

Abstracts of Theses Approved for the MSc at the School of Dental Sciences, Universiti Sains Malaysia Health Campus, Kubang Kerian, Kelantan, Malaysia

SOCKET PRESERVATION USING BOVINE BONE WITH AND WITHOUT DENTAL IMPLANT PLACEMENT

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Introduction: The alveolar bone is a highly dynamic bone supporting the tooth and its surrounding structures. It resorbs physiologically when the tooth is lost. Every day, thousands of teeth are extracted from the oral cavity leaving a residual defect following the loss of the alveolar bone that led to difficulty in prosthetic rehabilitation. Dental implantology has revolutionised the prosthetic replacement of artificial teeth by providing a high-quality artificial tooth replacement that mimics natural tooth structure and function.

Objectives: The aim of this interventional study was to assess healing, evaluate bone dimension and the resorption rate of the extraction alveolar socket using bovine bone with and without dental implant placement among the treated and non-treated tooth extraction sockets. The goal of these approaches was to preserve or minimise the ridge volume loss following tooth extraction by ridge augmentation procedures. The study also evaluates the degree of osseointegration between the immediate implant surface and the alveolar bone.

Methods: This interventional study was carried out on 30 patients at the University Dental Hospital Sharjah, Sharjah, United Arab Emirates. The patients aged between 18 and 40 years, who needed non-complicated tooth extraction of only one or both mandibular premolar teeth, and being fit and healthy, were included. The project has been approved by UOS and USM ethical committees, and informed consent was obtained. Patients were randomly divided into three groups. In group I, simple extraction was done and the empty extraction socket left untreated and allowed to heal in a conventional way. In group II, extraction sockets were filled with freeze-dried bovine bone xenograft (FDBBX) granules of size 1 mm. A resorbable pericardium membrane was placed to cover the defect to secure the bone granules within the socket and wound closure done with Vicryl suture. In group III, atraumatic extraction was done and an immediate implant placed into the sockets, and the circumferential gap was also filled with FDBBX bone granules and covered with pericardium membrane. This group was additionally subjected to resonance frequency analysis (RFA) by employing Osstell machine for measuring and evaluating the degree of secondary stability at 9 months.

The patients were followed-up clinically for healing assessment at 1 week, 3 months and 9 months post-operatively (PO). All groups were subjected to cone beam computed tomography scan (CBCT) for radiological evaluation immediately after the surgical procedure at three months and 9 months intervals using Sirona Dental Systems, GALILEOS SIDEXIS. CBCT was performed in 3 different views; coronal, sagittal and axial which involve linear measurements of the socket alveolar bone. RFA was recorded for group III at 9 months.

Results: There were no clinical differences in healing between the groups. Significant difference of bone resorption was evident in alveolar ridge width and height reduction within control group I, 1.84 mm (95% Confidence Interval (CI), 0.57 to 3.10) and 1.91 mm (95% CI, 0.64 to 3.14), respectively at the intervals of day 0 to 9 months. No significant alveolar bone resorption was observed within group II and III. Comparison between group I and III showed a highly significant difference of bone resorption in ridge width at 3 months 2.56 mm (95% CI, 4.22 to 0.90) $P \leq 0.001$, and at 9 months interval 3.2 mm (95% CI, 4.70 to 1.62). Between group II and III, there was a significant difference of bone resorption in ridge width of 1.9 mm (95% CI, 3.43 to 0.34) ($P \leq 0.001$). There was no significant vertical ridge resorption observed among the groups. High RFA values were observed in group III at 9 months post-operatively.

Conclusion: The insertion of immediate implants in fresh extraction sockets together with grafting the circumferential gap between the bony socket wall and the implant surface with bovine bone granules were able to preserve a greater amount of alveolar ridge volume when compared to leaving an extraction socket to heal alone in the conventional way or socket preservation with bovine bone graft only. The peri-implant new bone formation developed is of superior quality which led to successful osseointegration between the implant surface and inner surface of the buccal plate. We observed clinically that the USM manufactured FDBBX has completely resorbed and replaced by new bone in the area between the implant and the inner surface of the buccal plate in group III at nine months post-operative.

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EVALUATION OF HUMAN AMNIOTIC MEMBRANE AS A SCAFFOLD FOR PERIODONTAL TISSUE ENGINEERING: AN IN VITRO STUDY

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Introduction: Human amniotic membrane (HAM) has many biological properties suitable for periodontal tissue regeneration such as low immunogenicity, anti-fibrosis, anti-inflammation and rich in extracellular matrix component.

Objectives: This study aimed to evaluate the ability of this membrane as a scaffold for the growth of the predominant cells in periodontal tissues, human periodontal ligament fibroblasts (HPDLFs).

Materials and methods: Commercially available HPDLFs (Lonza, USA) were seeded on glycerol preserved HAM (USM Tissue Bank, Malaysia). HPDLFs attachment and surface morphology were observed through histological analysis and scanning electron microscopy (SEM) respectively. While the cell proliferation was assessed using alamarBlue® proliferation assay and nuclear labeling of DNA using 6-diamidino-2-phenylindole (DAPI) at day 1, 3, 7, 14 and 21. Histologically, HPDLFs showed mono layer to multilayers attachment on HAM from day 1 to day 7. On day 14 and 21, HPDLFs cell layers were reduced to single cell layer with more flattened appearance and longer spindle shaped cells.

SEM analysis demonstrated that HPDLFs had attached appropriately on HAM surface at day 1 to day 3 and became overlapping at day 7, while maintaining their flat shape. However, by day 14 and 21 the cells demonstrated alteration in their morphology and later became rounded in shape. Based on statistical analysis (Friedman's Two-Way Analysis of Variance by Ranks followed by pairwise comparison) using SPSS 22.0 proliferation assay showed that HPDLFs viability on HAM had increased significantly from day 1 to day 7 ($P = 0.012$). However, the proliferation of cells showed significant reduction at day 14 ($P = 0.002$) and day 21 ($P = 0.005$). DAPI staining of nuclear DNA showed the presence of HPDLFs up to day 7 only.

Results: This study showed that HAM is able to function well as a scaffold for HPDLFs within 7 days. Retardation of cellular growth after 7 days could be due to possible reasons such as density dependent inhibition of growth or the release of matrix metalloproteinases by the HPDLFs that might have degraded the membrane.

Conclusion: In conclusion, the findings suggest that HAM could be a promising scaffold for periodontal regeneration. However, cells' behaviour in relation to the membrane over longer culture duration requires further investigations.

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DETERMINATION OF TOOTH SIZE AND DENTAL ARCH DIMENSION IN A TRANSGENDER BANGLADESHI POPULATION

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Introduction: Research related to tooth size, tooth size discrepancy, arch size in transgender population is yet to be explored in dentistry.

Objectives: The purpose of this study was to establish normative data on mesiodistal, buccolingual, diagonal dimension, arch width and tooth size ratio in transgender population.

Materials and methods: The data were derived from dental casts of 150 transgender individuals. Data were analysed using descriptive, independent t -test, paired t -test and one sample t -test. The mean and standard deviation were calculated for individual tooth size, arch size, arch width (Pont's index), Bolton's overall and anterior ratios, separately for transgender males and females.

Results: Result showed that the mesiodistal, buccolingual and diagonal widths of the maxillary teeth showed higher variability than the mandibular teeth and the mean value was higher in transgender females than in males and revealed statistically significant differences between right and left sides of maxilla and mandible. Bolton's anterior ratios were found to be 78.50 (± 3.92) and Bolton's overall tooth ratio 91.27 (± 3.79). Statistically significant was showed in Bolton anterior ratio. The result showed that the means of the maxillary arch width shows the greater variability then mandible. The arch widths were larger in transgender females then that of transgender males. Also, the results showed statistically significant difference was observed in maxillary and mandibular arch width as well as arch perimeter.

Conclusion: These findings indicate that population-specific standards are necessary for clinical assessments and for several dental treatment purposes. Moreover, it is appropriate to use transgender norms in a regular dental practice for transgender individuals.

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