Titanium mini-plate for securing septal cartilage – a case of high-impact nasal trauma

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ABSTRACT

A technique is presented of securing the cartilaginous nasal septum using titanium mini-plates in the repair of a complex open comminuted type I nasoethmoid fracture, with internal impaction of the external cartilaginous nose. This technique allows primary skin closure and obviates the need for external metal-work and the attendant potential complications.

KEYWORDS

Titanium mini-plate – Septal cartilage – Nasoethmoid fracture

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Reconstruction of the external nose in cases of high-impact trauma can be complex and challenging.¹ We present a technique of securing the cartilaginous nasal septum using titanium mini-plates in the repair of a complex open comminuted type I nasoethmoid fracture, with internal impaction of the external cartilaginous nose.

Case report

A 20-year-old woman was an unrestrained passenger in a high-impact road traffic collision. Injuries included a complex laceration over the dorsal external nose with disruption of the nasal septum and upper lateral cartilages from their attachments, internal impaction of the nasal septum and resultant collapse of the external lower two-thirds of the nose.

High-definition computed tomography (CT) scanning identified a comminuted type I fracture of the bony septoethmoid complex and distortion of the right lamina papyracea, a horizontal fracture of the frontal process of the maxilla and air in the left medial orbit implying a breach of the left lamina papyracea.

For repair, a joint ENT-maxillofacial approach was utilised. Pre- and postoperative appearances are seen in Figure 1.

Access to the surgical site was via the dorsal nasal laceration, the cartilaginous septum was dissected internally from its posterior and perichondrial attachments and the bony septum was partially removed to allow the cartilaginous nose to be distracted. The inferocaudal corner of the cartilaginous septum was sutured to the anterior nasal spine using a non-absorbable suture. A titanium mini-plate was then used to secure the dorsal cartilaginous septum to the intact nasal bones. A 5-hole titanium mini-plate was placed along the midline of the dorsal external nose. This was secured using two titanium screws to the nasal

bones and two titanium screws to the dorsal cartilaginous septum. As the cartilaginous septum was directly perpendicular in alignment to the mini-plate, the long axis of the cartilaginous septum allowed for full purchase of the screws without complete perforation of the cartilage. Titanium mini-plates were also used to secure the fracture of the right frontal process of maxilla. A layer of PermacolTM was placed superficial to the metal-work prior to skin closure.

At 2 weeks' postoperatively, the cosmetic and functional elements of the external nose had been restored (Fig. 1). Dorsal and tip projection of the nose were maintained with good septal stability. The wound had healed well. At 3 months' postoperatively, there were no postoperative complications.

Discussion

Nasoethmoid fractures require complex management to minimise functional and cosmetic deformity.^{1,2} Principles of managing nasoethmoid fractures include the restoration of the nasal height, length, tip projection, dorsal projection and septal reconstruction.⁵ Where structural deformity following trauma is not addressed, up to 50% of patients following trauma will require revision rhinoplasty or septorhinoplasty.⁴

Restoration of dorsal nasal and tip projection, and nasal length as part of nasoethmoid fracture repair is often achieved by insertion of autologous or artificial graft material to the subcutaneous plane under the dorsal external nose and/or columella. Nasal septal reconstruction is commonly overlooked. This, however, is an important step as not only does this improve the functional result, but it may significantly reduce the need for ancillary procedures or grafting to restore dorsal and tip projection, and nasal lengthening.

Figure 1 (A) Pre-operative appearance; (B) peri-operative appearance with titanium mini-plates *in situ*; (C) appearance at 2 weeks' postoperatively.

Where nasal reconstruction has been described previously, this often takes the form of calvarial bone grafts or costal cartilage grafts.⁵ These augmentation grafts are inserted to replace the function of the septal/external cartilaginous nose and restore dorsal nasal and tip projection. If, however, the traumatised nasal septum is left *in situ*, this does not fully address the functional aspect and nasal obstruction may ensue. Studies evaluating the long-term results of using costal cartilage grafts suggest that though the patient's perception of the result was initially satisfactory, in a population of 38 patients, 9 cases (24%) required further surgery.⁵ Soft tissue augmentation was needed in one case, and three required tip revision. The shape of the cartilage graft in five patients had to be corrected.⁵

The patient in this case sustained a high-impact injury resulting in collapse of the external buttresses of the nose and ethmoid labyrinth. As a direct result, the perpendicular plate of ethmoid was rotated and quadrilateral cartilage forced posteriorly. Techniques used to repair this type of injury previously have involved the use of external fixation devices, for example, halo external fixation, external wire fixation, interfragment wire and the use of lead plates with wires.¹ Murphy *et al.*¹ described a technique using Kirschner wires, in a patient with an impacted nasal pyramid, fed through the septum and used to support the cartilaginous septum and pyramid. The wires remained *in situ* for 4 weeks, their ends protected by rubber shields. The wires were removed because of local infection that resolved after 2 weeks. The patient was satisfied with the cosmetic appearance, though the functional outcome is not described.¹

This report describes the use of titanium mini-plates to secure the dorsal septal cartilage to intact nasal bones. This technique minimises both the cosmetic and functional effects of septal impaction following trauma. By obviating the need for augmentation grafts or external fixation used in previous techniques, the associated complications (*e.g.* infection, rejection and graft dislodgement) are avoided.⁵ The use of an external device can limit the duration of time the graft material is kept in place, as demonstrated in the case by Murphy *et al.*¹ where local infection occurred. This could potentially compromise the final cosmetic and functional outcome. The titanium mini-plate is not an external fixation device.

The titanium mini-plates can be removed in the future to improve the cosmetic outcome further.

Conclusions

This case illustrates the use of titanium mini-plates to secure the dorsal septal cartilage to intact nasal bones, obviating the use of additional graft material or external fixation. We would advocate consideration of this technique in similar cases to minimise both the cosmetic and functional effects of septal impaction.

Acknowledgements

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