REVIEW

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Biomaterials for Orbital Floor Reconstruction: A Review

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ABSTRACT

Fractures of the floor of orbit commonly known as blow out fracture. It may be classified into pure and impure fractures. Isolated fractures of orbit are known as pure. many biomaterials have been used over the years to reconstruct the floor. This review discusses the role of different biomaterials for orbital floor reconstruction.

KEYWORDS: Blowout fractures, Biomaterials, Reconstruction

INTRODUCTION

Fracture of the floor of the orbit which may be associated with displacement of the orbital contents in the maxillary sinus.[1] Based on the orbital rim fracture along with floor fracture, Converse and Smith introduced the concept of pure blow out and impure blow out fractures.[2] The management of orbital floor fractures is still controversial with regard to indications, surgical timing[3] access, and reconstruction techniques. The eyes should be bright and reflect light, they are the windows to the soul[4] Over the years different authoritative opinions have alternated in the literature. Wide ranges of choices are available regarding the materials used for orbital floor reconstruction. They can be classified as autografts, allografts, or alloplasts.[5] Alloplasts can be classified as non-resorbable and resorbable materials. Titanium mesh, Teflon, Medpore, Silicone come under the non resorbable category. Resorbable materials include poly-L-Lactide, polydioxanone, polycaprolactone, polyglactine-910, and polyglycolic acid.[6] Allograft materials include lyophilized dura and lyophilized cartilage[6] Autografts include periosteum, rib grafts, auricular cartilage, iliac bone graft, mandibular bone graft, calvarial graft. Though autogenous bone graft provide framework for orbital walls, they carry the main demerit of donor site morbidity including nerve and blood vessel injury, gait disturbances, cosmetic disturbance, and donor site pain.[7]

Non resorbable alloplasts become as permanent foreign bodies and can cause late complication such as infection migration of implants, extrusion of implant and residual diplopia.[5] The reconstructive surgeon must always be aware that any non resorbable material has the potential to cause infection even after an interval of years. For this reason, autogenous grafts are still widely used. Of autografts, auricular cartilage[7,8] is indicated for the reconstruction of gaps in the orbital floor due to a shape that is very similar to that of floor.[9,10]

DISCUSSION

Management of orbital fracture is a challenging problem for the oral and maxillofacial surgeon. Their reconstruction requires 1) release of entrapped orbital floor muscle 2) reduction of the fractured floor, 3) reduction of the floor defect , 4) prevention of infection from antrum, 5) return of physiologic function the extraocular muscles, 6) elevation of the depressed zygoma and 7) correction of the volume discrepancy between the orbits.[11] Various factors influence the choice of material for use in orbital floor reconstruction. The choice depends on the size of the defect, involvement of multiple walls, adaption to the internal contours, restoration of proper volume, presence of adjacent sinus cavity, prevention of displacement, risk of further trauma, adhesions or restriction of ocular motility, early vs. late repair.[12] There is general consent that the ideal floor inlay material should be inexpensive, readily available in sufficient quantities, adaptable to regional anatomy (easy to contour and sharpen), easy to position, suitable to all types of defects, able to provide support to orbital contents, biocompatible, non-toxic , non-carcinogenic, free of potential for disease transmission , inert or biodegradable to zero remnant.[13] Alloplasts are available as either resorbable or non-resorbable materials. Non-resorbable materials are titanium

mesh, porous polyethylene sheet, BAG plate, hydroxylapetite sheet. These non resorbable materials remain as permanent foreign body, potential for disease transmission, expensive, not readily adaptable to walls[13] Resorbable materials used are PLLA and PLLA/PGA sheet, polyglygolic acid membrane , PDS sheet, polyglactin -910 mesh, periosteum polymer complex.[13] Unfortunately resorbable materials have not always performed well. Two major problems have been encountered that limit their potential. First is the ability of these materials to maintain support to the orbital tissues sufficiently long until replaced by fibrous or bony tissue to prevent enopthalmus. Second is the progress of degradation that is not benign.[14] advantages of alloplasts are that they can be applied in wider defects, good support to orbital contents. The other choice for orbital reconstruction is the use of allogenic materials. Waite And Clantons (1988) have reported these grafts as reconstruction material.[15] The main concern with regard to the use of these materials is the antigenicity of the material and transmission of infectious diseases. Delayed hypersensitivity reactions have also been reported with the use of xenografts. Despite being careful on the sterilization techniques, risk of infectious disease transmission is the main disadvantage of using allogenic materials.[13] Because of various shortcomings associated with use of alloplastic and allogenic materials, autogenous grafts still widely used for orbital reconstructions.

Disadvantages associated with autogenous bone grafts are donor site morbidity. Variable rates of resorption with subsequent development of enopthalmus and or ocular dystopia, difficulty in contouring and shaping. Intracranial complications such as scarring. Alopecia and injury to the temporal branch of facial nerve. A further disadvantage of using bone is the separate surgical field and time taken to harvest the gift.[14] The idea behind using auricular cartilage is that an ideal implant for orbital floor reconstruction for orbital defects because of its natural curve that fits into the orbital defects. Auricular cartilage seems to provide a good source of cartilage seems to provide an excellent source of autogenous tissue for the repair of orbital floor defects. With attention to surgical technique, the cartilage can be harvested without creating auricular deformities and objectional scarring.

Other advantage auricular concha include a donor area that is located in the close proximity of the recipient site that can be prepared and draped within the same surgical field.[16] Bayat et al.,[17] and Dharmindra et al.,[18] stated auricular cartilage seems to provide an excellent source of autogenous tissues for the repair of orbital floor defects because of 1) its thickness and concave shape 2) ease and less time to harvest and 3) minimal donor site morbidity. Castellani et al.,[19] Stated that cartilage is only slightly vascularized and thus requires little blood perfusion which means that it undergoes less resorption.

CONCLUSION

Considering all the biomaterials in our review, for larger defects alloplasts like titanium mesh, Medpore, poly-L-lactide etc should be used because of their ability to hold the orbital contents. Chances of Foreign body reactions will always be accompanied with the use Alloplasts and allogenic materials. For smaller and medium defects Autogenous grafts should be used. Now a days bone grafts are obsolete in orbital floor reconstruction. Conchal auricular cartilage graft can be used as a suitable implant for orbital floor reconstruction. The clinical outcome is comparable to other materials for orbital defects.

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