

Optimizing exposure of the posterolateral maxillary and pterygoid region: The lower cheek flap

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Abstract

Aim: Description of an alternative surgical approach to the posterolateral maxillary and pterygoid region.

Patients and method: Three patients with posterior maxillary/pterygoid lesions are described in whom a lower cheek flap was used to achieve optimal surgical exposure. After midline division of the soft tissues of the lower lip and chin, the incision is extended posteriorly in the inferior gingivobuccal sulcus and continued lateral from the retromolar trigone in the upward direction lateral from the maxillary tuberosity. The flap is elevated under the periosteum towards the angle of the mandible with detachment of the masseter muscle. By marginal resection of the anterior part of the ascending mandible, visualisation of the posterolateral maxillary and pterygoid region can be optimized.

Conclusion: As compared to the transoral approach, the lower cheek flap creates an optimal surgical exposure of the posterolateral maxillary sinus wall and pterygoid plates and should be considered for maxillary lesions extending into the pterygoid plate and pterygoid muscles.

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Introduction

When a maxillary sinus tumor extends into the posterior sinus wall and pterygoid plate, sufficient exposure of the lesion often determines adequate surgical resection via hemimaxillectomy. In these cases, the use of an upper cheek flap is often recommended using a modified Weber–Ferguson incision with subciliary extension.^{1,2} Although the use of the upper cheek flap increases surgical approach to the maxillary sinus significantly as compared to the transoral approach, posterolateral exposure of the maxillary sinus wall and pterygoid plates remains difficult. A direct lateral view on the pterygoid plates is hampered by the limited lateral extension of the subciliary incision and preservation of

the infra-orbital nerve. In addition, potential lower lid retraction as a result of the extended subciliary incision harbors the risk of ectropion of the lower eyelid, in particular, in those cases where the orbital floor has been removed. During the last 13 years we used a lower cheek flap as commonly used for a commando procedure, to optimize the exposure to the posterolateral maxilla and pterygoid and to avoid esthetic and functional sequelae of the lower eyelid. In this article we describe the surgical technique and demonstrate three patients with lesions in the posterolateral maxillary and pterygoid region representing difficult decision making with regard to the surgical approach.

Method

Step 1: raising the lower cheek flap

The surgery starts with the suprahyoidal incision (upper horizontal neck incision), which is normally used for

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(selective) neck dissection of level I–III. Subsequently, a skin flap is raised in a subplatysmal plane, until the level of the lower border of the mandible. Cranioposteriorly, the platysma is absent and there both greater auricular nerve and external jugular vein serve as indicators for the poster-superior dissection plane reaching over the parotid fascia up to an imaginary line drawn from the lower rim of the mandible in a posterior direction. While the assistant is retracting the skin flap using two large six prong-rakes, the marginal branch of the facial nerve is identified, running over the facial artery and vein near the lower rim of the mandible. This nerve branch is dissected posteriorly into the tail of the parotid to facilitate cranial mobilization beyond the lower border of the mandible, allowing for ligation and transection of the facial artery and vein. Depending on the presence of regional lymph node metastases, a (selective) neck dissection can be performed in the same surgical procedure.

A midline lower lip incision or paramedian curved incision is made extending inferiorly to meet the upper horizontal neck incision. The midline mucosal incision is extended into the inferior gingivobuccal sulcus posteriorly and then continued in upward direction lateral from the retromolar trigone and the maxillary tuberosity. The incision is made approximately 5 mm from the attached gingiva to facilitate adequate closure. The cheek flap is elevated subperiosteally from the midline to the angle of the mandible. The mental nerve cannot be preserved and is transected. The masseter muscle is detached from the ascending branch of the mandible upto the lower border of the mandibular notch. The attachment of the temporalis muscle to the coronoid process is transected. To improve visualisation of the posterolateral maxillary and pterygoid region, a marginal bony resection of the ascending branch of the mandible is performed using an oscillating saw. In this manner an appropriate view is created on the posterolateral region of the maxilla and the pterygoid plate (Figs. 1 and 2).

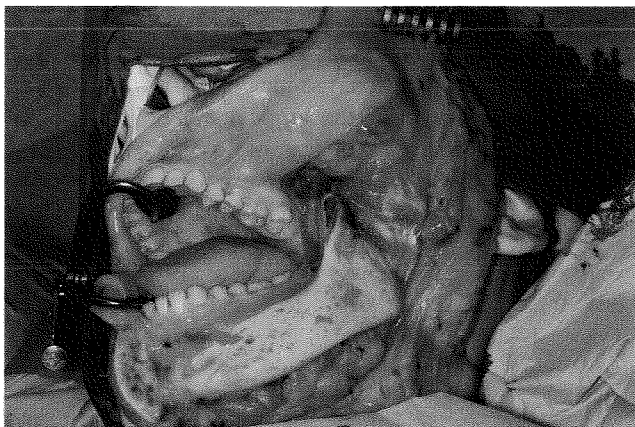


Figure 1. Perioperative view after raising the lower cheek flap. The coronoid process and part of the anterior rim of the ascending mandible have been removed to improve exposure of the region posterolaterally to the maxilla.

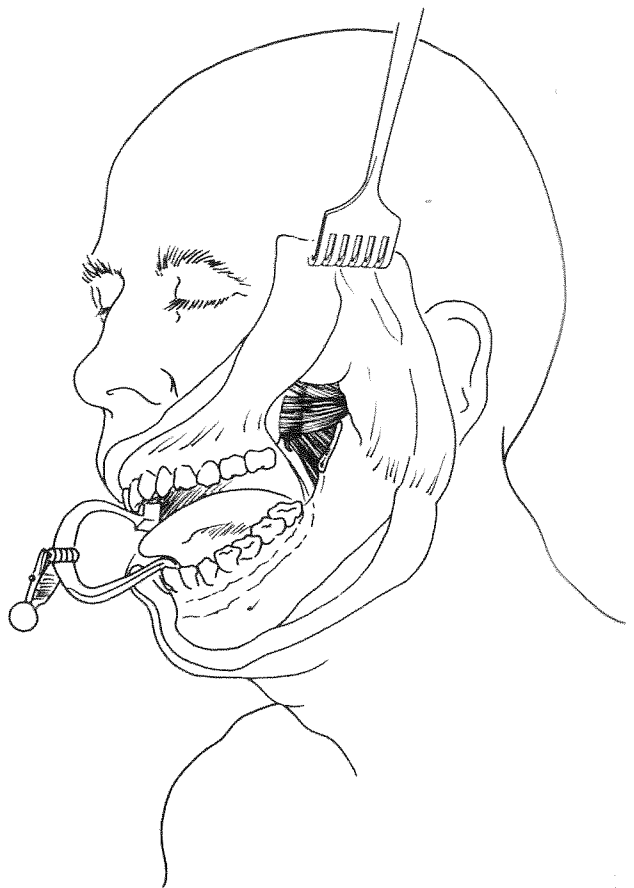


Figure 2. Schematic drawing of the lower cheek flap demonstrating the exposure of the posterolateral maxillary region and pterygoid plate.

After mobilizing the cheek flap laterally the mucosal incision can be continued in the upper gingivobuccal sulcus in an anterior direction towards the midline or with extension to the contralateral side depending on whether a maxillectomy has to be performed.

Step II: setting the borders

With the lower cheek flap raised, standard maxillectomy is easily performed by extending the incisions into the upper gingivobuccal sulcus and palate. In case of a malignancy extending into the posterior sinus wall and pterygoid plate, the posterolateral attachments of the maxilla are adequately exposed. The pterygoid muscles are then transected close to their attachment to the mandible to increase surgical margins. During this part of the operation the surgeon must also be aware of inadvertent damage of the maxillary artery, which has an unpredictable course in this retropterygoid area.

Patients

From 1994 to 2007 we operated 10 patients using the lower cheek flap for surgical removal of tumors of the

Table 1
Patients and tumor characteristics

Pat. no.	Sex	Age	Site	Stage	Histology	Indication to surgery	Operation findings	Post-surgery follow-up
1	F	58	Oral cavity—hard palate	T4N0	SCC	Primary cancer	Positive margin hard palate	NED 12 years
2	M	64	Maxillary sinus	T3N0	SCC	Recurrence post-RT	Complete resection	LFU
3	F	5	Infratemporal fossa	T2N0	RMS	AMORE-protocol ³	Complete resection	AWD 44 months
4	M	51	Nasal cavity	T2N0	ACC	Primary cancer	Incomplete resection; submucosal extension into nasopharynx	NED 22 months
5	F	14	Maxillary sinus	T2N0	PNET	AMORE-protocol ³	No residual tumor	NED 20 months
6	F	65	Maxillary sinus	T4N0	SCC	Primary cancer	Complete resection	NED 18 months
7	F	14	Pterygoid muscles	T2N0	RMS	AMORE-protocol ³	No residual tumor	NED 16 months
8	F	26	Lateral pterygoid muscle	NA	Hemangioma	Primary cancer	Complete resection	NED 13 months
9	M	54	Maxillary sinus	T4N0	SCC	Recurrence post-CCRT	Positive margin medially ethmoid	AWD 12 months
10	M	54	Paranasal sinus	T3N0	Adenocarcinoma	ORN post-S + RT/PDT	Complete resection	AWD 12 months

Abbreviations: AWD = alive with disease; CCRT = concurrent chemoradiation; DOD = dead of disease; F = female; LFU = no follow-up; M = male; NA = not applicable; NED = no evidence of disease; ORN = osteoradionecrosis; PDT = photodynamic therapy; PNET = primitive neuroectodermal tumor; RMS = rhabdomyosarcoma; RT = radiotherapy; S = surgery; SCC = squamous cell carcinoma.

maxilla and pterygoid region. Patient demographics, tumor characteristics, indications to surgery and pathological findings are summarized in Table 1. Postoperative courses were uneventful except for severe trismus in case 5. This child went back to her homeland and discontinued the exercise therapy for trismus. A temporary palsy of the marginal branch of the facial nerve was encountered in two cases. We selected three illustrative cases where we used the flap to demonstrate the advantage of the optimal exposure

* that it provides of the posterolateral region of the maxilla and pterygoid.

Case 1

A 58-year-old woman presented with a T4N0M0 squamous cell carcinoma of the left hard palate extending across the midline and into the maxillary sinus as well as the floor of the nasal cavity. On the CT scan, destruction of the posterior wall of the antrum was observed with infiltration of the pterygoid process and pterygoid muscles (Fig. 3). Using the lower cheek flap for surgical exposure of the posterolateral part of the maxillary sinus, an extended hemimaxillectomy crossing the midline was performed. For improvement of surgical exposure of the pterygoid muscles the anterior margin of the ascending mandible was resected. The floor of the orbital cavity remained intact. Antero-posterior osteotomies were placed paramedially in the hard palate and in the frontal wall of the maxillary sinus immediately below the level of the inferior rim of the orbit. The pterygoid muscles were cut close to their attachment to the mandible to allow for a free posterior margin. Finally, under maximal exposure, the pterygoid plates were released using a curved osteotome.

A previously fabricated dental obturator was covered by split skin and wired around the zygomatic arch. The postoperative course was uneventful and three weeks postoperatively the temporary obturator was replaced for a permanent version. Except for one incomplete margin by submucosal extension of the tumor at the junction of the hard and soft palate, the tumor was otherwise completely removed. Postoperative radiotherapy was given with a total dose of 60 Gy. Twelve years after surgery the patient is still alive with no signs of recurrent disease, only needing remodelling of the obturator once in 10 years postoperatively. There are no complaints about numbness of the lower lip, trismus or any disturbing scar formation.

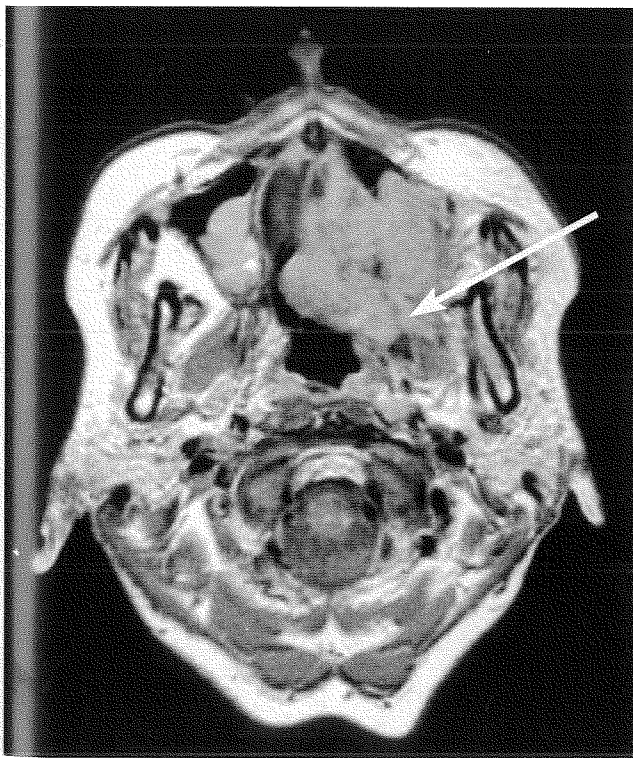


Figure 3. Axial CT scan of case 1 showing destruction of the posterior wall of the antrum (arrow) with infiltration of the pterygoid process and pterygoid muscles.

Case 7

A 14-year-old girl presented with an embryonal rhabdomyosarcoma in the pterygoid muscles and received six courses of chemotherapy (Ifosfamide, Vincristine and Adriamycin). A partial remission was achieved with a residual mass still visible on the MRI scan (Fig. 4). Following the AMORE-protocol³ – acronym for Ablation, Moulage and Reconstruction – we performed surgery for removal of a radiological residue by using a lower cheek flap. Except for some scar formation in the lateral pterygoid muscle, there was no clear evidence of a macroscopically detectable residual tumor mass. All scar tissue and surrounding pterygoid muscle tissue were removed, followed by preoperative brachytherapy (40 Gy) using gutta percha moulage. A free revascularized gracilis free flap with microvascular anastomoses to the facial artery and vein was inserted afterwards to prevent wound complications. For postoperative trismus the patient was put on a Therabite intervention program with successful improvement of the mouth opening.

Case 8

A 26-year-old woman presented with a recurrent swelling in the parotid area already existing for four years. The swelling occurred 3–4 times a year and was very painful. For reasons of an increasing incidence of painful swellings, she visited our outpatient clinic. At examination we found a non-well circumscribed swelling measuring 3 cm in diameter and a trismus limiting mouth opening to 3 cm. The clinical picture was not typical for a chronic recurrent

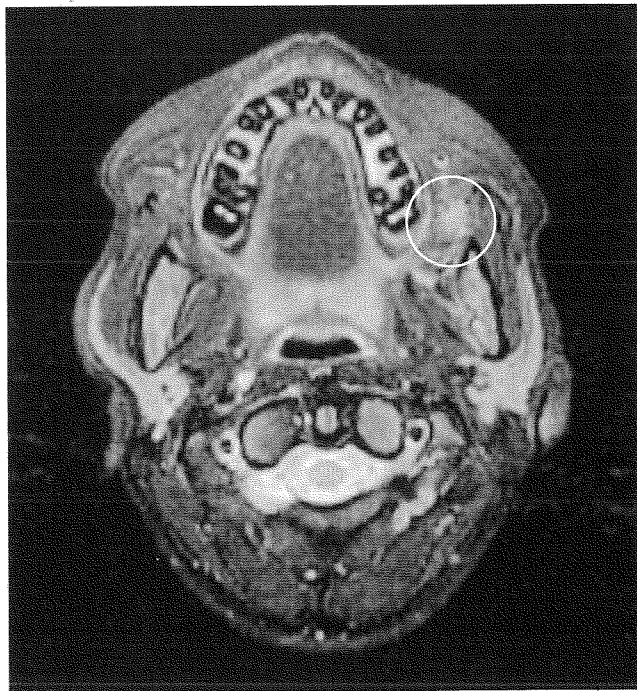


Figure 4. Axial MRI scan of case 7 showing a residual mass of rhabdomyosarcoma in the posterolateral maxillary region after intensive chemotherapy.

parotitis. Imaging revealed a lobulated lesion of 2 cm medial from the mandibular notch with a high signal on the T2 weighed images and irregular contrast enhancement (Fig. 5). Ultrasound guided aspiration cytology combined with the imaging data was indicative for a vascular malformation in the pterygoid muscles. For surgical removal of the lesion a lower cheek flap was used with transection of the tendinous attachment of the temporalis muscle from the condylar process. For better exposure of the masticator muscles the anterior margin of the ascending mandible was removed. An intramuscular lesion with a greyish appearance in the lateral pterygoid muscle was subsequently removed. Histopathological examination of the operation specimen confirmed the diagnosis of an arteriovenous malformation. Postoperatively the patient developed a trismus, which was successfully treated by intensive training under supervision of a physical therapist using Therabite. Except for some hypertrophic scar formation, there were no complaints about numbness of the under lip or drooling.

Discussion

Especially in the head and neck appropriate estimates on achievements of free surgical margins, preservation of function, and cosmesis make surgical decisions often difficult. This holds even more true for lesions of the oral cavity and lesions located in the posterolateral maxilla and pterygoid region, which cannot easily be removed by a transoral approach. This article describes the experience with the lower cheek flap for the surgical approach of the pterygoid area with possible (hemi-)maxillectomy on the basis of 10 cases with different disease locations and histologies. The flap

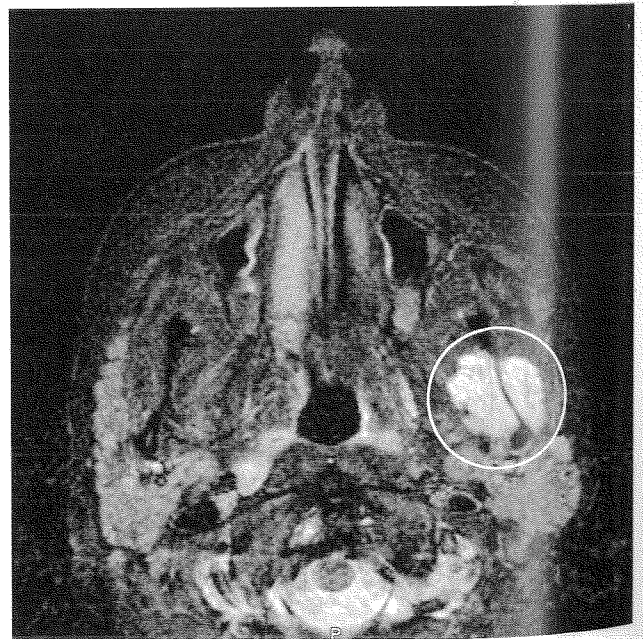


Figure 5. MRI imaging in case 8 shows a lobulated lesion of 2 cm medially and laterally from the mandibular notch with a high signal on the T2 weighed images and irregular contrast enhancement.

creates an excellent exposure to the lateral maxilla and pterygoid muscles/plates making removal of posteriorly located lesions much easier than with the use of an upper cheek flap via a Weber–Ferguson incision with subciliary extension. The longitudinal axis of this extended incision runs from the oral commissure to the anterior part of the zygomatic arch so that posterolateral exposure remains sub-optimal, which may even be more limited by the presence of the infra-orbital nerve. Apart from these limitations subciliary extensions may be complicated by ectropion of the lower eyelid.

In contrast to the axis of the extended Weber–Ferguson incision, the longitudinal axis of the lower cheek flap runs from the nasal vestibule to the mastoid tip, depending on the extension of the suprahyoidal incision, which creates a much better exposure of the posterolateral wall of the maxilla and the pterygoid plates. As demonstrated by case 1, removal of the anterior rim of the ascending branch of the mandible augments exposure of the posterolateral structures considerably. This offers also excellent opportunities for free flap reconstructions with availability of donor vessels in the neck. Apart from these obvious advantages, there are also some disadvantages to be mentioned. Interruption of the mental nerve during flap raising leads to a unilateral numbness of the under lip. Nevertheless, none of our patients complained about drooling or perceived problems by numbness of the lower lip. We could not find any literature addressing sequelae following interruption of the mental nerve and assume that – in agreement with our personal longstanding experience in patients undergoing commando surgery – this probably is a minor problem for the individual patient. Another disadvantage is the dissection of the marginal mandibular branch of the facial nerve, which is a standard part of the operation. In a recent retrospective study on 442 patients undergoing a modified radical neck dissection, a lesion of the marginal branch of the seventh cranial nerve occurred in nine cases (1.26%).⁴ This may lead to a lower lip asymmetry during smiling and oral incompetence during eating. Scars can be placed strategically using the esthetic unit principle. Using this principle the scar is positioned in the midline and the labiomental crease running around the chin unit towards the neck (Fig. 6).⁵ The risk of trismus is unrelated to the type of cheek flaps used and is dependent on the scar formation in the pterygoid muscles. We recommend exercises using a Therabite device to increase mouth opening, starting at the earliest postoperative moment⁶ as appeared helpful in cases 7 and 8.

Not only posterior extension of maxillary sinus carcinomas, but also small solitary benign lesions in the pterygoid region creates a difficult problem with regard to the choice of the most appropriate surgical approach. In this respect preoperative radiographic evaluation is very important, with preference for MRI scanning to delineate lesions towards the surrounding soft tissue compartments.⁷ Additional CT scan can be of help in optimizing geographic orientation during surgery.

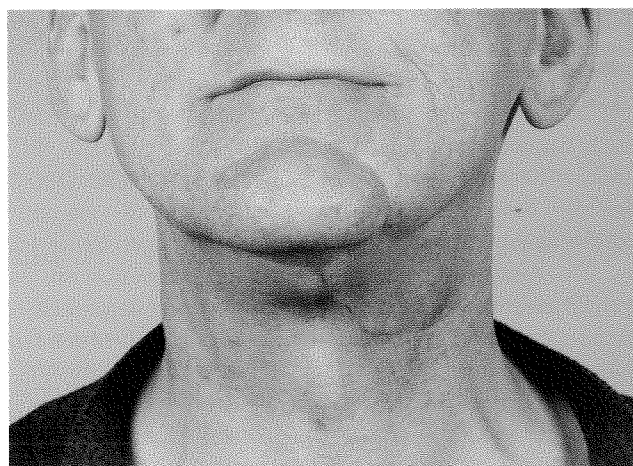


Figure 6. Postoperative view after hemimaxillectomy using the lower cheek flap for optimal surgical exposure and resulting in acceptable median chin and neck scar formation.

Summarizing the lower cheek flap is a welcome addition to the head and neck incisional armamentarium enabling a relevant improvement of exposure at the posterolateral maxillary and pterygoid region with minimal functional sequelae and good cosmetic outcome.

Conflict of interest

All authors agree with the contents of this article and there are no financial conflicts of interest.

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