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Extended Abstract

Patient Specific Implants (PSI) in orthognathic surgery

Martin Gaboury

OroSphere, Canada

E-mail: martin.gaboury@hotmail.com

Abstract

Maxillofacial correction of dentofacial deformities by means of orthognathic surgery is a common procedure nowadays. However, even if maxillary and mandibular osteotomies can greatly enhance facial aesthetic and harmony, some regions of the facial skeleton remain unchanged following conventional orthognathic surgery. Of these areas, the malar prominence and the mandibular angles warrant specific considerations. Indeed, surgical correction of malar and mandibular angles hypoplasia is challenging, and the ideal procedure or material for definitive augmentation is not yet established. With recent CAD-CAM technology advances, patient specific implant (PSI) based on mirroring algorithms have proven they to be a precise, safe and reliable option for the management of post-traumatic unilateral defect of the face. Based on that experience, PSI are now introduced in aesthetic augmentation of the facial skeleton. However, bilateral cases are much more demanding for the clinician, from a planning perspective. The complete workflow, form data-acquisition to 3D virtual treatment planning and manufacturing, will be discussed, highlighting the potential pitfalls of this rather new technology.

Martin Gaboury obtained his Doctor of Dental Medicine degree in 2007 at Laval University (Quebec) and then completed his residency in Oral and Maxillofacial Surgery at l' Hôspital de l'Enfant-Jésus, affiliated with Laval University (Quebec), in 2013. He is board certified in his specialty in Canada (FRCD(C)). He obtained his Master's degree the same year, with an award-wining thesis project focusing on orthognathic surgery. In 2015, he completed a one year clinical Fellowship in Maxillofacial and Facial Plastic Surgery in Bruges, Belgium. He is a reviewer for the International Journal of Oral and Maxillofacial Surgery and is co-author of three chapters of Prof. Gwen R J Swennen's new book, "3D Virtual Treatment Planning of Orthognathic Surgery".

Virtual surgery combined with patient-specific saw and drill guides and osteosynthesis materials are rapidly spreading from reconstructive surgery to orthognathic surgery. Most commercial partners are already providing computer-aided design and computer-aided manufacture (CAD/CAM) wafers and patient-specific saw guides. Clear benefits have been demonstrated for custom-made drill guides combined with individually designed three-dimensional (3D) printed patient-specific implants (PSI) as a reposition and fixation system in Le Fort I osteotomy.

Materials and methods: We treated 30 patients who underwent bilateral sagittal split osteotomy (BSSO) due to class II dento-skeletal deformities with the additional use of drill guides combined with PSI as a fixation and positioning system.

The PSIs fitted bilaterally with total precision in 11 of the 30 patients. In 17 patients, the PSIs were used with some modifications. In 2 of 30 patients, the PSIs could not be used as a fixation due to misfit.

Due to unpredictable fitting, the use of PSIs with drill guides alone in BSSO without wafers cannot be recommended. Further studies are needed to evaluate the interfering parts, which seem to be related to condylar positioning and bony interferences at the osteotomy sites.

The use of virtual surgery, patient-specific saw and drill guides, and custom-made osteosynthesis plates is rapidly spreading from deformity surgery to orthognathic surgery. Most of the commercially available systems are using computer-aided design/computer-aided manufacture (CAD/CAM) wafers to produce patient-specific saw guides. However, most plate systems provided are still the conventional "in stock" mini plates that can be individually designed by pre-bending according to the stereolithographic model of the patient. Custom made three-dimensional (3D) printed implants have earlier been demonstrated to be an ideal solution in deformity surgery and in reconstruction of complex posttraumatic cases. In this study, we report the novel use of patient-specific saw and drill guides combined with patient-specific 3D titanium alloy implants as a fixation system in maxillary movement after Le Fort I and maxillary osteotomies (n = 32). The implants were individually designed for each patient to follow anatomical structures and to provide exact positioning and stability of the repositioned maxilla.

To present 4 cases of unilateral mydriasis associated with orthognathic surgery and to review the differential diagnosis and management related to this condition.

Four cases of unilateral mydriasis associated with orthognathic surgery were identified from the authors' institutional experience. All maxillary osteotomies performed by the authors' department from 2001 to 2013 were identified based on Current Procedural Terminology codes; 4 cases of unilateral mydriasis were found. Cases are presented and the literature is reviewed.

Two male and 2 female patients with an age range of 16 to 34 years developed unilateral mydriasis after maxillary osteotomy; the estimated prevalence is 0.004%. Although the precise cause can be difficult to determine, in this series 1 case was attributable to swelling affecting contents of the superior orbital fissure, 1 was

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related to edema or medications, and 2 were pharmacologically induced.

Although rare, a review of the differential diagnosis for and management of unilateral mydriasis associated with orthognathic surgery is pertinent to those who perform corrective jaw surgery.