

The Use of Detachable Flanges on Customized Titanium Orbital Implants: A Technical Note

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ABSTRACT

The combined use of three-dimensional reformatted images, stereolithographic models, and rapid prototyping allows the construction of an accurate, individually made titanium implant for the reconstruction of orbital floor defects. Despite the perfect fit of the custom-made plate to the model, there might be several locations on the bone where the plate may reside intraoperatively. Most titanium orbital plates therefore contain extensions over the inferior orbital rim to help locate and stabilize the plate in its position on the bone. Such over-the-rim extensions may be palpable and can cause discomfort postoperatively. We describe the use of two small detachable flanges that help to accurately locate the orbital plate in place and allow its fixation. The locating flanges are then detached and discarded, leaving a smooth implant surface within the confines of the bony orbit.

KEYWORDS: Custom-made titanium, SLA, orbital implants, orbital fracture, detachable flange

The combined use of three-dimensional reformatted images, stereolithographic models, and rapid prototyping allows the construction of an accurate, individually made titanium implant for the reconstruction of orbital floor defects.^{1,2} The process confers several advantages including a precise fit to the bony contour³ and reduction in operating time. However, even with close adaptation of the plate to the model, there may be several positions on the corresponding bone where the plate may reside, and exact intraoperative duplication of the preplanned position can be difficult.

Previous authors have advocated the use of infraorbital rim extensions to aid in accurate localization of customized orbital floor implants and provide easy access for anterior screw immobilization. These anterior extensions also prevent the implant being inserted too far

posteriorly. However, such extensions are often palpable and serve no purpose other than assisting implant placement.⁴

To overcome the problem of palpability, two small, detachable infraorbital rim extensions or flanges are incorporated into the orbital implant design. Once accurate localization of the plate is achieved intraoperatively, migration is prevented using screw fixation on the anterosuperior aspect of the orbital floor through predrilled plate holes. During construction of the implant, the flanges are intentionally weakened just above the level of the inferior orbital rim using a laser welder (Fig. 1). This facilitates their detachment from the plate with minimal force using a gentle twisting motion. The resultant cleavage from the secured orbital implant leaves a clean, smooth surface without sharp margins and an

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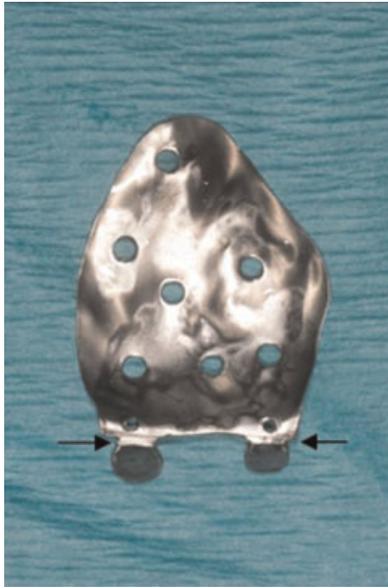


Figure 1 Custom-made titanium orbital implant with inferior orbital rim detachable flanges (arrows indicate weakened lines of cleavage).



Figure 3 The flange following its detachment and removal from the custom-made orbital implant.

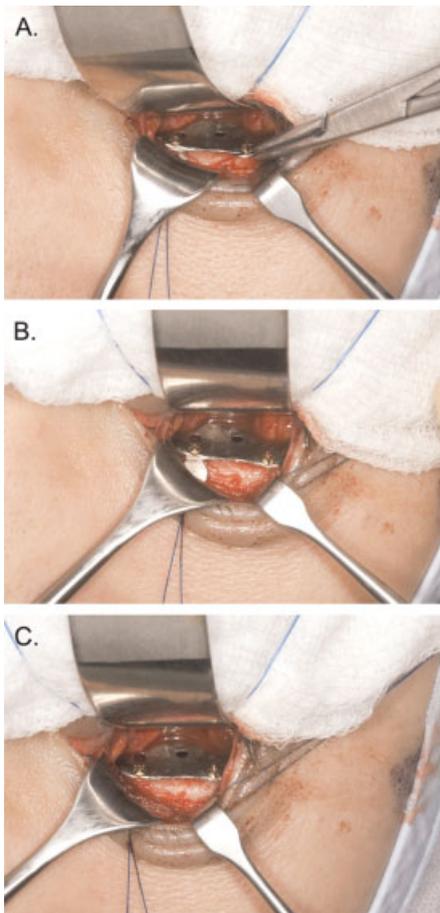


Figure 2 (A) The customized orbital implant accurately located and secured with screws with the flange being removed using an artery clip. (B) The plate in place with one flange removed. (C) The plate in place following the removal of both detachable flanges leaving a clean, smooth surface.

orbital floor reconstruction that is limited to the confines of the bony orbit (Fig. 2). The detached locating titanium flange can then be safely discarded (Fig. 3). Care must be taken during plate manufacture in the laboratory to maintain a fine balance between weakening the flanges enough to make them easily detachable and preventing the potential for deformation or detachment during preoperative and intraoperative handling. This is why we send all our customized implants with specific care instructions to the Hospital Sterilisation and Disinfection Unit to prevent implant damage or mishandling. This design change is now incorporated into our customized orbital plate manufacture protocol.

REFERENCES

1. Hughes CW, Page K, Bibb R, Taylor J, Revington P. The custom-made titanium orbital floor prosthesis in reconstruction for orbital floor fractures. *Br J Oral Maxillofac Surg* 2003; 41:50–53
2. Mustafa SF, Key SJ, Evans PL, Sugar AW. Virtual reconstruction of defects of the orbital floor using the morphometry of the opposite maxillary sinus. *Br J Oral Maxillofac Surg* 2010;48: 392–393
3. Bill JS, Reuther JF, Dittmann W, et al. Stereolithography in oral and maxillofacial operation planning. *Int J Oral Maxillofac Surg* 1995;24(1 Pt 2):98–103
4. Ochs M. Orbital and ocular trauma. In: Miloro M, Ghali GE, Larsen PE, Waite P, eds. *Peterson's Principles of Oral and Maxillofacial Surgery*. Hamilton, London: BC Decker Inc. p. 486