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Orbital floor reconstruction using a tensor fascia lata sling after total maxillectomy

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ABSTRACT

Purpose: Reconstruction after total maxillectomy with extensive orbital floor defects poses a significant challenge for the reconstruction. The aim of this study is to present the outcomes of orbital floor reconstruction using tensor fascia lata slings after total maxillectomy and to compare these results to orbital floor reconstruction using alloplastic implants.

Method: This was a retrospective analysis of 19 consecutive patients who underwent tumor resection with orbital floor removal for malignancies. Reconstructions were performed using either tensor fascia lata slings (Group A) or alloplastic implants (Group B). The early and late postoperative outcomes such as wound infection, plate exposure, ectropion, diplopia, and enophthalmos, were analyzed and compared between the two groups.

Results: Patients in group A had significantly less wound complication than in group B ($p < 0.05$). In group A, there were no early or late wound complications after the operation. However, in group B, five patients had infection, the plate was exposed in eight of fourteen patients, and three patients had enophthalmos. Eight patients in group B underwent reoperation to correct their complications.

Conclusions: Reconstruction of the orbital floor with a tensor fascia lata sling offers reliable support to the globe and prevents the ophthalmic complications associated with loss of orbital support.

1. Introduction

Reconstruction after total maxillectomy with extensive orbital floor defects presents a significant challenge for the reconstructing surgeon from the standpoints of vision, oral function, and esthetics. The goals of total maxillectomy defect reconstruction are: (1) to provide support to the preserved orbital contents, to maintain the position of the globe, and to preserve orbital volume and visual function, (2) to maintain separation of the nasal and oral cavities to restore oral function, such as speech, swallowing, and mastication, and (3) to minimize facial deformity (Andrades et al., 2011).

Traditionally, maxillary defects were reconstructed using skin grafts to line the exposed mucosal defects and dental prostheses (Andrades et al., 2011; Iyer and Thankappan, 2014). However, several drawbacks exist, including prosthesis discomfort, the inconvenience of cleaning, and the need for frequent readjustments. Other surgical options such as local palatal, pharyngeal, and nasal septal flaps, temporalis flaps, and distant flaps can be considered as alternatives for maxillary defect reconstruction. The method choice is governed by location, size of the defects, and the quality of the residual skeletal structure and soft tissue (Iyer and Thankappan, 2014).

Removal of the orbital walls is often required for tumor ablation therapy. Although no reconstruction is needed for small orbital wall defects, a sturdy support is essential for large defects to prevent complications such as ectropion, enophthalmos, and diplopia (Joo et al., 2013). The ideal materials to reconstruct the orbital floor should be strong enough to support the orbital contents, flexible enough to fit the defect, biocompatible without side effects, and safe to the side effects of therapeutic irradiation (Iyer et al., 2012; Joo et al., 2013). Several methods have been described for orbital reconstruction, including free bone grafts, alloplastic materials, pedicled vascularized bone, and free vascularized flaps (Iyer et al.,

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2012). Alloplastic materials include titanium mesh and polyethylene implants. Although the alloplastic materials have been widely utilized due to their good contour and ease of use, they are prone to exposure and infection, especially after radiotherapy (Nakayama et al., 2004). Autologous free bone grafts using ribs and calvarial bone have been commonly used, but this method is limited due to donor morbidity and resorption risk (Iyer et al., 2012; Joo et al., 2013).

There are few clinical reports of orbital floor reconstruction using tensor fascia lata after maxillectomy (Celikoz et al. 1997; Iyer et al., 2012). Crawford (1968) pointed out the value of tensor fascia lata in its wide distribution in sheet-like layers, great tensile strength, elasticity, ability to mold to all possible shapes, and its high survival rate after transplantation. In addition, autogenous fascia lata does not result in tissue reaction or rejection, which avoids the need for immediate removal.

The current study presents the outcome of orbital floor reconstruction using tensor fascia lata slings after total maxillectomy and to compare the results to reconstructions using alloplastic materials through the postoperative period.

2. Materials and methods

2.1. Patients

This study was a retrospective analysis of 19 consecutive patients who underwent maxillectomy with orbital floor removal for malignancies with subsequent reconstruction with a tensor fascia lata sling or with alloplastic materials between 2003 and 2013. Institutional review board of Severance hospital waived informed consent and approved the design of this retrospective study. The biologic information, pathology, cancer stage, reconstructive methods, and adjuvant therapy were recorded.

The early outcomes occurring within 3 months of the operation included the presence of hematoma, wound dehiscence, infection, plate exposure, and donor site problems. Late wound complications (e.g. plate exposure and wound infection) and ophthalmic function including the presence of diplopia, abnormalities in globe position (e.g. enophthalmos), and eyelid problems (e.g. ectropion) were assessed more than 3 months after the operation.

For statistical assessment, the nonparametric Pearson chi-square test of independence was performed on categorical variables. The significance level was set at a value of $p < 0.05$.

2.2. Surgical procedure

The patient was positioned supine under general anesthesia. The head and neck surgery team performed either subtotal or total maxillectomy involving the inferior orbital wall, and surgical margins were examined by frozen section. For maxillary bony defects, we only reconstructed the inferior orbital wall in Brown Class IIIa defects using either tensor fascia lata or alloplastic materials after maxillectomy. With Brown Class IIIa defects, orbital support is lost in addition to anterior support of the cheek and dental arch (Brown et al., 2000).

When using the tensor fascia lata sling, the tensor fascia lata graft was harvested as follows. With the leg flexed at the knee and intorted at the hip, the iliotibial band was easily palpated along the line from the anterior superior iliac spine to the lateral condyle of the tibia. A 5–6 cm vertical incision was made approximately 10 cm superior to the lateral condyle. The dissection was carried down through skin and subcutaneous fat to the glistening white fascia. Fascia was separated from subcutaneous fat. The required amount of fascia was sharply incised with a scalpel blade and cut with Metzenbaum scissors. The designated fascia was harvested and coagulation was performed. The wound was closed in the primary fashion with subcutaneous and skin sutures. The harvested fascia graft was fixed with non-absorbable sutures and titanium screws to the nasal bone, lateral canthal tendon, and the remnant of the posterior orbital floor. The repair was done under proper tension to prevent ptosis of the orbital contents. When using alloplastic materials, the implant was trimmed with scissors and placed at the orbital floor defect. Next, the implant was fixed on the nasal bone and the lateral orbital rim with non-absorbable sutures or screws. The exposed maxillary mucosal defect was covered with harvested spilt thickness skin graft. Finally, the facial incision was repaired.

3. Results

Nineteen patients had total or subtotal maxillectomy with orbital floor reconstruction. Five patients had orbital floor reconstructions with tensor fascia lata slings (Group A), and 14 patients had reconstructions with alloplastic implants (Group B). The alloplastic implants we used included porous high-density polyethylene, titanium mesh, and absorbable sheet.

There were twelve male and seven female patients, and the mean average age of the patients was 56 years ranging from 24 to 79 years. The mean follow-up in these patients was 57 months. All patients had T3 or T4 malignant tumors of the maxillary sinus. Six patients underwent preoperative external beam radiotherapy before surgery and thirteen patients underwent adjuvant external beam radiotherapy, however only one patient did not receive radiotherapy. Table 1 shows the details of cases according to gender, age, tumor pathology, stage, defect size, material used, reconstruction, and radiotherapy.

The outcomes are described in Table 2. In group A, there were no early or late wound complications after the operation. In group B, postoperative wound infection was noted in one patient and alloplastic implant was exposed in three patients within 3 months of the operation. After the first 3 post-operative months, wound infections occurred in four patients and implant was exposed in five patients. Patients with tensor fascia lata sling had significantly fewer wound complications than those with alloplastic material ($p < 0.05$).

In all patients, eye movements and visual function were well preserved, and no patients experienced diplopia. In group A, enophthalmos was not noted in any patient, and two patients had ectropion. In group B, three patients had enophthalmos, and nine patients had ectropion. In terms of reoperations, eight patients in group B underwent revision surgeries to correct their complaints, while no patients in group A underwent reoperation.

3.1. Case 1

A 24-year-old man presented with facial pain and swelling. He underwent computed tomography (CT) scanning that showed a mass filling the maxillary sinus and extending to the buccal area, alveolar bone, and inferior orbital floor. Endoscopic biopsy confirmed a maxillary chondrosarcoma. He then underwent total maxillectomy involving the inferior orbital wall. A tensor fascia lata flap was harvested (3×7 cm) and used to reconstruct the inferior orbital wall, and the mucosal defect was covered with split thickness skin graft. The obturator was applied in the oral cavity. After surgery, he had radiation therapy (total dose: 59.4 Gy). Notably, postoperative complications and the evidence of tumor recurrence were not seen (Fig. 1).

3.2. Case 2

A 47-year-old man presented with facial swelling and headache. CT scan showed a maxillary mass that damaged the anterior and posterior maxillary wall, extending into the inferior orbital wall and cheek