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A craniofacial statistical shape model for the virtual reconstruction of bilateral maxillary defects.

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Purpose: Bilateral maxillary defects (whether traumatic, surgical, or congenital in origin) challenge fibula free flap (FFF) reconstruction surgery due to limitations in virtual surgery planning (VSP) workflows. While segmented 3D meshes of unilateral maxillary defects can be mirrored to virtually reconstruct missing anatomy, bilateral defects (Brown class c and d) lack a contralateral reference and associated anatomical landmarks. This often results in poor placement of osteotomized fibula segments. The current study improves the VSP workflow for FFF reconstructions using statistical shape modelling (SSM) – a form of unsupervised machine learning – to virtually reconstruct premorbid anatomy in an automated, reproducible, and patient-specific manner.

Methods: The SSM training set was sourced from the New Mexico Decedent Image Database via stratified random sampling to ensure even age and sex distributions. Skulls from 104 computed tomography scans were segmented and rigidly aligned, after which principal component (PC) analysis was applied to construct a discrete Gaussian process (GP). Defect reconstruction was accomplished on a validation set of 8 skulls via an iterative closest point algorithm with GP regression.

Results: Preliminary analysis shows that Brown class 2c maxillectomy defects can be virtually reconstructed with promising accuracy [Hausdorff distance = 7.89 ± 1.63 mm, volumetric Dice coefficient = 99.1 ± 0.01%, compactness = 7.22×105 mm2 (over the first 97 PC), specificity = 1.18 mm, and generality = 1.06×10−5 mm].

Conclusion: SSM-guided VSP will allow surgeons to create patient-centric treatment plans, increasing reconstruction accuracy and reducing the risk of complications. This is expected to improve post-operative outcomes.

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Implants

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Quantitative evaluation of zygomatic buttress, ramus and symphysis onlay grafts in ridge augmentation

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Background: Placement of endosseous dental implants requires adequate bone width for prosthetic support. In severe deficiency of bone width, implant placement is challenging. This study evaluates onlay grafts from zygomatic buttress, ramus and symphysis in ridge augmentation prior to implant placement.

Method: A comparative study comprising of 30 patients with maxillary and mandibular edentulous width of less than 3mm radiographically were selected. Patients were randomly divided into 3 groups- Group A (Zygomatic buttress), Group B (Ramus), Group C (Symphysis). They were evaluated in terms of pain, interincisal opening (IIO), postoperative complications, patient satisfaction score and width of the newly formed bone using CBCT immediate postoperative and then at 1 month, 3 months and 6 months.

Findings: All patients demonstrated an average bone width increase of 4.75 mm. There was no significant difference in postop pain, and interincisal opening on later follow-up, at 1 month, 3 months and 6 months. However, the immediate postoperative IIO was less and swelling was more in Group B followed by Group C and Group A. The average increase in bone width was 4.4, 5.2 and 4.7 mm for Group A, B and C respectively at 6 months. Grafts resorption was seen in two cases in Group A.

Conclusion: Ramal graft provides more bone volume compared to zygomatic buttress and symphysis. Symphysis graft leaves an aesthetic defect at the donor site. Therefore, ramal grafts may be considered the ideal intraoral bone grafts for implant surgery.

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How much time is sufficient to achieve hemostasis following dental extraction: Few minutes to many minutes- A randomized controlled trial

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There is no consensus regarding the duration of pressure pack placement following tooth extraction. The duration varies from 5 minutes to 60 minutes. Standard duration of pressure pack placement following tooth extractions performed on healthy patients needs to be defined. The aim of the study was to determine the duration for which a pressure pack is required to achieve hemostasis following dental extraction. A randomized controlled trial of 192 patients undergoing intralaveolar extractions were recruited by consecutive random sampling and randomized using permuted block randomisation. Patients underwent extractions and pressure packs were placed for 10 or 60 minutes depending upon the group to which they belonged. Incidence of post-extraction bleeding, reactionary and secondary hemorrhage was compared in between groups. 192 participants were included in the study. The majority of the study participants belonged to the 18 to 45 years of age group (49%) and were female (60%). Hemostasis was achieved in the majority of the participants (91%) with the primary pack. 9.4% of participants in the 10 minutes group and 8.3% of participants in the 60 minutes group failed to achieve hemostasis with the primary pack. This difference was not statistically significant (p-value= 0.799). The additional pack requirement was statistically not different (p-value= 0.233) between the 10 minutes group (8.3%) and 60 minutes group (4.2%). Ten minutes is sufficient time to achieve hemostasis following tooth extraction and hence the pressure pack may be removed after ten minutes by the surgeon himself.

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