Reconstructive options following orbital exenteration

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Abstract

Purpose of review. The purpose of this review is to examine current trends in reconstruction following orbital exenteration. Defects ranging from isolated exenteration to more complex midface resections are explored.

Recent findings. Goals of reconstruction include separating the sino-orbital cavities and creating a safe, stable wound that can withstand adjuvant radiation. When planning for orbital rehabilitation, it is important to create a concave cavity that can accommodate a prosthesis. This is primarily achieved through secondary granulation or split-thickness skin grafts. Recently, the use of dermal allografts has been investigated and shown good success with epithelization of the orbital cavity. For complex orbitomaxillectomy defects, musculocutaneous free tissue flaps remain the mainstay for reconstruction.

Summary. Reconstructive options following orbital exenteration are based on extent of the defect, need for postoperative radiation, and plans for orbital rehabilitation with prosthesis.

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Introduction

Surgical resections that require orbital exenteration are disfiguring procedures that lead to functional impairment and psychological stress for the patient. Exenteration is most often utilized for primary orbital malignancies and secondary tumor spread from adjacent structures, including the skin, lacrimal complex, and sinonasal cavities. Variations of this procedure range from isolated removal of orbital soft-tissue contents with exposure of the bony cavity, to extensive midface resections involving the entire orbitomaxillary complex. Reconstruction of the orbit and midface is complex and requires careful preoperative planning. Reconstructive options are determined by several factors including the extent of the surgical defect, need for postoperative radiation, and plans for prosthetic rehabilitation. Defect classification schemes exist and aim to categorize surgical defect sites based on resection of key structures and orientation of the defects as a way to guide subsequent reconstruction. However, there has been no consensus on defect classification or subsequently standardized approach to reconstruction.

Goals of Reconstruction

Goals of reconstruction of exenteration defects follow relatively simple tenets; primary objectives include: obliteration of the defect, separation of the nasal and orbital cavities, sealing of the skull base, and creating a safe wound for adjuvant radiation. Aesthetics, including reconstituting bony contour and optimizing the defect for orbital prosthetic placement are secondary goals of reconstruction. When planning for an orbital prosthesis, maintaining a concave orbital cavity is imperative to permit placement.

Isolated Orbital Exenteration

There are multiple approaches to reconstruction after isolated orbital exenteration without resection of the maxilla or significant surrounding tissue. The orbital cavity can be reconstructed using: spontaneous granulation (no reconstruction), split-thickness skin grafts, dermal fat grafts, local tissue advancement flaps such as temporalis muscle or temporoparietal fascia flaps, pedicled musculocutaneous flaps, and free tissue transfer. With spontaneous granulation, prior studies have noted prolonged healing time,

frequent wound care requirements, and high rates of sino-orbital fistula ^[1]. Accordingly, this technique is not recommended in patients that require postoperative radiation, due to risk of delay of adjuvant therapy. After healing is complete, however, this method will yield a concave cavity conducive to prosthetic placement.

Split-thickness skin grafts are commonly used when there is no involvement of sinonasal or intracranial cavities, or plans for adjuvant radiation. This technique offers faster operative times and higher rates of prosthetic rehabilitation as compared with regional flaps or free tissue transfer. Risks include postoperative infection and partial or complete graft loss, rates of which are higher in patients who receive postoperative radiation ^[1,2]. Split-thickness skin grafts are an ideal means of reconstructing simple, exenterated cavities in patients not planning for adjuvant radiation. Recently, there have been investigations into alternative materials for split-thickness skin grafts. Young *et al.* ^[3] examined meshed human acellular dermal allograft as a lining material for exenterated cavities and found good success with spontaneous epithelialization over the grafts. A different preliminary examination has found shorter healing times after reconstructing using a manufactured dermal regeneration template (Integra), compared with spontaneous granulation ^[4]. These methods limit skin graft donor-site morbidity and operative times, however, still require weeks to months for complete healing. Further evaluation needs to be done to establish the role of these materials in orbital reconstruction.

Regional flaps can be harvested from the scalp, forehead, galea, and pericranium. Regional pedicled cutaneous flaps have reliable vascularity but are often too thick to line the orbital cavity and leave an undesirable donor site defect. The thinner temporoparietal fascia flap (TPFF) is more pliable and will contour to the orbital cavity well. These flaps have a dependable blood supply, large degree of rotation, and minimal donor site morbidity. Multiple studies have demonstrated the TPFF as a reliable flap for reconstructing an exenterated cavity ^[1,5]. For larger resections involving significant surrounding soft tissue, especially in the setting of periorbital skin cancers, free tissue transfer is often necessary for adequate reconstruction. Fasciocutaneous free flaps, like radial forearm free flaps, offer thin, pliable, and

reliable tissue for reconstruction ^[6]. Both regional and free flaps facilitate safe, vascularized wounds, able to withstand postoperative radiation.

Of note, eyelid-sparing exenteration technique should be considered when oncologically appropriate. The retained eyelids can be sutured together to preserve the natural contour of the face and maintain color match. This technique is associated with quicker recovery times and lower rates of eye patch use. It is important to note that these flaps can dehiscence and should not be used in cases with planned radiation.

Orbitomaxillectomy Defects

Because of the heterogenous nature of wounds that can result following orbitomaxillary resections, defect analysis is critical to optimize the quality of repair. With greater maxilla involvement, additional consideration needs to be given to issues like separation of the oral cavity, larger volume obliteration, and facial projection. Skull-base defects requiring targeted repair may also be present. Unlike limited exenteration defects, prosthetic placement is often not feasible or planned, given extensiveness of resection and interruption to the bony orbital skeleton. Accordingly, replacement of tissue volume becomes much more important in these cases. It is critical to note that many of the tumors that require total maxillectomy are aggressive and engender poor prognosis; therefore, creating a safe, well healed cavity for adjuvant treatment is paramount. In essence, expedient wound healing and robust separation of the intracranial, sinonasal, and oral cavities take precedence over functional and aesthetic goals.

Most reconstructive surgeons are proponents of musculocutaneous flaps like rectus, latissimus, and anterolateral thigh (ALT), which are the most frequently utilized flaps for these defects ^[2]. Soft tissue flaps, when used alone, effectively eliminate defects and separate cavities. With complex midface resection, some surgeons propose the use of bone-containing flaps to reconstitute projection of the midface. The osteocutaneous scapular flap is the most commonly used vascularized bone flap for this defect, especially when used for orbital rim replacement ^[2]. Other combinations of the scapular system flaps can be used as well. Osteocutaneous fibular flaps generally do not provide adequate volume of soft

tissue to fill dead space and thus require an additional soft tissue flap. In many cases, there is little utility in reconstructing the orbital floor when orbital contents have been removed. The orbital defect can be filled with soft tissue to obliterate the cavity and achieve adequate aesthetic results. Rehabilitation with orbital prosthesis is often limited by the bulkiness of the soft tissue required for obliteration. Select cases of patients who are younger and/or have less aggressive tumors could benefit from orbital floor reconstruction with bone flaps or orbital floor implants.

Conclusion

There are numerous options available for reconstructing the exenterated orbit, ranging from spontaneous granulation and split-thickness graft, to regional flaps and free tissue transfer. With such diversity in techniques available, there is no single technique that is considered standard. Reconstructive decision-making must therefore take into account tumor factors including degree of resection and need for adjuvant radiation, as well as patient factors including overall preoperative functional status, comorbidities, and desire for prosthetic rehabilitation. Specific reconstructive technique must be selected with the ultimate goal to create a safe, stable wound, with optimal prosthetic rehabilitation and cosmetic outcome.

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Conflicts of interest

There are no conflicts of interest.

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