapex, ZOE and MTA,

respectively. The other side was untreated as a control. Root resorption of these deciduous teeth were observed.

Results: In the absence of a permanent tooth germ, root resorption of deciduous tooth was delayed. The expression of odontoclast marker genes and inducing genes in dental pulp was higher than that in periodontium. Early pulpectomy could further delay the root resorption of deciduous teeth in the absence of permanent tooth germ. Filling materials used in this study had similar effect on root resorption of these deciduous teeth.

Conclusion: After surgical removal of the permanent successors, pulpectomy of primary teeth delayed the root resorption.