Accelerated Osteomesh Resorption: A Case Report

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ABSTRACT

Facial fractures occur commonly as a result of blunt trauma from road traffic accidents, assaults, and sporting injuries. Orbital floor fractures form a significant proportion of these and when large enough, the defect often requires surgical reconstruction of the floor to prevent orbital content herniation. Here, we present a case of a 28-year-old gentleman, who sustained an orbital floor fracture from a soccer-related injury. The resulting floor defect was surgically repaired using an osteomesh that was hand-cut to size. He developed delayed enophthalmos and entrapment of the inferior rectus muscle due to early resorption of the osteomesh, requiring revision surgery.

KEYWORDS: Accelerated osteomesh resorption, orbital floor implant, orbital floor fracture

Facial fractures form a significant bulk of the craniofacial trauma patient load in our center. This is due to a high volume of road traffic accident and workplace accident cases being sent to the emergency department here. A considerable number of these facial injuries include orbital floor fractures which may also be associated with orbital floor defects and the resultant herniation of orbital contents. The relief of the herniated contents, be it orbital fat or recti musculature, and the concomitant reconstruction of the orbital floor defect can be a challenging proposition.

Here, we present a case report of a 28-year-old gentleman who was referred to our department after sustaining blunt orbital trauma to his right eye during a soccer game. His initial presentation was that of right periorbital swelling and pain. Clinical examination showed a right periorbital haematoma, decreased upward gaze of his right eye and diplopia on upward gaze.

A CT scan of his orbits was performed, and blowout fractures of his medial wall and orbital floor were noted with resultant herniation of orbital fat and the right inferior rectus muscle (Fig. 1). He was brought to the operating theater and the herniated orbital contents were elevated out from the orbital floor defect; the 1 × 1 cm orbital floor defect was reconstructed with a 1.5 × 1.5 cm bioabsorbable Osteomesh that was fashioned to size. The Osteomesh implant was placed over the floor defect and was not anchored; the periosteum was closed over the implant. The forced duction test performed was normal. An on-table decision was made by the consultant-in-charge not to fix the medial wall defect. On postoperative day 1, he was noted to have complete resolution of his diplopia and the upward movement of his right eye was near full. He was discharged well and subsequently seen in the outpatient clinic.

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Figure 1 Posttrauma CT scan of the orbits. Coronal view showing right orbital blow-out fractures of the floor and medial wall and herniation of the orbital fat and inferior rectus muscle with concomitant right maxillary sinus haemoantrum.

On the clinic follow-up 1 month postoperatively, he complained of diplopia on upward and left lateral gaze. Clinically, he was noted to have enophthalmos of 3 mm, as well as decreased upward movement of his right eye. Extraocular movement inferiorly, laterally and medially of his right eye was full. A repeat CT scan of his orbits was performed which showed reherniation of his orbital fat and inferior rectus muscle through his right orbital floor as well as herniation of orbital fat through the medial wall defect. The defect size was comparable to the defect seen on the preoperative CT scan with near-complete resorption of the Osteomesh used for reconstruction of the floor defect (Fig. 2).

He was originally scheduled for revision surgery to alleviate the herniated orbital contents and floor and medial wall reconstruction. However, on the clinic visit date prior to the operation date, he reported marked improvement in his diplopia, which now only appeared on extreme upward gaze. He was also unconcerned about

Figure 2 CT scan of the orbits 6 weeks postoperation showing reherniation of the right orbital contents with partial osteomesh resorption. Resolution of the right maxillary sinus haemoantrum is noted.

the enophthalmos. As such, he has elected to postpone the surgery indefinitely.

DISCUSSION

Osteomesh is composed of a biocompatible plastic, polycaprolactone (PCL) belonging to the aliphatic polyester family, that is manufactured by Osteopore International that provides a scaffold for the craniofacial bone to regenerate and cover over a defect.^{1,2} It has been approved by the U.S. Food and Drug Administration for several medical and drug-delivery devices. In addition to his osteoconductive properties, it is supposed to have a slow biodegradation rate of ~2 to 3 years. The scaffold can be fabricated to fit the patient's defect intraoperatively since the PCL is a thermoplastic with a softening temperature just below 60°C.^{1,3,4} Due to these properties, Osteomesh had been used extensively for the reconstruction of orbital floor and wall defects by our department.

Orbital floor reconstruction can be undertaken in a variety of ways, such as using nonresorbable material such as titanium meshes, resorbable techniques such as Osteomesh, or autologous avenues such as calvarial bone and cartilage grafts.⁵⁻¹⁰ Each carries inherent advantages and disadvantages, but all carry similar aims of restoring orbital volume and providing a stable platform for the orbital contents, preventing enophthalmos, restricted gaze, and diplopia.¹¹

In our patient, the choice of using a porous bioabsorbable mesh was driven by the relative small size of the orbital floor defect coupled with the patient's decision not to have a secondary donor site operation, ruling out the use of autogenous material. The relatively posterior location of the defect also made the use of an easily conformable plastic polymer superior to that of a titanium mesh. Unfortunately, the patient experience accelerated biodegradation and resorption of the Osteomesh at 1 month after surgery with recurrence of his preoperative symptoms.

A Pubmed search did not reveal any previous case reports of accelerated resorption of the PCL polymer type of mesh, although there have been reports of resorbable mesh resulting in gaze restriction.¹² Normal degradation of PCL occurs via chemical hydrolysis into low-molecular weight oligomers and monomers.^{1,3,4,13} Accelerated degradation of PCL polymers have been simulated in vitro at body temperature using an alkaline environment using sodium hydroxide (NaOH).^{1,14} Decomposition of the polymer with resultant loss of tensile strength would also occur at temperatures close to 350°C.¹ These conditions were of course not met in our patient.

A 2-year review of Osteomesh use was performed in our center. Out of 39 cases, this remains the only patient which showed accelerated resorption of the PCL polymer mesh. We believe it is an isolated incident but

the small likelihood of this occurring should be explained to patients.

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