

# Nasal meatus plasty: a contribution to plastic reconstruction of the nasal valve during midfacial degloving

## Die Meatus-Nasi-Plastik: ein Beitrag zur plastischen Rekonstruktion der Nasenklappe beim Midfacial Degloving

### Abstract

Midfacial degloving is a proven method for easily accessing the midface, the nasal pyramid, the maxillary and ethmoidal sinuses, the orbits, as well as the anterior skull base. Indications for this method of access mainly include tumour resections in the area of the midface, the septum, the maxillary sinus, the paranasal to the sphenoidal sinus as well as the clivus. In addition, this method of access allows for the exposure of the bony structures of the midface in the event of extensive fractures. In general, this method of access combines an incision in the oral vestibule and circular incisions in the nasal vestibule area in order to release the nasal pyramid.

After removing the facial wall of the maxillary sinus, extensive exposure of the surgical site is possible.

One disadvantage of this method of access is the difficult reconstruction of the nasal valve area, which often leads to cicatricial stenoses and difficulties with breathing through the nose. Furthermore, wound healing problems and osteoradionecrosis in the area of the lateral margin of the anterior nasal aperture after replantation of the facial wall of the maxillary sinus have been described, because in this area sufficient soft tissue coverage cannot be ensured when a conventional technique is used.

We describe a soft tissue flap pedicled in the cranial and caudal directions in the nasal valve area which makes both the reconstruction of the nasal vestibule and sufficient soft tissue coverage of the anterior nasal aperture possible.

**Keywords:** midfacial degloving, vestibular stenosis, paranasal sinus tumours

### Zusammenfassung

Das Midfacial Degloving hat sich als übersichtlicher Zugang zum Mittelgesicht, der Nasenpyramide, den Sinus maxillares et ethmoidales, der Orbita sowie der vorderen Schädelbasis bewährt. Indikationen für diesen Zugang sind vor allem Tumorresektionen im Bereich des Mittelgesichts, des Septums, der Kieferhöhlen, der Nasennebenhöhlen bis zur Keilbeinhöhle sowie des Clivus. Außerdem ermöglicht dieser Zugang die Exposition der knöchernen Strukturen des Mittelgesichts bei ausgedehnten Frakturen.

Grundsätzlich kombiniert dieser Zugang eine Inzision im Vestibulum oris sowie zirkuläre Inzisionen im Bereich des Vestibulum nasi zum Auslösen der Nasenpyramide.

Nach Entfernen der fazialen Kieferhöhlenwand gelingt dann die weite Exposition des Operationsgebietes.

Als nachteilig hat sich bei diesem Zugangsweg die schwierige Rekonstruktion der Nasenklappenregion erwiesen, die häufig zu narbigen

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Stenosen mit Nasenatmungsbehinderungen führt. Ebenso werden Wundheilungsstörungen und Radioosteonekrosen im Bereich der lateralen freien Kante der Apertura piriformis nach Reimplantation der facialis Kieferhöhlenwand beschrieben, da in diesem Bereich bei konventioneller Technik keine ausreichende Weichteildeckung möglich ist. Wir beschreiben einen kranial und kaudal gestielten Weichteillappen im Bereich der Nasenklappe, der die Rekonstruktion des Vestibulum nasi ebenso wie eine ausreichende Weichteildeckung der Apertura piriformis ermöglicht.

**Schlüsselwörter:** Midfacial Degloving, Naseneingangsstenose, Nasennebenhöhlentumore

## Introduction

Midfacial degloving is a proven surgical technique for accessing deeper areas of the midface, whose soft tissue coverage, a large skin flap, is cranially transposed. This technique was first described by Portmann in 1927, but the modern technique is based on the work of Casson and dates from 1974 [6]. In 1979, Conley and Price published first results in the treatment of malignant paranasal sinus processes [7]. In German-speaking countries, the midfacial degloving approach was primarily introduced by the work of Berghaus [2], [3]. This method of access is basically a combination of rhinoplasty and sublabial-transfacial access via an oral vestibule incision. Advantages of the midfacial degloving approach are a good overview that permits extensive exploration of the entire paranasal sinus system, the anterior skull base, and the septum [1], [3], [4], [5], [8], [9], [11], [13], [14], [16], [17], [19], [20], [24], [25]. If required, it also allows for a bilateral approach and a working direction parallel to the skull base and the lamina papyracea [3], [7]. Finally, this method of access does not leave any visible scars on the patient's face [6], [7]. The midfacial degloving approach is thus a good alternative to the usual methods of access to the midfacial skeleton and the anterior skull base such as the transmaxillary approach according to Denker, transpalatal techniques, and transfacial incisions such as a lateral rhinotomy with transposition of the facial nerve and the mandible.

Indications for midfacial degloving include malignant tumours of the paranasal sinuses and the anterior skull base, the septum and the nasal cavity, as well as inverted papilloma and, with restrictions, tumours of the nasopharynx. Midfacial degloving is also used as a method of access in midfacial traumatology [1], [4], [7], [8], [16], [20]. In combination with a coronal incision, the midfacial degloving approach makes the exploration of the entire frontal facial skeleton possible.

Apart from the advantages, midfacial degloving also entails a few possible complications. These include sensory disturbance of the area innervated by the trigeminal nerve (V2) and nasolacrimal duct stenoses as well as postoperative large encrusting wound cavities [4], [6], [19]. These complications are not only associated with midfacial degloving, however, but with all surgical techniques that leave behind large wound cavities due to extensive resec-

tions. In addition, stenoses in the nasal valve area are possible, as well as osteonecroses in the area of the margin of the anterior nasal aperture not covered by soft tissue, especially when the facial wall of the maxillary sinus has been replanted in the course of osteoplastic work. The latter complications can be observed if insufficient attention was paid to adapting the incision edges in the reconstruction of the nasal vestibule. Osteonecroses are a possible complication when patients who have undergone midfacial degloving because of malignant tumours in the area of the paranasal sinuses receive postoperative radiation. In order to avoid these complications, we developed a soft tissue flap pedicled in the basal and cranial directions in the area of the nasal vestibule which allows coverage of the bone margin not covered by soft tissue and the reconstruction of the nasal vestibule.

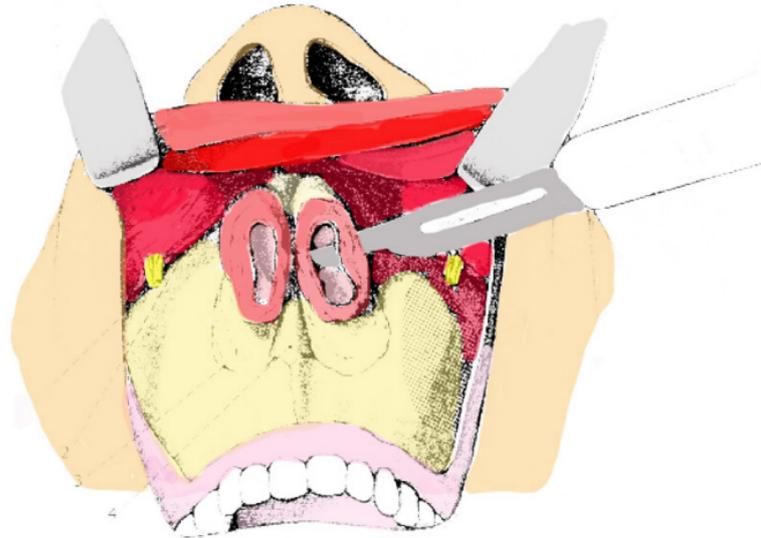
## Surgical technique

As described in the works of Berghaus, Conley and Price [2], [3], [7], the midfacial degloving approach is a combination of four types of incisions (Figure 1):

1. Transfixion incision
2. Bilateral intercartilaginous incisions
3. Bilateral circumvestibular incisions
4. Bilateral sublabial incision across the midline in the fold of the oral vestibule.

Next, the periosteum of the nasal skeleton is prepared. After connecting all incisions, the soft tissues of the midface including the alar cartilages can now be jointly elevated away from the upper lip, cheek and nose and moved upwards. In doing so, care must be taken not to injure the infraorbital nerve.

The next step is dissecting the soft tissue including the mucous membrane in the area of the margin of the anterior nasal aperture and of the lateral wall of the nasal cavity by preparing the border of the inferior nasal concha. If necessary, the bony border of the inferior concha can be separated from the lateral septum with a chisel. The preparation of the meatus flap begins with the removal by scalpel of an approximately 0.5 cm wide strip of mucosal soft tissue parallel to the margin of the anterior nasal aperture from the mucosal parts of the lateral



**Figure 1:** Depiction of incisions used to prepare the meatus flap. Creation of 5–10 mm wide mucosal soft tissue flap pedicled in the cranial and caudal directions.

nasal cavity wall (Figure 2). It must be ensured that this strip of mucous membrane remains pedicled both in the cranial and the caudal directions; this is a major precondition for the blood supply of this meatus flap. The meatus flap is transposed medially towards the septum and fixed with a small purse-string suture if necessary. An osteotomy can now be performed in the area of the facial wall of the maxillary sinus as usual. If required by the extension of the process, this osteotomy is combined with an osteotomy in the area of the lateral wall of the nasal cavity, so that sufficient exploration of the maxillary sinus, the paranasal sinus system, the nasal cavity and the entire septum is possible.

After resection surgery, the nasal vestibule is reconstructed with the meatus flap described above. For this purpose, three to four small holes are drilled into the area of the anterior nasal aperture and the previously removed maxillary sinus front wall. The bone flap is then replanted either with absorbable sutures or with mini plate fixation (Figure 3). The mucosal flap can now be securely fixed to the boreholes at the anterior nasal aperture by absorbable sutures (Figure 4). This ensures soft tissue coverage of the bone margin. After the soft tissue cover is put back in place, the nasal valve can safely be reconstructed on the soft tissue already fixed in the area of the nasal vestibule. In this way, vestibular stenosis can usually be prevented (Figure 5).

## Results

Midfacial degloving is a technique we have been using for 23 years now. A total of 72 patients have undergone this type of surgery. We have been performing meatus plasty in the manner described above for 19 years now, in which time 57 patients have undergone this surgery. Indications have included malignant tumours of the nasal septum, the nasal conchae, the maxillary sinuses, the

ethmoid bone, and inverted papilloma that could not be safely removed with an endoscope (Table 1). In the group of patients who underwent conventional surgery, we observed 5 cases of vestibular stenosis (Figure 6) and 2 cases of osteonecrosis in the area of the replanted maxillary sinus bone flap after radiation. In the group of patients who underwent meatus plasty, we observed one case of vestibular stenosis and no case of osteoradionecrosis after radiation (Table 1). This technique did not significantly prolong surgery time. Postoperative swelling that abated within one week was found in 34 patients. There were three cases of secondary haemorrhaging that was stopped by a tamponade. One patient developed a vestibulonasal fistula that had to be treated surgically.

**Table 1:** Patient characteristics and postoperative complications

	Meatus plasty	Conventional technique
Number of patients	57	15
male	48	11
female	9	4
Age	49 (26–82)	52 (30–79)
<b>Tumour entity</b>		
Inverted papilloma	41	10
Squamous-cell carcinoma (SCC)	8	2
Adenocarcinoma	4	3
Melanoma	4	0
<b>Location</b>		
Septum	3	1
Ethmoid bone	12	1
Maxillary sinus	35	10
Middle nasal concha	7	3
<b>Complications</b>		
Nasovestibular fistula	1	3
Vestibular stenosis	1	5
Osteonecrosis	0	2
Deformity	0	0
Haemorrhage	3	4
Swelling	3	4

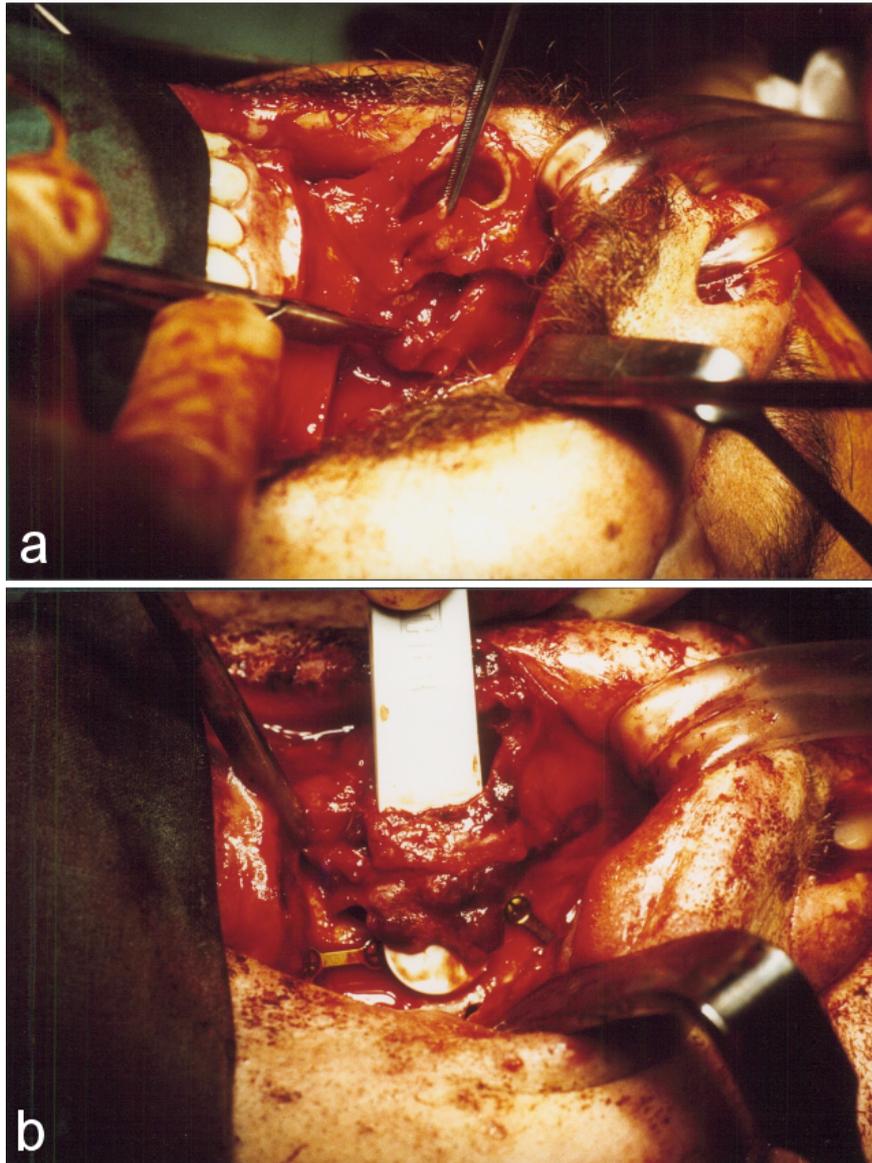


Figure 2a and b: Preparation of meatus flap

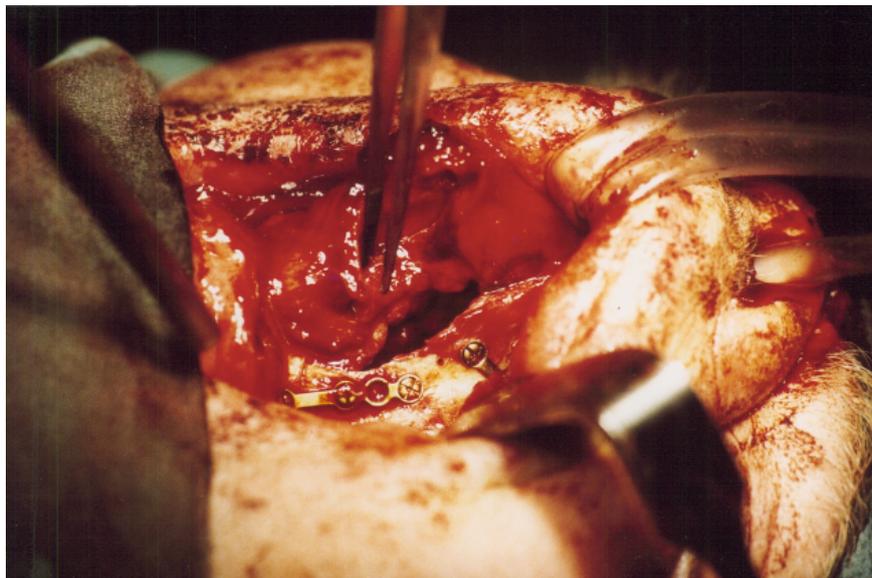


Figure 3: Refixed facial wall of the maxillary sinus with boreholes in the area of the anterior nasal aperture

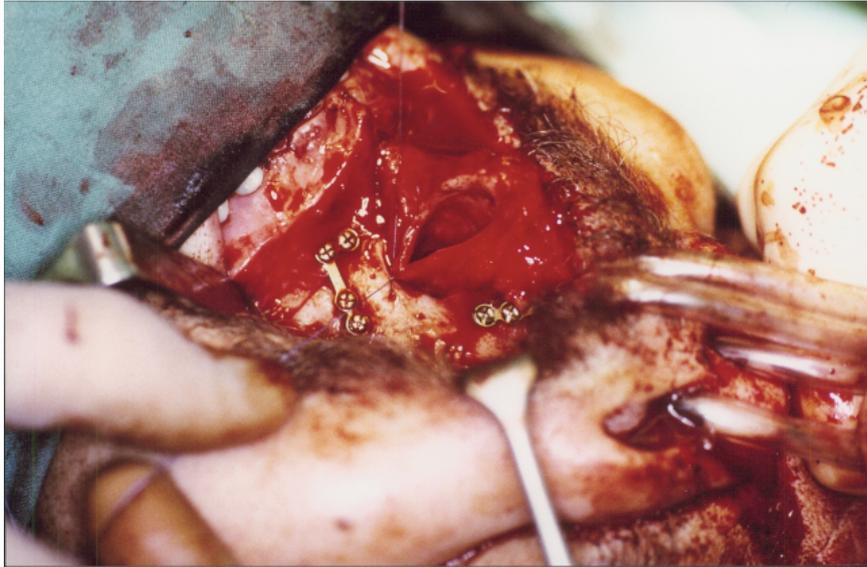


Figure 4: Fixation of meatus flap on the anterior nasal aperture



Figure 5: Postoperative result approximately 8 weeks after surgery with meatus plasty

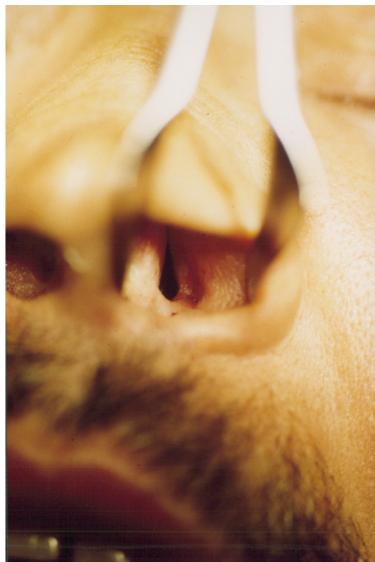


Figure 6: Postoperative result for patient without meatus plasty with vestibular stenosis

## Discussion

Since its description by Casson and his staff in 1974 [6] and by Conley and Price [7] in 1979, midfacial degloving has proven to be a successful method of exploring the midface and the paranasal sinus system underneath. In particular because of the good aesthetic postoperative results without visible external scars, this method of access can also be used for benign tumours and especially with young patients. In particular, disfigurements due to scarring and functional damage due to a distortion of the nasal alae or ectropion with epiphora can be avoided. In addition to extended paranasal sinus surgery, especially in the case of inverted papilloma, this method of access has proven successful for space occupying lesions on the septum, in trauma treatment of the entire midfacial complex, and in the resection of juvenile nasopharyngeal angiofibromas [1], [4], [5], [9], [13], [16], [18], [21], [22], [23], [24], [25]. Further indications include tumours of the upper jaw and alveolar cysts [15], [26], [28], [29]. When this approach is combined with endoscopic techniques, more indications can be added to the list [10], [12], [27].

One problem with this method of access is the difficult reconstruction in the nasal valve area, which entails a considerable risk of vestibular stenosis (Figure 6) and possibly insufficient soft tissue coverage, particularly on the margin of the replanted facial wall of the maxillary sinus. Our modification along the lines of a meatus plasty makes it possible to safely and easily avoid these complications to a large extent, because it ensures that the bone margin of the replanted bone flap is covered with soft tissue. By fixing the mucosal flap to the bone, we create a kind of buttress sufficiently to the front towards the nasal valve which allows for smooth and easy repositioning and fixation of the frontal nasal valve with a reduced risk of vestibular stenosis. The meatus plasty technique presented here is thus a fast, simple and safe alternative to nasal valve reconstruction during midfacial degloving. It is especially useful for tumours of the lateral nasal septum which necessitate a resection of the inferior nasal concha and of parts of the medial wall of the maxillary sinus. If tumours are too close to the nasal vestibule, the remaining soft tissue may be insufficient for a meatus flap. In all other cases, problem-free preparation is possible. In order to ensure an adequate supply of blood, the flap needs to remain pedicled in the cranial and caudal directions. Otherwise, scarring may lead to constriction of the nasal valve.

In addition, we temporarily fix the flap onto the septum with two sutures, so as not to endanger the 1–2 cm wide flap during surgery and in order to maintain a good overview of the surgical site. This technique is particularly suitable if there are pathological findings that require a resection of the inferior nasal concha or the lateral nasal septum. The complication rate of this surgery is very low. There has been no case with major complications. The oronasal fistula involving the oral vestibule which we ob-

served in two cases is very rare and can usually be prevented by means of a careful stitching technique.

## Notes

### Competing interests

The authors declare that they have no competing interests.

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