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Midfacial Degloving Approach for Malignant Maxillary Tumors

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ABSTRACT

Purpose: The aim of this work is to study the use of this technique in extirpation of malignant tumors of the maxillary sinus. This includes the exposure for adequate tumor resection and the preservation of as much as possible functional tissue integrity. This approach will be evaluated including the advantages and disadvantages as regards the physiological function, aesthetic outcome and the complications related to the procedure.

Methods: Fourteen patients underwent the midfacial degloving technique for excision of malignant maxillary sinus tumors during the period from 1999 to 2003 at the National Cancer Institute, Cairo University. This procedure uses 4 basic incisions; sublabial incision, bilateral intercartilaginous incision, septocolumellar-complete transfixion incisions, and bilateral pyriform aperture incisions extending to the vestibule. Immediate reconstruction of the palatal defect was done in all cases by prosthetic obturator.

Results: All patients successfully underwent the planned procedures through the midfacial degloving approach for the treatment of malignant lesions of the maxilla without significant complications. Fifty of the patients had immediate postoperative face edema which resolved within a week. Oral infection occurred in 4% of patients. Other sequelae were nasal crusting and infraorbital hypoesthesia, both of which resolved within 2 to 3 months.

Conclusion: The midfacial degloving approach offers a good exposure of the mid third of the face with excellent cosmetic results. This approach may be combined with down fracture of the maxilla for access to expose and resect sinonasal malignancies. The midfacial degloving technique can be considered as a valuable procedure with low mortality and excellent cosmetic outcome.

Key Words: *Maxillary sinus - Tumors - Malignancy - Midfacial - Degloving.*

INTRODUCTION

The techniques of sinusectomy have been changed dramatically since the first maxillectomy was performed by Lizars in 1826 [1]. A mark in this development was attributed to Weber-Fergusson (1845) who described the classic procedure currently used [2]. Trying to preserve as much as possible functional tissue integrity, midface degloving procedure was introduced [3, 4]. A facial degloving procedure was first suggested by Portmann in 1927, but the modern technique had its origin in 1974 with the report of Casson et al. [5]. Conley and Pirce first suggested the use of the midfacial degloving procedure for excision of neoplastic diseases in 1979 [6]. Later, Maniglia popularized this technique as an approach for resection of benign and malignant tumors in the paranasal sinuses [7,8]. Several reports have subsequently suggested that it can be of great benefit for the management of various lesions, allowing adequate bilateral maxillary and lower nasal cavity exposure without cosmetic deformity.

The present report presents the surgical technique, indications, and results of midfacial degloving approach for a variety of malignant tumors of the maxillary sinus

PATIENTS AND METHODS

A prospective study was commenced during the period from 1999 to 2003. Fourteen patients with malignant maxillary sinus tumors underwent a midfacial degloving approach at the hospital of NCI, Cairo University. Maxillary tumors that were not involving the skin or subcutaneous tissue or extending to the infratemporal fossa, zygoma or skull base were included in this study. Midline lesions or involvement of both maxillary sinuses, as well as involvement of ethmoid or sphenoid sinuses were not a contraindication. Biopsies were taken either by fibro-optic sinuscopy or punch biopsy from fungating intra-oral lesions, to prove the malignant nature of the maxillary tumor by histopathology.

Computerized tomography (CT) was done for every patient for accurate preoperative staging of the maxillary tumor and to assure that there was no involvement of skull base, infratemporal fossa or soft tissue of the cheek.

An imprint of the jaw was done for preoperative preparation of temporary obturator by a specialized dentist.

Total maxillectomy with preservation of the orbit was performed in 10 patients and subtotal maxillectomy was done in 4 patients. Reconstruction of the orbital floor was performed in 5 patients (rotated temporalis muscle flap in 4, and pedicled nasal septal cartilage in 1).

All the patients received adjuvant radiation therapy that was started 2 to 3 weeks postoperatively in the form of 50 to 60 Gray in 5- 6 weeks through 2 wedged fields as a part of their treatment protocol.

Operative Procedure:

A curved endotrachial tube secured to the midline of the chin was used to administer general anaethesia. The nasal mucosa was treated by injection of 1% lidocaine with 1:100,000 epinephrine into planned intranasal and sublabial incisions and the canine fossa to ensure local hemostasis.

A full standard transfixition incision was carried out extending from high in the tip of the nose onto the nasal floor, sweeping posteriorly near its completion. Intercartilaginous incisions joined the superior end of the transfixition incision medially. These incisions extended beyond the lateral margin of the upper lateral cartilages. Full-thickness incision down through the periosteum of the pyriform margin and nasal floor completed the circumvestibular release.

Dissection through the intercartilaginous incision exposed the dorsum of the upper lateral cartilage that led to the nasal bones. The periosteum was incised with a curved Joseph knife, and soft tissues were widely elevated. Elevation extended laterally to the nasomaxillary sutures and superiorly to the glabella. All adhesions between the nasal skeleton and soft tissue were released to allow full elevation.

The sublabial incision was made with a No. 10 blade or Bovie electrocautery. The incision was carried down through the periosteum of the canine fossa. It should be designed so as to leave a cuff of loose tissue on the gingival side to allow for closure. The standard incision from one first molar to the contralateral first molar was extended unilaterally around the maxillary tuberosity and onto the soft palate. Soft tissue over the anterior maxilla was elevated in the subperiosteal plane, extending widely to the zygoma and up to the infraorbital rim.

Superiorly, the neurovascular bundle of the infraorbital nerve was visualized and carefully preserved if not involved by malignancy. The nasal floor and sublabial incisions were connected. Full retraction of the facial soft tissues, including the upper lip, intact columella, and nasal tip, were performed up to the level of the medial canthus. Then, maxillectomy was insured in the standard way. After resection, the soft tissues were allowed to return to the normal anatomic position. The preoperatively prepared temporary obturator was used for immediate reconstruction of the palatal defect after filling of the resulting cavity with guttabercha (thermoplastic material) and fixed in place by interzygomatic wiring (Figs. 1-4).

Closure of the nasal incision began with 3-0 chromic transfixition stitches. The precise placement of this suture is critical in determining the final position of the nasal tip. The circumvestibular incisions were carefully reapproximated with three or more 4-0 polyglycolic acid sutures placed at the intercartilaginous, pyriform, and nasal floor areas. Hemostasis was achieved by packing of the nasal cavity bilaterally using Sufra tull to be removed after 24 hours. Closure of the sublabial incision was assured through reapproximation at the frenulum using 3-0 chromic or polyglycologic acid material.

Perioperative broad spectrum antibiotics (3rd generation cephalosporins) as well as postoperative steroids and anti-inflammatory drugs were used for 5-7 days.

RESULTS

All patients successfully underwent the planned procedures after the midfacial degloving technique for the treatment of malignant maxillary lesions. The study included 7 males and 7 females, with a mean age of 33.4 years (range 13 to 65 years). Table (1) shows the patients' characteristics who were treated with the midfacial degloving approach. Tumors were staged according to the TNM system of the American Joint Committee on Cancer [9]. The majority of patients presented at an advanced stage of the disease; stage III (50%) as shown in table (2).

No intraoperative or post operative mortality occurred in this series. Edema of the face was significant in 50% of patients; this immediate postoperative facial edema subsided within 5 to 7 days. This was minimized with steroidal and non-steroidal anti-inflammatory drugs. The immediate obturator functioned well regarding the restoration of oral feeding without regurge and speech performance. However, it was associated with oral infection in 4 patients. This was aggravated by the accumulation of food debris in the space between the prosthesis and buccal tissue, especially with the lack of the proper mouth hygiene.

Other postoperative sequelae were moderate nasal crusting for 3 to 4 weeks and infraorbital hypoesthesia. The crusting was easily managed with periodic nasal saline irrigation. Hypoesthesia resolved spontaneously within 1 to 2 months.

No postoperative complications such as epistaxis, vestibular stenosis, or aesthetic problems of the nose were seen. The cosmetic results were excellent and the patients were satisfied (Fig. 5).

Following the patients after completion of post operative radiation therapy revealed that the well vascularized soft tissue of the face tolerated well the high doses of radiation. There was no skin contracture, sloughing epiphora or ectropion of the lower eye lid secondary to cicatrization of external face incisions (Fig. 6).

Table (1): Characteristics of patients treated with midfacial degloving approach.

Patient	Age (year)	Gender	Pathology	Location	Presenting symptom
1	13	F	Fibrosarcoma Grade 1	Rt. maxillary sinus & Rt. nasal cavity, ethmoid sinus and sphenoid sinus	Facial pain, epistaxis, Nasal obstruction
2	40	M	Adenocarcinoma Grade 2	Rt. maxillary sinus with infiltration of med. & inf. walls and ethmoid sinus	Nasal obstruction, facial pain
3	18	F	Osteosarcoma Grade 2	Lt. maxillary sinus destroying floor to oral cavity & pterygoid plate inferiorly	Mass of hard palate
4	21	F	Mucoepidermoid Ca. Low Grade	Lt. maxillary sinus destroing Lt. pterygoid plate & medial wall	Mass of hard palate
5	54	M	Sq. C. Ca. Grade 2	Rt. maxillary sinus with infiltration of the floor and fungation to hard palate	Facial pain, mass of hard palate
6	36	F	Adenocarcinoma Low Grade	Rt. nasal sinus & Rt. lateral nasal wall	Nasal obstruction
7	23	M	Sq. C. Ca. High Grade	Rt. anterior maxilla, nasal septum & Rt. pterygoid plate	Mass, nasal obstruction
8	65	M	Sq. C. Ca. Grade 3	Rt. anterior maxilla destroying hard palate	Facial pain, epistaxis, mass
9	47	M	Adenocarcinoma High Grade	Bilat. anterior maxillae and nasal cavity	Epistaxis, nasal obstruction, mass
10	45	F	Sq. C. Ca. Grade 3	Rt. maxilla, hard palate, nasal cavity, ethmoid sinus	Nasal obstruction, hard palate mass
11	40	F	Sq. C. Ca. Grade 2	Lt. maxillary sinus and lt. lateral nasal wall	Facial pain, mass
12	15	M	Giant Cell Tumor	Lt. ant. maxilla	Mass
13	23	M	PNET	Rt. maxilla invading orbital floor	Proptosis, asymmetry
14	28	F	Adenoid Cystic Ca.	Rt. maxilla invading orbital floor and ethmoid sinus	Mass

Sq. C. Ca.: Squamous cell carcinoma PNET: Poimitive neuro - ectodermol tumor

Table (2): Surgicopathological staging.

T	N	M	No.	%
T2	N0	M0	6	42.9
T3	N0	M0	7	50.0
T4	N0	M0	1	7.1

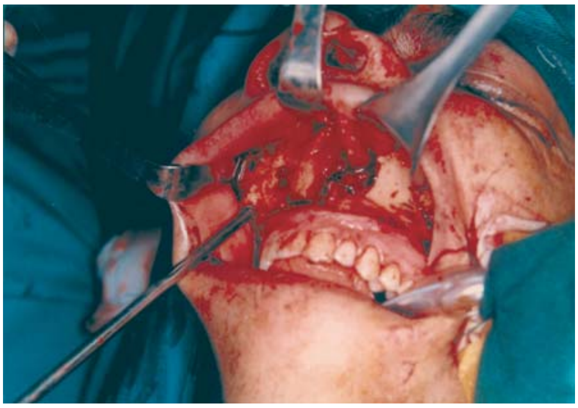

Fig. (1): Elevation of soft tissue of the face up to the orbital floor with good exposure of both maxillae.

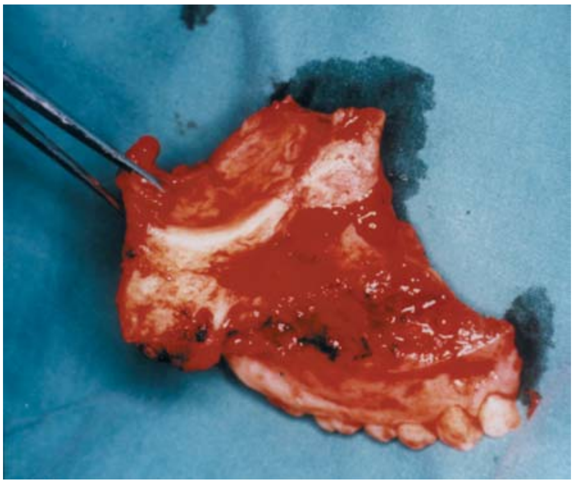

Fig. (2): Specimen of total right maxillectomy with orbital floor excision.

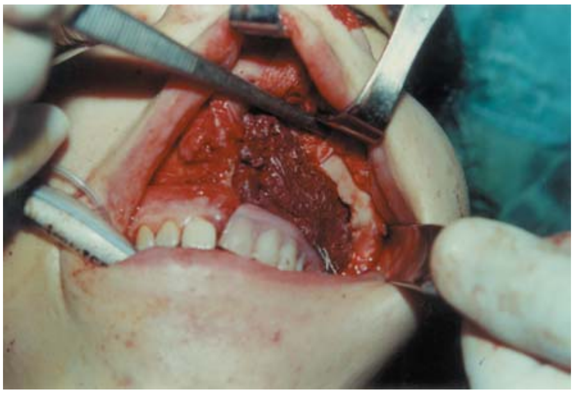

Fig. (3): Immediate reconstruction of the palatal defect with temporary obturator after filling of the resultant cavity with guttabercha.

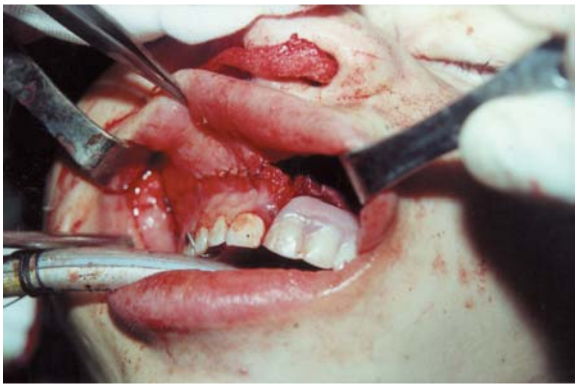

Fig. (4): Reposition of soft tissue of the face in place after fixation of the temporary obturator.

Fig. (5): Patient with left total maxillectomy one week post operative.

Fig. (6): Patient with left total maxillectomy after completion of post operative radiation therapy.

DISCUSSION

The midfacial degloving approach to the midfacial structures is a versatile technique. Midfacial degloving can be characterized as an alternative surgical approach for exposing the bony structures of the midface **[10]**. It uses 4 basic incisions **[8,11]** to obtain adequate exposure: 1) bilateral sublabial incision from maxillary tuberosity to tuberosity, 2) bilateral intercartilaginous incisions, 3) septocolumellar-complete transfixion incisions, and 4) bilateral pyriform aperture incisions extending to the vestibule. This procedure requires precise surgical technique and thorough understanding of the anatomy of the midface. The advantage of this technique is the ability to obtain excellent bilateral exposure of the mid third of the face, such as maxilla, paranasal sinuses, nasal cavity, and nasopharynx, without skin incisions **[11]**. This approach provides aesthetically pleasing outcomes, leaving no visible scars and virtually no functional disability, with a low complication rate. It has clear advantages over conventional surgical approaches, such as Weber-Fergusson, Dieffenbach, or lateral rhinotomy, though easy to perform yet they result in facial scars and possible epiphera. These methods may be associated with disfigurement of the face such as upward contracture of the alae and deviation of the nose, asymmetry of the upper lip and nasolabial groove, and medial canthal deformity. Despite excessive undermining of the midfacial region, our patients who underwent the midfacial degloving procedure showed excellent cosmetic results without sagging of tissue, deviation of the nose, or flattened alae.

Indications for this procedure include a wide variety of benign maxillary or sinonasal conditions, such as ameloblastoma, inverted papilloma, angiofibroma, and various odontogenic or nonodontogenic cysts **[7,8,12,13]**. Particularly advantageous is the use of this procedure in the management of locally aggressive, histologically benign lesions such as odontogenic keratocyst and ameloblastoma where complete removal of the lesion is recommended without facial incisions. This approach can also be used in benign fibro-osseous conditions, facial fractures, orthognathic surgery, and bone grafting **[12,14]**.

Malignant tumors can be excised in a similar fashion with an en bloc resection using this technique. Howard and Lund **[12,13]** mentioned that the use of this technique should only be attempted in selected cases that can be successfully encompassed by the exposure. Some consider that the midfacial degloving approach is indicated for small and slow-growing salivary gland malignancies (ie, low-grade mucoepidermoid carcinoma, low-grade polymorphous adenocarcinoma, acinic cell carcinoma) and other malignant tumors as long as safe clean margins are maintained **[12,13,15,16]**. On the other hand, Maniglia **[7,8]** extended this technique for a wide range of resections, such as medial maxillectomy, radical maxillectomy with and without orbital exenteration, anterior skull base craniofacial resection, and partial rhinectomy. He found it an excellent and useful access for removal of both malignant and benign lesions.

However, the use of this procedure was limited by its technical difficulty and the limited exposure of the infratemporal fossa, and therefore was not suitable for those patients supposed to have tumor extension to this area. The application of this technique in 14 patients with relatively advanced stage (50% stage 3, 42.9% stage 2 and 7.1% stage 4) was done without great difficulty. The midface degloving approach had the advantage of avoidance of disrupting the soft tissue of the face and therefore better preservation of function as well as appearance. The avoidance of disruption of the vascular and lymphatic vessels of the tissues of the face renders it more tolerable to the ischemic and cicatrizing effect of radiation. In addition, patients who underwent this procedure with a combined immediate obturator could restore oral fluid feeding at day one postoperatively with almost no speech difficulties. Early postoperative facial edema was a significant notification; however it was minimized with corticosteroids and subsided within 5 to 7 days.

The previous tradition practiced by surgeons was to leave the maxillectomy defect open, to enable for frequent clinical examination. This has now been changed towards the tendency to reconstruct the defect for restoration of function as well as appearance. Follow-up is easily checked with CT scanning.

The obturator was the preferred procedure, because of its technical simplicity as well as good function. Immediate reconstruction is by far better than delayed reconstruction. This delayed reconstruction is limited by trismus and contracture especially after radiotherapy. Immediate reconstruction had the difficulty of requiring accurate preoperative planning for the exact extent of resection and teeth to be extracted for proper designation of the obturator. This may sometimes be difficult to accurately determine the preoperative extent of resection needed to achieve tumor free margins. The malfitting painful temporary obturator was corrected with subsequent replacement with a well-fitting permanent one.

Frequent oral infections were another problem noticed with the reconstructive prosthesis. Mouth infection was reported in 4 patients .These patients were strictly instructed and taught to practice antiseptic mouth wash with high pressure (using a syringe) after meals to remove food debris.

In the present study, we noticed that the advantage of the immediate obturator exceeded its potential complications. The temporary obturator was designed to maintain the normal contour of the face and enable the patient to practice normal oral feeding and speech. This was replaced 2-3 months later by a permanent one. The permanent obturator was therefore designed to correct any defects in the temporary design. The permanent obturator could be taken off and placed easily; this allowed for better mouth hygiene with subsequent improvement of infection.

The most common complications of the midfacial degloving technique were moderate transnasal crusting and facial paresthesia **[8,11]**. Nasal crusting is inevitable as an immediate postoperative sequela but subsides as regrowth of mucosa occurs. Infraorbital numbness and paresthesia should resolve in few months if the infraorbital nerves were carefully preserved during surgery. Problems such as postoperative nasal bleeding, vestibular stenosis, and oronasal or oroantral fistula are infrequently encountered. Vestibular stenosis and fistula formation can be avoided if the incisions are sutured promptly and meticulously **[11,14]**.

Recently, neoadjuvant chemotherapy and radiotherapy have gained acceptance in clinical oncology of head and neck cancer to reduce functional damage caused by surgery **[17-20]**. The midfacial degloving procedure can be used after chemotherapy and/or radiotherapy **[12,13]** due to the excellent vascularity of the flap. Hence, this midfacial degloving technique is expected to become increasingly popular in the future as a reduced form of midface surgery.

In conclusion, midfacial degloving can be considered as an excellent, useful, and safe approach for many lesions and has low complication rates. It should be incorporated into the oncological and maxillofacial surgeon’s surgical armamentarium to avoid external incisions.

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