

T16.OR007

Finite element analysis of stress distribution in anchor teeth in surgically assisted rapid palatal expansionE. Gonçalves^{1,*}, D. de Assis², P. Noritomi³, A. Goncalves¹¹ Sao Paulo University, Bauru Dental School, Brazil² Maranhão Federal University, São Luis, Brazil³ Renato Archer Technology Information Center, Three-Dimensional Technologies Division, Campinas, Brazil

The treatment of transverse maxillary deficiency in skeletally mature individuals should include surgically assisted rapid palatal expansion. This study evaluated the distribution of stresses that affect the expander's anchor teeth using finite element analysis when the osteotomy was varied. For this, five models were virtually built and the surgically assisted rapid palatal expansion was simulated. The results showed tension on the lingual face of teeth and alveolar bone and compression on the buccal side of the alveolar bone. The subtotal Le Fort I osteotomy combined with intermaxillary suture osteotomy seemed to reduce the dissipation of tensions. Therefore, subtotal Le Fort I osteotomy without step in the zygomaticomaxillary buttress combined with intermaxillary suture osteotomy and pterygomaxillary disjunction may be the osteotomy of choice to reduce tensions on anchor teeth, which tended to move mesiobuccally (premolar) and distobuccally (molar).

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The availability of imaging with new patient referrals

E. Gruber*, A. Messahel

Shrewsbury and Telford NHS Trust, United Kingdom

Background: Dentists should accompany referrals with good quality, suitably diagnostic radiographic imaging that enables the referral to be triaged effectively. This will minimise radiation exposure necessitated by repeat radiographs. The use of radiographs for dental, oral and maxillofacial applications is controlled by Ionising Radiation (Medical Exposure) Regulations (2000) in the UK. All radiographs must be justified and reported in the patient's notes and referral letter and a quality assurance programme must be established. The aim of this study was to evaluate the availability of good quality imaging with new patient referrals.

Methods: Prospective analysis was carried out over a two-month period on referral documentation to assess if imaging was provided and whether it was diagnostically sufficient.

Results: 133 new referrals were analysed. 50 (38%) included a radiograph. The majority of imaging was on CD, film or paper printouts. 60% of these (30 referrals) were deemed unsatisfactory due to poor quality, inappropriate anatomical area imaged or being out of date. These patients required further imaging, usually with orthopantomogram.

Conclusions: There is lack of compliance with IR(ME)R regulations and practitioners should be made aware of the legal requirement to provide good quality radiographs when possible. **Key words:** referral; radiograph; radiation exposure

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T16.OR009

Practical application of CBCT evaluation possibilities in the diagnosis of the presence of foreign bodies in head and neck region—experimental study

M. Kotlarski*, B. Szczodry, M. Rybicki, D. Samolczyk-Wanyura

Clinic for Cranio-Maxillofacial Surgery, Oral Surgery and Implantology, Switzerland

Background and objectives: Existence of foreign bodies in head and neck tissues may be caused by both injuries and incorrect medical treatment. There are many medical articles describing cases of foreign bodies in head and neck tissues such as metal, glass, organic materials – wood and plastics. They might be as well the result of inappropriate treatment.

Aim of this study: The objective of this work is to assess the possibilities of the use of computed tomography in diagnosis of existence of different foreign bodies compared to conventional RTG diagnosis.

Methods: This work is the result of the review of medical literature and experiments. A head of pig was used for the experiment in order to imitate the conditions of human body. 12 different foreign bodies were put into it. CBCT and conventional RTG diagnosis were carried out then. 12 different objects with different absorption grades of RTG radiation were used in the experiment. Materials that occur most often with the patients after head and neck injuries or may be the result of incorrect medical treatment were chosen. CBCT was carried out using apparatus New Tom 3G (model QR-DVT 9000).

Result: As distinct from classical computed tomography CBCT cannot be used to measure the level of RTG radiation absorption in Hounsfield units. Therefore the results were gathered based on RTG radiation absorption by different foreign bodies shown in the pictures and compared to nearby structures such as: air, soft tissues and bones. Foreign bodies made of materials that have high level of the RTG radiation absorption such as: metal, concrete, disc are visible well on conventional RTG images. On the contrary, non-metallic foreign bodies such as wood, glass and medical materials are hardly visible.

Conclusions: CBCT is a valuable tool used in diagnostics of the existence of foreign bodies.

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Three dimensional paper models experimental validation in vitroM. Kozakiewicz^{1,*}, P. Szymor¹, R. Olszewski²¹ Medical University of Lodz, Poland² Universite catholique de Louvain, Belgium

Background and objectives: Individualised therapy of maxillofacial skeleton, especially orbital walls fractures becomes recently more and more popular. Possibility to 3D print a model of a mirrored intact orbit allows to use pre-bent titanium mesh for individual orbital wall reconstruction. The possibility of introducing paper 3D printing technology from Mcor Technologies to create models available for use in operating room was the background of investigation. The technology is promising because of very low cost of model.

Aim: Evaluation of sterilisation process influence to shape stability and cytotoxicity of paper printed 3d models.

Methods: There were printed 30 cuboids 10 mm × 20 mm × 30 mm and 60 cylinders 3 mm height × 14 mm diameter. Cuboids were divided into 3 groups at random. Each group was sterilised using different procedure (radiation, gas plasma, ethylene oxide). Each cuboid was measured using calliper 3 times before and 3 times after sterilization. Cylinders were divided into 6 groups: 3 methods of sterilization, with and without Dermabond cyanoacrylate tissue adhesive coating. Cytotoxicity of 3d-printed paper blocks was tested using normal adult human dermal fibroblasts (ATCC PCS-201-012). Survival of cells was tested using spectrophotometry with XTT and was defined as ratio of absorbancy of tested probe to absorbancy of control probe.

Results: There was no statistically significant influence of sterilization processes to cuboids dimensions. Models showed cytotoxic effect to the cell cultures. Used coating of paper model improved biological behaviour of the material. It decreased cytotoxicity of the model independently of sterilization method. The best method of sterilization for uncoated models was by radiation where gas plasma was the best sterilization method for coated models.

Conclusions: Paper-based 3d printed solids are not allowed to implantation, but it is possible to use them as templates for individual reconstructions of face skeleton even intraoperatively.

Key words: custom paper model; sterilization; shape stability; coating; cytotoxicity

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Advantages of 3D planned mandibular reconstruction using a free vascularized fibular flap

T. Maal*, C. Coppen, W. Weijs, R. Vreeken, T. Merckx, S. Berge

Department Oral and Maxillofacial Surgery, Radboud University Nijmegen, Medical Centre, Netherlands

Purpose: Reconstruction of oromandibular defects remains one of the most formidable surgical challenges the reconstructive head and neck surgeon faces. The purpose of this study is to illustrate the added value of 3D imaging and preoperative planning.

Methods: In this study 30 patients undergoing a free vascularized fibular bone graft were included. In 17 of these 30 patient 3D planning was performed using a triple template technique. The remaining 13 patients were treated without 3D planning in a conventional manner. Ischemic time was compared between both groups. Furthermore, the accuracy of the 3D planning was evaluated for all 17 patients of the first group by registration of the pre-operative planning and postoperative CBCT scan.

Results: The use of the 3D triple template technique resulted in an average shorter ischemic time, reduction of 28 min. A clear learning curve was visible. The accuracy between 3D planning and actual postoperative result illustrated a small average error of 3.5 mm.

Conclusion: Computer aided surgery and planning, using the triple template method, leads to an accurate and oncological safe reconstruction of the mandibular geometry by eliminating intraoperative decision making, reducing ischemic time of the fibular graft and reducing overall operative time.

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Conventional versus computer-assisted techniques for reconstruction of orbitozygomatic fractures: a controlled clinical trial

Y. Nassar^{1,*}, A. Barakat¹, M. Hakam¹, K. Abdel-Ghany², A. Abou-ElFetouh¹

¹ *Oral & Maxillofacial Surgery Department, Cairo University, Egypt*

² *Ministry of Scientific Research and Technology, Central Metalurgical Research and Development Institute, Cairo, Egypt*

Background and objectives: Several attempts were reported in the literature regarding the use of computer-assisted techniques in reconstruction of orbitozygomatic fractures. The costs of such techniques may limit their use in routine practice, except if they offer higher accuracy and significant improvement in clinical outcomes. Therefore a comparison of the “free-hand” and “computer-assisted” techniques for repair of orbitozygomatic fractures was necessary.

Methods: Ten patients with unilaterally displaced orbitozygomatic fractures were divided into two equal groups: Group I: Received a computer-assisted reconstruction. Group II: Received a conventional “free-hand” reconstruction. Group I received corrected stereolithographic orbital models and zygomatic templates. Titanium meshes were bent onto the models preoperatively, while the templates were used intraoperatively for guidance of zygomatic reduction into the pre-planned position. In group II bending of the titanium meshes was carried out intraoperatively and “free-hand” reduction of the zygomatic complex was accomplished. Pre- and postoperative CT based volumetric assessment of the intact, traumatized and reconstructed orbits were executed. In addition, CT based linear measurement of the degree of enophthalmos was done pre- and postoperatively.

Results: Calculations of the reconstructed versus the intact orbital volumes showed a reconstruction accuracy of $97.9 \pm 5.03\%$ for group I (i.e. a mean of 2.1% of overcorrection) while group II showed an accuracy of $101.7 \pm 5.38\%$ (i.e. a mean of 1.71% of undercorrection). There was no statistically significant difference between the accuracy of both techniques in restoring the orbital volume ($p=0.28$). Similarly, there were no statistically significant differences between both groups regarding their pre- and postoperative degrees of enophthalmos ($p=0.773$ and 0.477 respectively).

Conclusion: Free-hand orbitozygomatic reconstruction appears to be a valid technique among other attractive emerging techniques. Computer-assisted reconstruction could be helpful in cases with massive internal orbital disruption and in delayed cases when some degree of bone resorption hinders anatomical reduction.

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