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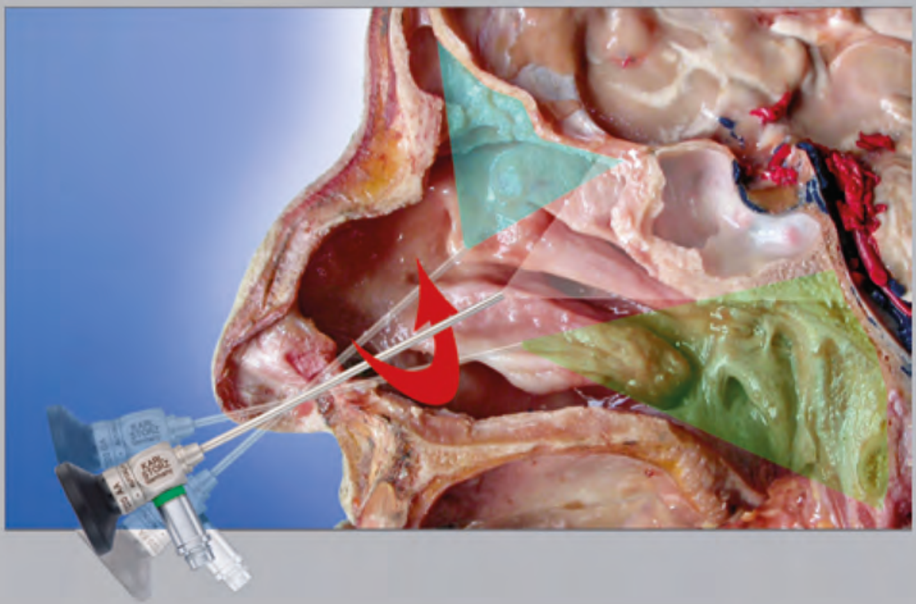
THE ENDOSCOPIC SURGICAL TECHNIQUE "TWO NOSTRILS – FOUR HANDS"



Paolo CASTELNUOVO
Davide LOCATELLI

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"TWO NOSTRILS – FOUR HANDS"

Authors:

Paolo CASTELNUOVO, M.D.
Chairman of Department of Otorhinolaryngology,
Insubria University Clinical Center,
Hospital Circolo e Fondazione Macchi,
Varese, Italy

Davide LOCATELLI, M.D.
Head of Neuroendoscopy
Department of Neurosurgery
Civic Hospital, Legnano, Italy

Co-Authors:

Ilaria ACCHIARDI, M.D.
Maurizio BIGNAMI, M.D.
Giovanni DELÙ, M.D.
Francesco MELONI, M.D.
Andrea PISTOCHINI, M.D.
Federico RAMPA, M.D.

Collaborators:

P. Battaglia, P. Bossolesi, C. Cambria, F.R. Canevari, P. Carena,
F. De Bernardi, G. Di Giulio, E. Emanuelli, G. Minonzio, G. Padoan,
F. Pagella, P. Palma, L. Sammarchi, F. Sberze, P. Scagnelli, F. Simoncello

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The Endoscopic Surgical Technique “Two Nostrils – Four Hands”
Paolo Castelnuovo and **Davide Locatelli**

Correspondence address of the author:
Prof. **Paolo Castelnuovo,** M.D.
Direttore Clinica Otorinolaringoiatrica Università dell’Insubria,
Varese Azienda Ospedaliera-Universitaria Ospedale di Circolo
e Fondazione Macchi di Varese
Viale Borri, 57 – 21100 Varese
E-mail: paolo.castelnuovo@me.com
E-mail: paolo.castelnuovo@ospedale.varese.it

Davide Locatelli, M.D.
Azienda Ospedaliera di Legnano
Dipartimento di Neurochirurgia
Via Papa Giovanni Paolo II
20025 Legnano, Italia

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P.O. Box, 78503 Tuttlingen, Germany
Phone: +49 (0) 74 61/1 45 90
Fax: +49 (0) 74 61/708-529
E-mail: endopress@t-online.de

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Contents

Introduction

Surgical access to the skull base and to the sellar and parasellar regions has undergone substantial development over the years, resulting in minimally invasive surgery. In line with this, the surgical feasibility of procedures using the intranasal endoscopic technique has paved the way for providing a valid alternative option to the classic transcranial and transseptal approaches.

The endonasal endoscopic technique, classically applied in the field of ENT for the treatment of inflammatory sinonasal pathologies involves guiding the operating instrument with the dominant hand while the non-dominant hand holds the endoscope. The first author to promote the endoscopic technique using more than two hands was *May* in 1990[1]. The modification of the endoscopic technique that he suggested, allows the use of more surgical instruments in a single nasal cavity and requires the collaboration of two surgeons in such a way that the first surgeon is able to use both hands while the second surgeon holds the endoscope. *Briner* and *Simmen* have recently emphasized the positive aspects of this technique with particular regard to reducing duration of surgery, improving vision of the surgical field (owing particularly to the possibility of introducing a suction tube as a second instrument) and the no less important optimizing of resources[2].

In recent years, the experience of other authors in the neurosurgical field, for example *Kassam* and *Snyderman,* has demonstrated how this technique can be extended to the treatment of advanced pathology of the anterior, middle and, in selected cases, posterior skull base[3–9].

With the aim of further reducing the surgical trauma to the sinonasal mucosa during skull base procedures, and to speed up and facilitate resection, we decided in 1997 to start using the “Two Nostrils – Four Hands Technique”.

More precisely, we have used this technique for the surgical management of sellar and parasellar pathology, sinonasal tumors and neoplastic lesions with intracranial invasion, in the latter case, using it in addition to the traditional external approach (“Cranioendoscopic” technique)[10,11].

4-Hands Bilateral Endonasal Endoscopic Surgical Technique

The “Two Nostrils – Four Hands” technique requires the constant collaboration of two surgeons throughout the entire procedure: in the initial stage of the approach to the area affected by pathology, and also in the stages of tumor removal and cranial base duraplasty.

It is possible for the two surgeons to work together in various ways, applying the endoscopic-assisted technique according to different modalities. Initially, the endoscope can be held by the first surgeon together with one instrument, for example a curette, while the second surgeon controls microhemorrhages by means of a suction tube.

In this case, the technique is performed with three hands, which can be considered the standard transnasal technique where the surgeon guides the endoscope to maintain topo-graphical orientation by identification of specific anatomical landmarks and assessment of spatial depth. In addition, while removing the lesion, a second surgeon keeps the operative field clear by means of suction (**Fig. 1**).

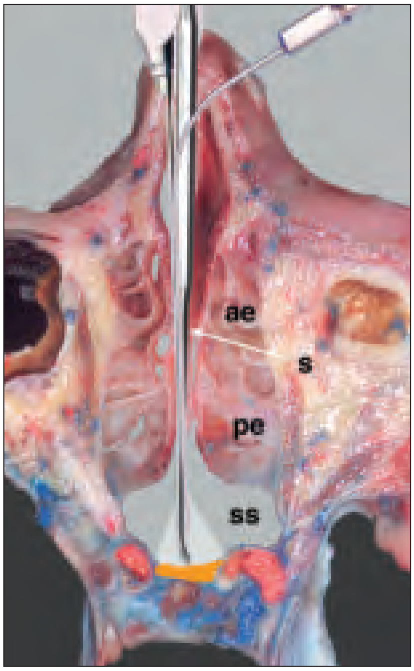


Fig. 1
Macroscopic axial section of an anatomical specimen. Positioning of the endoscope and of the instruments in a paraseptal transsphenoidal unilateral approach to the sellar region with 3 hands.
ss = sphenoid sinus
pe = posterior ethmoid
ae = anterior ethmoid
s = nasal septum

Fig. 2
External view of a 4-hands approach. The first surgeon is holding the endoscope and works in one nasal fossa, the assisting surgeon works on the contralateral side.
I op = first surgeon
II op = second surgeon

Fig. 3
External view of a 4-hands approach. The first surgeon is holding the endoscope and operates using both nasal fossae, as does the second surgeon.
I op = first surgeon
II op = second surgeon

Fig. 4
External view of a 4-hands approach. The second surgeon holds the endoscope using a different instrument in the contralateral nasal fossa and allowing the first surgeon to use two surgical instruments.
I op = first surgeon
II op = second surgeon

Alternatively, the second surgeon may guide a second instrument in addition to the suction tube or the endoscope, thus allowing the surgeon to operate with two instruments using both hands to remove the lesion. This four-hands technique can be considered the further development of the traditional three-hands technique without the use of holders and has evolved from the increasing interaction of the surgical team as the two surgeons became accustomed to working with four hands (**Figs. 2–4**).

In every case, the endoscope is held by three fingers (thumb, index, middle), like a pencil, and is introduced in the nasal vestibule under direct vision. The instruments are usually introduced from below the endoscope, along the side of the dominant hand and parallel to the endoscope, which is used as a guide. The mobility of the endoscope is one of the main benefits of this technique. Guiding the endoscope without the use of holders, in fact provides the permanent option of “to-and-fro” movements, which are crucial to maintain the spatial orientation, with sense of spatial depth, and the visual control of the more peripheral landmarks. Particularly in complex anatomical situations, the possibility of changing the visual angle and the angle of the instruments offers undoubted advantages to the surgeon in inspecting the lesions to be removed.

Since the two surgeons alternate as first and second surgeon frequently throughout the procedure, it is evident that the technique requires dual training: both with regard to handling the endoscope and specific instruments, and with regard to coordination with the second surgeon.

The approaches through which it has been possible, in our experience, to utilize the advantages offered by the 4-hands technique are summarized in **Diagram 1.**

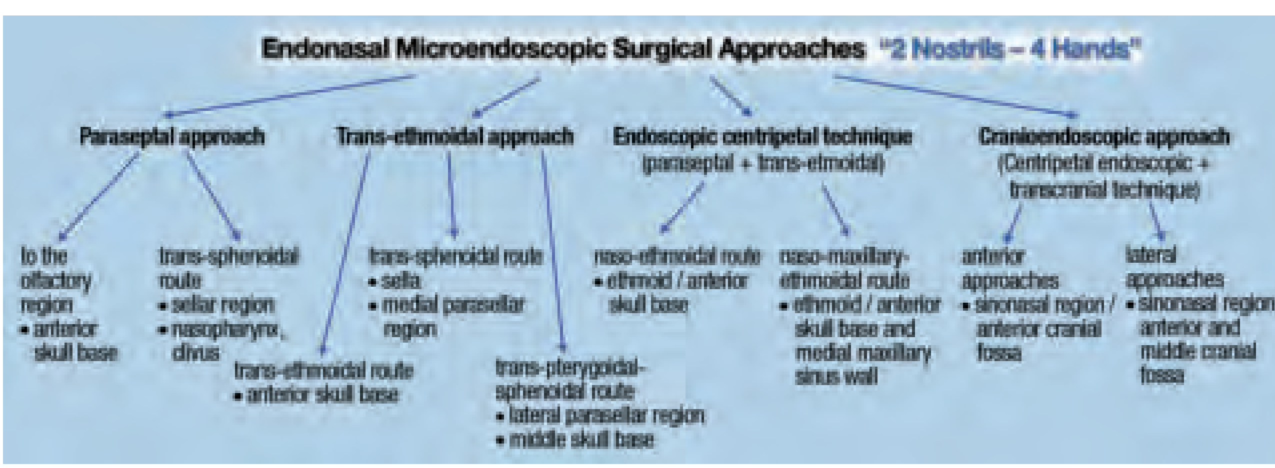


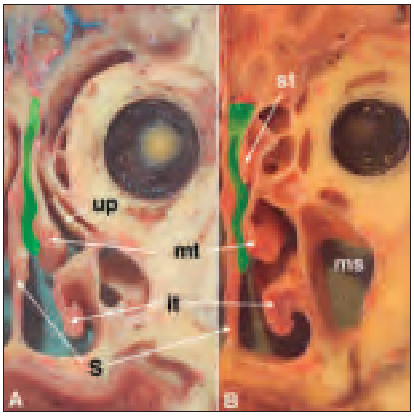
Diagram 1

1.0 Paraseptal Approach

1.1 Direct Paraseptal Approach to the Olfactory Region

The paraseptal approach is directed through one nasal fossa to treat medial meningoencephalic herniations while sparing the ethmoid (**Figs. 5A, B**). In this case, the procedure is performed using three hands. The endoscope is guided with different angles. Suction and one operating instrument are used as well. The surgical steps for removal of a meningoencephalocele of the olfactory cleft are (see **Chapter 6.3**):

- Bipolar electrocoagulation of the mass as far as the cribriform plate
- Resection of the cribriform plate and removal of the lesion
- Exposure of the recipient site for the graft with debridement of the intracranial dural edges
- Preparation of free grafts of septal mucoperichondrium and cartilage
- Repair in 2–3 layers
- Stabilization of the graft and packing



Figs. 5A, B
A Macroscopic coronal section of an anatomical specimen at the level of the frontal sinus.
up = uncinate process
mt = middle turbinate
it = inferior turbinate
S = nasal septum

B Macroscopic coronal section of an anatomical specimen, posterior to the one shown in **A**.
st = superior turbinate
ms = maxillary sinus
mt = middle turbinate
it = inferior turbinate
S = nasal septum

In both sections (**A, B**) the green highlighted area demonstrates the target site for treatment via paraseptal approach to the olfactory cleft.

1.2 Direct Paraseptal Trans-sphenoidal Approach

1.2.1 Direct Bilateral Paraseptal Trans-sphenoidal Approach to the Sellar Region

This is the preferential approach to the sellar region and provides rapid access to the sphenoid sinus using the natural pathways leading to the sphenoid cavity.

The type of approach is regarded as standard in the case of space-occupying lesions with sellar and suprasellar invasion without infiltration of the cavernous sinus and, in fact, allows access to the sellar and suprasellar structures and permits good hemostasis and absolute respect for the anatomical structures of the nasal and paranasal cavities and for their function.

During the procedure, a 0° endoscope (diam. 4 mm) is used. Initially, the endonasal paraseptal access to the sphenoid sinus is gained by choosing the nasal cavity that offers more space for surgery. Depending on the individual anatomical situation, we prefer to use two different methods for approaching the sphenoid sinus.

The first type involves patients with a narrow sphenoid rostrum and a broad sphenoethmoid recess which makes it easier to localize the natural ostium of the sphenoid sinus. In these cases, we proceed parallel to the nasal septum and to the nasal floor with the medial edge of the inferior turbinate as lateral landmark, and the superior edge of the choana as superoposterior landmark. When the latter is reached, we proceed upwards, following the medial edges of the tails of the ethmoid turbinates (middle, superior and supreme) (**Figs. 6–7**).

The sphenoid ostium will become visible medial to the tail of the superior or supreme turbinate. The ostium is enlarged centrifugally with a circularbite cutting punch or Citelli forceps (**Figs. 8–10**).

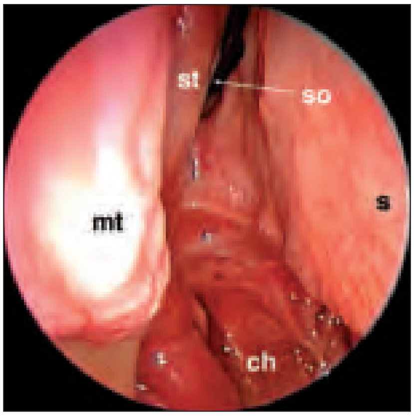


Fig. 6
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. In the presence of a non-pneumatized rostrum, once the superior border of the choana has been reached and proceeding upwards it is possible to localize the natural ostium of the sphenoid sinus medial to the tail of the superior or supreme turbinate.
st = superior turbinate
mt = middle turbinate
ss = sphenoid sinus
ch = choana
s = nasal septum

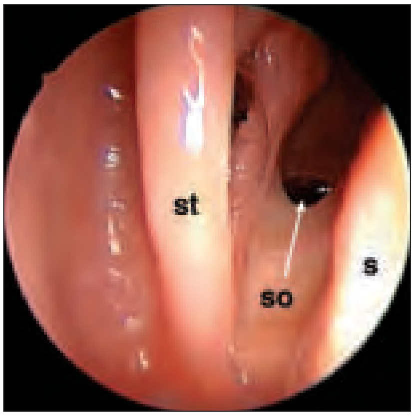


Fig. 7
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once the superior (or supreme) turbinate has been localized, it is possible to identify the natural ostium of the sphenoid sinus cavity medially.
st = superior turbinate
so = sphenoid ostium
s = nasal septum

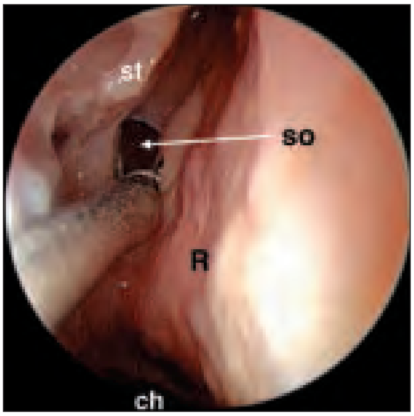


Fig. 8
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. A circular-bite cutting punch is used to enlarge the natural sphenoid sinus ostium.
st = superior turbinate
so = sphenoid ostium
R = sphenoid rostrum
ch = choana

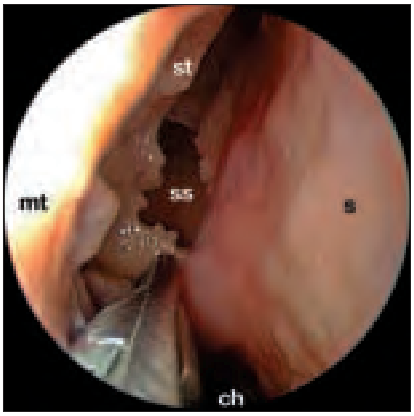


Fig. 9
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Removal of the anterior wall of the sphenoid sinus is completed using a Citelli forceps.
st = superior turbinate; **mt** = middle turbinate; **ss** = sphenoid sinus; **ch** = choana; **s** = nasal septum

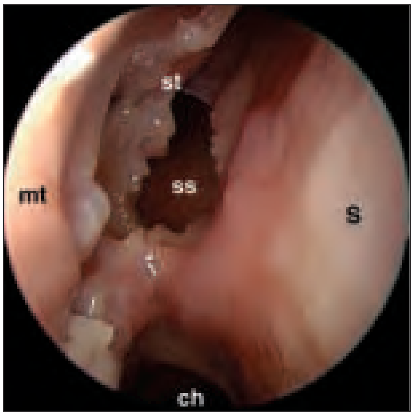


Fig. 10
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Sphenoid sinus after removal of the anterior wall. This procedure allows the sphenoid sinus cavity to be inspected.
st = superior turbinate; **mt** = middle turbinate; **ss** = sphenoid sinus; **ch** = choana; **s** = nasal septum

Anatomical landmarks:
- choanal margin
- tail of the superior turbinate
- sphenoid ostium

Risks:
- iatrogenic injury to the skull base at the level of the olfactory cleft with CSF leak
- iatrogenic injury to the olfactory neuroepithelium with hyposmia
- iatrogenic injury to the optic nerve and internal carotid artery

Tricks:
- the sphenoid ostium is enlarged centrifugally using a circular-bite cutting punch
- instruments with a greater capacity for removing bone are then used, such as Citelli forceps or an intranasal drill with cutting burr, removing the sphenoid rostrum
- the septal branch of the spheno-palatine artery may be encountered; this is electrocoagulated with bipolar forceps beneath the tail of the superior turbinate

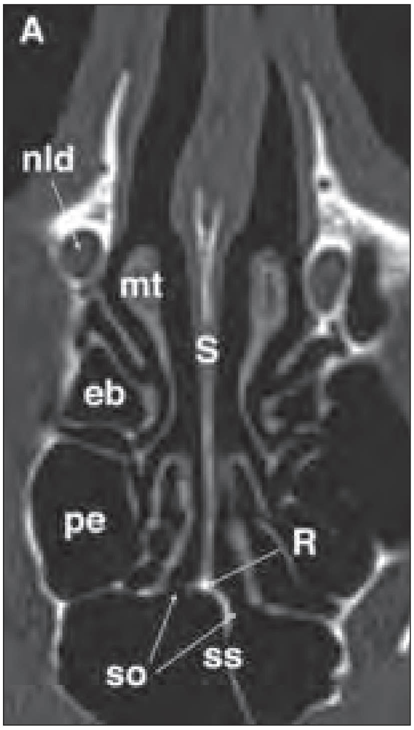


Fig. 11A
Axial CT scan at the level of the sphenoid ostia demonstrating the poorly pneumatized sphenoid rostrum.
nld = nasolacrimal duct; **mt** = middle turbinate; **S** = nasal septum; **eb** = ethmoidal bulla; **R** = sphenoid rostrum; **so** = sphenoid ostium; **ss** = sphenoid sinus; **pe** = posterior ethmoid

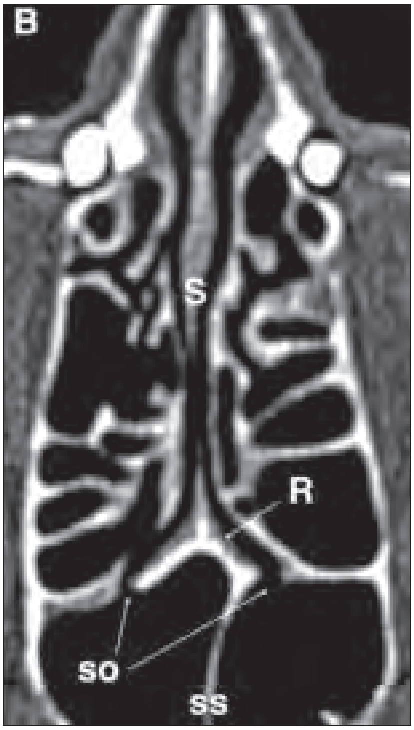


Fig. 11B
Axial CT scan at the same level as **Fig. 11A** showing a pneumatized rostrum and lateral displacement of the sphenoid ostia.
S = nasal septum; **R** = sphenoid rostrum; **so** = sphenoid ostium; **ss** = sphenoid sinus

The second type involves patients with a well-pneumatized sphenoidal rostrum and narrow sphenoethmoidal recess, where it is not possible to localize the sphenoidal ostium. The morphological appearance of this different anatomical situation can be assessed with an axial CT scan, centered on the sphenoidal rostrum at the level of the sphenoidal ostia (**Figs. 11A, B**). In this way, it will be possible to evaluate the degree of lateral displacement of the ostia and thus to determine the anticipated degree of difficulty to gain direct access to the ostia, and to choose the appropriate type of approach.

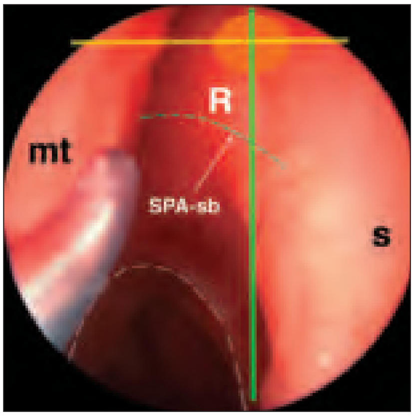


Fig. 12
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The image demonstrates the secure site for drilling the sphenoid sinus, at the junction of the vertical line parallel to the medial margin of the choana, with the horizontal line parallel to the tail of the superior turbinate.
mt = middle turbinate
s = nasal septum
R = sphenoid rostrum
SPA-sb = septal branch of the sphenopalatine artery

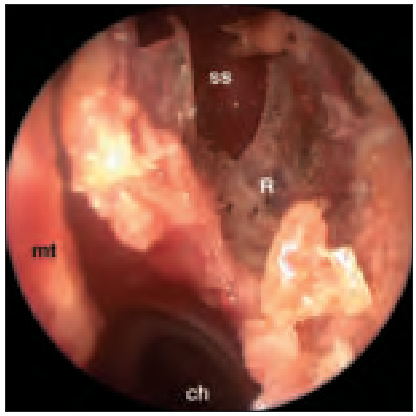


Fig. 13
Endoscopic view, 0° endoscope, diam. 4 mm right nasal fossa. The picture follows the previous one. After drilling the rostrum, the sphenoid sinus cavity comes into view.
ss = sphenoid sinus
R = sphenoid rostrum
ch = choana
mt = middle turbinate

In this second case, it will be necessary to drill the sphenoid rostrum at a secure anatomical site to gain access to the sphenoid sinus (**Figs. 12, 13**).

The secure site for access to the sphenoid sinus is represented by the junction of two lines, the first vertical and parallel to the interchoanal septum and the second horizontal (parallel to the tail of the superior turbinate).

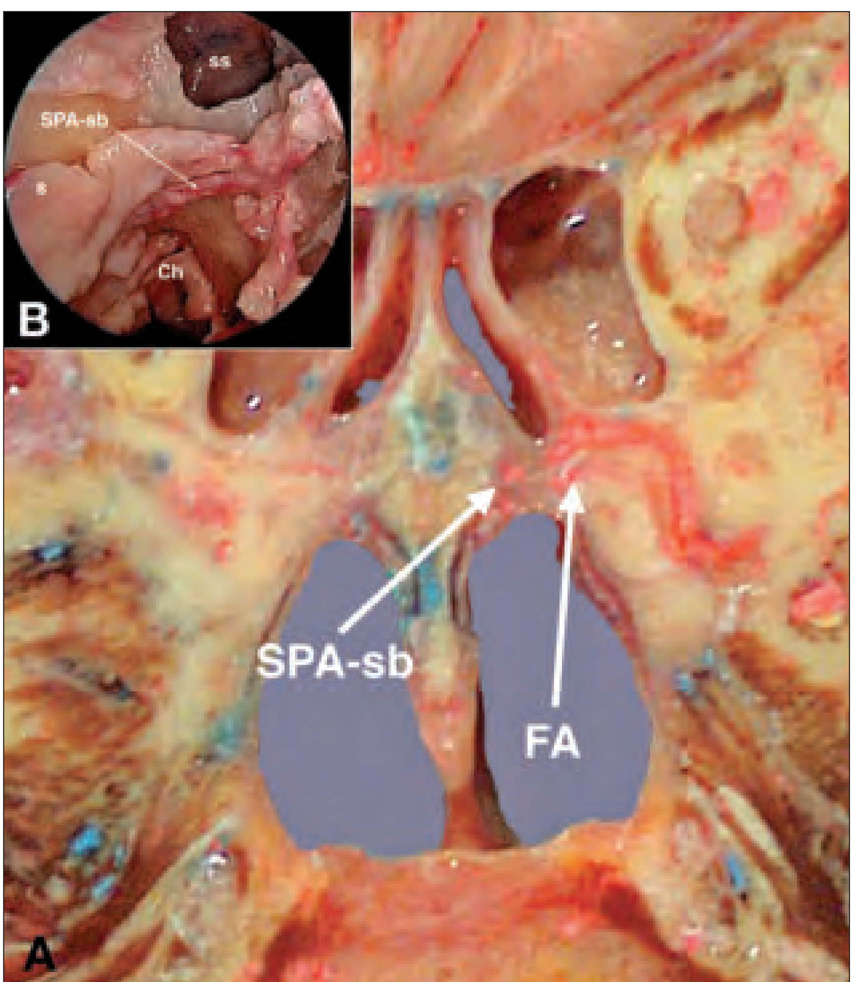
Anatomical landmarks:
- floor of the nasal fossa
- superior border of the choana
- tail of the superior turbinate

Risks:
- iatrogenic injury to the skull base with CSF leak
- iatrogenic injury to the optic nerve and internal carotid artery

Tricks:
- access to the sphenoid sinus is gained by perforating medial to the secure anatomical site
- direct drilling of the sphenoid rostrum without elevating mucosal flaps

In both cases, enlarging the sphenoid sinus opening facilitates locating the intracavitary position of the internal carotid artery and of the optic nerve. While widening the opening inferiorly, attention must be paid to the septal branch of the sphenopalatine artery, which is electrocoagulated with bipolar forceps (**Fig. 14**).

At this point, after opening the sphenoid sinus on one side, the same approach is employed on the opposite side to obtain a wider access and to continue the surgical procedure using both nasal fossae, possibly also removing a limited part of the vomer. The technique allows for complete removal of the entire anterior wall of the sphenoid sinus,



◀ **Fig. 14**
A Macroscopic coronal section of an anatomical specimen at the level of the superior choanal margin.
SPA-sb = septal branch of the sphenopalatine artery
FA = pharyngeal artery

B Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Anatomical specimen with exposure of the septal branch of the sphenopalatine artery. **SPA-sb** = septal branch of the sphenopalatine artery; **ss** = sphenoid sinus; **s** = nasal septum; **Ch** = choana

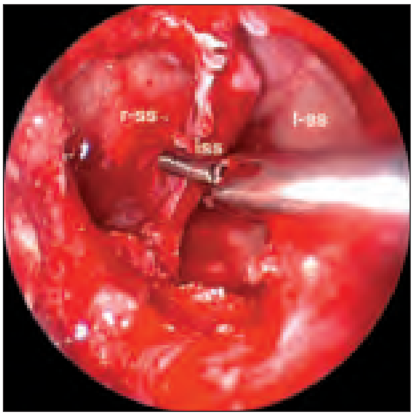


Fig. 15
Endoscopic view, 0° endoscope, diam. 4 mm, intersphenoidal septum, using the contralateral nasal fossa to introduce the cutting instrument.
r-ss = right sphenoid sinus
iss = intersphenoidal septum
l-ss = left sphenoid sinus

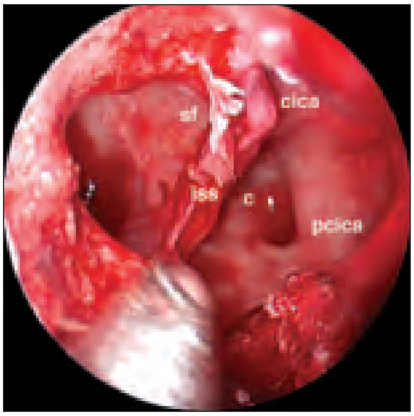


Fig. 16
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal cavity. Intracavitary view of the sphenoid sinus after removal of its anterior wall and of the intersphenoidal septum.
sf = sellar floor
iss = intersphenoidal septum
cica = cavernous internal carotid artery
c = clivus
pcica = paraclival internal carotid artery

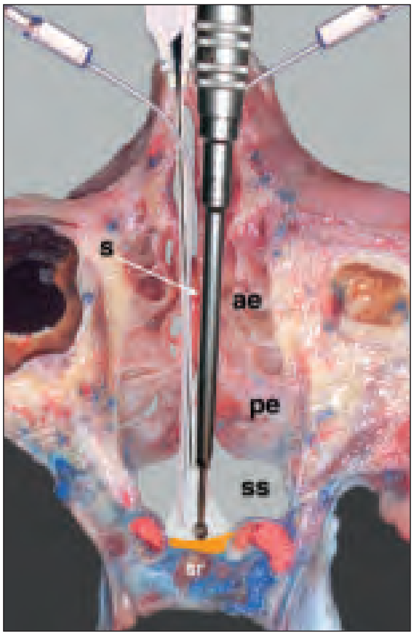


Fig. 17
Macroscopic axial section of an anatomical specimen. The picture illustrates the use of four instruments, that are inserted in both nasal fossae in a direct bilateral paraseptal trans-sphenoidal approach to the sellar region.
S = nasal septum
ae = anterior ethmoid
pe = posterior ethmoid
ss = sphenoid sinus
s = sellar region

joining the two ostia, removing the intersphenoidal septum and thus exposing the sellar floor (**Figs. 15, 16**).

To facilitate the insertion of operating instruments, it may sometimes be necessary to create access to the second nasal cavity by endoscopically removing a septal spur. From this step onwards, it is very useful to collaborate with the second surgeon who can irrigate and aspirate at the same time to keep the surgical field bloodless (**Fig. 17**).

The intersphenoidal septum is removed using cutting instruments such as the intranasal drill. In a step-by-step fashion, both the septum and the sphenoid rostrum are removed with this device. Once the entire sphenoid sinus cavity is exposed, the sellar floor will be opened.

1.2.2 Direct Bilateral Paraseptal Trans-sphenoidal Approach to the Nasopharynx and Clivus

The technique, similar to the previous one in the approach to the sphenoid sinus, provides for removal of the sphenoid sinus floor rather than opening the sellar floor. This maneuver, combined with resection of the posterior third of the vomer, gives access to the nasopharynx (**Fig. 18**). This type of approach enables treatment of selected cases of pathology located in the nasopharynx, clivus and retroclival spaces (including C1–C2 and the posterior cranial fossa), which can be achieved by drilling the clivus (**Fig. 19**).

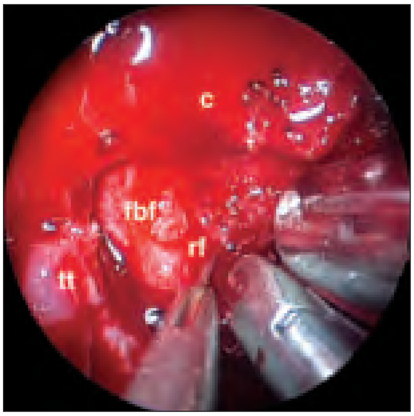


Fig. 19
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Use of three operating instruments, two of them introduced in the contralateral nasal fossa, during debulking of nasopharyngeal tissue.
np = nasopharynx
fbf = pharyngobasilar fascia
c = clivus
tt = torus tubarius

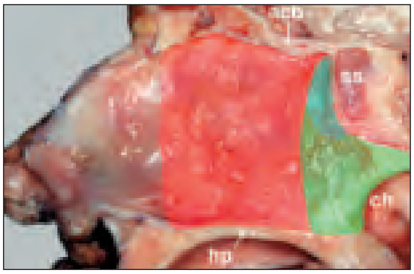


Fig. 18
Macroscopic sagittal section of an anatomical specimen. The picture shows the extent of septal resection in various approaches. The part removed during the bilateral paraseptal approach to the sphenoid sinus is highlighted in blue, the part removed in the paraseptal approach to the clivus and nasopharynx in green, and the part removed using the multilayer centripetal technique is colored in red.
acb = anterior cranial base
ss = sphenoid sinus
ch = choana
hp = hard palate

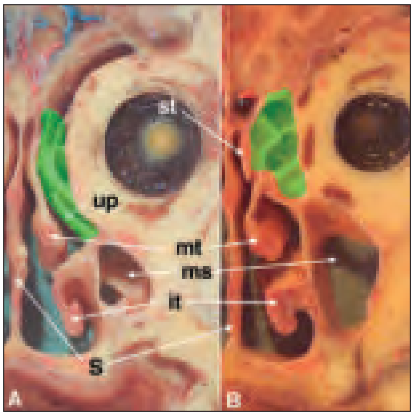


Fig. 20
A Macroscopic coronal section of an anatomical specimen at the level of the frontal sinus.
up = uncinate process
mt = middle turbinate
ms = maxillary sinus
it = inferior turbinate
S = nasal septum

B Macroscopic coronal section of an anatomical specimen, posterior to the preceding one.
st = superior turbinate
ms = maxillary sinus
mt = middle turbinate
it = inferior turbinate
S = nasal septum

Both of the green sections in **A** and **B** show the area that is removed with the trans-ethmoidal approach.

2.0 Trans-ethmoidal Approach

2.1 Trans-ethmoidal Approach

This approach is adopted for the treatment of lesions involving the ethmoid with possible extension to the anterior cranial fossa, but without involving the olfactory cleft. A classical example is represented by congenital or acquired defects of the ethmoidal roof associated with menin.

The surgical procedure starts from the nasal cavity into which the lesion extends. This is generally performed with a unilateral approach using three hands. At the beginning, the approach allows the middle nasal meatus to be entered with removal of the second third of the middle turbinate (frontal part). To do this, depending on the specific anatomy, it will be necessary to perform an uncinectomy and to completely remove the ethmoidal bulla. The second third of the middle turbinate is completely removed avoiding injury to the first and the third parts to preserve the stability of the turbinate itself. The frontal recess is then broken down by removal of the most cranial part of the uncinate process and of the agger nasi (**Fig. 20**).

In this way, an overall view of the entire ethmoidal roof will be obtained, extending from the frontal sinus ostium to the anterior sphenoid sinus wall. A modification of this procedure is required in the case of particular anatomical circumstances in which, in order to inspect the frontal infundibulum, it is necessary to drill the frontal sinus floor using a Draf type **IIa** or **IIb** frontal sinusotomy.

The safety maneuver to access the frontal infundibulum is represented by the localization of the free aspect of the uncinate process cranial portion (**Fig. 21**)

Risks:
- iatrogenic injury to the lamina papyracea and to the nasolacrimal duct
- iatrogenic injury to the lateral part of the lamina cribrosa with the risk of a CSF leak
- iatrogenic injury to the medial rectus muscle

Tricks:
- Uncinectomy has to be performed with a back-bite cutting punch, working inferiorly to the inferomedial margin of the ethmoidal bulla

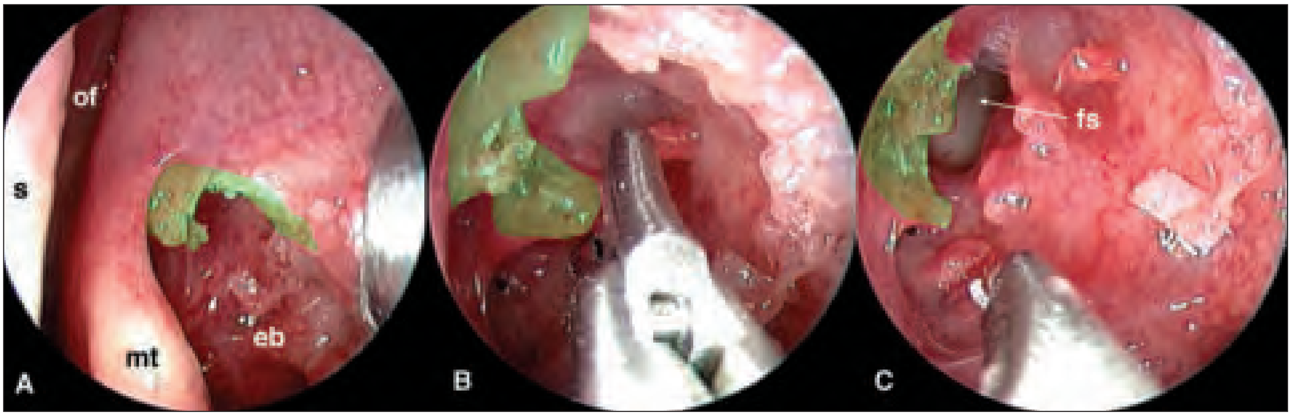


Fig. 21
A Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa.
s = nasal septum
m = middle turbinate
eb = ethmoidal bulla
of = olfactory cleft

B Endoscopic view, endoscope 45°, diam. 4 mm, left nasal fossa.

C Endoscopic view, endoscope 45°, diam. 4 mm, left nasal fossa. The series of pictures shows the opening of the frontal recess. Performing uncinectomy, the residual cranial part of the uncinate process (green) acts as a landmark for identifying the bony shell, which obstructs access to the frontal ostium.
This is removed with angled cutting forceps (no.1).
fs = frontal sinus

2.2 Trans-ethmoidal-sphenoidal Approach

This approach is performed to remove lesions involving the sellar region with extension to the medial parasellar region, the lateral recess of the sphenoid sinus and the posterolateral ethmoid. Using this route, the posterior ethmoid, the apex of the orbit, the lateral wall of the sphenoid sinus (pterygoid recess) or the medial component of the cavernous sinus may readily be inspected (**Fig. 22**).

The surgical procedure begins from the nasal fossa of the side into which the tumor extends laterally. The approach allows the middle nasal meatus to be entered initially with removal of the second third of the middle turbinate (frontal part).

To do this, depending on the specific anatomy, it will be necessary to partially or completely remove the ethmoidal bulla (**Figs. 23, 24**), while the uncinate process will generally be preserved (**Fig. 25,** see p. 14).

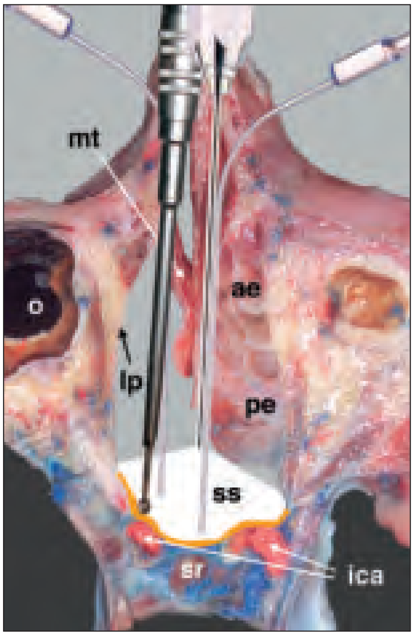
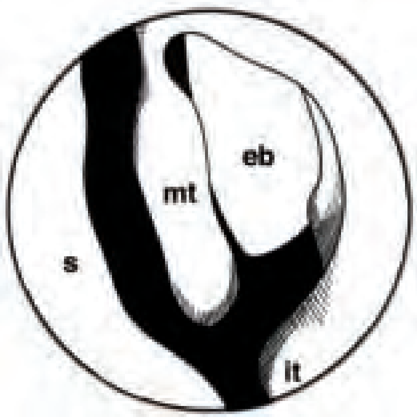


Fig. 22
Macroscopic axial section of an anatomical specimen. The image illustrates the use of four instruments inserted through both nasal fossae in a trans-ethmoidal trans-sphenoidal approach to the sellar and parasellar region. Note the left-sided ethmoidectomy, which allows space to be gained laterally.
mt = middle turbinate
lp = lamina papyracea
ae = anterior ethmoid
pe = posterior ethmoid
ss = sphenoid sinus
sr = sellar region
ica = internal carotid artery



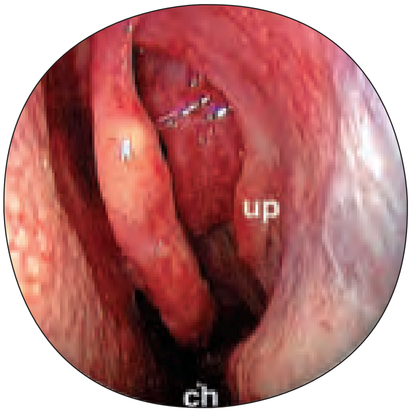
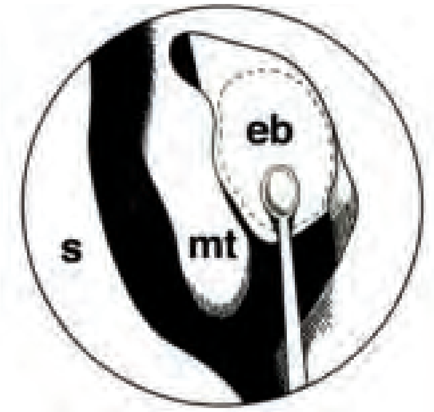
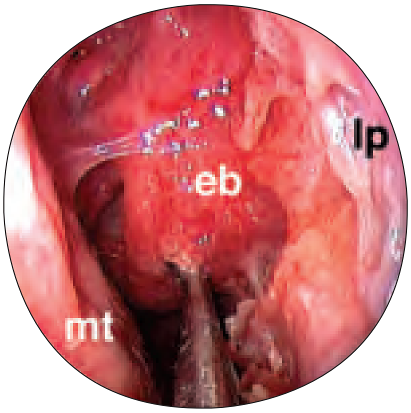


Fig. 23
A Schematic drawing showing the left ostio-meatal complex.
S = nasal septum
mt = middle turbinate
eb = ethmoidal bulla
it = inferior turbinate

B Endoscopic view, 0° endoscope diam. 4 mm, left nasal fossa.
up = uncinate process
ch = choana





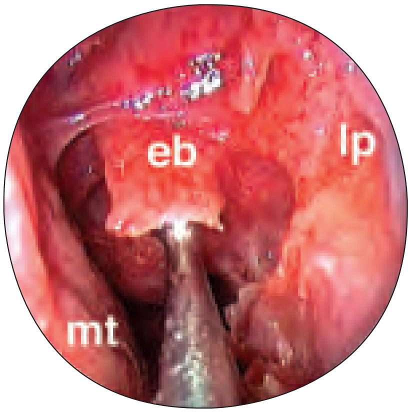


Fig. 24
A Schematic drawing illustrating the initial maneuver used to open the ethmoidal bulla.
S = nasal septum
mt = middle turbinate
eb = ethmoidal bulla

B Endoscopic view, 0° endoscope diam. 4 mm, left nasal fossa. The trans-ethmoidal approach starts with removal of the ethmoidal bulla, which is opened with a J-curette.
mt = middle turbinate
eb = ethmoidal bulla
lp = lamina papyracea

C Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Picture following 24B and showing the movement from within forwards, latero-medial, to the opening of the ethmoidal bulla.
mt = middle turbinate
eb = ethmoidal bulla
lp = lamina papyracea

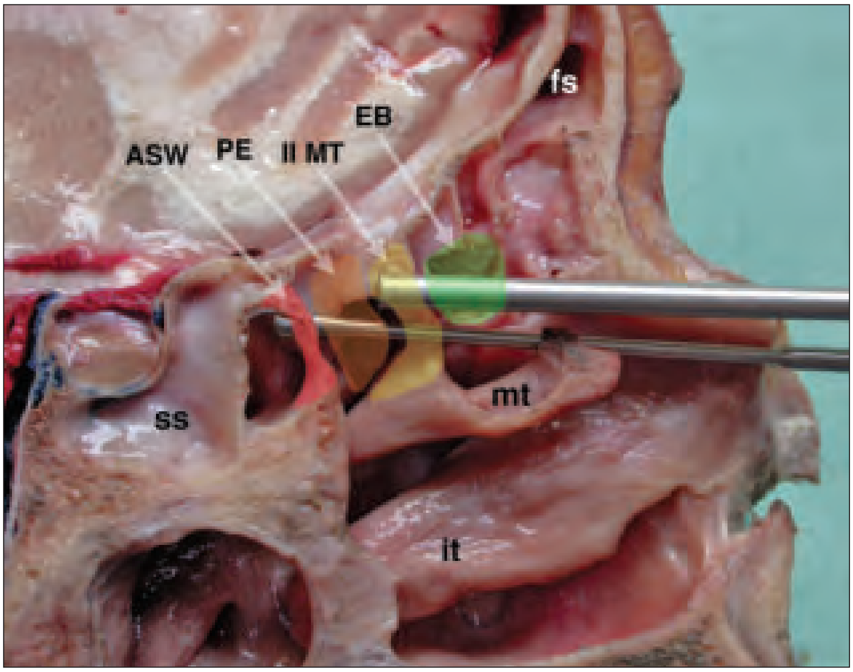


Fig. 25
Macroscopic sagittal section of an anatomical specimen. Different colors show the structures that will be removed during the trans-ethmoidal approach to the sphenoid sinus.
The ethmoidal bulla (**EB**) is colored in green, the second third of the middle turbinate (**II MT**) in yellow, the posterior ethmoid (**PE**) in orange, and the anterior wall of the sphenoid sinus (**ASW**) in red.
ss = sphenoid sinus; **it** = inferior turbinate; **mt** = middle turbinate; **fs** = frontal sinus

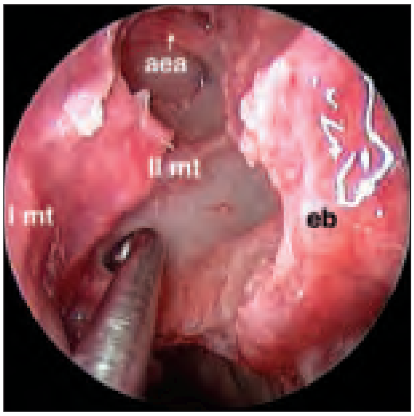
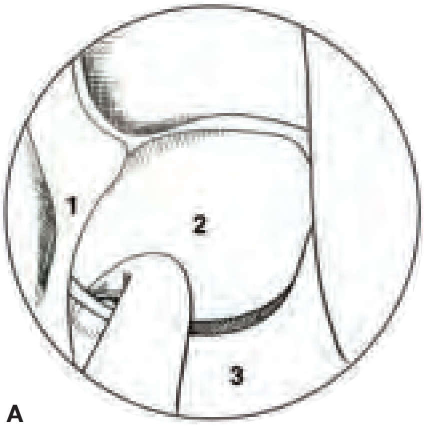


Fig. 26
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. The next step is to remove the second third of the middle turbinate, which separates the anterior ethmoidal cells from the posterior ones. Using a double-ended curette the procedure commences at the secure site.
I mt = anterior third of the middle turbinate
II mt = second third of the middle turbinate
eb = ethmoidal bulla
aea = anterior ethmoid artery



A

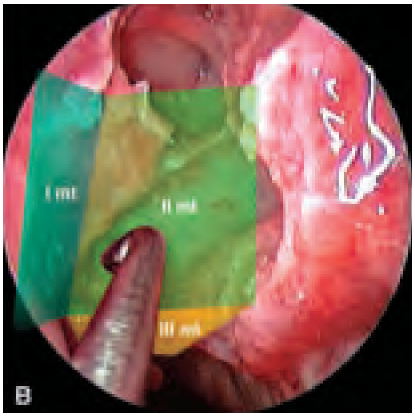


Fig. 27
A Schematic drawing showing the opening of the second third of the middle turbinate at the secure site using a J-curette.
1 = first portion of the middle turbinate
2 = second portion of the middle turbinate
3 = third portion of the middle turbinate

B Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Different colors highlight the three parts of the middle turbinate, located in the three spacial planes.
I mt = first portion of the middle turbinate
II mt = second portion of the middle turbinate
III mt = third portion of the middle turbinate

The second third of the middle turbinate is completely removed, avoiding injury to the anterior and posterior thirds as to preserve the stability of the turbinate itself.

The **secure point** to access the structures of the posterior ethmoid is localized in correspondence with the inferomedial angle of the second third, the point where all three parts of the middle turbinate meet. (**Figs. 26, 27**).

The next step is to identify the free inferior edge of the superior turbinate. The turbinate is then gently lateralized, thus allowing the sphenoid ostium to be localized.

After the cutting of the inferior portion of the superior turbinate and, if necessary, of the supreme turbinate, the sphenoid sinus ostium is enlarged with a circular-bite cutting punch (**Figs. 28–29, Fig. 30** see page 16).

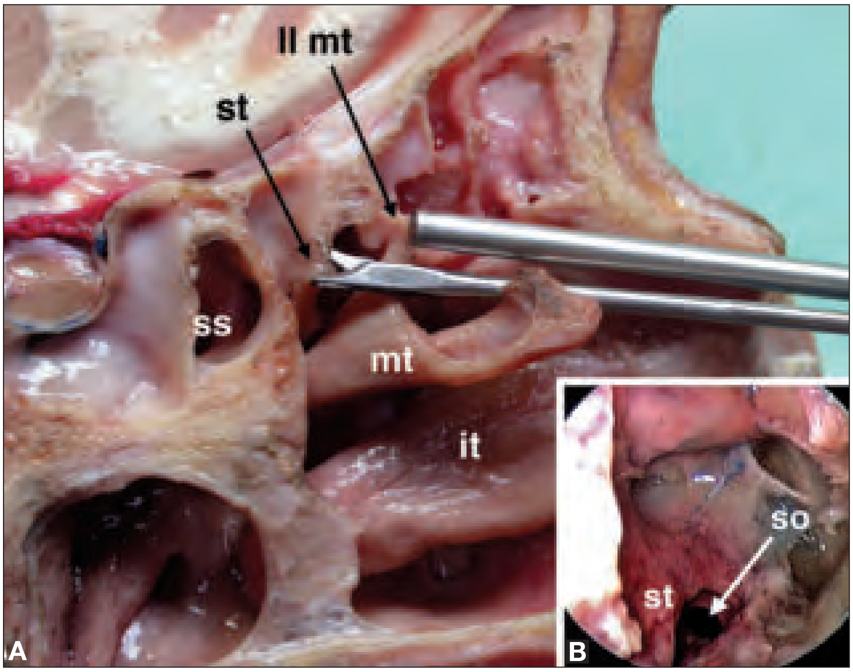


Fig. 28

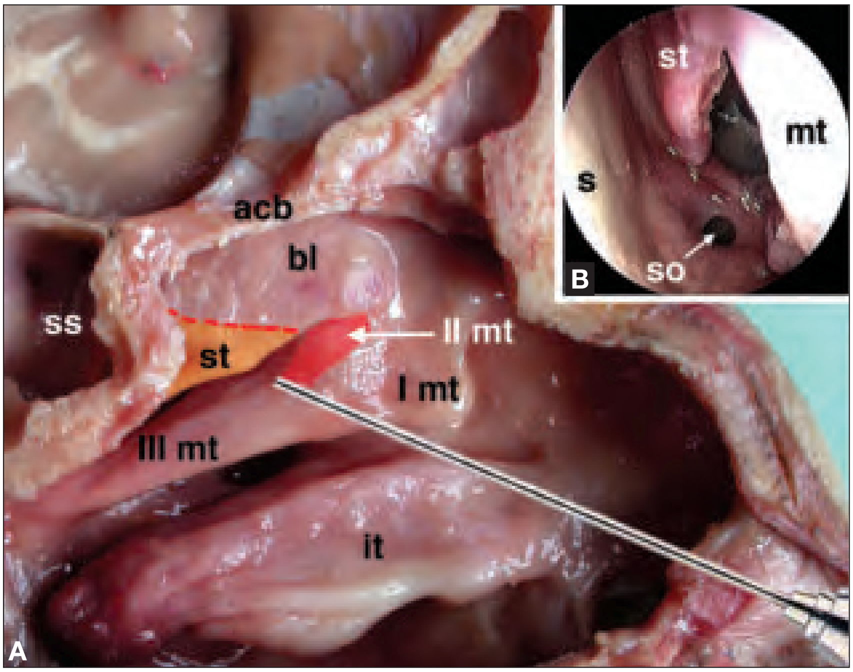
A Macroscopic sagittal section of an anatomical specimen. The picture illustrates the maneuver of resecting the superior turbinate tail during a sphenoidectomy in a trans-ethmoidal approach, after removal of the second third of the middle turbinate.
ss = sphenoid sinus; **t** = superior turbinate; **II mt** = second third of the middle turbinate; **mt** = middle turbinate; **it** = inferior turbinate

B Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. View of the natural ostium of the sphenoid sinus after removal of the superior turbinate tail in a trans-ethmoidal approach.
so = natural ostium of the sphenoid sinus; **st** = superior turbinate

Fig. 29 ▶

A Macroscopic sagittal section of an anatomical specimen. The portion of the tail of the superior turbinate, that will be removed to allow visualization of the natural ostium of the sphenoid sinus in the trans-ethmoidal approach is highlighted in orange. The red area indicates the second third of the middle turbinate, that will be removed to visualize the superior turbinate.
ss = sphenoid sinus
st = superior turbinate
acb = anterior cranial base
bl = basal lamella
I mt = anterior third of the middle turbinate
II mt = second third of the middle turbinate
III mt = posterior third of the middle turbinate
it = inferior turbinate

B Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa.
The endoscope, in paraseptal position, allows to confirm that the superior turbinate has been resected as required.
S = nasal septum
so = sphenoid ostium
m = middle turbinate
st = superior turbinate



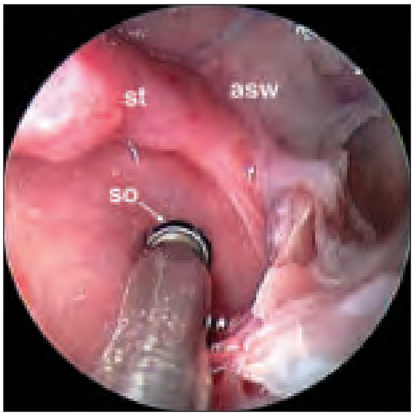


Fig. 30
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Once the tail of the superior turbinate has been removed, it is possible to widen the natural ostium of the sphenoid sinus with a cutting round-jawed forceps introduced by the paraseptal route.
so = sphenoid sinus ostium
st = superior turbinate
asw = anterior wall of the sphenoid sinus

The anterior wall of the sphenoid sinus is then completely removed (**Figs. 31–33**).

Risks:

- iatrogenic injury to the olfactory cleft with anosmia and risk of CSF leak
- iatrogenic injury to the optic nerve and cavernous internal carotid artery
- iatrogenic injury to the medial rectus muscle

Tricks:

- The inferior part of the superior turbinate must be cut and not roughly removed

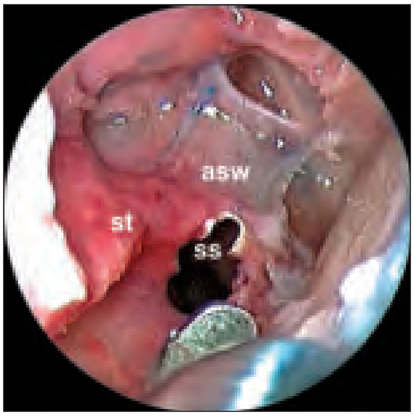


Fig. 31
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. The anterior wall of the sphenoid sinus can also be removed using a Citelli forceps.
st = superior turbinate
ss = sphenoid sinus
asw = anterior wall of the sphenoid sinus

Fig. 32
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Removal of the anterior wall of the sphenoid sinus allows for endoscopic intracavitary inspection.
asw = anterior wall of the sphenoid sinus
iocr = interoptic-carotid recess
ss = sphenoid sinus

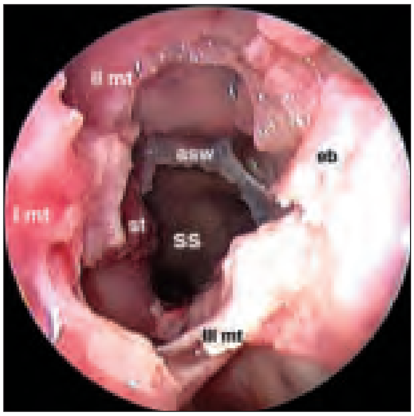


Fig. 33
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Complete left ethmoido-sphenoidectomy.
I mt = anterior third of the middle turbinate
II mt = second third of the middle turbinate
III mt = posterior third of the middle turbinate
st = superior turbinate
SS = sphenoid sinus
asw = anterior wall of the sphenoid sinus
eb = ethmoidal bulla

This surgical approach provides optimal view of the entire sellar floor and, in particular, of the lateral sphenoidal wall. In addition, the inclination of the operating instruments, different from the paraseptal approach, facilitates the inspection of the sphenoidal roof.

At this point, the procedure allows the four-hands work utilising a trans-ethmoidal approach on one side and a direct paraseptal approach on the contralateral side. The contralateral introduction of the operating instruments allows wider movements of the endoscope with better vision of the surgical field, three-dimensional orientation of the field and wider exposure of the spheno-ethmoidal region.

Use of the 45° endoscope allows visual control of instruments even when introduced on the opposite side. In this way, the endoscope may also be used via paraseptal approach.

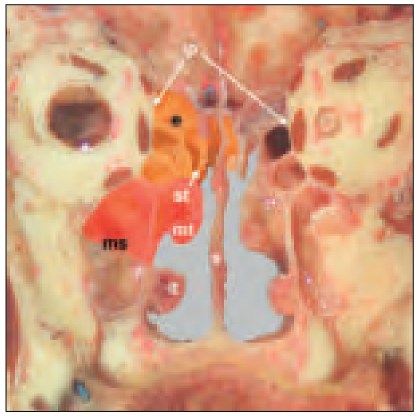


Fig. 34
Macroscopic coronal section of an anatomical specimen at the level of the superior nasal meatus. The structures that are removed during a right trans-ethmoidal and left paraseptal approach to the sellar region are highlighted in orange. The structures that are removed subsequently using a trans-ethmoidal-pterygoidal approach are shown in red.
ms = maxillary sinus
e = ethmoid
lp = lamina papyracea
st = superior turbinate
mt = middle turbinate
it = inferior turbinate
s = nasal septum

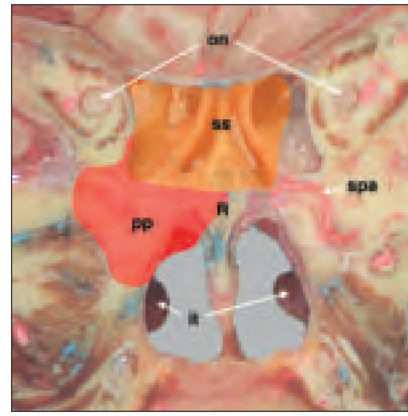
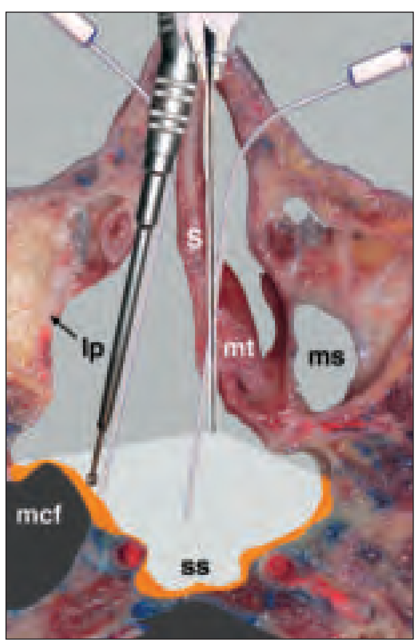


Fig. 35
Macroscopic coronal section of an anatomical specimen at the level of the sphenoid sinus. The structures that are removed during a right trans-ethmoidal and left paraseptal approach to the sellar region are shown in orange. The structures that are removed subsequently using a trans-ethmoidal-pterygoidal approach are shown in red.
pp = pterygoid process of the sphenoid
ss = sphenoid sinus
on = optic nerve
R = sphenoid rostrum
it = inferior turbinate
spa = sphenopalatine artery

2.3 Trans-ethmoidal-pterygoidal-sphenoidal Approach

This third surgical approach is indicated for surgical inspection of the lateral part of the anterior and middle skull base, such as the lateral part of the cavernous sinus, the base of the middle cranial fossa, particularly in case of well-pneumatized pterygoidal-sphenoidal recesses, and the infratemporal fossa (**Fig. 36**).

The surgical approach starts with an ethmoidectomy with partial resection of the middle and superior turbinates. This removal, in combination with resection of the posterior ethmoidal cells, allows the exposure of the anterior wall of the sphenoid sinus, of the orbital apex and of the base of the pterygoid. The anterior wall of the sphenoid sinus is then removed and the sphenopalatine artery is electrocauterized (at its septal and turbinate branches) using bipolar forceps.



◀ **Fig. 36**
Macroscopic axial section of an anatomical specimen. The image illustrates the use of four instruments inserted through both nasal cavities in a trans-ethmoidal-pterygoidal-sphenoidal approach to the sellar and parasellar region and to the middle cranial fossa. Both the right ethmoidectomy and maxillectomy can be seen, which allows the instruments to be moved easily in a lateral direction.
lp = lamina papyracea
mcf = middle cranial fossa
s = nasal septum
mt = middle turbinate
ms = maxillary sinus
ss = sphenoid sinus

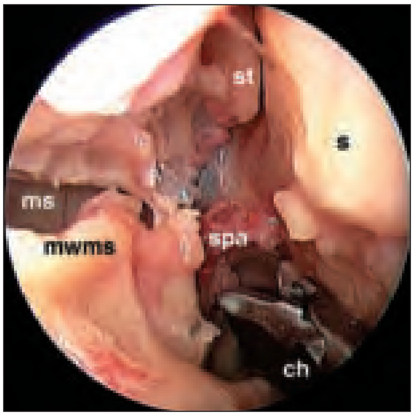


Fig. 37
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once ethmoidectomy is complete, the area of the fontanelle of the middle and posterior thirds of the inferior turbinate has to be removed using a cutting instrument via trans-ethmoidal-pterygoidal-sphenoidal approach.
ms = maxillary sinus
mwms = medial wall of the maxillary sinus
st = superior turbinate
spa = sphenopalatine artery
ch = choana
s = nasal septum

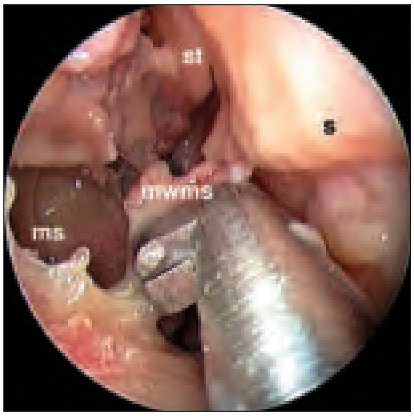
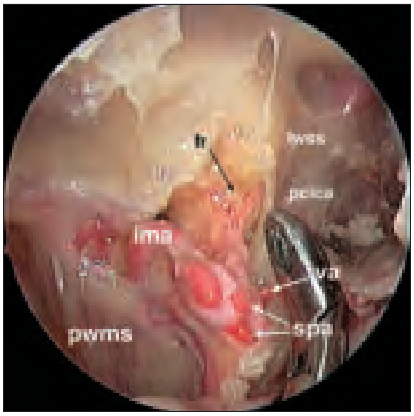


Fig. 38
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The medial wall of the maxillary sinus may be removed using a lateral-bite cutting forceps.
ms = maxillary sinus
mwms = posterior wall of the maxillary sinus
st = superior turbinate
s = nasal septum

The posterior wall of the maxillary sinus is then exposed with an incomplete medial maxillectomy, removing the area of the fontanelle of the middle and posterior thirds of the inferior turbinate (**Figs. 37, 38**). Subsequently, the pterygo-maxillary fossa is opened, widening its foramen with a Citelli forceps (**Fig. 39**). With the same forceps, the posterior wall of the maxillary sinus is removed. Once the content of the pterygo-maxillary and infratemporal fossae is visible, the vidian foramen and the foramen rotundum may be localized. After the electrocoagulation of the vidian artery, the base of the pterygoid and the sphenoid floor are drilled. This maneuver opens up the view of both the cavernous sinus and the base of the middle cranial fossa. In cases where the treatment of the pathology would require even further lateral inspection, a total maxillectomy may be combined with this approach.

The procedure comprises a wide contralateral paraseptal approach, drilling the sphenoid rostrum to access to the sphenoid sinus and removing its anterior wall and the intersphenoidal septum. This is followed by the removal of the posterior third of the vomer from the floor of the nose to the skull base.

The drilling of the sphenoid floor is completed. Moreover, the contralateral access permits a wider angle of insertion of surgical instruments, allowing work to proceed more laterally. In this way, it will be easy to use four surgical hands in various combinations because of the wider space.



◀ **Fig. 39**
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once the posterior wall of the maxillary sinus has been exposed, it is possible to gain access to the pterygomaxillary fossa.
pwms = posterior wall of the maxillary sinus
ima = internal maxillary artery
spa = sphenopalatine artery
va = vidian artery
spa = branches of the sphenopalatine artery
lwss = lateral wall of the sphenoid sinus
fr = foramen rotundum
pcica = paraclival internal carotid artery

Risks:
- iatrogenic injury to the olfactory cleft with anosmia and risk of CSF-leak
- iatrogenic injury to the optic nerve and cavernous internal carotid artery
- iatrogenic injury to the medial orbital wall (medial rectus muscle)

Tricks:
- sparing of the anterior third of the middle turbinate and of the superior part of the lamella of the ethmoidal turbinates

2.4 Approach to the Sellar Cavity

The **opening of the sellar floor** is a common stage for the trans-sphenoidal approaches to the sella.

The removal of the sellar floor involves prior localization of specific anatomical landmarks to avoid iatrogenic injury to major structures, such as the internal carotid artery, the optic nerve and the dura mater. These intrasphenoidal anatomical landmarks vary in appearance depending on the degree of pneumatization of the sphenoid sinus: presellar, sellar, conchal. The bony prominences covering the two paraclival carotid arteries, the depression of the clivus wall through which the sellar floor becomes visible, the bony prominence that covers the cavernous carotid artery, the bony prominence that covers the optic nerve and the interoptic-carotid recess are the secure anatomical landmarks, generally in the presellar type of sphenoid sinus. These structures surround the sellar floor through 360°, encircling a central area that can be surgically removed without the risk of iatrogenic injury (**Fig. 40**).

When the central bony part of the sellar floor has been removed, the periosteal dural layer is incised, and the tumor is removed (**Figs. 41–43**).

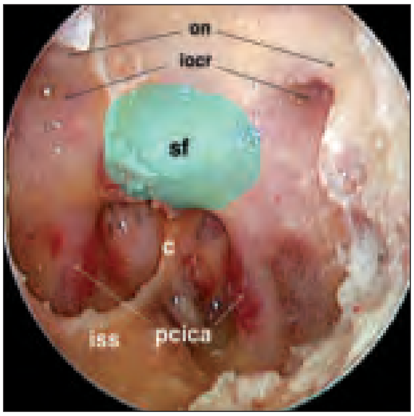
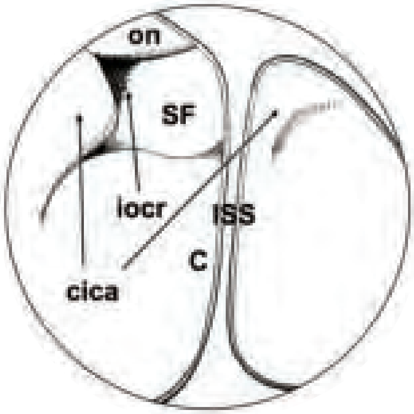


Fig. 40
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Sellar type sphenoid sinus after the removal of the left anterior sphenoidal wall and of the intersphenoidal septum. The landmarks that allow the sellar floor to be localized are clearly visible.
on = optic nerve
iocr = interoptic carotid recess
sf = sellar floor
pcica = paraclival internal carotid artery
Iss = intersphenoidal septum
c = clivus

Anatomical landmarks:
varying according to the type of sphenoid (sellar, presellar, conchal):
- bony prominence covering both paraclival internal carotid arteries
- depression of the wall of the clivus
- bony prominence of the cavernous tract of the internal carotid arteries
- chiasmatic protrusion
- interoptic carotid recess

Risks:
- iatrogenic injury to the optic nerve, internal carotid and basilar artery

Tricks:
- the anatomical landmarks surround the sellar floor through 360°, encircling a central area that can be resected without the risk of iatrogenic injury



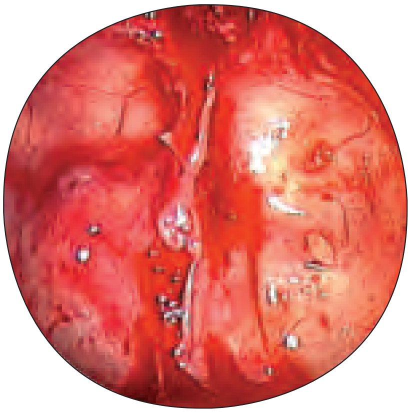
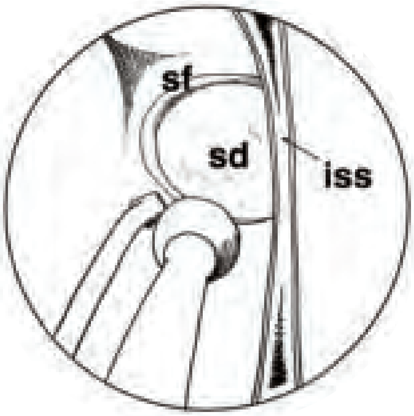


Fig. 41
A Schematic drawing of the intracavitary endoscopic view (**B**) of the sphenoid sinus after removal of the anterior wall and of the intersphenoidal septum.
iocr = interoptic carotid recess;
sf = sellar floor; **cica** = cavernous tract of the internal carotid artery; **C** = clivus;
ISS = intersphenoidal septum;
on = optic nerve

B Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa.
The sphenoid sinus cavity after removal of the anterior wall and the intersphenoidal septum.



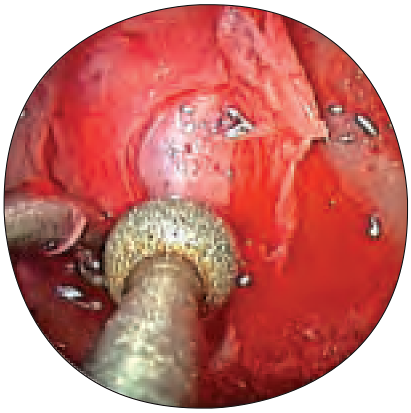


Fig. 42
A Schematic drawing of the drilling of the sphenoid floor.
sf = sellar floor
sd = sellar dura
iss = intersphenoidal septum

B Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa.
The sellar floor is opened with a diamond burr.

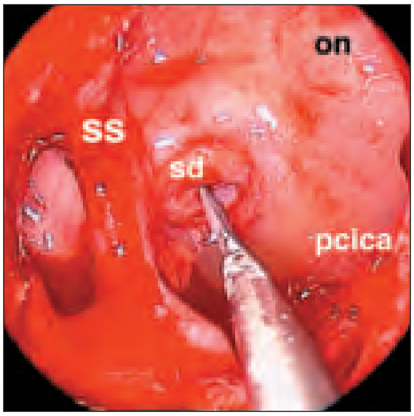


Fig. 43
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The sellar dura is incised with a curved scalpel.
SS = sphenoid sinus
sd = sellar dura
on = optic nerve
pcica = paraclival internal carotid artery

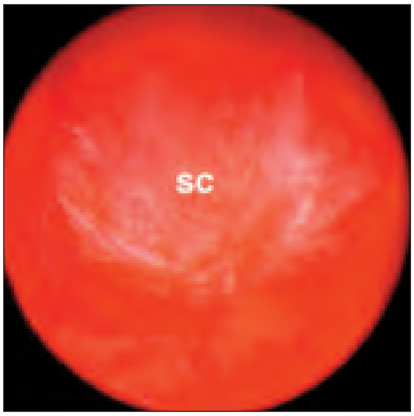


Fig. 44
Endoscopic view, 0° endoscope, 4 mm, sellar cavity. Continuous irrigation and suction allows a residual intrasellar tumor to be detected.
SC = sellar cavity

The intrasellar surgical technique assumes use of continuous washing of the endoscope (hydroscopy). This will allow hydro-detachment of the tumor and continuous irrigation of the sellar cavity and also improve hemostasis (**Fig. 44**). Elevation of the suprasellar cistern, which frequently protrudes towards the base, getting in the way and impeding tumor removal, is also essential (**Fig. 45**). This problem is overcome by using more surgical hands. Moreover, the use of 45° telescopes allows 360° inspection of the recesses of the sellar cavity.

Extension to the parasellar region requires the removal of the bone that covers the cavernous internal carotid arteries. The lateral wall of the sphenoid sinus is then removed to expose the orbital apex. In well-pneumatized sphenoid bones, resection can involve the medial part of the greater wing of the sphenoid itself. The option of gaining access to the lateral part of the cavernous sinus is offered by its devascularization due to tumour invasion.

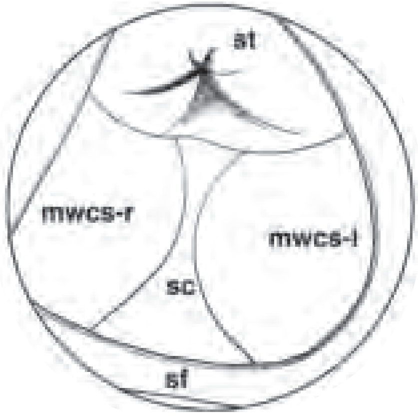


Fig. 45
A Diagram illustrating the sellar cavity following its evacuation.
sd = sellar diaphragm
mwcs-r = medial wall of the right cavernous sinus
mwcs-l = medial wall of the left cavernous sinus
sc = sellar cavity
sf = sellar floor

B Endoscopic view, 0° endoscope, 4 mm. After evacuation of the sellar cavity, the medial walls of the cavernous sinuses can be bilaterally assessed. The superior wall is made up by the arachnoid membrane of the suprasellar cistern.

Risks:
- iatrogenic injury to the 6th cranial nerve in the approach to the cavernous sinus

Tricks:
- the 6th cranial nerve crosses the sphenoid sinus in a mediolateral direction

The techniques that can be advantageously applied during lesion resection or endosellar exploration are:
- **Doppler probe** avoids disorientation of the surgeon showing the anatomical landmark of pulsatory movements of the carotid artery.
- **Neuronavigation:** demonstrates anatomical landmarks that can be localized in the patient on the basis of neuroradiological imaging.
- **Navigation in intrasellar immersion:** intracavitary exploration performed under continuous irrigation and suction allows visualization of supra- and parasellar structures with good hemostasis: the flow pressure of the irrigation liquid limits the descent of the suprasellar cisterns and limits bleeding from the anterior intercavernous sinus and the medial wall of the cavernous sinus, which is sometimes eroded by the lesion.
- **Diode laser:** useful in the resection of tumors of hard to elastic consistency, offers the advantage of coagulating and vaporizing tissues only on contact without producing heat at a distance; may require simultaneous readjustment of the objective lens or endoscopes of various directions of view for access relative to the point of endoscopic access.

3.0 Multilayer Centripetal Technique

This technique, which is based on the criterion of oncologic radicality (to obtain surgical margins free of disease), has been made possible by the introduction of two important procedures: the piecemeal removal and the cavitation of the lesion. Both of these procedures allow a reduction in the volume of the lesions with control of their margins.

Once the origin has been identified, cavitation of the mass allows centripetal collapse of the “surgical box” that has to be resected.

At this point, the centripetal technique is capable of obtaining sufficiently wide resection margins of healthy tissue sourrounding the lesion.

3.1 Naso-ethmoidal Approach

This technique allows removal of sinonasal neoplasms with extension limited to the anterior skull base. This type of centripetal removal has five steps:

- debulking of the lesion (piecemeal removal and cavitation)
- dissection of a subperiosteal layer comprising the ethmoid and the nasal fossa: the initial horseshoe-shaped incision includes the septum, the nasal vault anteriorly to the first olfactory fibers, the lamina papyracea and the lateral nasal wall (medial wall of the maxillary sinus). This allows the centripetal anteroposterior elevation of a single flap of periosteum containing the pathological tissue
- removal of the bony margins: lamina papyracea, ethmoidal roof, cribriform plate, nasal septum and medial maxillary wall
- removal of the periorbit, the dura of the anterior cranial fossa and, if possible, of the olfactory bulb
- skull base duraplasty

In this way, working in successive steps, the structures surrounding the lesion are removed until healthy tissue is found. Multiple frozen histological sections and reconstruction of the skull base are very important. The contralateral approach, when required, consists of a median sphenoidotomy with removal of the two posterior thirds of the nasal septum (**Fig. 18,** see page 11). With this wider space, the surgical procedure is continued using two nasal cavities and four hands.

3.2 Naso-maxillo-ethmoidal Approach

When needed, the naso-ethmoidal approach can include a medial maxillectomy to widen the surgical field to the lateral nasal wall; the combination with a medial maxillectomy thus allows en bloc removal of malignant tumors involving this structure by the centripetal technique (**Fig. 46**).

Depending on tumor infiltration and thus on the need to remove the lateral nasal wall, dissection may include:

- removal of the medial wall of the maxillary sinus with preservation of the anterior portion of the inferior turbinate and of the nasolacrimal duct,
- removal of the medial wall of the maxillary sinus with complete removal of the inferior turbinate, dissection of the nasolacrimal duct and en bloc removal of the maxillary sinus mucoperiosteum,
- removal of the medial wall of the maxillary sinus with complete removal of the inferior turbinate, dissection of the nasolacrimal duct, removal of the lateral wall of the piriform nasal aperture and en bloc removal of the maxillary sinus mucoperiosteum,

It is also possible to employ the “Two Nostrils – Four Hands” technique with this surgical procedure by removing an adequate portion of the nasal septum.

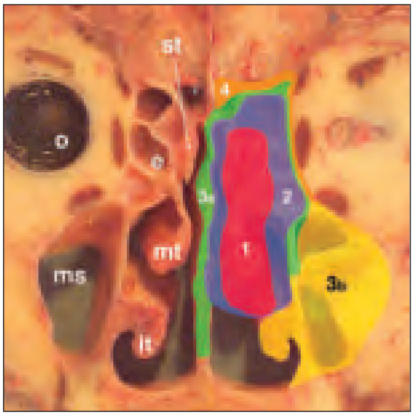


Fig. 46
Macroscopic coronal section of an anatomical specimen. The structures removed during the stages of the centripetal endoscopic technique are shown in different colors. The area that is removed to reduce the volume of the mass to be removed is colored in red (**1**), the structures comprising the inside of the nasoethmoidal subperiosteal plane in violet (**2**), the bony margins defining the entity containing the pathology in green (**3**a), and the dura, the olfactory bulb and the periorbit which may possibly be removed is shown in orange (**4**).
The procedure, here shown only on the left, can be extended to both nasal fossae and may need to be combined with a medial maxillectomy (**3b**).
ms = maxillary sinus
o = orbit
e = ethmoid
mt = middle turbinate
it = inferior turbinate
st = superior turbinate

Risks:

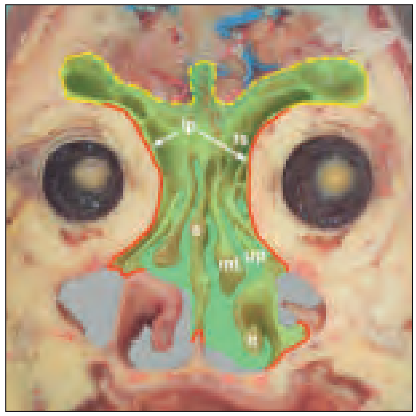
- iatrogenic injury to the spheno-palatine artery and to the descending palatine artery
- iatrogenic perforation of the hard palate
- iatrogenic injury to the nasolacrimal duct

The exclusion criteria for this procedure are:

- invasion of the frontal sinus
- invasion of the orbital content
- massive invasion of the dura (not only focal contact)
- invasion of the bony walls of the maxillary sinus with the exception of the medial wall
- extension to the nasopharynx (with the exception only of the pharyngo-basilar fascia)
- invasion of the lacrimal pathways
- invasion of the hard palate
- invasion of the nasal pyramid

4.0 Cranioendoscopic Technique

This technique is applied in the treatment of malignant sinonasal tumors with intracranial infiltration and also in cases of benign intracranial extra-axial median and paramedian tumors of the anterior and middle skull base. The cranioendoscopic technique combines the classic transcranial approach with the multilayer centripetal endonasal technique and allows the entire outer circumference of the lesion to be exposed and removed en bloc, without the need for classic transfacial osteotomie (**Figs. 47–51**).



◀ **Fig. 47**
Macroscopic coronal section of an anatomical specimen at the level of the frontal sinus. The structures that can be removed in a cranioendoscopic approach are shown in green. The lines of bone resection performed by the neurosurgeon in an external frontal craniotomy approach are colored in yellow. The lines of transsection performed in an endonasal endoscopic approach, which may be extended (or not) to the medial maxillary sinus wall are shown in red.
it = inferior turbinate
mt = middle turbinate
up = uncinate process
s = nasal septum
lp = lamina papyracea
fs = frontal sinus

Fig. 48
Same color scheme as in **Fig. 47** on a macroscopic coronal section of an anatomical specimen at the level of the anterior ethmoid.
it = inferior turbinate
mt = middle turbinate
s = nasal septum
mwms = medial wall of the maxillary sinus
st = superior turbinate
e = ethmoid
lp = lamina papyracea

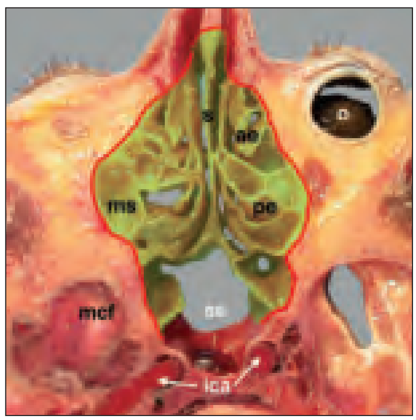


Fig. 49
Macroscopic axial section of an anatomical specimen. The structures that can be removed in a cranioendoscopic approach are shown in green. The lines of endoscopic resection are highlighted in red.
S = nasal septum
ae = anterior ethmoid
pe = posterior ethmoid
ss = sphenoid sinus
ica = internal carotid artery
ms = maxillary sinus
mcf = middle cranial fossa

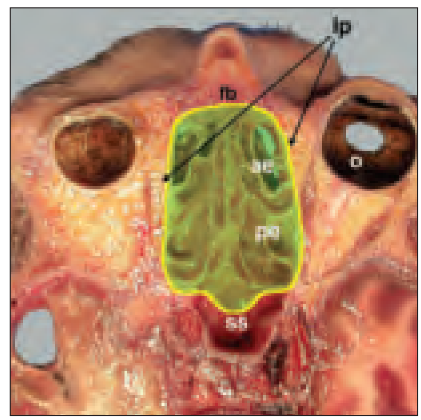
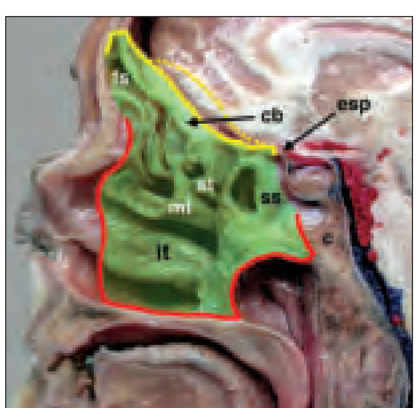


Fig. 50
Macroscopic axial section of an anatomical specimen. The structures that can be removed in a cranioendoscopic approach are shown in green. The lines of resection performed in an external approach are shown in yellow.
lp = lamina papyracea
fb = frontal bone
ae = anterior ethmoid
pe = posterior ethmoid
o = orbit
ss = sphenoid sinus

The exclusion criteria for this procedure are:

- involvement of the lacrimal pathways
- involvement of the bony maxillary sinus walls, with the exception of the medial wall
- involvement of the hard palate
- involvement of the nasal pyramide



◀ **Fig. 51**
Macroscopic sagittal section of an anatomical specimen. The structures that can be removed in a cranioendoscopic approach are shown in green. The lines of bone resection performed by the neurosurgeon in an external approach are shown in yellow. The lines of endoscopic resection are shown in red. The broken yellow line highlights the resection when cerebral infiltration of the tumor mass is present.
fs = frontal sinus; **cb** = cranial base; **st** = superior turbinate; **mt** = middle turbinate; **it** = inferior turbinate; **ss** = sphenoid sinus; **c** = clivus; **esp** = ethmoidal-sphenoidal planum

The approach requires a surgical team of four surgeons (two neurosurgeons and two otolaryngologists) and a nurse; the operating room equipment should include two video monitors (one for the operating microscope and one for the endoscope), to make sure that all surgeons have a 360° view of the lesion to be removed (**Fig. 52**).

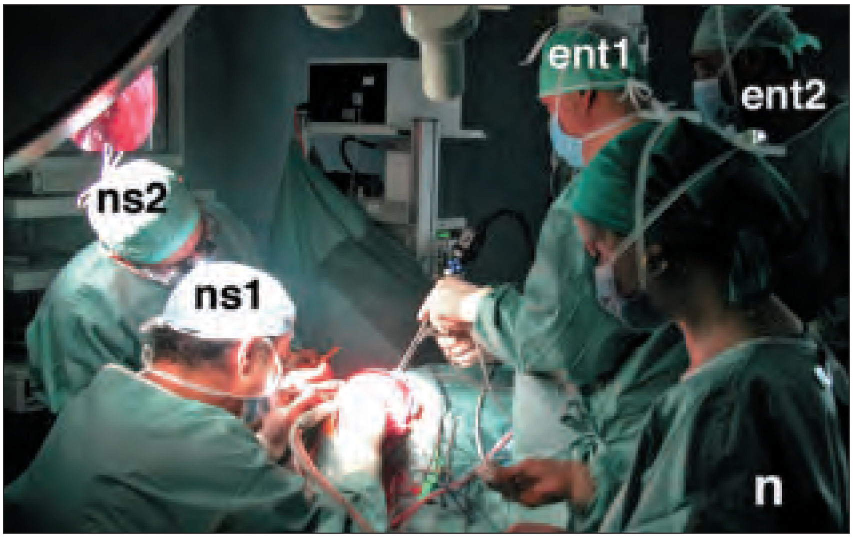


Fig. 52 ▶
Intraoperative view demonstrating the positioning of the surgical team in the OR.
ns1 = first neurosurgeon
ns2 = second neurosurgeon
ent1 = first ENT surgeon
ent2 = second ENT surgeon
n = nurse

4.1 Endoscopic Step

The step of endoscopic surgery involves the use of rigid endoscopes of 0° and 45° direction of view and in conjunction with corresponding specific straight, angled and double-curved operating instruments.

The sphenopalatine arteries are exposed and coagulated bilaterally to reduce bleeding.

The nasal septum is transsected at its base, and anteriorly by a vertical incision that reaches the nasal vault at the level of the superior nasal spine. The nasal septum is mobilized posteriorly by means of lateral transsection of the anterior wall of the sphenoid sinuses, which is extended inferiorly to the level of the sphenoid floor posterior to the rostrum.

The lateral transsections also require the lamina papyracea to be localized, and then dissected from the periorbita starting from its anterior margin as far as the orbital apex. Finally, the lamina papyracea is removed en bloc with the ethmoidal labyrinth.

In the course of the transcranial approach, the neurosurgeon cauterizes the ethmoidal arteries and assists the otolaryngologist in medializing the lamina papyracea using malleable spatulas.

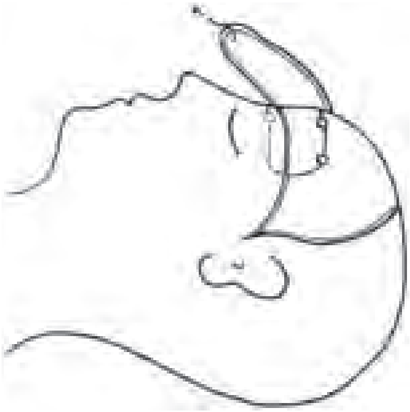


Fig. 53
Schematic drawing of the coronal incision, and the size and position of the frontal bone flap elevated during the cranioendoscopic approach.

4.2 Transcranial Step

The transcranial approach needs a coronal subperiosteal flap to be elevated, taking care not to injure the superior branch of the facial nerve. A frontal or lateral craniotomy of different shape and size is then performed depending on the individual requirements of surgery (**Figs. 53, 54**).

At the frontal level, the craniotomy is performed a few millimeters superior to the upper orbital arches to permit a wide opening to be created as tangentially as possible to the anterior skull base so as to prevent excessive retraction of the cerebral parenchyma, and to prevent the pericranial flap from being overly bent while reconstructing the anterior skull base.

Once the superior sagittal sinus at the level of its insertion at the base is ligated, the dura is opened in the fronto-orbital region. With the aid of the operating microscope, the cerebral falx is transsected at its base and the frontal lobes are gently retracted, gradually draining the cerebrospinal fluid. The basal cisterns are accessed in this way, and the medial part of the anterior cranial fossa is exposed bilaterally by the opening of the chiasmatic cistern. Following the course of the olfactory nerves, the ethmoidal-sphenoidal planum, the optic nerves, the chiasm, the A1 and A2 tracts of the anterior cerebral artery, the posterior communicating artery, the pituitary stalk and the carotid arteries are exposed. At this point, it is possible to start centripetal dissection of the neoplasm until surgical margins of healthy tissue are achieved. The superior margin of the bony box is created using a cutting burr until the endonasal margin accomplished previously by the nasal endoscopic approach is joined, achieving its isolation.

Fig. 54
A Schematic drawing showing the skin incision and the size and position of the pterional bone flap that is elevated during the combined approach to the middle cranial fossa.
B Preoperative positioning of the triggers for the neuronavigation system. The red dotted line highlights the line of incision.
C Intraoperative view demonstrating the use of four surgical hands during the endoscopic step of the procedure.

4.3 En-bloc Removal of the “Ethmoidal Box”

This is the surgical step in which the two teams have to communicate and collaborate as closely as possible. The technical feature of working with two video monitors – one connected to the microscope and one to the endoscope – provides a full view of the ethmoidal labyrinth during its removal without leaving visible tumour margins.

5.0 Duraplasty Techniques

5.1 Sellar Duraplasty

In most of the surgical procedures, there is no need for reconstruction of the sellar floor after tumor removal is completed. However, this becomes necessary in the presence of a cerebrospinal fluid leak detected at the end of tumor removal. The technique requires multilayer reconstruction of the sellar floor using different types of material. The authors prefer autologous materials such as temporal fascia, septal or turbinate mucoperiosteum; quadrangular cartilage and turbinate bone. At times, heterologous material may also be used. The choice of material depends on the type of employed surgical approach and on the individual anatomical variance.

For example, if the patient presents with a concha bullosa, the lateral part of this structure will be harvested during conchal repair, a procedure that is also of benefit to the patient. The obtained tissue is then dissected in two layers of bone and mucoperiosteum. The procedure does not remove anatomical structures and preserves nasal function. If during surgery (transethmoidal-pterygoidal-sphenoidal approach) the middle turbinate has to be removed, this structure can be used to provide free grafts.

The technique comprises placement of an intrasellar layer of connective fascia, a second layer of bone or cartilage (underlay) and a third extracranial layer of muco-periosteum on the sellar floor (overlay). The layers may be reduced to two (underlay and overlay) and the fascia may also be used alone. The various combinations, as mentioned above, are placed in a different manner in each individual patient (**Figs. 55–57**).

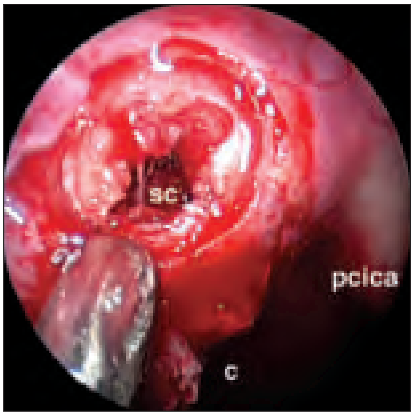


Fig. 55
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Sellar cavity following removal of the tumor mass.
sc = sellar cavity
pcica = paraclival internal carotid artery
c = clivus

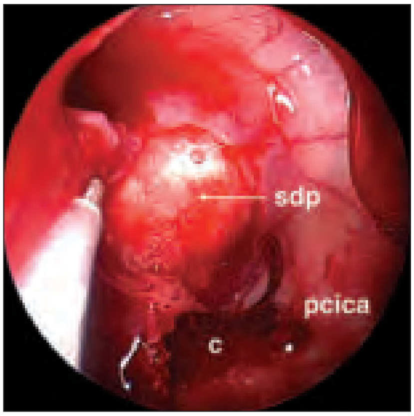


Fig. 57
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The duraplasty is completed using fibrin glue to stabilize the graft.
sdp = dural patch
pcica = paraclival internal carotid artery
c = clivus

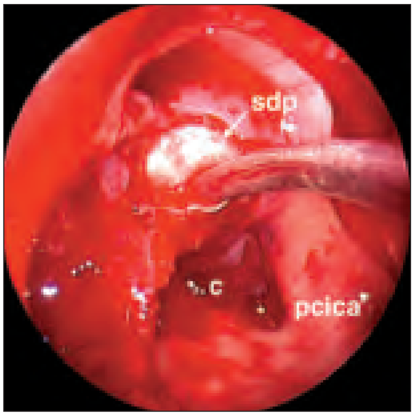


Fig. 56
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. With an instrument introduced into the left nasal fossa sellar duraplasty is performed, placing an underlay graft of synthetic dural substitute.
sdp = dural patch
c = clivus
pcica = paraclival internal carotid artery

5.2 Skull Base Duraplasty after Nasoethmoidal Approach

The ethmoidal duraplasty, after the removal of tumors invading the anterior skull base, is performed using a multilayer technique with artificial liodura or connective fascia as intracranial underlay grafts and muco-perichondrial or muco-periosteal grafts as overlay grafts (**Fig. 58**).

5.3 Skull Base Duraplasty after Cranioendoscopic Approach

After en-bloc removal of the "box" made up of skull base and ethmoid, the defect is reconstructed by replacing the flap of pericranial galea, previously elevated during the transcranial coronal approach, inside the cranium. From the endonasal side, a layer of connective tissue (temporal fascia) is placed to reinforce the site of repair. To provide additional support the grafts are packed with Spongostan gelatin foam (**Fig. 59**).

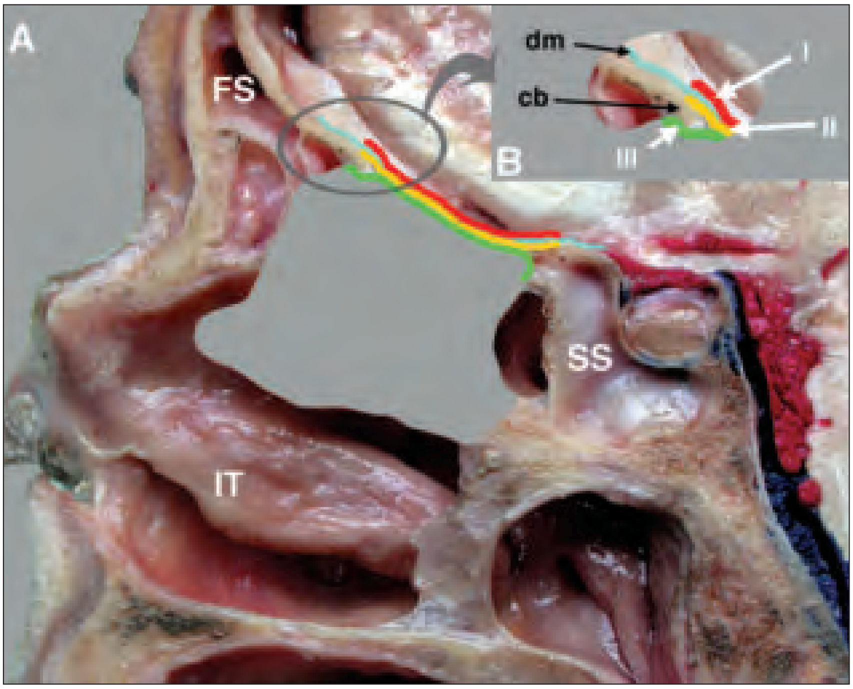


Fig. 58
A Macroscopic sagittal section of an anatomical specimen. The layers of the anterior skull base duraplasty following centripetal technique are highlighted in different colors.
FS = frontal sinus
SS = sphenoid sinus
IT = inferior turbinate

B Close-up view;
dm = dura mater;
sb = skull base
I = intracranial intradural underlay graft
II = intracranial extradural underlay graft
III = extracranial overlay graft

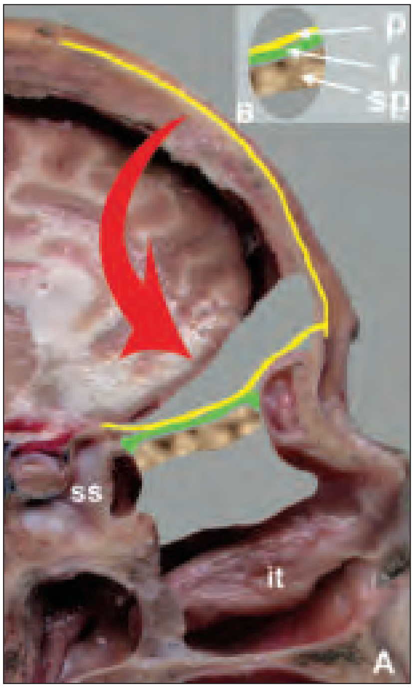


Fig. 59
Macroscopic axial section of an anatomical specimen demonstrating the maneuver of bending the flap of the pericranium to reconstruct the anterior skull base.
ss = sphenoid sinus
it = inferior turbinate
p = pericranium
f = fascia
sp = absorbable sponges

6.0 Clinical Cases

6.1 Apoplectic Adenoma with Bilateral Compression of the Optic Chiasm and Cavernous Sinus

Clinical Findings

The patient presented with severe, exacerbating headache and ensuing manifestation of right-sided ptosis and diplopia. Visual field testing showed temporal hemianopsia in the left eye and upper temporal quadrantanopsia in the right eye. The cranial MR scan showed an expanding sellar lesion with apoplectic component of about 4 cm in diameter, with compression of the medial walls of both cavernous sinuses, particularly on the right side, and displacement of the optic chiasm (**Figs. 60–62**).

Surgical Procedure

We performed a combined endonasal endoscopic and bilateral paraseptal approach with drilling of the sphenoid rostrum, removal of the intersphenoidal septum, and drilling of the sella turcica deformed by the tumor mass. The erosion of the bony clivus wall was evident. Removal of the heteroplasia following coagulation and stellate incision of the dura. Intrasellar evacuation of the lateral recesses under continuous irrigation (hydroscopy) using 45° endoscopes. The medial walls of the cavernous sinuses appeared bilaterally displaced but not infiltrated (**Figs. 63–66**).

Fig. 60
Axial T1-weighted MR scan after administration of contrast agent: the expansive lesion, 4 x 3.8 x 3.2 cm in size, appears non-homogeneously hypointense on T1, and is surrounded by a peripheral pseudocystic ring, about 3 mm thick, with homogeneous contrast enhancement.
* = tumor mass

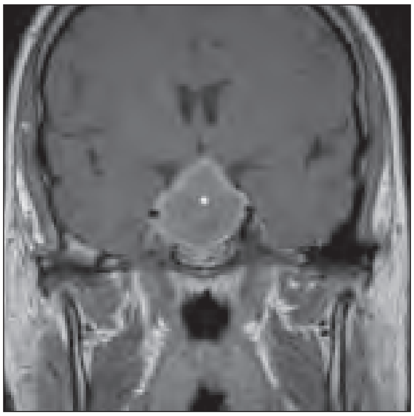


Fig. 61
Coronal T1-weighted MR after administration of contrast agent: caudally, the lesion causes the sellar floor to descend into the sphenoid sinus, cranially the lesion extends as far as the suprasellar cistern, is imprinted on the anterior recesses of the third ventricle and displaces the optic chiasm cranially, particularly to the left. Laterally, the lesion bulges the medial wall of the cavernous sinuses particularly on the right, with minimal infiltration of the intracavernous part of the carotid siphon close to the superior wall.
* = tumor mass

Fig. 62
Sagittal T1-weighted MR with contrast: the posterior part of the expansive process appears adjacent to the basilar artery. The pituitary stalk and the anterior intercavernous sinus are displaced cranially.
* = tumor mass
c = clivus

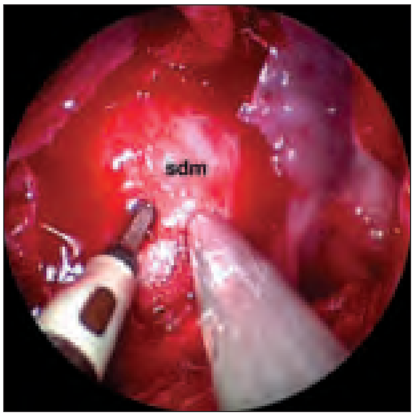
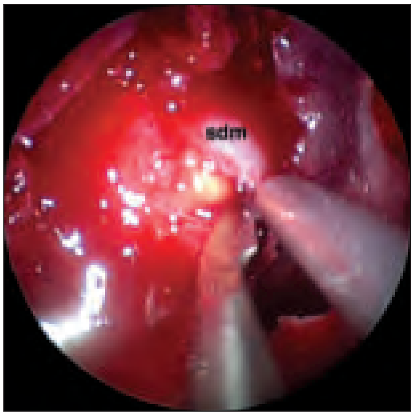


Fig. 63
Bipolar electrocoagulation of the dura: the bilateral approach allows contralateral introduction of the suction for good hemostasis.
sdm = sellar dura mater



◀ **Fig. 64**
Dural incision using a curved scalpel introduced by the first surgeon together with the endoscope. Suction is introduced by the second surgeon on the contralateral side.
sdm = sellar dura mater

Post-operative Course

The MRI scan of the hypophysis taken on the first post-operative day showed the outcome of surgery. The cavernous sinuses and anterior recesses of the third ventricle demonstrated normal appearance in terms of shape and symmetry. The suprasellar cistern was free of disease (**Figs. 67–69**).

Clinically, the patient presented regression of the deficits of the right third and sixth cranial nerves on the first post-operative day. The patient was discharged five days after surgery.

The visual field was tested one month after surgery and appeared normal. Neither early nor latedeficits of the hypothalamic-pituitary axis occurred. Endoscopic follow-up was performed on a regular basis (**Fig. 70**). Histopathological features were compatible with apoplectic pituitary adenoma.

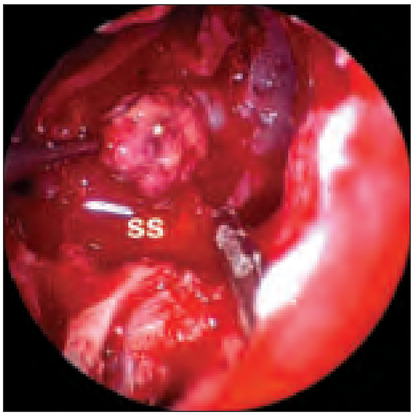


Fig. 65
Removal of the mass and evacuation of the sellar cavity with angled curettes introduced via both nasal fossae to obtain an increase in angulation and an enlarged view of the surgical field.
***** = tumor mass
ss = sphenoid sinus

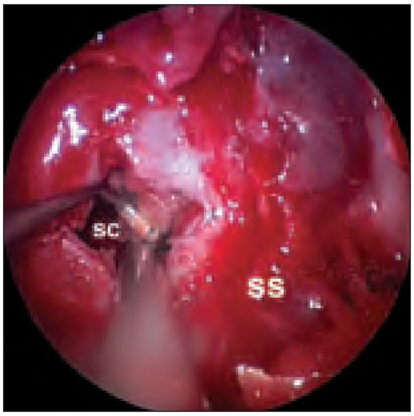


Fig. 66
Intrasellar endoscopic view with curettes and suction introduced via both routes of access. In this case, the endoscope is guided by the hand of the second surgeon.
sc = sellar cavity
ss = sphenoid sinus

Fig. 67
Axial T1-weighted MR scan after administration of contrast agent.

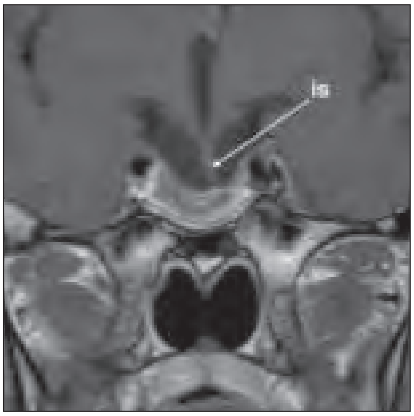
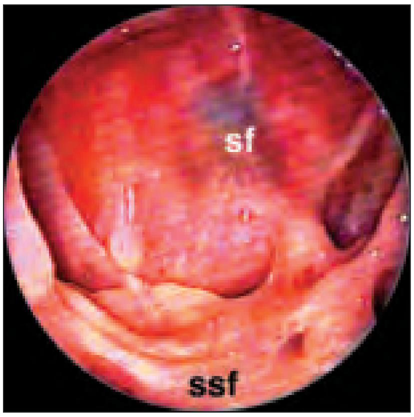


Fig. 68
Coronal T1-weighted MRI scan after administration of contrast agent: integrity of the pituitary stalk is demonstrated, the residual adenohypophysis and the disease-free suprachiasmatic cistern are visible.
is = pituitary stalk

Fig. 69
Sagittal T1-weighted MR scan after administration of contrast agent: the optic chiasm is free from compression, the configuration of the anterior recesses of the third ventricle and the course of the pituitary stalk are in normal condition.
is = pituitary stalk

Fig. 70 ▶
One month after surgery, endoscopic control. Reabsorption of the hemostatic packing and complete mucosal re-epithelialization of the sinus cavity can be demonstrated, with no signs of poorly ventilated mucosa.
sf = sellar floor
ssf = floor of the sphenoid sinus



6.2 Macroadenoma with Suprasellar Extension

Clinical Findings

The patient presented with progressive loss of vision and subsequent onset of increasing diplopia. Visual fieldtesting showed bitemporal hemianopsia. The cranial MRI scan demonstrated an expansive sellar lesion of about 2 x 1.5 x 1.2 cm in size with suprasellar extension occupying the corresponding cistern. The optic chiasm appeared compressed and displaced cranially (**Fig. 71**).

Surgical Procedure

The endonasal endoscopic access was created using a bilateral paraseptal approach with drilling of the sphenoid rostrum, after a left turbinoplasty. After drilling the intersphenoidal septa and the sellar floor, spontaneous pressure-related descent of the adenoma was visible. The sellar cavity was inspected with angled curettes, and the residual tumor was removed using grasping forceps. Intrasellar exploration was performed under irrigation (hydroscopy) and the residual adenopituitary gland was localized (**Figs. 72–73**).

Fig. 71
Sagittal T1-weighted MR scan after administration of contrast agent: Compression of the optic chiasm with its cranial displacement is clearly evident. The supraoptic and infundibular recesses of the third ventricle appear compressed and displaced cranially.
Capsule with a thickness of about 2 mm with impregnatione.
***** = tumor mass

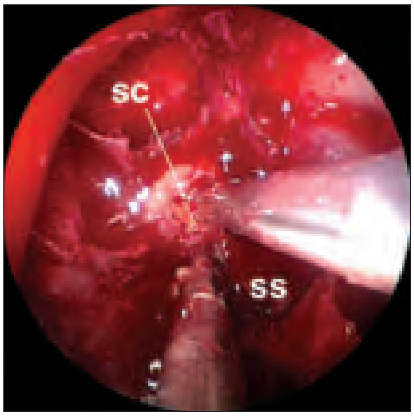


Fig. 72
Removal of the expansive lesion using grasping forceps and hemostasis by aspiration through the contralateral access.
ss = sphenoid sinus
sc = sellar cavity

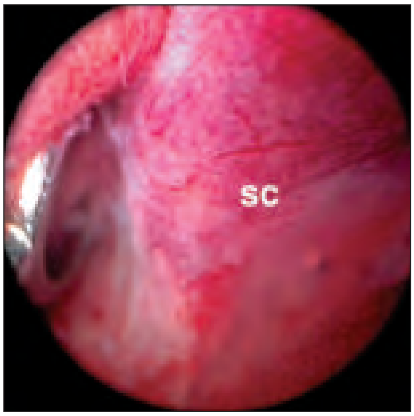


Fig. 73
Intrasellar inspection in immersion with continuous lavage (hydroscopy).
Simultaneous introduction of curette and endoscope into the intrasellar space.
The lavage helps counteract the pressure of any microhemorrhages and slows down the descent of the suprasellar cistern, which could occupy the site of surgery, masking residues of the lesion.
sc = sellar cavity

Post-operative Course

The post-operative course was normal without any neurological, ophthalmologic or endocrine complications. The patient was discharged six days after surgery.

MRI of the hypophysis, three months after surgery, shows the total removal of the expansive lesion and the absence of compression at the level of the optic chiasm or supraoptic and infundibular recesses of the third ventricle.

The visual field was tested three months after surgery and showed substantial improvement with a slight residual bitemporal visual field deficit. One year after surgery, there was no more evidence of deficits in the hypothalamic-pituitary axis (**Figs. 74–77**).

Histopathological features consistent with a null cell type non-secreting pituitary adenoma.

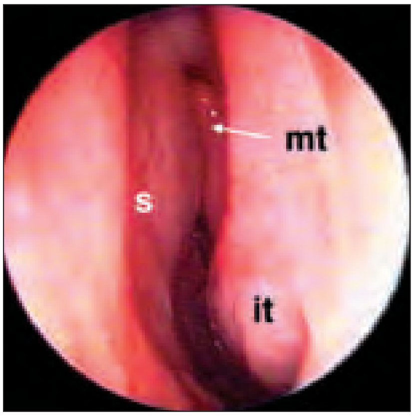


Fig. 74
Endoscopic control one month after surgery. In the right nasal fossa, the paraseptal surgical access route is visible, confirming the integrity of the middle turbinate without scars. There was no evidence of poor ventilation affecting the nasal fossae.
S = nasal septum
it = inferior turbinate
mt = middle turbinate

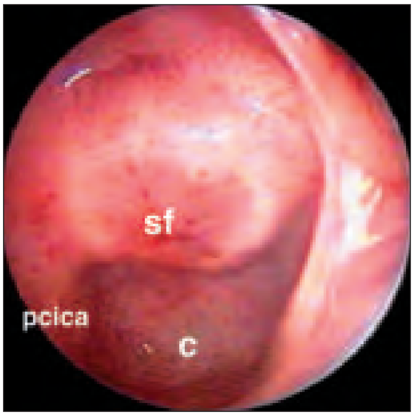


Fig. 75
Endoscopic follow-up one month after the surgery. Complete mucosal re-epithelialization of the sphenoid sinus with no signs of poor ventilation.
sf = sellar floor
c = clivus
pcica = paraclival internal carotid artery

Fig. 76
Coronal T1-weighted MR after administration of contrast agent: postoperative follow-up three months after surgery. The correct position of the pituitary stalk and residual adenohypophysis can be demonstrated.
ps = pituitary stalk
ss = sphenoid sinus

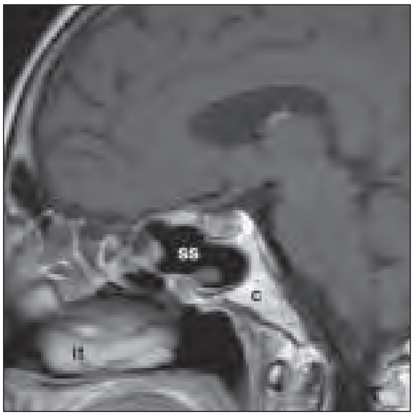


Fig. 77
Sagittal T1-weighted MR after administration of contrast agent: postoperative follow-up three months after surgery. The suprasellar cistern appears free of disease and the optic chiasm is in place.
it = inferior turbinate
sf = sellar floor
ss = sphenoid sinus

6.3 Removal of a Right Ethmoidal Meningoencephalocele with Preservation of the Middle Turbinat

Clinical Findings and Surgery

The patient was referred to us following an episode of meningitis and with a continuous CSF leak, diagnosed with a dosage of beta-2-transferrin. The surgery required removal of the herniated part of the brain and duraplasty corresponding to the bony defect, with preservation of the middle turbinate. Duraplasty was performed with the three-layer technique, using autologous and heterologous materials (**Figs. 78–85**).

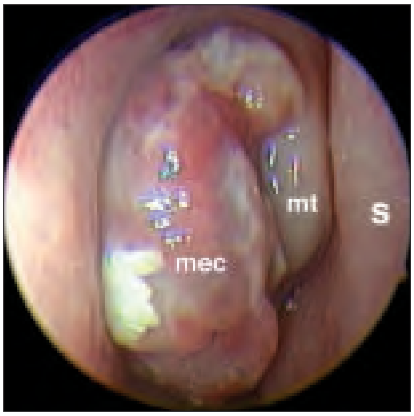


Fig. 78
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Preoperative endoscopy showing the encephalic herniation at the level of the middle meatus.
S = nasal septum
mt = middle turbinate
mec = meningoencephalocele

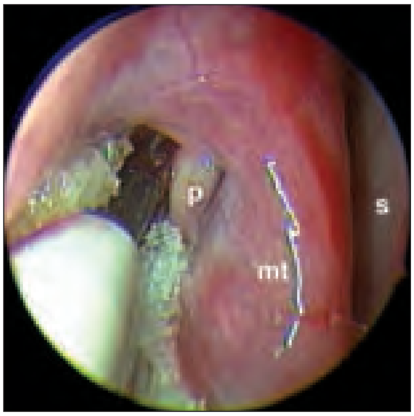


Fig. 79
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Bipolar electrocoagulation of the mass until its pedicle is reached.
S = nasal septum
mt = middle turbinate
p = pedicle of the meningoencephalocele

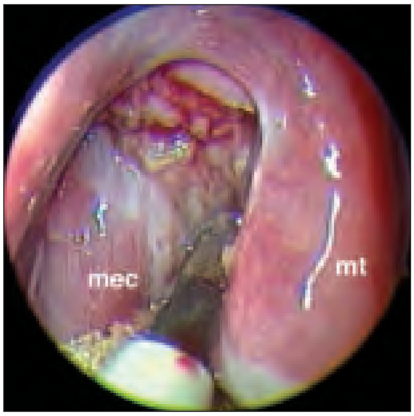


Fig. 80
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Resection of the pedicle and removal of the mass.
mt = middle turbinate
mec = meningoencephalocele

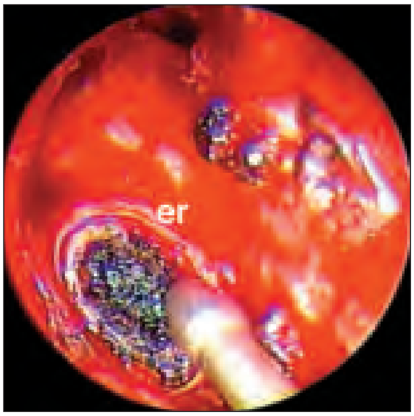


Fig. 81
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. Coagulation of the pedicle to induce its retraction.
er = ethmoidal roof

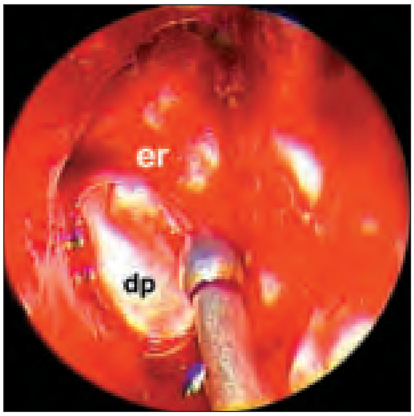


Fig. 82
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. Placement of the intracranial extradural underlay graft of dural substitute after debridement of the intracranial dural edges.
dp = patch of dural substitute
er = ethmoidal roof

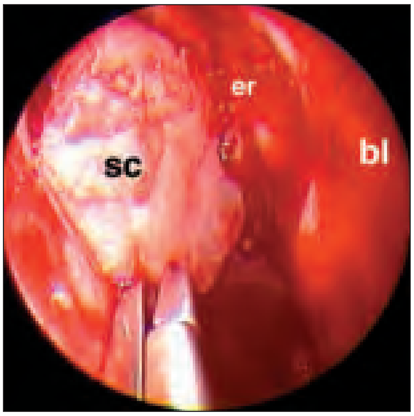


Fig. 83
Endoscopic view with 45° endoscope, diam. 4 mm, right nasal fossa. Placement of the free intracranial extradural graft of septal cartilage.
bl = basal lamella
sc = septal cartilage
er = ethmoidal roof

Fig. 84
Endoscopic view with 45° endoscope, diam. 4 mm, right nasal fossa. Placement of the free overlay graft of septal mucoperichondrium.
er = ethmoidal roof
mt = middle turbinate
smp = septal mucoperichondrium

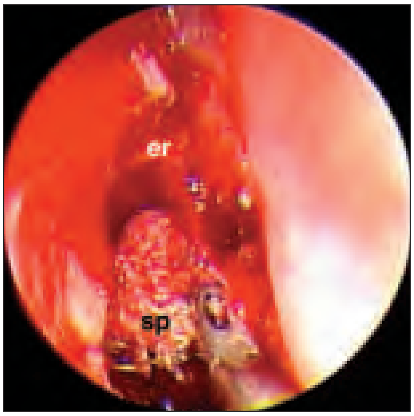


Fig. 85
Endoscopic view with 45° endoscope, diam. 4 mm, right nasal fossa. The flap is kept in a stable position by means of absorbable sponges.
er = ethmoidal roof
sp = absorbable sponges

Post-operative Course

Six months after surgery, endoscopic control and MR showed stable attachment of the muco-perichondrial flap and the absence of a CSF leak, with no signs of intracranial hypertension (**Figs. 86–87**).

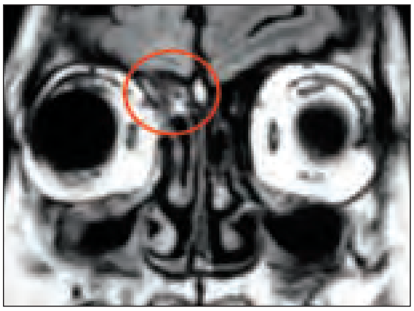


Fig. 86
MR six months after the surgery confirmed the stable attachment of the flap and continuous integrity of duraplasty.

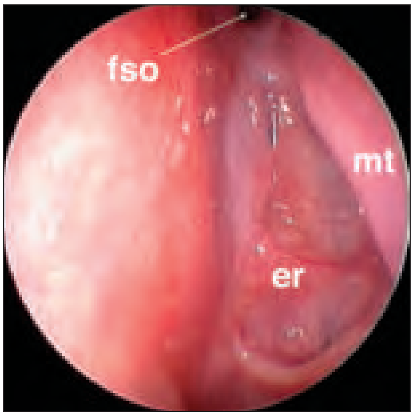


Fig. 87
Endoscopic follow-up at six months, showing healthy graft mucosa and complete closure of the defect.
Mt = middle turbinate
er = ethmoidal roof
fso = frontal sinus ostium

6.4 Removal of a Right Ethmoidal Tumor with Multilayer Centripetal Technique and Endoscopic Medial Maxillectomya

Clinical Findings and Surger

The patient was referred to us with symptoms of nasal obstruction and epistaxis. The endoscopic examination revealed a right ethmoidal neoplasm occupying nearly all of the nasal fossa. A CT without contrast and a gadolinium-enhanced MRI were performed followed by biopsy with histopathological diagnosis of an intestinal-type adenocarcinoma G3 (T4N0M0). The neoplasm was removed by centripetal endoscopic technique followed by reconstruction of the anterior skull base (**Figs. 88–100**).

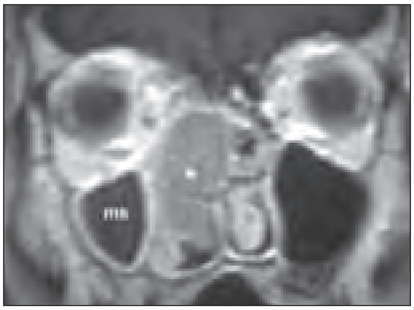
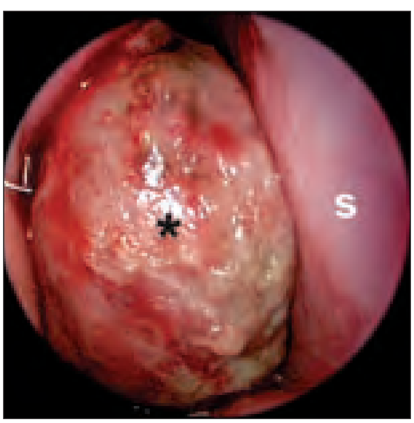


Fig. 88
The gadolinium-enhanced coronal MR scan shows a right ethmoidal neoplasm completely occupying the nasal fossa. Neither the periorbit nor the walls of the maxillary sinus show any signs of infiltration. The neoplasm appears slightly enhanced and is in contact with the dura, however there is no evidence of intracranial invasion. The maxillary sinus is filled with inflammatory fluid.
✱ = tumor mass
ms = maxillary sinus

Fig. 89 ▶
The gadolinium-enhanced axial MR scan shows a right ethmoidal neoplasm. Neither the periorbit nor the sphenoid sinus walls show any signs of infiltration. The sphenoid sinus cavity appears to be occupied by secretions.
✱ = tumor mass



◀ Fig. 90
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Preoperative endoscopy demonstrates a neoplasm completely occupying the right nasal fossa.
✱ = tumor mass
s = nasal septum

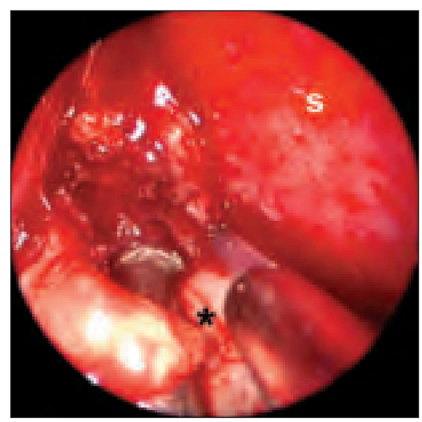


Fig. 91 ▶
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. The volume of the lesion is reduced by removing the intranasal part by use of a diode laser.
✱ = tumor mass
s = nasal septum

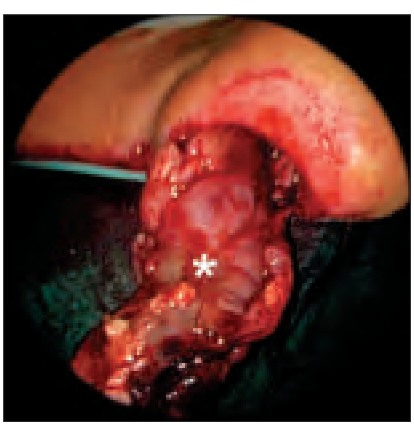


Fig. 92
External view obtained with a 0° endoscope, diam. 4 mm. Surgical removal of the intranasal part of the tumor mass through a transnasal approach.
✱ = intranasal part of the tumor mass

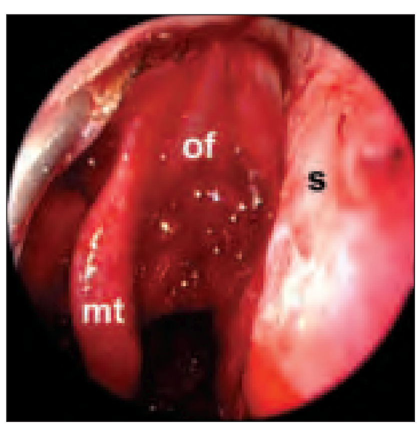


Fig. 93
Endoscopic view, 45° endoscope, diam. 4 mm, right nasal fossa. Horseshoe incision to elevate a sinonasal subperiosteal layer.
Mt = middle turbinate
of = olfactory cleft
s = nasal septum

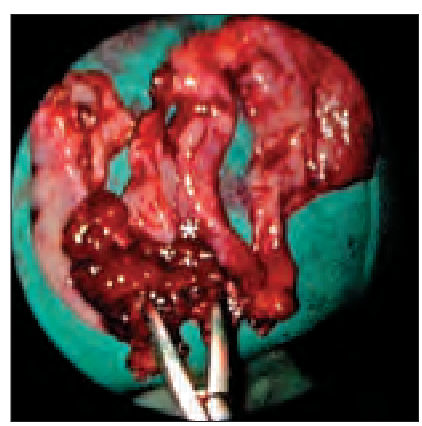


Fig. 94
External view obtained with a 0° endoscope, diam. 4 mm. Intra-operative specimen consisting of sinonasal periosteum, removed by centripetal technique, and of part of the residual tumor wrapped en bloc with the ethmoid.
✱ = sinonasal periosteum including the part of the residual tumor

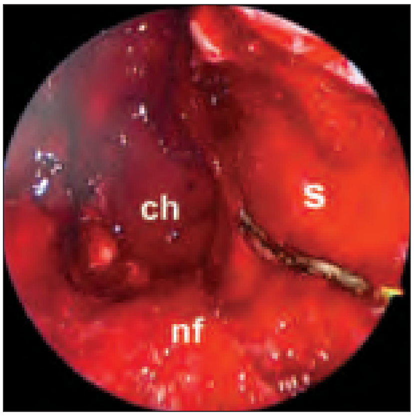


Fig. 95
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Removal of the bony margins of the "resection box" started by inferior transsection of the nasal septum, in this case performed with a diode laser.
ch = choana
nf = nasal floor
s = nasal septum

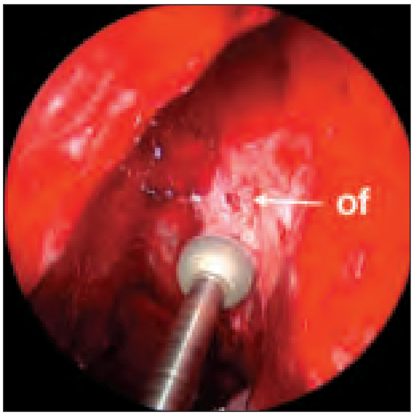


Fig. 96
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Drilling of the anterior skull base in correspondence with the olfactory cleft.
of = olfactory cleft

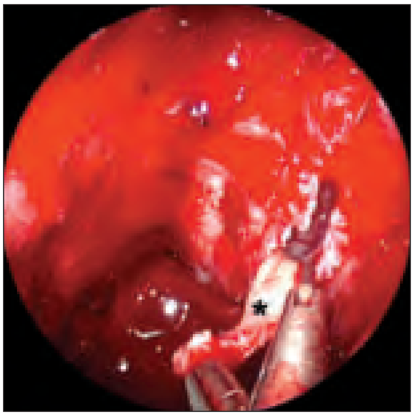


Fig. 97
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. Resection of the dura and right olfactory bulb by endonasal endoscopic approach.
***** = dura mater of the olfactory cleft, including the olfactory bulb

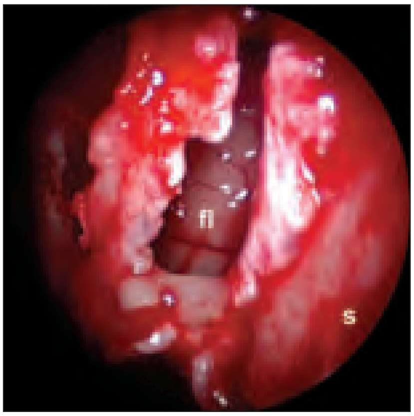


Fig. 98
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once the dura has been removed from the olfactory cleft, it is possible to localize the frontal cerebral lobe through the defect.
Fl = frontal cerebral lobe
s = nasal septum

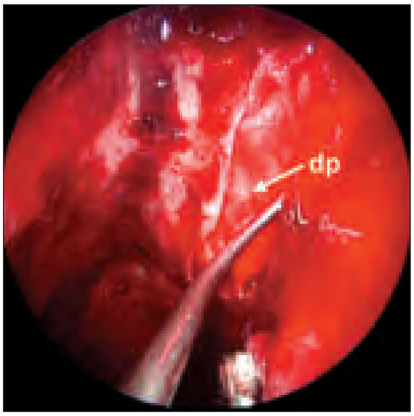


Fig. 99
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Underlay placement of the heterologous graft of dural substitute.
Dp = patch of dural substitute

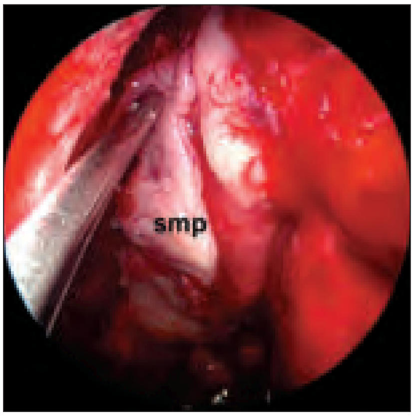


Fig. 100
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Overlay placement of the autologous graft of septal muco-perichondrium.
Smp = septal muco-perichondrium

Post-operative Course

The patient is free of disease 18 months after surgery (**Fig. 101**).

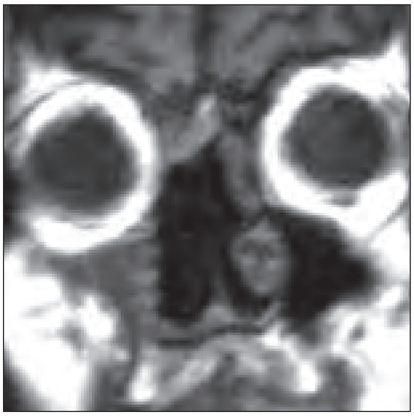


Fig. 101 ▶
Twelve months after surgery, the gadolinium-enhanced coronal MR scan shows no signs of recurrence at the ethmoidal level. There is slight uptake of contrast at the level of the ethmoidal roof indicating trophic scar after skull base duraplasty. The MRI scan also gives evidence of post-operative scar at the level of the maxillary sinus after medial maxillectomy.

6.5 Removal of a Meningoencephalocele of the Olfactory Cleft with Preservation of the Middle Turbinate

Clinical Presentation and Surgery

The three-year-old patient was referred to us with rhinorrhea and unilateral right nasal obstruction from one year. Nasal endoscopy showed a large mass, grayish in color, occupying the right nasal fossa and consistent with meningoencephalic hernia-tion. The T2-weighted MR scan confirmed the diagnosis. Removal of the lesion was performed with a direct paraseptal approach, and the skull base duraplasty was performed with three layers of dural substitute, septal cartilage and septal mucoperichondrium (**Figs. 102–104**).

Post-operative Course

Four years after surgery, the patient presented with a stable condition of the anterior skull base duraplasty (**Figs. 105–107**).

Fig. 102
T2-weighted coronal MR scan showing bulky meningoencephalic herniation completely occupying the right nasal fossa.
***** = meningoencephalocele

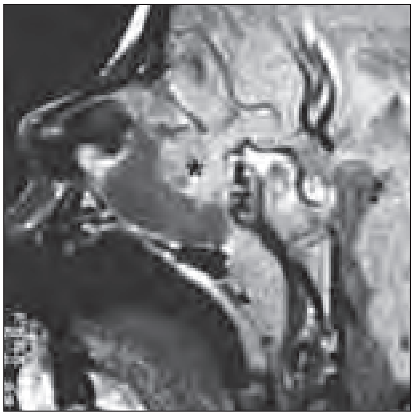


Fig. 103
Sagittal MR scan, which shows the herniated meningoencephalocele and the cribriform plate at the level of the olfactory cleft.
***** = meningoencephalocele

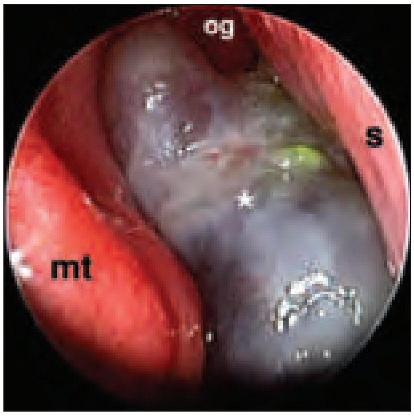


Fig. 104
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The meningoencephalocele, colored in gray, and originating from the olfactory cleft, entirely occupies the nasal fossa. The green color is due to lumbar intrathecal injection of 5% fluorescein (0.5 ml).
Mt = middle turbinate; **s** = nasal septum;
of = olfactory cleft;
***** = meningoencephalocele

Fig. 105
MR scan in coronal section confirming the correct placement of the graft and the integrity of the duraplasty.

Fig. 106
Radiological follow-up four years after surgery. The sagittal MR scan demonstrates complete resection of the meningoencephalocele and confirms integrity of the skull base at the level of the duraplasty.

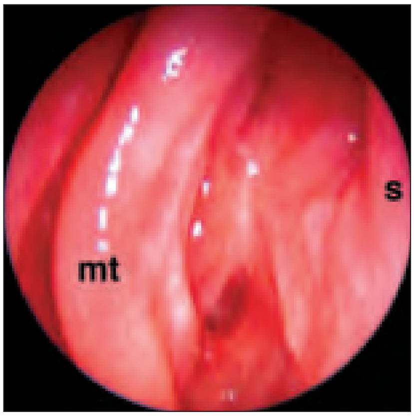


Fig. 107
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. Endoscopic follow-up four years after surgery. The muco-periosteal graft appears trophic and is in the correct place in the olfactory cleft. No signs of cerebrospinal fluid leak.

6.6 Removal of a Sinonasal Intestinal-type Adenocarcinoma by a Combined Cranioendoscopic Approach

Clinical Findings and Surgery

The patient was referred to us complaining of unilateral nasal obstruction. He had CT and MRI with contrast followed by biopsy giving histopathological evidence of an intestinal-type adenocarcinoma. To remove the mass surgery was performed using a combined cranioendoscopic approach with reconstruction of the anterior skull base (**Figs. 108–113**).

Fig. 108
Gadolinium-enhanced MR scan showing a bulky ethmoidal neoplasm with intracranial extension and pronounced enhancement.
***** = tumor mass

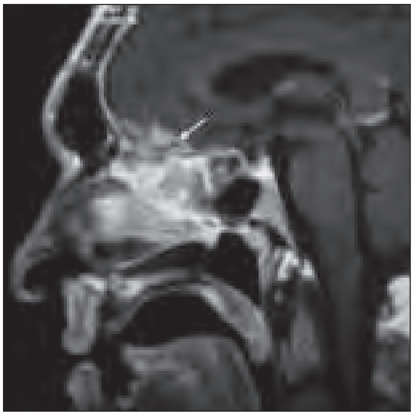


Fig. 109
Gadolinium-enhanced sagittal MR scan. The arrow indicates the intracranial extension of the neoplasm above the ethmoidal roof with invasion of the frontal cerebral lobe.

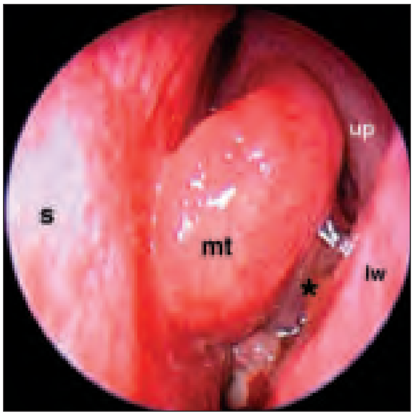


Fig. 110
Endoscopic intranasal view, 0° endoscope, diam. 4 mm, left nasal fossa. Endoscopy shows, that the neoplasm is at the level of the left middle meatus.
s = nasal septum
up = uncinate process
mt = middle turbinate
lw = lateral nasal wall
***** = vegetating part of the neoplasm

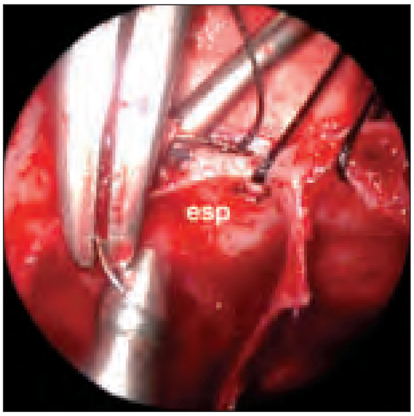


Fig. 111
Intranasal endoscopic view, 0° endoscope, diam. 4 mm. Duraplasty of the anterior skull base with suture of the pericranial flap to the ethmoidal-sphenoidal planum.
esp = ethmoidal-sphenoidal planum

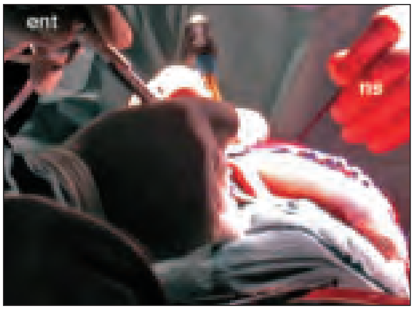


Fig. 112
External view demonstrating the simultaneous four-hands collaboration of the neurosurgeon and of the otolaryngologist.
The otolaryngologist (**ent**) holds the endoscope in the left hand and the operating instrument in the right hand, while the neurosurgeon (**ns**) holds the bipolar electrocoagulator in the right hand and the suction in the left hand.

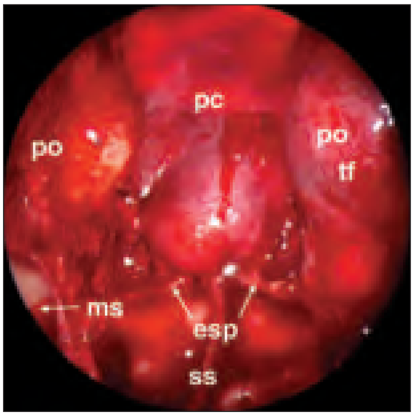


Fig. 113
Intranasal endoscopic view, 0° endoscope, diam. 4 mm. The picture shows the reconstruction of the ethmoido-sphenoidal roof using a pedicled graft of pericranium.
pc = pedicled graft of pericranium
esp = ethmoidal-sphenoidal planum
po = periorbit
ms = maxillary sinus
ss = sphenoid sinus
tf = temporal fascia

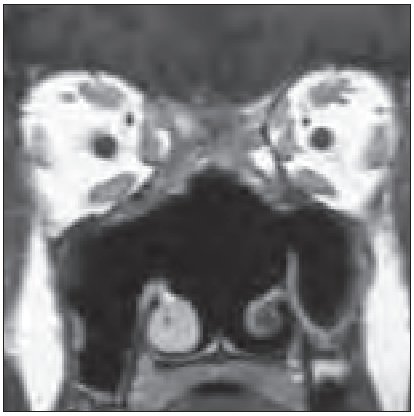


Fig. 114
MR scan in coronal section. Postoperative radiological follow-up three years after surgery confirming surgical reconstruction of the anterior skull base.

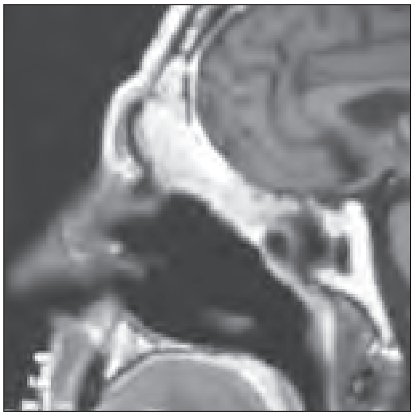


Fig. 115
MR scan in sagittal section. Postoperative radiological follow-up three years after surgery confirming surgical reconstruction of the anterior skull base.

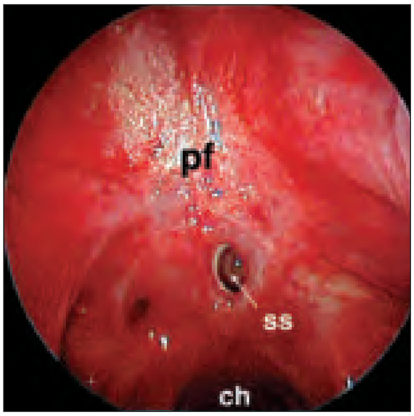


Fig. 116
At four years follow up, the pericranial flap positioned to reconstruct the anterior skull base appears trophic. There is no evidence of CSF leak or recurrence of the disease. At the level of the previously removed anterior sphenoid sinus wall, there is a central sphenoid neo-ostium due to excessive scarring.
pc = pericranial graft
ch = choana
ss = sphenoid sinus

Post-operative course

The patient had post-operative radiotherapy (56 Gy) and is free of disease four years after surgery (**Figs. 114–116**).

References

1. MAY M, HOFFMANN DF, SOBOL SM: Video endoscopic sinus surgery: a two-handed technique. Laryngoscope (1990) Apr; 100(4) :430–2.
2. BRINER HR, SIMMEN D, JONES N: Endoscopic sinus surgery: advantages of the bimanual technique. Am J Rhinol. (2005) May-Jun; 19(3): 269–73.
3. KASSAM A, SNYDERMAN CH, MINTZ A, GARDNER P, CARRAU RL: Expanded endonasal approach: the rostrocaudal axis. Part II. Posterior clinoids to the foramen magnum. Neurosurg Focus (2005); Jul 15; 19(1):E4.
4. KASSAM AB, GARDNER P, SNYDERMAN C, MINTZ A, CARRAU R: Expanded endonasal approach: fully endoscopic, completely transnasal approach to the middle third of the clivus, petrous bone, middle cranial fossa, and infratemporal fossa. Neurosurg Focus, (2005) Jul; 15:19(1):E6.
5. CASTELNUOVO P, LOCATELLI D, MAURI S, DE BERNARDI F: Extended endoscopic approaches to the skull base, anterior cranial base CSF leaks, In: de Divitiis E, Cappabianca P. (ed): Endoscopic endonasal trans-sphenoidal surgery. New York, Springer Wien, (2003), pp 137–138.
6. JHO HD: Endoscopic transsphenoidal surgery. J Neurooncol (2001) Sep; 54(2): 187–95.
7. FRANK G, SCIARRETTA V, MAZZATENTA D, FARNETI G, MODUGNO GC, PASQUINI E: Transsphenoidal endoscopic approach in the treatment of Rathke’s cleft cyst. Neurosurgery (2005) Jan; 56(1): 124–8; discussion 129.
8. DE DIVITIIS E, CAPPABIANCA P, CAVALLO LM: Endoscopic transsphenoidal approach: adaptability of the procedure to different sellar lesions. Neurosurgery. (2002) Sep;51(3):699–705; discussion 705–7.
9. CAVALLO LM, MESSINA A, CAPPABIANCA P, ESPOSITO F, DE DIVITIIS E, GARDNER P, TSCHABITSCHER M: Endoscopic endonasal surgery of the midline skull base: anatomical study and clinical considerations. Neurosurg Focus (2005); 19(1): E2 1–14.
10. CASTELNUOVO P, MAURI S, LOCATELLI D, EMANUELLI E, DELÚ G, GIULIO G: Endoscopic repair of cerbrospinal fluid rhinorrhea: learning from our failures. Am J Rhinol (2001); 15: 333–342.
11. LOCATELLI D, LEVI D, RAMPA F, PEZZOTTA S, CASTELNUOVO P: “Endoscopic approach for treatment of relapses in cystic craniopharyngiomas”; Childs Nerv Syst (2004), Nov; 20 (11-12): 863–7.

Other articles published by the same authors:

- CASTELNUOVO P, LOCATELLI D, SANTI L, EMANUELLI E, PAGELLA F, CANEVARI FR: Sinonasal Endoscopic Access To The Pituitary Gland. In: Stammberger, Wolf, eds. ERS & ISIAN Meeting 1998. Monduzzi, (1998); 337–339.
- LOCATELLI D, CASTELNUOVO P, SANTI L, CERNIGLIA M, INFUSO L: Limiti e complicanze dell’endoscopia transfenoidale. Rivista di neuroradiologia13:911-915, (2000).
- LOCATELLI D, CASTELNUOVO P, SANTI L, CERNIGLIA M, MAGHNIE M, INFUSO L: Endoscopic approaches to the cranial base: perspectives and realities. Childs Nervous System Springer Verlag 16(10-11):686-691, (2000) Nov.
- BIGNAMI M, MAURI S, DE BERNARDI F, LOCATELLI D, CASTELNUOVO P: Endoscopic Treatment of Pediatric Meningoencephalocele. Hepato-Gastroenterolog-SupplementI, volume 47, March, (2000), Pages CXCVII.
- LOCATELLI D, RAMPA F, ACCHIARDI I, SCAGNELLI P, PEZZOTTA S, CASTELNUOVO P: Transethmoidal meningoencephalocele in children: an endoscopic approach. ESPN Rome 2004 Childs Nerv Syst (2004) 20: 263.
- LOCATELLI D, RAMPA F, ACCHIARDI I, ARIENTA C, CASTELNUOVO P: Endonasal endoscopic treatment of CSF leaks and meningoencephaloceles in children. 32nd ISPN Buenos Aires 29 august–2 september 2004. Childs Nerv Syst (2004) 20: vol 8-9, 666.
- CASTELNUOVO P, LOCATELLI D: Endoscopic surgical treatment of cerebrospinal fluid rhinorrhea. Silver book (informative publication) published by Endo-Press®.
- LOCATELLI D, RAMPA F, ACCHIARDI I, BIGNAMI M, PISTOCHINI A, CASTELNUOVO P: Endoscopic endonasal approaches to anterior skullbase defects in pediatric patients; Child‘s nervous system 2006, vol. 22, no11, pp. 1411-1418.
- LOCATELLI D, RAMPA F, ACCHIARDI I, BIGNAMI M, DE BERNARDI F, CASTELNUOVO P: Endoscopic endonasal approaches for repair of CSF leaks: nine-year experience; Neurosurgery. 2006 Apr; 58(4 Suppl 2): ONS-246-56.
- CASTELNUOVO PG, BELLI E, BIGNAMI M, BATTAGLIA P, SBERZE F, TOMEI G: Endoscopic nasal and anterior craniotomy resection for malignant nasoethmoid tumors involving the anterior skull base. Skull Base. 2006 Feb;16(1):15-8.

- CASTELNUOVO PG, DELÚ G, LOCATELLI D, PADOAN G, BERNARDI FD, PISTOCHINI A, BIGNAMI M: Endonasal endoscopic duraplasty: our experience. Skull Base. 2006 Feb;16(1):19-24.
- CASTELNUOVO PG, DELÙ G, SBERZE F, PISTOCHINI A, CAMBRIA C, BATTAGLIA P, BIGNAMI M: Esthesioneuroblastoma: endonasal endoscopic treatment. Skull Base. 2006 Feb;16(1):25-30.
- CASTELNUOVO P, PISTOCHINI A, LOCATELLI D: Different surgical approaches to the sellar region: focusing on the "two nostrils four hands technique". Rhinology. 2006 Mar;44(1):2–7.
- CASTELNUOVO P, DALLAN I, PISTOCHINI A, BATTAGLIA P, LOCATELLI D, BIGNAMI M: Endonasal endoscopic repair of Sternberg's canal cerebrospinal fluid leaks. Laryngoscope. 2007 Feb;117(2):345-9.
- CASTELNUOVO P, BIGNAMI M, DELÙ G, BATTAGLIA P, BIGNARDI M, DALLAN I: Endonasal endoscopic resection and radiotherapy in olfactory neuroblastoma: our experience. Head Neck. 2007 Sep;29(9):845-50.
- NICOLAI P, CASTELNUOVO P, LOMBARDI D, BATTAGLIA P, BIGNAMI M, PIANTA L, TOMENZOLI D: Role of endoscopic surgery in the management of selected malignant epithelial neoplasms of the naso-ethmoidal complex. Head Neck. 2007 Dec;29(12):1075-82.
- BIGNAMI M, DALLAN I, TERRANOVA P, BATTAGLIA P, MICELI S, CASTELNUOVO P: Frontal sinus osteomas: the window of endonasal endoscopic approach. Rhinology. 2007 Dec;45(4):315-20.
- CASTELNUOVO P, DALLAN I, BIGNAMI M, PISTOCHINI A, BATTAGLIA P, TSCHABITSCHER M: Endoscopic endonasal management of petroclival cerebrospinal fl uid leaks: anatomical study and preliminary clinical experience. Minim Invasive Neurosurg. 2008 Dec;51(6):336-9.
- CASTELNUOVO P, BIGNAMI M, PISTOCHINI A, BATTAGLIA P, LOCATELLI D, DALLAN I: Endoscopic endonasal management of encephaloceles in children: an eight-year experience. Int J Pediatr Otorhinolaryngol. 2009 Aug;73(8):1132-6.
- LOCATELLI D, VITALI M, CUSTODI VM, SCAGNELLI P, CASTELNUOVO P, CANEVARI FR: Endonasal approaches to the sellar and parasellar regions: closure techniques using biomaterials.: Acta Neurochir (Wien). 2009 Nov;151(11):1431-7.
- BOLZONI VILLARET A, YAKIREVITCH A, BIZZONI A, BOSIO R, BIGNAMI M, PISTOCHINI A, BATTAGLIA P, CASTELNUOVO P, NICOLAI P: Endoscopic transnasal craniectomy in the management of selected sininasal malignancies. Am J Rhinol Allergy 2010 Jan-Feb, 24(1) 60-5.
- CASTELNUOVO P, DALLAN I, BATTAGLIA P, BIGNAMI M: Endoscopic endonasal skull base surgery: past, present and future. Eur Arch Otorhinolaryngol. 2010 May; 267(5):649-63. Epub 2010 Jan 9.
- BIGNAMI M, DALLAN I, BATTAGLIA P, LENZI R, PISTOCHINI A, CASTELNUOVO P: Endoscopic, endonasal management of sinonasal haemangiopericytoma: 12-year experience. J Laryngol Otol. 2010 Nov;124(11):1178-82. Epub 2010 May 4.
- CASTELNUOVO P, DALLAN I, BIGNAMI M, BATTAGLIA P, MAURI S, BOLZONI VILLARET A, BIZZONI A, TOMENZOLI D, NICOLAI P: Nasopharyngeal endoscopic resection in the management of selected malignancies: ten-year experience. Rhinology. 2010 Mar 2;48(1):84-89. [Epub ahead of print].
- LOCATELLI D, MASSIMI L, RIGANTE M, CUSTODI V, PALUDETTI G, CASTELNUOVO P, DI ROCCO C: Endoscopic endonasal transsphenoidal surgery for sellar tumors in children. Int J Pediatr Otorhinolaryngol. 2010 Nov;74(11):1298-302. Epub 2010 Sep 9.
- LOMBARDI D, TOMENZOLI D, BUTTÀ L, BIZZONI A, FARINA D, SBERZE F, KARLIGKIOTIS A, CASTELNUOVO P, NICOLAI P: Limitations and complications of endoscopic surgery for treatment for sinonasal inverted papilloma: A reassessment after 212 cases. Head Neck. 2010 Oct 21. [Epub ahead of print].

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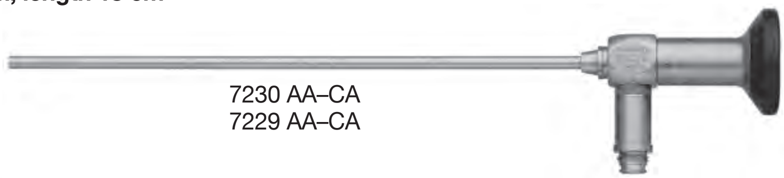

7230 AA–CA
7229 AA–CA

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autoclavable,
fiber optic light transmission incorporated,
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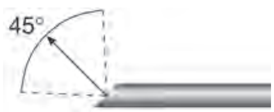

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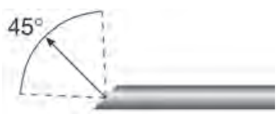
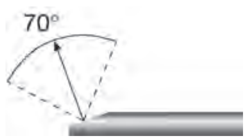


7230 FLA **HOPKINS® Forward-Oblique Telescope 45°,**
enlarged view, diameter 4 mm, length 18 cm,
autoclavable,
connection for fiber optic light cable on the left,
fiber optic light transmission incorporated,
color code: black



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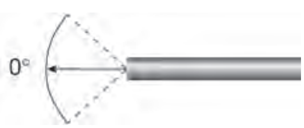

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fiber optic light transmission incorporated,
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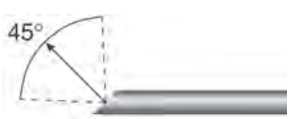

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color code: black

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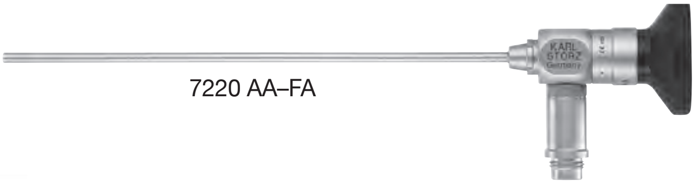
enlarged view, diameter 2.7 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: yellow

It is recommended to check the suitability of the product for the intended procedure prior to use.

HOPKINS® Telescopes – autoclavable

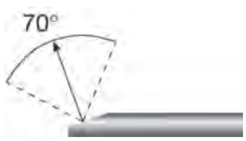
diameter 3 mm, length 14 cm



7220 AA–FA

7220 AA **HOPKINS® Straight Forward Telescope 0°,**
enlarged view, diameter 3 mm, length 14 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: green

7220 BA **HOPKINS® Forward-Oblique Telescope 30°,**
enlarged view, diameter 3 mm, length 14 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: red



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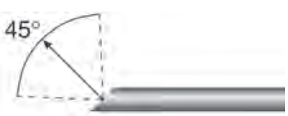
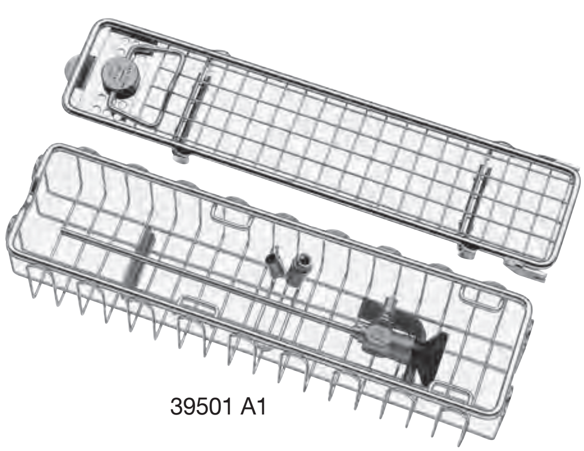
enlarged view, diameter 3 mm, length 14 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: yellow

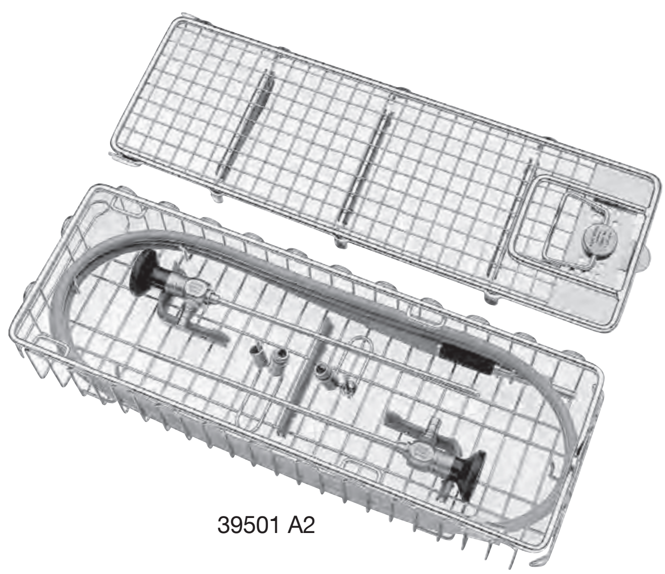


7220 FA **HOPKINS® Forward-Oblique Telescope 45°,**
enlarged view, diameter 3 mm, length 14 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: black

Wire Tray for Cleaning, Sterilization and Storage



39501 A1



39501 A2

39501 A1 **Wire Tray for Cleaning, Sterilization and Storage**
NEW
of one rigid endoscope, including holder for light post adaptors, silicone telescope holders and lid, external dimensions (w x d x h): 290 x 60 x 52 mm, for rigid endoscopes with up to 5 mm diameter and 20 cm working length

39501 A2 **Wire Tray for Cleaning, Sterilization and Storage,**
of two rigid endoscopes and one light cable, including holder for adaptors, silicone telescope holders and lid, external dimensions (w x d x h): 352 x 125 x 54 mm, for rigid endoscopes with up to diameter 10 mm and working length 20 cm

KARL STORZ CLEARVISION® II System

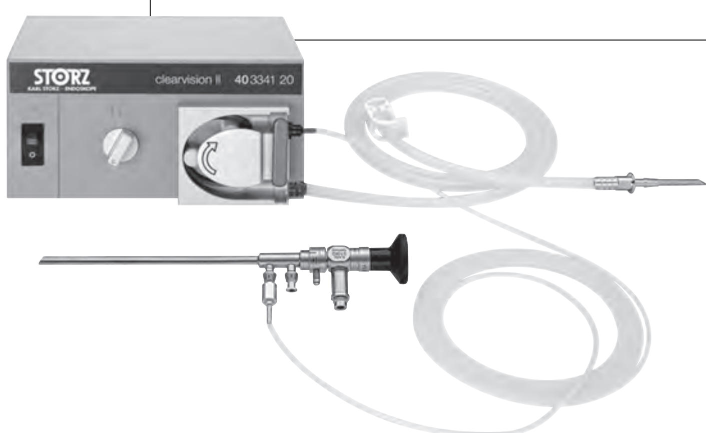
for intra-operative irrigation of the telescope lens

One-pedal footswitch

20 0142 30

UNIT SIDE

PATIENT SIDE

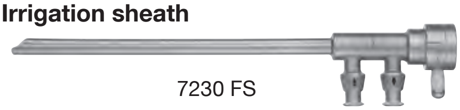


Silicone tubing set*

40 3341 40

40 3341 01 **KARL STORZ CLEARVISION® II Set,**
Lens irrigation system for telescopes,
power supply: 100–240 VAC, 50–60 Hz
including:
CLEARVISION® II
Mains Cord
One-pedal Footswitch
Silicone Tubing Set

Irrigation sheath



7230 FS

)*Optional Accessories:
MTP 031229-10 Single-use tubing set.
For use with KARL STORZ CLEARVISION® II. Sterile, 10 per pack

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KARL STORZ CLEARVISION® II

Irrigation Sheath for use with CLEARVISION® II System

Irrigation Sheath, proximally reinforced for use with Adjustable Holder 28272 RKB 				**Compatible HOPKINS® Telescopes** 			
Detail	**Order No.**	**Outer Diameter**	**Working length**	**Order No.**	**View**	**Outer Diameter**	**Working length**
	7230 AS	4.8 x 6.0 mm	14 cm	7230 AA	0°	4.0 mm	18 cm
	7230 BS	4.8 x 6.0 mm	14 cm	7230 BA	30°	4.0 mm	18 cm
	7230 FS	4.8 x 6.0 mm	14 cm	7230 FA	45°	4.0 mm	18 cm
	7230 CS	4.8 x 6.0 mm	14 cm	7230 CA	70°	4.0 mm	18 cm
	7220 AS	3.7 x 4.8 mm	10 cm	7220 AA	0°	3.0 mm	14 cm
	7220 BS	3.7 x 4.8 mm	10 cm	7220 BA	30°	3.0 mm	14 cm
	7220 FS	3.7 x 4.8 mm	10 cm	7220 FA	45°	3.0 mm	14 cm
	7220 CS	3.7 x 4.8 mm	10 cm	7220 CA	70°	3.0 mm	14 cm
	7219 AS	3.5 x 4.7 mm	14 cm	7229 AA	0°	2.7 mm	18 cm
	7219 BS	3.5 x 4.7 mm	14 cm	7229 BA	30°	2.7 mm	18 cm
	7219 FS	3.5 x 4.7 mm	14 cm	7229 FA	45°	2.7 mm	18 cm
	7219 CS	3.5 x 4.7 mm	14 cm	7229 CA	70°	2.7 mm	18 cm
	7230 AES	4,8 x 6 mm	14 cm	7230 AE	15°– 90°	4 mm	18 cm

Elevators, Curettes and Knives

479100

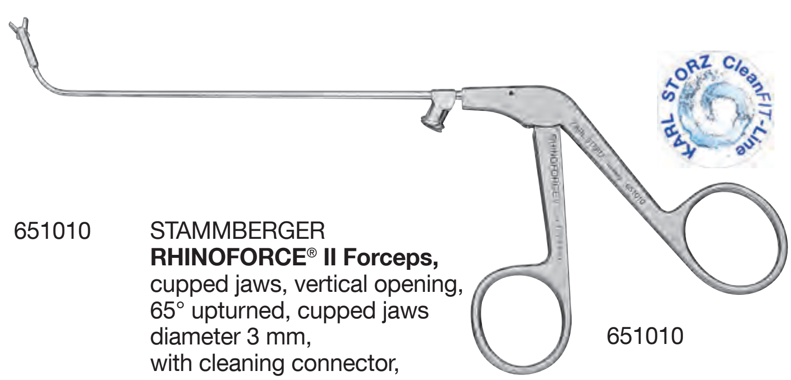
660500

660506

628702
628712–
628714

479100	COTTLE **Elevator,** double-ended, semisharp and blunt, graduated, length 20 cm	628702	**Antrum Curette,** oblong, small size, length 19 cm
660500	**Sickle Knife,** slightly curved, pointed, length 18 cm	628712	KUHN-BOLGER **Frontal Sinus Curette,** 55° curved, oval, forward cutting, length 19 cm
660506	**Round Knife,** vertical cutting, 3.5 x 2.5 mm, length 18 cm	628714	**Same,** 90° curved
660509	**Round Knife,** angled 45°, diameter 2 mm, length 18 cm		

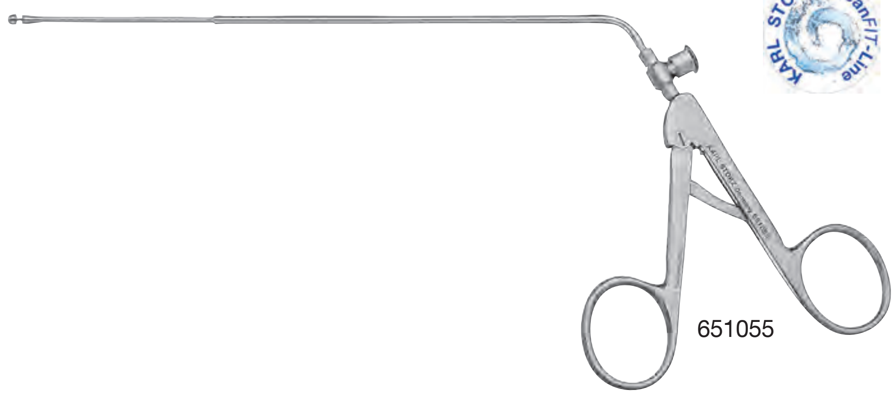
STAMMBERGER **RHINOFORCE® II Forceps**



651010 STAMMBERGER **RHINOFORCE® II Forceps,** cupped jaws, vertical opening, 65° upturned, cupped jaws diameter 3 mm, with cleaning connector, working length 12 cm

651020 **Same**, horizontal opening

STAMMBERGER **Punch**



651055

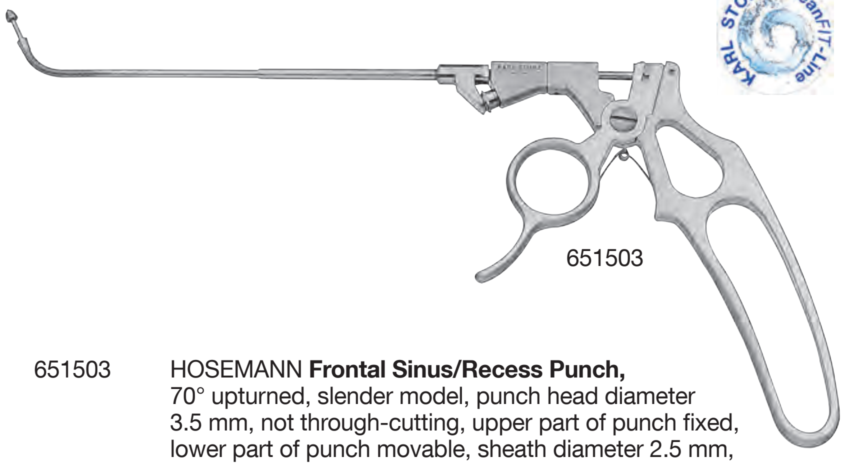
651055	STAMMBERGER **Punch,** circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 3.5 mm, with cleaning connector, working length 18 cm, including Cleaning Tool 651050 R
651050	**Same,** diameter 4.5 mm
651060	STAMMBERGER **Punch,** circular cutting, 65° upturned, for frontal sinus recess, diameter 3.5 mm, with cleaning connector, working length 17 cm, including Cleaning Tool 651050 R
651065	**Same,** diameter 4.5 mm
651061	STAMMBERGER **Punch,** egg-shaped tip, circular cut, 90° cutting direction, tip diameter 3.5 mm, sheath 65° upturned, for frontal sinus recess, with cleaning connector, working length 17 cm
651066	**Same,** diameter 4.5 mm

Cleaning Tool

651050 R

651050 R	**Cleaning Tool,** for circular cutting punches type 651050 / 651055 / 60 / 65, double-ended, length 14 cm

HOSEMANN **Frontal Sinus/Recess Punch**
HOSEMANN **Sphenoid Punch**
with integrated irrigation channel



651503

651503 HOSEMANN **Frontal Sinus/Recess Punch,**
70° upturned, slender model, punch head diameter 3.5 mm, not through-cutting, upper part of punch fixed, lower part of punch movable, sheath diameter 2.5 mm, integrated irrigation channel with LUER-Lock, working length 13 cm

651504 HOSEMANN **Sphenoid Punch,**
straight, slender model, punch head diameter 3.5 mm, not through-cutting, front part of punch fixed, rear part of punch movable, sheath diameter 2.5 mm, integrated irrigation channel with concealed LUER-Lock irrigation adaptor, working length 13 cm

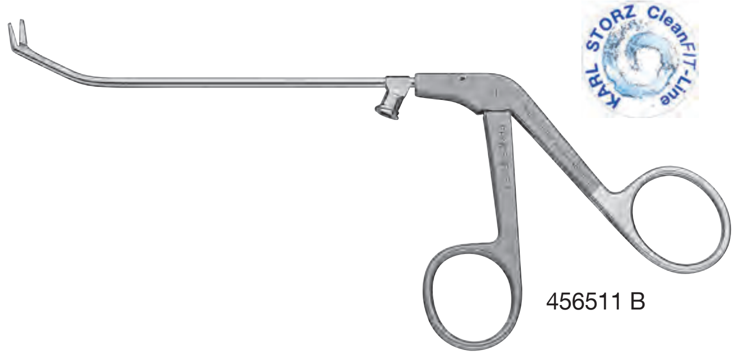
BLAKESLEY **RHINOFORCE® II Nasal Forceps**

456000 B

456000 B BLAKESLEY **RHINOFORCE® II Nasal Forceps,** straight, size 0, with cleaning connector, working length 13 cm

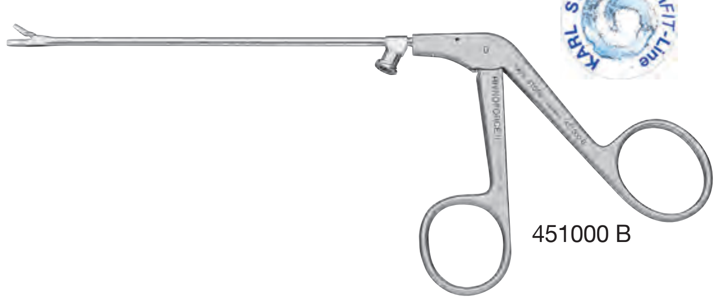
456500 B BLAKESKEY-WILDE **RHINOFORCE® II Nasal Forceps,** 45° upturned, size 0, with cleaning connector, working length 13 cm

BLAKESLEY-CASTELNUOVO **RHINOFORCE® II Nasal Forceps**
end of sheath 25° upturned



456511 B BLAKESLEY-CASTELNUOVO **RHINOFORCE® II Nasal Forceps,** end of sheath 25° upturned, jaws 45° angled upwards, width 3.5 mm, with cleaning connector, working length 13 cm

GRÜNWALD-HENKE **RHINOFORCE® II Nasal Forceps**



451000 B GRÜNWALD-HENKE **RHINOFORCE® II Nasal Forceps,** straight, through-cutting, tissue-sparing, BLAKESLEY shape, size 0, width 3 mm, with cleaning connector, working length 13 cm

451500 B **Same,** 45° upturned

BLAKESLEY-CASTELNUOVO **RHINOFORCE® II Nasal Forceps**

end of sheath 25° upturned

456010 B

456009 B **BLAKESLEY-CASTELNUOVO**
RHINOFORCE® II Nasal Forceps,
end of sheath 25° upturned, with straight jaw,
width 2.5 mm, with cleaning connector,
working length 13 cm

456010 B BLAKESLEY-CASTELNUOVO
RHINOFORCE® II Nasal Forceps,
end of sheath 25° upturned, with straight jaws,
width 3 mm, with cleaning connector,
working length 13 cm

456509 B **Same,** jaws 45° upturned, width 2.5 mm

456510 B **Same,** jaws 45° upturned, width 3 mm

451010 B CASTELNUOVO **RHINOFORCE® II Nasal Forceps,**
end of sheath 25° upturned, through-cutting,
with straight jaws, BLAKESLEY shape, width 3 mm,
with cleaning connector, working length 13 cm

451510 B **Same,** jaws 45° upturned

SilCut® Nasal Forceps

Special features:

- **Tactile instrument feedback**
- **Uniform patented force transmission**
- **Powerful resection under precise control**
- **Accurate incision due to small tolerances**
- **Special cutting geometry to prevent tissue from slipping**
- **Large aperture angle**
- **Flat jaws**
- **Through-cutting and backward-cutting versions also available**

456021 GRÜNWALD-HENKE **SilCut® Nasal Forceps,** straight, not through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled grasping and removal of tissue, cartilage and bone fragments, new ergonomic handle design, BLAKESLEY shape, size 1, with cleaning connector, working length 13 cm

456521 **Same,** 45° upturned

451020 GRÜNWALD-HENKE **SilCut® Nasal Cutting Forceps,** straight, through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, BLAKESLEY shape, size 0, with cleaning connector, working length 13 cm

451021 **Same,** size 1

451520 GRÜNWALD-HENKE **SilCut® Nasal Cutting Forceps,** 45° upturned, through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, BLAKESLEY shape, size 0, with cleaning connector, working length 13 cm

451521 **Same,** size 1

459151 STAMMBERGER **SilCut® Antrum Punch,** extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, right side downward and forward cutting, with cleaning connector, working length 10 cm

459152 **Same,** left side downward and forward cutting

459161 **SilCut® Antrum Punch,** right side upward and forward cutting, sheath distally curved right, with cleaning connector, working length 10 cm

459162 **Same,** left side upward and forward cutting, sheath distally curved left

452011 MACKAY-GRÜNWALD **SilCut® Nasal Cutting Forceps,** straight, through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, size 1, 8 x 3 mm, with cleaning connector, working length 13 cm

452021 **SilCut® Nasal Cutting Forceps,** straight, through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, width of cut 1.5 mm, with cleaning connector, working length 13 cm

452031 **Same,** jaws upturned 15°

RHINOFORCE® II Nasal Scissors

449211–
449213

449211 **RHINOFORCE® II, Nasal Scissors,**
straight, small model, length of cut 10 mm,
with cleaning connector, working length 13 cm

449212 **Same,** curved to right

449213 **Same,** curved to left

RHINOFORCE® II Miniature Nasal Forceps

452831

452831 **RHINOFORCE® II Miniature Nasal Forceps,**
with extra fine flat jaws, through-cutting, tissue-sparing,
straight sheath, straight jaws, width of cut 1.5 mm,
with cleaning connector, working length 13 cm

452832 **Same,** jaws upturned 45°

452833 **Same,** sheath curved 30°, straight jaws

452834 **Same,** sheath curved 30°, jaws 45° upturned

CASTELNUOVO **RHINOFORCE® II Miniature Nasal Forceps**

452841

452841 CASTELNUOVO **RHINOFORCE® II Miniature Nasal Forceps,**
with extra fine flat jaws, through-cutting, tissue-sparing, 65° upturned, backward opening, width of cut 1.5 mm, with cleaning connector, working length 13 cm

452841 L **Same,** left side opening

452841 R **Same,** right side opening

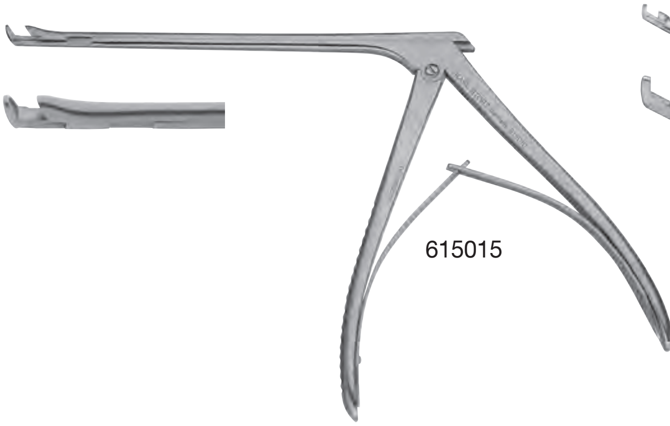
HEUWIESER **Antrum Grasping Forceps**

653000

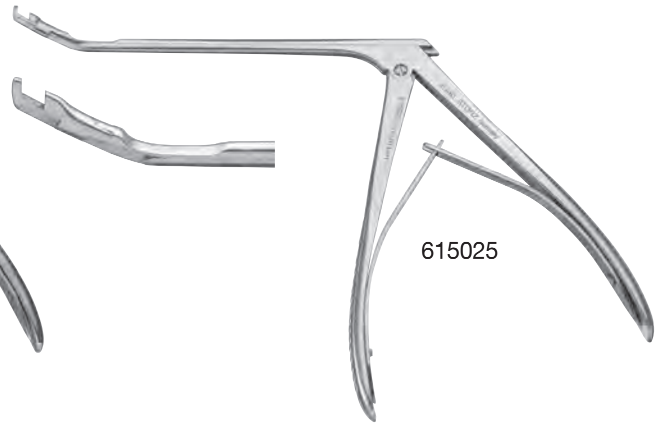
653000 HEUWIESER **Antrum Grasping Forceps,**
jaws curved downwards,
fixed jaw curved 90°, movable jaw backward opening 120°,
with cleaning connector,
working length 10 cm

653005 HEUWIESER **Antrum Grasping Forceps,**
with extra long curve for anterior alveolar recess,
fixed jaw curved downwards 115°,
movable jaw backward opening up to 140°,
with cleaning connector, working length 10 cm

CASTELNUOVO **Sphenoid Punch**



615015

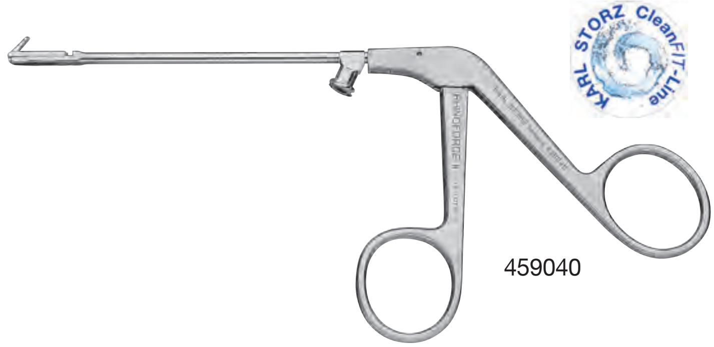


615025

615015 CASTELNUOVO **Sphenoid Punch,**
rigid, 65° upbiting forward cutting,
size 3.5 x 3.7 mm, fixed jaw extra thin,
working length 11 cm

615025 NEW CASTELNUOVO **Sphenoid Punch,**
rigid, 30° upturned, not through-cutting,
upbiting forward cutting, fixed jaw extra flat,
size 2 x 2 mm, working length 11 cm

PARSONS **RHINOFORCE® II Punch**



459040

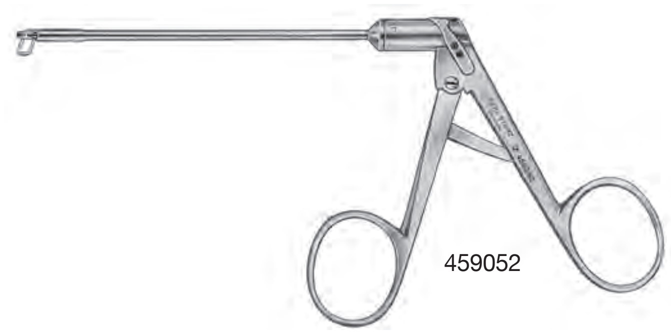
459040 PARSONS **RHINOFORCE® II Punch,**
for partial resection of the uncinate process,
upside backward cutting, movable jaw with round tip,
diameter 2.5 mm, with cleaning connector,
working length 10 cm

OSTRUM **Rotating Antrum Punch**

459097 **Rotating Punch,** for resection
of the uncinate process,
with set screw, backward cutting,
sheath slightly curved downwards,
small size, bite 2.3 x 4 mm,
with cleaning connector,
working length 9 cm

459097

STAMMBERGER **Antrum Punch**



459051 STAMMBERGER **Antrum Punch,**
right side downward and forward cutting,
working length 10 cm

459052 **Same,** left side downward and forward cutting

CASTELNUOVO **TAKE-APART® Bipolar Forceps**

bipolar

462020 *NEW*

CASTELNUOVO **TAKE-APART® Bipolar Forceps**
with fine jaws, width 2 mm, distally angled 45°,
outer diameter 3.4 mm, working length 14 cm,
with irrigation connection for cleaning,
including:
Handle
Outer Sheath
Inner Sheath
Bipolar Insert

CASTELNUOVO **Frontal Sinus Probe and Positioning Instrument**

629820

629820 **Probe,** double-ended, maxillary sinus ostium seeker, ball-shaped ends diameter 1.2 and 2 mm, length 19 cm

629822

629822 *NEW* CASTELNUOVO **Positioning Instrument,** double-ended, curved/double curved, with 4 spikes, length 22 cm

629823

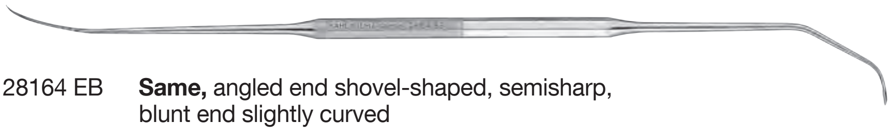
629823 *NEW* CASTELNUOVO **Positioning Instrument,** double-ended, straight/curved 60°, with 4 spikes, length 22 cm

629824

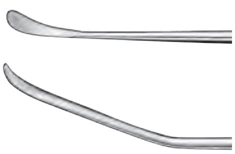
629824 CASTELNUOVO **Frontal Sinus Probe,** curved, double-ended, length 22 cm

CASTELNUOVO **Elevators, double-ended**

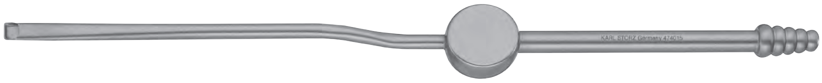

28164 EA CASTELNUOVO **Elevator,** double-ended,
semisharp and blunt, length 26 cm

28164 EB **Same,** angled end shovel-shaped, semisharp,
blunt end slightly curved




28164 EC **Same,** blunt end angled,
semisharp end slightly curved, graduated




474015 CASTELNUOVO **Suction Elevator,**
flat tip, 5 x 1.8 mm, lateral suction opening, bayonetshaped,
with grip plate, length 21 cm


474016 CASTELNUOVO **Suction Elevator,**
flat tip, 3 x 1.8 mm, lateral suction opening, bayonetshaped,
with grip plate, length 21 cm


474017 NEW CASTELNUOVO **Suction Elevator,**
5 x 1.8 mm, double curved, length 21 cm

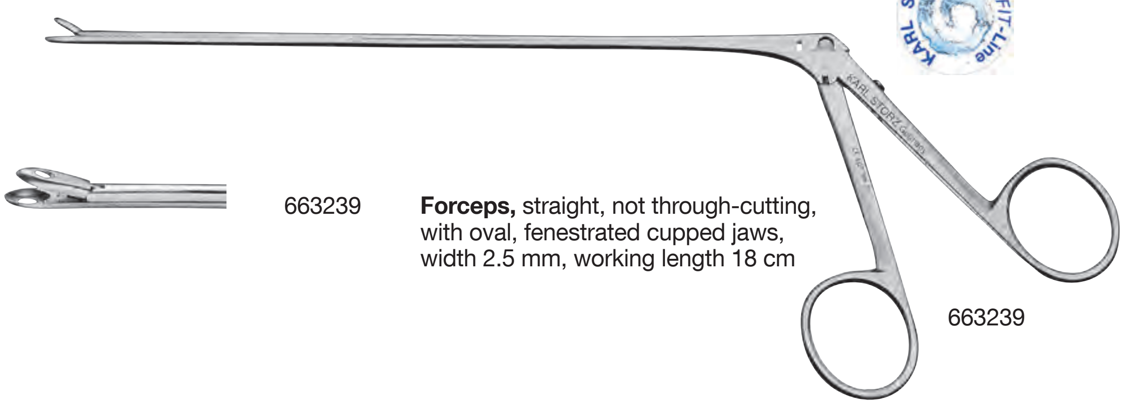

474018 NEW CASTELNUOVO **Suction Elevator,**
3 x 1.8 mm, double curved, length 21 cm

STRÜMPEL **Nasal Forceps**

634825 A

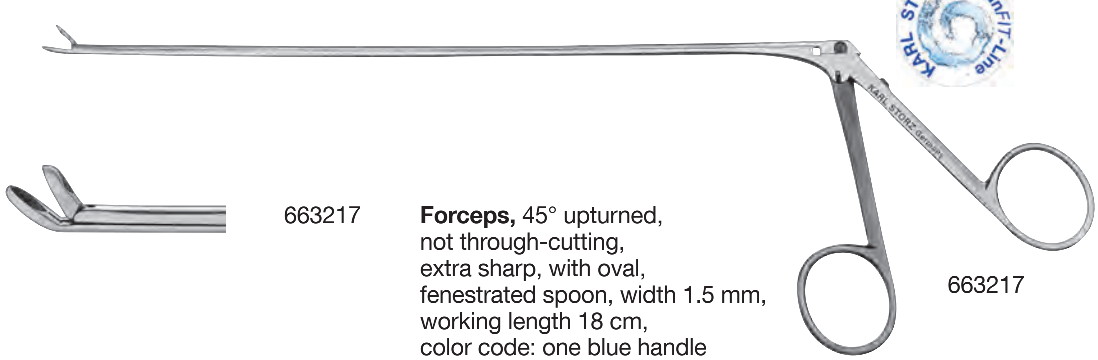
634825 A	STRÜMPEL **Forceps,** with oval, fenestrated, cupped jaws, 45° upturned, width 2.5 mm, working length 12.5 cm

Forceps



663239	**Forceps,** straight, not through-cutting, with oval, fenestrated cupped jaws, width 2.5 mm, working length 18 cm

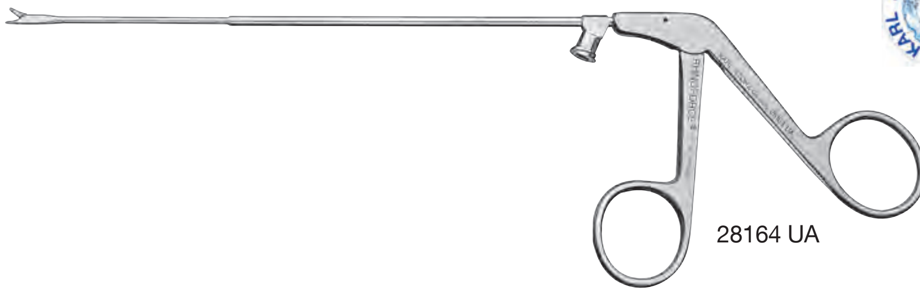
663239



663217	**Forceps,** 45° upturned, not through-cutting, extra sharp, with oval, fenestrated spoon, width 1.5 mm, working length 18 cm, color code: one blue handle

663217

RHINOFORCE® II Nasal Forceps



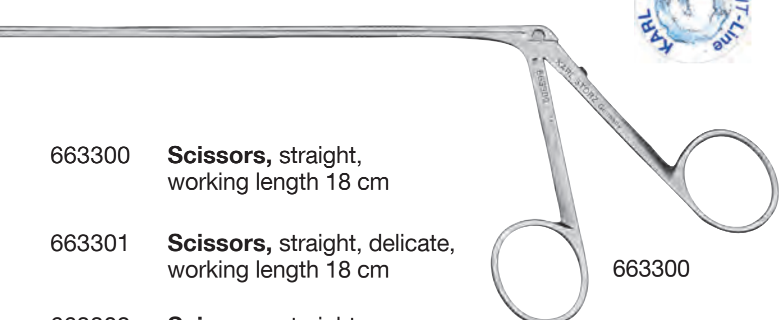
28164 UA

28164 UA **RHINOFORCE® II Nasal Forceps,** with extra fine flat jaws, through-cutting, tissue sparing, width of cut 1.5 mm, straight sheath, straight jaws, with cleaning connector, working length 18 cm

28164 UB **Same,** jaws angled upwards 45°

28164 UE **Same,** jaws angled downwards 45°

Scissors



663300

663300 **Scissors,** straight, working length 18 cm

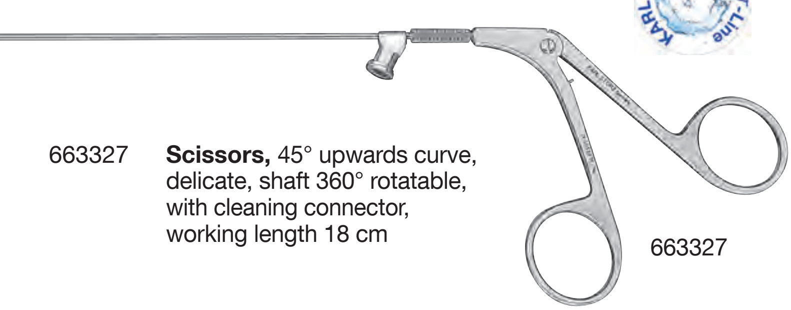
663301 **Scissors,** straight, delicate, working length 18 cm

663302 **Scissors,** straight, extra delicate, working length 18 cm

663304 **Same,** curved to right

663305 **Same,** curved to left

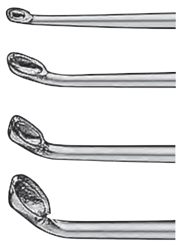
663307 **Same,** 45° curved upwards



663327

663327 **Scissors,** 45° upwards curve, delicate, shaft 360° rotatable, with cleaning connector, working length 18 cm

Curettes, Dissectors and Elevators



28164 KA	**Curette,** round spoon, tip slightly angled, size 1 mm, with round handle, length 23 cm
28164 KB	CAPPABIANCA-de DIVITIIS **Curette,** round spoon, tip slightly angled, size 2 mm, with round handle, length 23 cm
28164 KF	**Curette,** round spoon, tip highly angled, size 2 mm, with round handle, length 23 cm
28164 KG	**Same,** size 3 mm

28164 RN	CAPPABIANCA-de DIVITIIS **Ring Curette,** with round wire, inner diameter 3 mm, tip angled 45°, with round handle, length 25 cm
28164 RE	**Same,** malleable
28164 RO	CAPPABIANCA-de DIVITIIS **Ring Curette,** with round wire, inner diameter 5 mm, tip angled 45°, with round handle, length 25 cm
28164 RJ	**Same,** malleable
28164 RI	CAPPABIANCA-de DIVITIIS **Ring Curette,** with round wire, inner diameter 3 mm, tip angled 90°, with round handle, length 25 cm
28164 RG	**Same,** inner diameter 5 mm
28164 RB	CAPPABIANCA-de DIVITIIS **Ring Curette,** with round wire, inner diameter 3 mm, laterally curved sheath end, with round handle, length 25 cm
28164 RD	CAPPABIANCA-de DIVITIIS **Ring Curette,** with round wire, inner diameter 5 mm, laterally curved sheath end 90°, with round handle, length 25 cm
28164 RW	**Same,** inner diameter 7 mm
28164 RR	CAPPABIANCA-de DIVITIIS **Curette,** blunt, stirrup-shape, with round handle, length 25 cm

28164 DA	**Dissector,** sharp, tip angled 45°, round spatula, with round handle, size 2 mm, length 23 cm
28164 DB	**Same,** size 3 mm
28164 DF	**Dissector,** sharp, tip angled 15°, flat long spatula, with round handle, size 1.5 mm, length 23 cm
28164 DS	**Elevator,** sharp, tip angled 15°, slightly curved spatula, with round handle, size 2 mm, length 23 cm
28164 DM	**Elevator,** sharp, straight tip, slightly curved spatula, with round handle, size 3 mm, length 23 cm

de DIVITIIS-CAPPABIANCA **Scalpel**
Round Knife

28164 M — de DIVITIIS-CAPPABIANCA **Scalpel,** with retractable blade,
including:
Handle
Outer Sheath
Micro Knife, pointed

28164 KK — de DIVITIIS-CAPPABIANCA **Scalpel,** with retractable blade,
including:
Handle
Outer Sheath
Micro Knife, sickle-shaped

28164 MP — **Round Knife,** vertical, oval, with round handle, 3.5 x 2.5 mm, length 25 cm

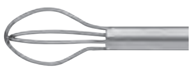
de DIVITIIS-CAPPABIANCA **Suction Curettes,**
with stylet, basket-shaped and hook-shaped

28164 RSB

28164 RSB — CAPPABIANCA-de DIVITIIS **Suction Curette,** blunt, inner diameter 5 mm, tip angled 45°, LUER, length 25 cm

28164 RSC — **Same,** inner diameter 7 mm

28164 RT — CAPPABIANCA-de DIVITIIS **Suction Curette,** with basket, round, size 5 mm, rotatable tube, LUER, length 25 cm



28164 RU — **Same,** size 6.5 mm

28164 HKL — **Hook Curette,** curved to left, hook width 2.5 mm, hook size 0.5 mm, length 25 cm

28164 HKR — **Hook Curette,** curved to right, hook width 2.5 mm, hook size 0.5 mm, length 25 cm

CASTELNUOVO **Hook and Suction Tube**

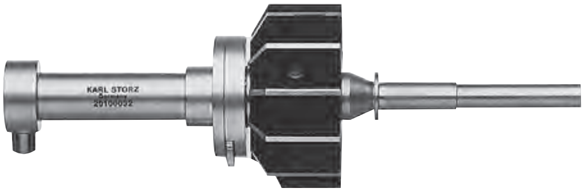
28164 H

28164 H CASTELNUOVO **Hook,** 90°, blunt,
with round handle, length 25 cm

28164 X

28164 X CASTELNUOVO **Suction Tube,** diameter 2 mm, malleable,
lateral suction holes, working length 25 cm

Fluorescein Blue Filter System



20100032

20100032 **Fluorescein Blue Filter System** for fluorescence diagnosis,
with 2 rotatable integrated blue filters of different spectral
characteristic and additional passage for white light illumination,
for use with **KARL STORZ** cold light fountains and
fiber optic light cables. The use of fluorescein barrier filter
20100033 is recommended

20100033

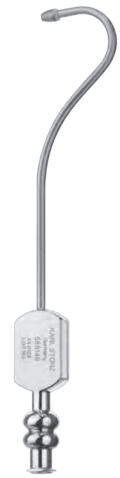
20100033 **Fluorescein Barrier Filter,** for use with fluorescein blue filter
systems **20**100032 and HOPKINS® telescopes series 7230,
for visual observation or for connection to **KARL STORZ**
Endovision® video cameras

Antrum Cannulas

586125-586130

586225-586230

586145



586146

586125 v. EICKEN **Antrum Cannula,** LUER-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm

586130 **Same,** outer diameter 3 mm

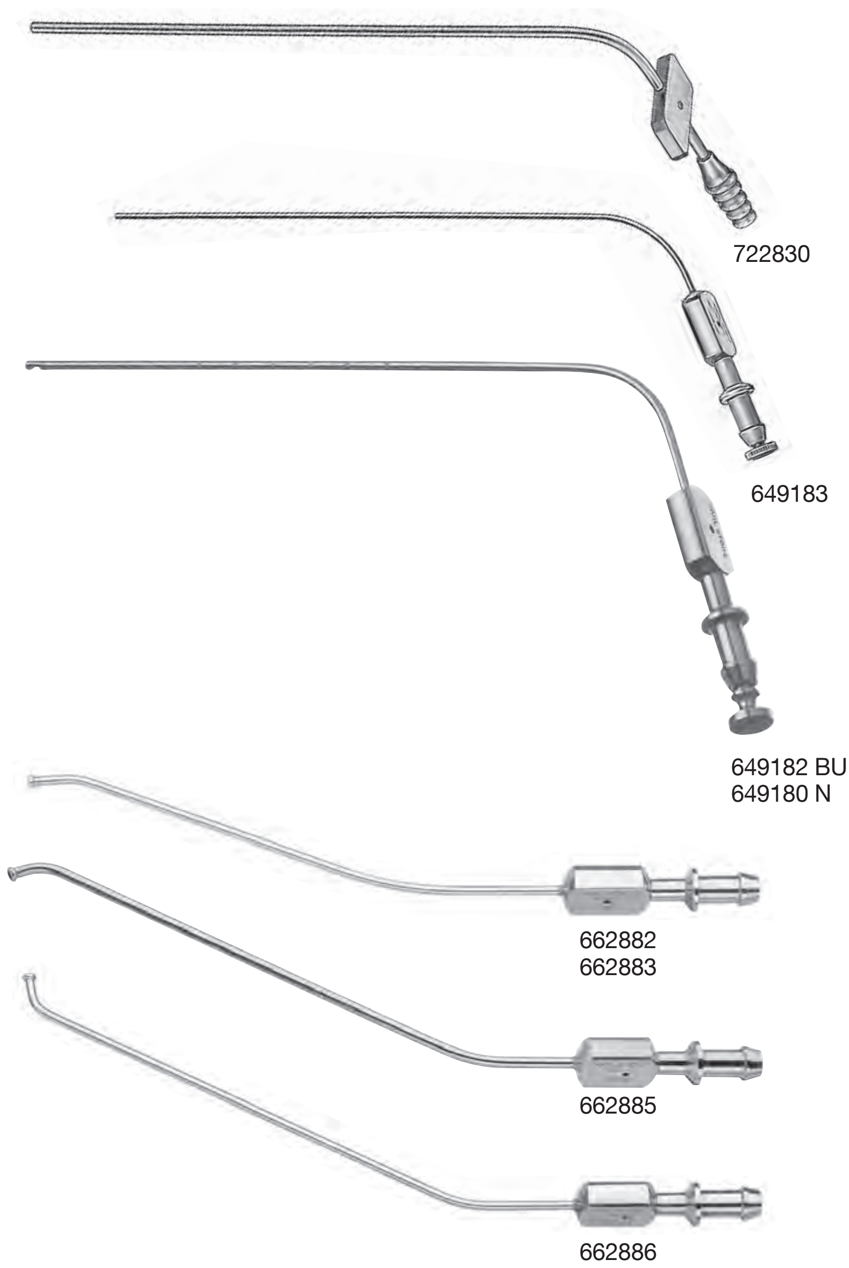
586225 v. EICKEN **Antrum Cannula,** LUER-Lock, short curved, outer diameter 2.5 mm, length 12.5 cm

586230 **Same,** outer diameter 3 mm

586145 v. EICKEN-CASTELNUOVO **Antrum Cannula,** LUER-Lock, S-shaped slightly curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm

586146 **Same,** S-shaped strongly curved

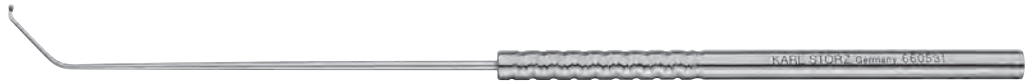
Suction Tube



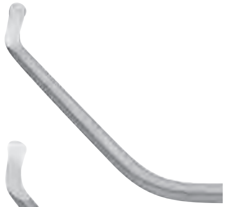
722830	**Suction Tube,** angular, with grip plate and cut-off hole, LUER-Lock, outer diameter 3 mm, working length 14 cm
649180 N	FERGUSON-CASTELNUOVO **Suction Tube,** without cut-off hole, with stylet, LUER, diameter 2 mm, working length 15 cm
649182 BU	FERGUSON-CASTELNUOVO **Suction Tube,** with cut-off hole and mandrel, with calibration markings, lateral opening downwards, diameter 2.5 mm, working length 15 cm
649183	FERGUSON **Suction Tube,** with cut-off hole and stylet, LUER, 10 Fr., working length 15 cm
662882	FRANK-PASQUINI **Suction Tube,** angular, tip curved upwards, ball end, with grip plate and cut-off hole, LUER, diameter 2.4 mm, working length 13 cm
662883	**Same,** tip curved downwards
662885	FRANK-PASQUINI **Suction Tube,** angular, tip curved upwards, ball end, with grip plate and cut-off hole, LUER, diameter 3 mm, working length 13 cm
662886	**Same,** tip curved downwards

Instrument Set for Endonasal Dacryocystorhinostomy NEW

according to Prof. CASTELNUOVO



660531



660531 CASTELNUOVO **Dissector,** 90°, right, double curved, length 19.5 cm

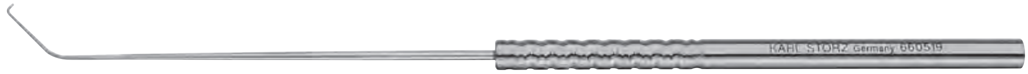
660532 **Same,** left, double curved

660533 CASTELNUOVO **Dissector,** 45°, right, double curved, length 19.5 cm

660534 **Same,** left, double curved

660537 CASTELNUOVO **Knife,** round, 45°, horizontal, diameter 2 mm, double curved, length 19.5 cm

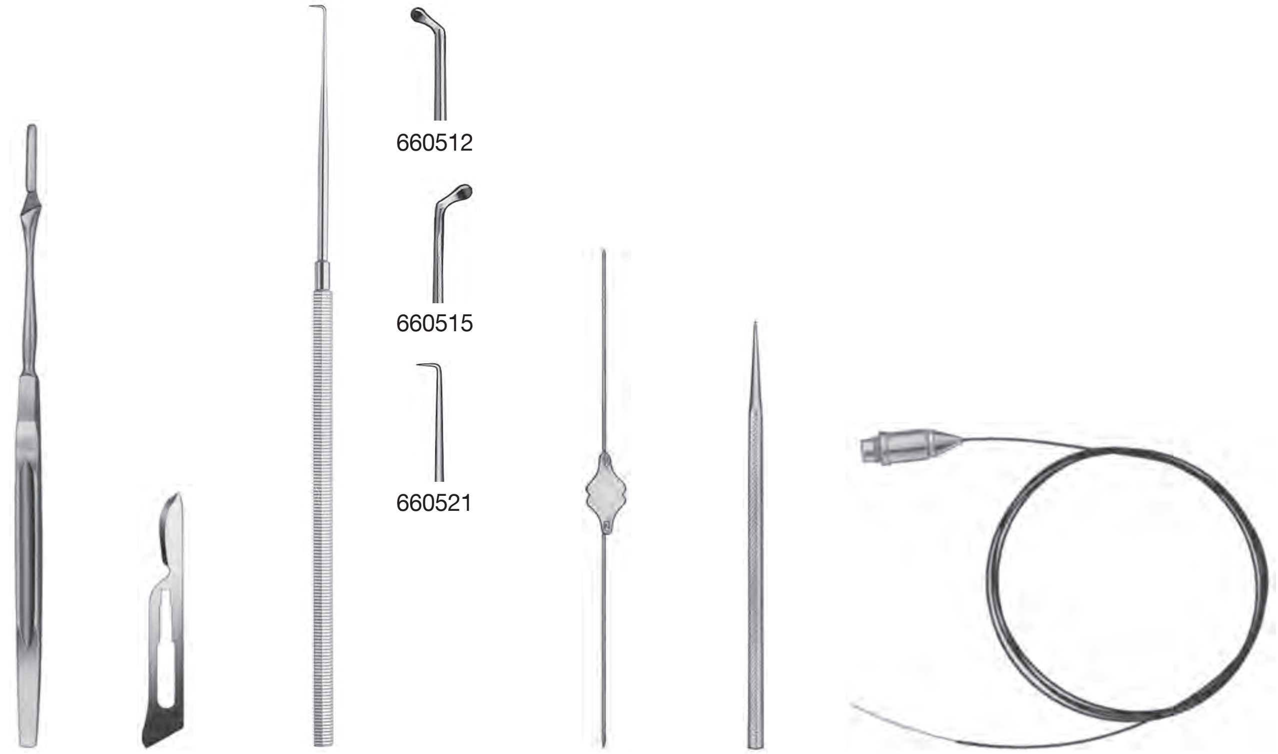
660538 **Same,** vertical, diameter 2 mm, double curved



660519

660519 CASTELNUOVO **Palpation Probe,** 90°, double curved, length 19.5 cm

Knives, Elevator, Hook and WILDER **Dilator**
BOWMAN **Lachrymal Probe, Light Transmission Probe**



748000 208215 660521 634840 745900 496 V

748000	**Surgical Handle,** Fig. 7, length 16.5 cm, for Blades 208010 – 15, 208210 – 15
208215	**Blade,** Fig. 15, sterile, package of 100
660512	**Elevator,** sharp, curved to right, length 18 cm
660515	**Elevator,** sharp, curved to left, length 18 cm
660521	**Hook,** 90°, blunt, length 18 cm
745900	WILDER **Dilator,** for salivary duct, length 11 cm
634840	BOWMAN **Lachrymal Probe,** length 13 cm including: **Probe,** size 0000 – 000 **Probe,** size 00 – 0 **Probe,** size 1 – 2
496 V	**Light Transmission Probe,** for diaphanoscopic localization of the nasolacrimal ducts and fistulae, diameter of distal tip 0.5 mm, sterile, for single use, for use with Fiber Optic Light Cable 495 NL, package of 3

UNIDRIVE® S III ENT SCB/UNIDRIVE® S III ECO

The multifunctional unit for ENT

UNIDRIVE® S III ENT SCB

UNIDRIVE® S III ECO

Special Features:	**UNIDRIVE® S III ENT SCB**	**UNIDRIVE® S III ECO**
Touch Screen: Straightforward function selection via touch screen	●	–
Set values of the last session are stored	●	●
Optimized user control due to touch screen	●	–
Choice of user languages	●	–
Operating elements are single and clear to read due to color display	●	–
One unit – multifunctional: – Shaver system for surgery of the paranasal sinuses and anterior skull base – INTRA Drill Handpieces (40,000 rpm and 80,000 rpm) – Sinus Shaver – Micro Saw – STAMMBERGER-SACHSE Intranasal Drill – Dermatome	●	●
– High-Speed Handpieces (60,000 rpm and 100,000 rpm)	●	–
Two motor outputs: Two motor outputs for simultaneous connection of two motors: For example, a shaver and micro motor	●	●
Soft start function	●	–
Textual error messages	●	–
Integrated irrigation and coolant pump: – Absolutely homogeneous, micro-processor controlled irrigation rate throughout the entire irrigation range – Quick and easy connection of the tubing set	●	●
Easy program selection via automated motor recognition	●	●
Continuously adjustable revolution range	●	●
Maximum number of revolutions and motor torque: Microprocessor-controlled motor rotation speed. Therefore the preselected parameters are maintained throughout the drilling procedure.	●	●
Maximum number of revolutions can be preset	●	●
SCB model with connections to the KARL STORZ Communication Bus (KARL STORZ-SCB)	●	–
Irrigator rod included	●	–

Motor Systems

Specifications

System specifications

Mode		**Order No.**	**rpm**
Shaver mode Operation mode: Max. rev. (rpm):	oscillating in conjunction with Handpiece: DrillCut-X® II Shaver Handpiece DrillCut-X® II N Shaver Handpiece	 **40** 7120 50 **40** 7120 55	 10,000* 10,000*
Sinus burr mode Operation mode: Max. rev. (rpm):	rotating in conjunction with Handpiece: DrillCut-X® II Shaver Handpiece DrillCut-X® II N Shaver Handpiece	 **40** 7120 50 **40** 7120 55	 12,000 12,000
High-speed drilling mode Operation mode: Max. rev. (rpm):	counterclockwise or clockwise in conjunction with: High-Speed Micro Motor	 **20** 7120 33	 60,000/100,000
Drilling mode Operation mode: Max. rev. (rpm):	counterclockwise or clockwise in conjunction with: micro motor and connecting cable	 [**20** 7110 33 **20** 7111 73]	 40,000/80,000
Micro saw mode Max. rev. (rpm):	in conjunction with: micro motor and connecting cable	 [**20** 7110 33 **20** 7111 73]	 15,000/20,000
Intranasal drill mode Max. rev. (rpm):	in conjunction with: micro motor and connecting cable	 [**20** 7110 33 **20** 7111 73]	 60,000
Dermatome mode Max. rev. (rpm):	in conjunction with: micro motor and connecting cable	 [**20** 7110 33 **20** 7111 73]	 8,000
Power supply:	100 – 240 VAC, 50/60 Hz		
Dimensions: (w x h x d)	300 x 165 x 265 mm		
Two outputs for parallel connection of two motors			
Integrated irrigation pump: Flow:	 adjustable in 9 steps		

* Approx. 4,000 rpm is recommended as this is the most efficient suction/performance ratio.

	UNIDRIVE® S III ENT SCB	**UNIDRIVE® S III ECO**
Touch Screen:	6,4" / 300 cd/m²	
Weight:	5.2 kg	4.7 kg
Certified to:	IEC 601-1 CE acc. to MDD	IEC 60601-1
Available languages:	English, French, German, Spanish, Italian, Portuguese, Greek, Turkish, Polish, Russian	numerical codes

Motor Systems

Special features of high-performance EC micro motor II and of the high-speed micro motor

Special features of high-performance EC micro motor II:

- **Self-cooling, brushless high-performance EC micro motor**
- **Smallest possible dimensions**
- **Autoclavable**
- **Reprocessable in a cleaning machine**
- **Detachable connecting cable**
- **INTRA coupling for a wide variety of applications**
- **Maximum torque 4 Ncm**
- **Number of revolutions continuously adjustable up to 40.000 rpm**
- **Provided a suitable handle is used, the number of revolutions is continuously adjustable up to 80,000 rpm**

20 7110 33

20 7110 33 **High-Performance EC Micro Motor II,** for use with UNIDRIVE® II/UNIDRIVE® ENT/OMFS/NEURO/ECO and Connecting Cable **20** 7110 73, or for use with UNIDRIVE® S III ENT/ECO/NEURO and Connecting Cable **20** 7111 73

20 7111 73 **Connecting Cable,** to connect High-Performance EC Micro Motor **20** 7110 33 to UNIDRIVE® S III ENT/ECO/NEURO

Special Features of the high-speed micro motor:

- **Brushless high-speed micro motor**
- **Smallest possible dimensions**
- **Autoclavable**
- **Reprocessable in a cleaning machine**
- **Maximum torque 6 Ncm**
- **Maximum torque 6 Ncm**
- **Number of revolutions continuously adjustable up to 60.000 rpm**
- **Provided a suitable handle is used, the number of revolutions is continuously adjustable up to 100,000 rpm**

20 7120 33

20 7120 33 **High-Speed Micro-Motor,** max. speed 60,000 rpm, including connecting cable, for use with UNIDRIVE® S III ENT/NEURO

UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO

Recommended System Configuration

UNIDRIVE® S III ENT SCB

40 7016 20-1

UNIDRIVE® S III ECO

40 7014 20

40 7016 01-1 **UNIDRIVE® S III ENT SCB,** motor control unit with color display, touch screen, two motor outputs, integrated irrigation pump and SCB module, power supply 100 – 240 VAC, 50/60 Hz

including:

Mains Cord

Irrigator Rod

Two-Pedal Footswitch, two-stage, with proportional function

Silicone Tubing Set, for irrigation, sterilizable

Clip Set, for use with silicone tubing set

SCB Connecting Cable, length 100 cm

Single Use Tubing Set*, sterile, package of 3

40 7014 01 **UNIDRIVE® S III ECO,** motor control unit with two motor outputs and integrated irrigation pump, power supply 100 – 240 VAC, 50/60 Hz

including:

Mains Cord

Two-Pedal Footswitch, two-stage, with proportional function

Silicone Tubing Set, for irrigation, sterilizable

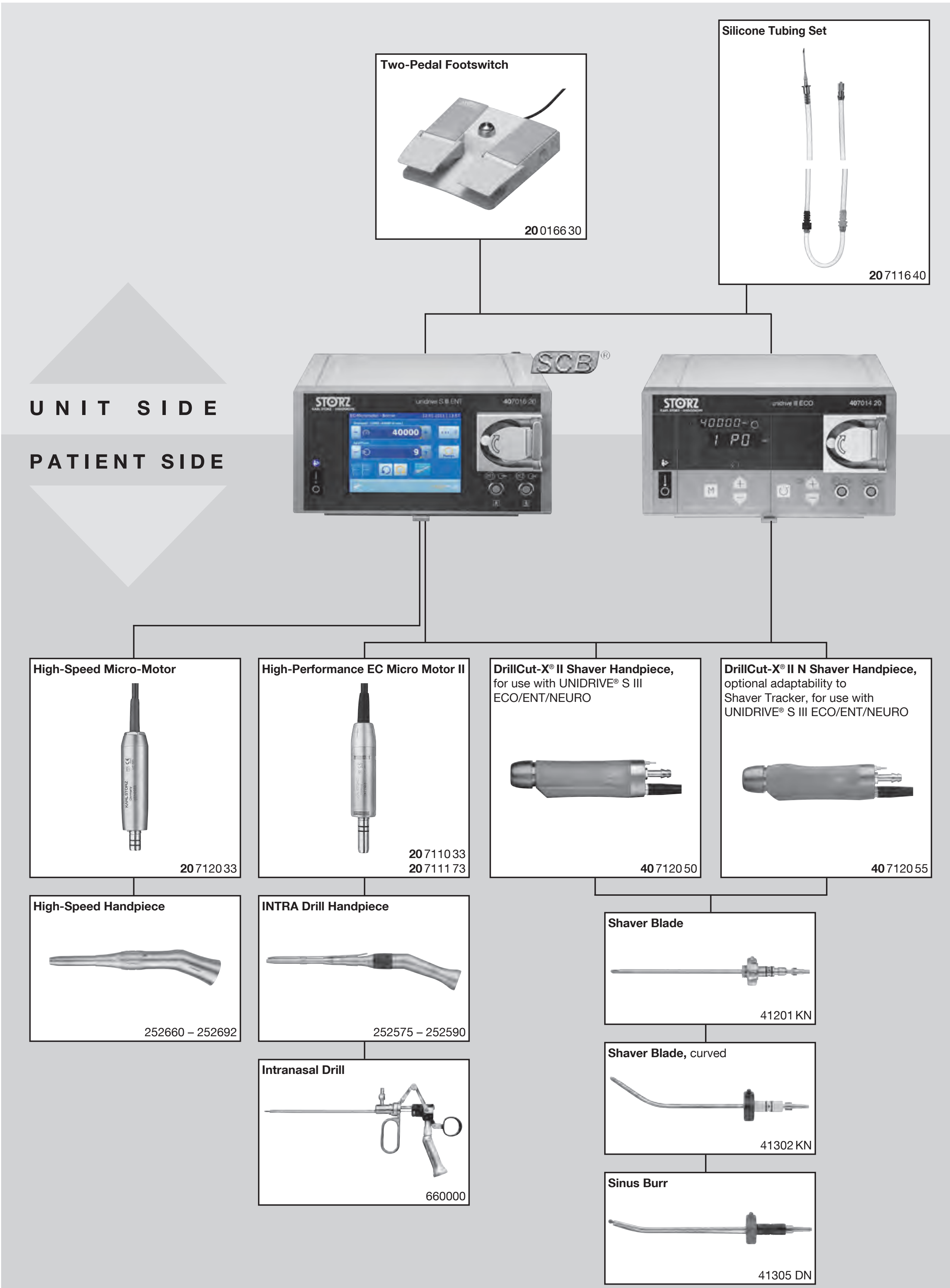
Clip Set, for use with silicone tubing set

Specifications:

Touch Screen	UNIDRIVE® S III ENT SCB: 6,4"/300 cd/m²	Dimensions w x h x d	300 x 165 x 265 mm
Flow	9 steps	Weight	5.2 kg
Power supply	100-240 VAC, 50/60 Hz	Certified to	EC 601-1, CE acc. to MDD

* mtp medical technical promotion gmbh,
Take-Off GewerbePark 46, D-78579 Neuhausen ob Eck, Germany

UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO
System Components



Optional Accessories
for UNIDRIVE® S III ENT SCB and UNIDRIVE® S III ECO

	280053	**Universal Spray,** 6x 500 ml bottles – HAZARDOUS GOODS – UN 1950 including: **Spray Nozzle**
	280053 C	**Spray Nozzle,** for the reprocessing of INTRA burr handpieces, for use with Universal Spray 280053 B
	031131-10*	**Tubing Set,** for irrigation, for single use, sterile, package of 10

* mtp medical technical promotion gmbh,
Take-Off GewerbePark 46, D-78579 Neuhausen ob Eck, Germany

DrillCut-X® Shaver Handpieces
Special Features

Special Features:	**DrillCut-X® II** 40 7120 50	**DrillCut-X® II N** 40 7120 55
Max. 10,000 rpm for shaver blades, max. 12,000 rpm for sinus shaver	●	●
Straight suction channel	●	●
Integrated irrigation channel	●	●
Powerful motor, also suitable for harder materials	●	●
Absolutely silent running, no vibration	●	●
Completely immersible and machine-washable	●	●
LOCK allows fixation of shaver blades and sinus shavers	●	●
Extremely lightweight design	●	●
Optional, ergonomic handle, detachable	●	●
Can be adapted to navigation tracker	–	●

40 7120 50

40 7120 50 **DrillCut-X® II Shaver Handpiece,**
for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40 7120 55

40 7120 55 **DrillCut-X® II N Shaver Handpiece,**
optional adaptability to Shaver Tracker **40** 8001 22,
for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

DrillCut-X® II Shaver Handpiece

Special Features:

- **Powerful motor**
- **Absolutely silent running**
- **Enhanced ergonomics**
- **Lightweight design**
- **Oscillation mode for shaver blades, max. 10,000 rpm**
- **Rotation mode for sinus shavers, max. 12,000 rpm**
- **Straight suction channel and integrated irrigation**
- **The versatile DrillCut-X® II Shaver Handpiece can be adapted to individual needs of the user**
- **Easy hygienic processing, suitable for use in washer and autoclavable at 134 °C**
- **Quick coupling mechanism facilitates more rapid exchange of work inserts**
- **Proven DrillCut-X® blade portfolios can be used**

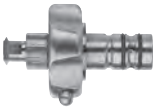
40 7120 50

40 7120 50 **DrillCut-X® II Shaver Handpiece,**
for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40 7120 90

40 7120 90 **Handle,** adjustable, for use with DrillCut-X® II **40** 7120 50
and DrillCut-X® II N **40** 7120 55

Optional Accessory:



41250 RA

41250 RA **Cleaning Adaptor,** LUER-Lock,
for cleaning DrillCut-X® shaver handpieces

DrillCut-X® II Shaver N Handpiece

Special Features:

- **Powerful motor**
- **Absolutely silent running**
- **Enhanced ergonomics**
- **Lightweight design**
- **Oscillation mode for shaver blades, max. 10,000 rpm**
- **Rotation mode for sinus shavers, max. 12,000 rpm**
- **Straight suction channel and integrated irrigation**
- **The versatile DrillCut®-X II Shaver N Shaver Handpiece can be adapted to the individual needs of the user**
- **Easy hygienic processing, suitable for use in washer and autoclavable at 134 °C**
- **Quick coupling mechanism facilitates more rapid exchange of working inserts**
- **Proven DrillCut-X® blade** portfolios **can be used**
- **Optional adaptability to Shaver Tracker 40** 8001 22
- **Allows shaver navigation when used with NPU 40** 8000 01

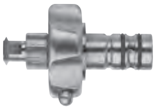
40 7120 55

40 7120 55 **DrillCut-X® II N Shaver Handpiece,** optional adaptability to Shaver Tracker **40** 8001 22, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40 7120 90

40 7120 90 **Handle,** adjustable, for use with DrillCut-X® II **40** 7120 50 and DrillCut-X® II N **40** 7120 55

Optional Accessory:



41250 RA

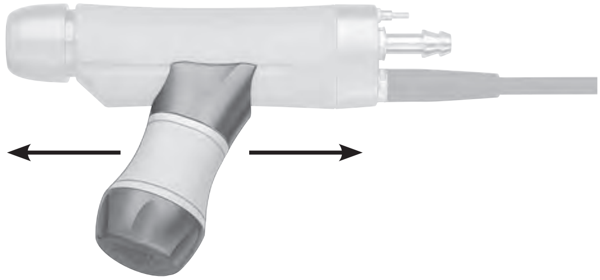
41250 RA **Cleaning Adaptor,** LUER-Lock, for cleaning DrillCut-X® shaver handpieces

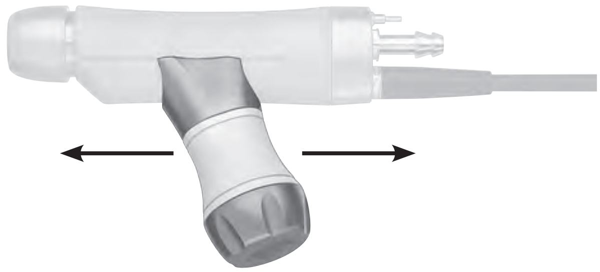
Handle for DrillCut-X® II Shaver Handpiece

for use with DrillCut-X® II 40 7120 50 **and DrillCut-X® II N 40** 7120 55

Special Features:

- **Ergonomic design**
- **Ultralight construction**
- **Easy handle control allows individual adjustment**
- **The adjustable handle can be mounted to DrillCut®-X II or -X II N Shaver Handpiece**
- **Easy fixation via rotary lock**
- **Sterilizable**





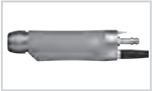
40 7120 90

40 7120 90	**Handle,** adjustable, for use with DrillCut-X® II **40** 7120 50 and DrillCut-X® II N **40** 7120 55

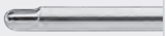
Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N


41201 GN

Shaver Blades, straight, sterilizable

Detail	for use with **40712050 DrillCut-X® II Handpiece** **40712055 DrillCut-X® II N Handpiece**	**Shaver Blade** length 12 cm
	41201 KN	serrated cutting edge, diameter 4 mm, color code: blue-red
	41201 KK	double serrated cutting edge, diameter 4 mm, color code: blue-yellow
	41201 GN	concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green
	41201 LN	concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-black
	41201 SN	straight cutting edge, diameter 4 mm, color code: blue-blue
	41201 KSA	serrated cutting edge, diameter 3 mm, color code: blue-red
	41201 KKSA	double serrated cutting edge, diameter 3 mm, color code: blue-yellow
	41201 KKSB	double serrated cutting edge, diameter 2 mm, color code: blue-yellow
	41201 LSA	concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black

Optional Accessory:

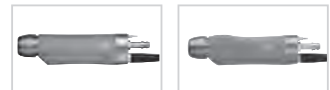
 

41200 RA **Cleaning Adaptor,** LUER-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx

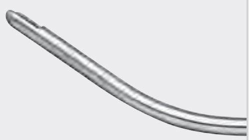
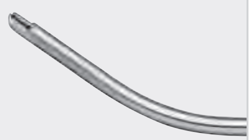
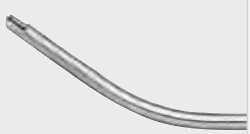
Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N

41204 KKB



Shaver Blades, curved 35°/40°, sterilizable

Detail	for use with 40712050 DrillCut-X® II Handpiece 40712055 DrillCut-X® II N Handpiece	**Shaver Blade** length 12 cm
	41202 KN	curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red
	41204 KKF	curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow
	41204 KKB	curved 40°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow
	41204 KKFA	curved 40°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow
	41204 KKBA	curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow

Optional Accessory:

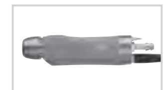
41200 RA **Cleaning Adaptor,** LUER-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx

Shaver Blades, curved

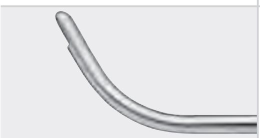
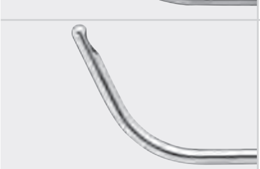
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N

41203 KKF



Shaver Blades, curved 65°, sterilizable

Detail	for use with 40712050 DrillCut-X® II Handpiece, 40712055 DrillCut-X® II N Handpiece	Shaver Blade length 12 cm
	41203 KNF	curved 65°, cutting edge serrated forwards, diameter 4 mm, color code: blue-red
	41203 KNB	curved 65°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red
	41203 KKF	curved 65°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow
	41203 KKB	curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow
	41203 KKFA	curved 65°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow
	41203 KKBA	curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow
	41203 GNF	curved 65°, concave cutting edge, oval cutting window, forward opening, diameter 4 mm, color code: blue-green
	41203 GNB	curved 65°, concave cutting edge, oval cutting window, backward opening, diameter 4 mm, color code: blue-green

Optional Accessory:

41200 RA **Cleaning Adaptor,** LUER-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx

Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N

41301 KK


Shaver Blades, straight, for single use, sterile, package of 5

Detail	for use with 40 7120 50 DrillCut-X® II Handpiece 40 7120 55 DrillCut-X® II N Handpiece	Shaver Blade length 12 cm
	41301 KN	serrated cutting edge, diameter 4 mm, color code: blue-red
	41301 KK	double serrated cutting edge, diameter 4 mm, color code: blue-yellow
	41301 GN	concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green
	41301 LN	concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-black
	41301 SN	straight cutting edge, diameter 4 mm, color code: blue-blue
	41301 KSA	serrated cutting edge, diameter 3 mm, color code: blue-red
	41301 KKSA	double serrated cutting edge, diameter 3 mm, color code: blue-yellow
	41301 KKSB	double serrated cutting edge, diameter 2 mm, color code: blue-yellow
	41301 LSA	concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black

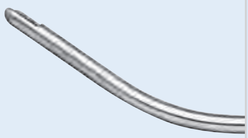
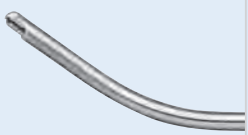
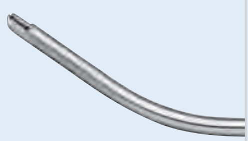
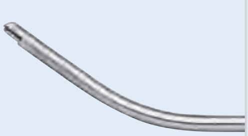
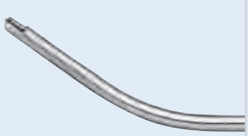
Shaver Blades, curved

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N

41302 KN

Shaver Blades, curved 35°/40°, for single use, sterile, package of 5

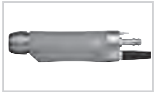
Detail	for use with **40 7120 50 DrillCut-X® II Handpiece** **40 7120 55 DrillCut-X® II N Handpiece**	**Shaver Blade** length 12 cm
	41302 KN	curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red
	41304 KKF	curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow
	41304 KKB	curved 40°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow
	41304 KKFA	curved 40°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow
	41304 KKBA	curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow

Shaver Blades, curved

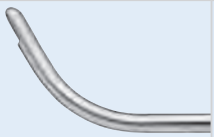
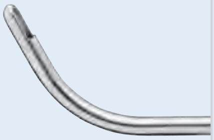
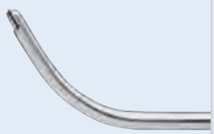
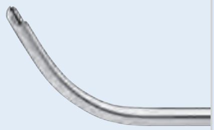
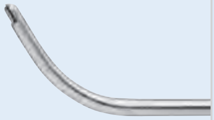
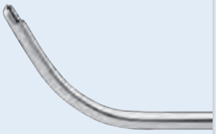
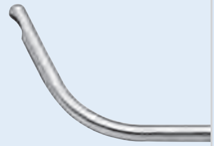
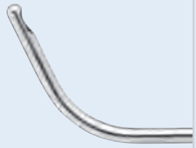
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N

41303 KKB



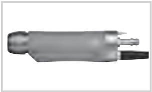
Shaver Blades, curved 65°, for single use, sterile, package of 5

Detail	for use with **40 7120 50 DrillCut-X® II Handpiece** **40 7120 55 DrillCut-X® II N Handpiece**	**Shaver Blade** length 12 cm
	41303 KNF	curved 65°, cutting edge serrated forwards, diameter 4 mm, color code: blue-red
	41303 KNB	curved 65°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red
	41303 KKF	curved 65°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow
	41303 KKB	curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow
	41303 KKFA	curved 65°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow
	41303 KKBA	curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow
	41303 GNF	curved 65°, cutting edge concave forwards, oval cutting window, diameter 4 mm, color code: blue-green
	41303 GNB	curved 65°, cutting edge concave backwards, oval cutting window, diameter 4 mm, color code: blue-green

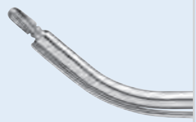
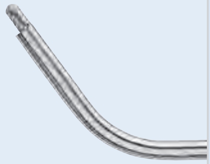
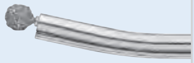
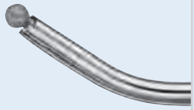
Sinus Burrs, curved
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X® II and DrillCut-X® II N

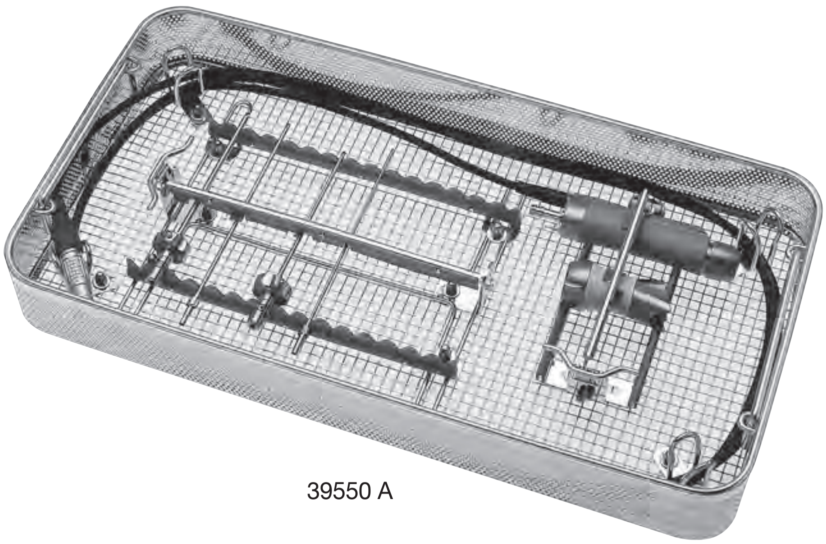

41305 RN




Sinus Burrs, curved 70°/55°/40°/15°, for single use, sterile, package of 5

Detail	for use with 40 7120 50 DrillCut-X® II Handpiece 40 7120 55 DrillCut-X® II N Handpiece	Sinus Burr length 12 cm
	41304 W	curved 40°, cylindric, drill diameter 3 mm, shaft diameter 4 mm, color code: red-blue
	41303 WN	curved 55°, cylindric, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-blue
	41305 RN	curved 15°, bud drill, drill diameter 4 mm, shaft diameter 4 mm, color code: red-black
	41305 DN	curved 15°, diamond head, drill diameter 3 mm, shaft diameter 4 mm, color code: red-yellow
	41305 D	curved 15°, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow
	41305 DW	curved 40°, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow
	41303 DT	curved 70°, diamond head, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-yellow

Accessories for Shaver



39550 A

39550 A **Wire Tray,** provides safe storage of accessories for KARL STORZ paranasal sinus shaver systems during cleaning and sterilization

for storage of:

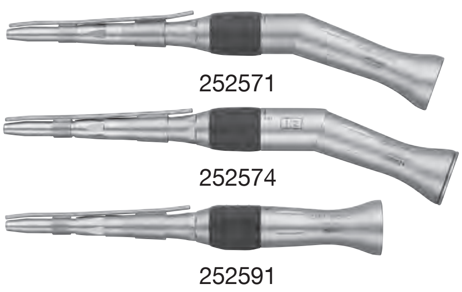
– Up to 7 shaver attachments
– Connecting cable

Please note: The instruments displayed are not included in the sterilizing and storage tray.

INTRA Drill Handpiece
for Surgery in Ethmoid and Skull Base Area

Special Features:

- **Tool-free closing and opening of the drill**
- **Right/left rotation**
- **Max. rotating speed up to 40,000 rpm / 80,000 U/min**
- **Detachable irrigation channels**
- **Lightweight construction**
- **Operates with little vibrations**
- **Low maintenance**
- **Reprocessable in a cleaning machine**
- **Safe grip**



252571 **INTRA Drill Handpiece,** angled, length 15 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

252574 **Same,** Transmission 1:2 (80.000 rpm)

252591 **INTRA Drill Handpiece,** straight, length 13 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

649600 – 649770 G

Detail	Size	Dia. mm	Standard	Diamond	Diamond coarse
	014	1.4	649614	649714	–
	018	1.8	649618	649718	–
	023	2.3	649623	649723	649723 G
	027	2.7	649627	649727	649727 G
	031	3.1	649631	649731	649731 G
	035	3.5	649635	649735	649735 G
	040	4	649640	649740	649740 G
	045	4.5	649645	649745	649745 G
	050	5	649650	649750	649750 G
	060	6	649660	649760	649760 G
	070	7	649670	649770	649770 G

649600 **Standard Straight Shaft Burr,** stainless, size 014 – 070, length 9.5 cm, set of 11

649700 **Diamond Straight Shaft Burr,** stainless, size 014 – 070, length 9.5 cm, set of 11

649700 G **Rapid Diamond Straight Shaft Burr,** stainless, with coarse diamond coating for precise drilling and abrasion without hand pressure and generating minimal heat, size 023 – 070, length 9.5 cm, set of 9, color code: gold

280033 **Rack,** for 36 straight shaft burrs with a length of 9.5 cm, foldable, sterilizable, size 22 x 14 x 2 cm

INTRA Drill Handpiece

for Surgery in Ethmoid and Skull Base Area

Special Features:

- **Tool-free closing and opening of the drill**
- **Right/left rotation**
- **Max. rotating speed up to 40,000 rpm/80,000 U/min**
- **Detachable irrigation channels**
- **Lightweight construction**
- **Operates with little vibrations**
- **Low maintenance**
- **Reprocessable in a cleaning machine**
- **Safe grip**

252572

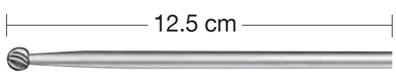
252575

252592

252572 **INTRA Drill Handpiece,** angled, length 18 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

252575 **Same,** transmission 1:2 (80,000 rpm)

252592 **INTRA Drill Handpiece,** straight, length 17 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs



649600 L – 649770 GL

Detail	Size	Dia. mm	Standard sterilizable	Diamond sterilizable	Diamond coarse sterilizable
	014	1.4	649614 L	649714 L	–
	018	1.8	649618 L	649718 L	–
	023	2.3	649623 L	649723 L	649723 GL
	027	2.7	649627 L	649727 L	649727 GL
	031	3.1	649631 L	649731 L	649731 GL
	035	3.5	649635 L	649735 L	649735 GL
	040	4	649640 L	649740 L	649740 GL
	045	4.5	649645 L	649745 L	649745 GL
	050	5	649650 L	649750 L	649750 GL
	060	6	649660 L	649760 L	649760 GL
	070	7	649670 L	649770 L	649770 GL

649600 L **Standard Straight Shaft Burr,** stainless, size 014 – 070, length 12.5 cm, set of 11

649700 L **Diamond Straight Shaft Burr,** stainless, size 014 – 070, length 12.5 cm, set of 11

649700 GL **Rapid Diamond Straight Shaft Burr,** stainless, with coarse diamond coating for precise drilling and abrasion without hand pressure and generating minimal heat, sizes 023 – 070, length 12.5 cm, set of 9, color code: gold

280034 **Rack,** for 36 straight shaft burrs with a length of 12.5 cm, foldable, sterilizable, size 22 x 17 x 2 cm

Accessories for Burrs

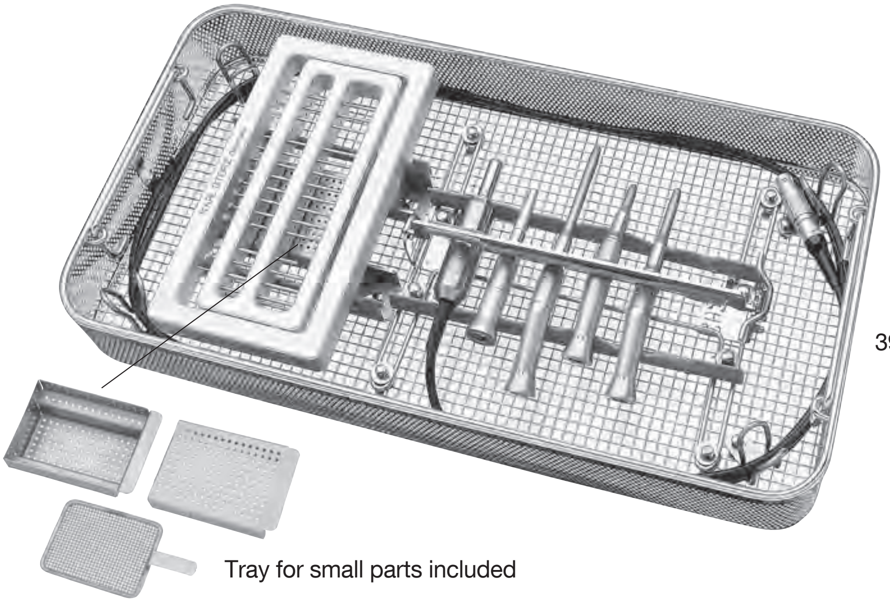
280033
280034

280043

	280033	**Rack,** for 36 straight shaft burrs with a length of 9.5 cm, foldable, sterilizable, size 22 x 14 x 2 cm
	280034	**Rack,** for 36 straight shaft burrs with a length of 12.5 cm, foldable, sterilizable, size 22 x 17 x 2 cm
NEW	280043	**Rack,** flat model, to hold 21 straight shaft burrs with a length of 7 cm (6 pcs) and 9.5 cm (15 pcs), folding model, sterilizable, size 17.5 x 11.5 x 1.2 cm

Please note: The burrs displayed are not included in the racks.

Accessories for Burrs



39552 B

Tray for small parts included

39552 A **Wire Tray,** provides safe storage of accessories for KARL STORZ drilling/grinding systems during cleaning and sterilization, includes tray for small parts, for use with Rack 280030, rack **not** included

for storage of:

– Up to 6 drill handpieces
– Connecting cable
– EC micro motor
– Small parts

39552 B **Wire Tray,** provides safe storage of accessories for KARL STORZ drilling/grinding systems during cleaning and sterilization, includes tray for small parts, for use with Rack 280030, rack **included**

for storage of:

– Up to 6 drill handpieces
– Connecting cable
– EC micro motor
– Up to 36 drill bits and burrs
– Small parts

Please note: The instruments displayed are not included in the sterilizing and storage tray.

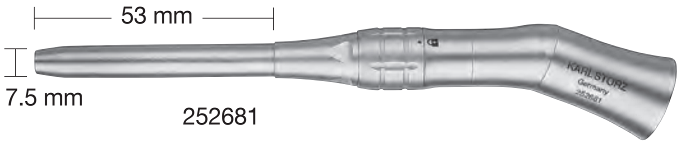
UNIDRIVE® S III ENT SCB

High-Speed Handpieces, angled, 100,000 rpm

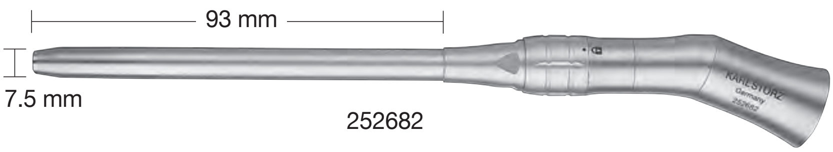
For use with High-Speed Drills, shaft diameter 3.17 mm and with High-Speed Micro Motor 20 7120 33

100,000 rpm
diameter 7.5 mm

20 7120 33



252681



252682

252681	**High-Speed Handpiece,** medium, angled, 100,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33
252682	**High-Speed Handpiece,** long, angled, 100,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33

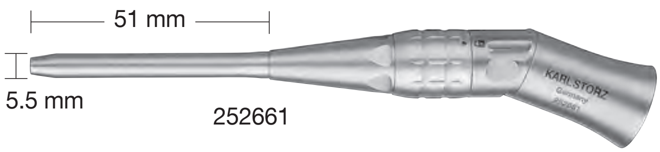
UNIDRIVE® S III ENT SCB

High-Speed Handpieces, angled, 60,000 rpm

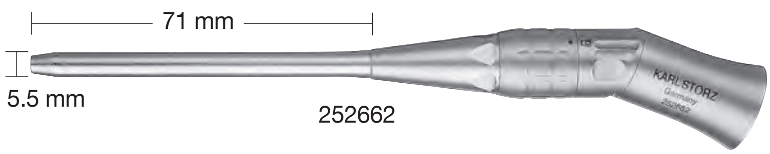
For use with High-Speed Drills, shaft diameter 2.35 mm and with High-Speed Micro Motor 20 7120 33

60,000 rpm
diameter 5.5 mm

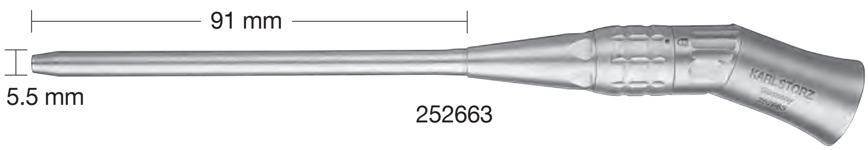
20 7120 33



252661



252662



252663

252661	**High-Speed Handpiece,** short, angled, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33
252662	**High-Speed Handpiece,** medium, angled, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33
252663	**High-Speed Handpiece,** long, angled, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33

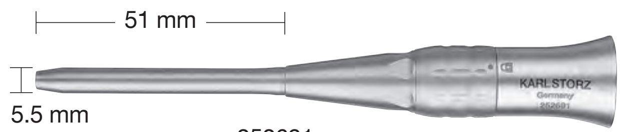
UNIDRIVE® S III ENT SCB

High-Speed Handpieces, straight, 60,000 rpm

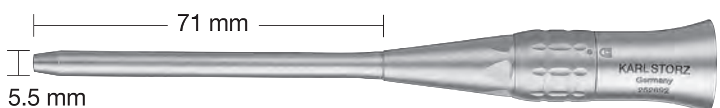
For use with High-Speed Drills, shaft diameter 2.35 mm and with High-Speed Micro Motor 20 7120 33

60,000 rpm
diameter 5.5 mm

20 7120 33



252691



252692

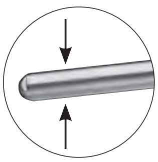
252691	**High-Speed Handpiece,** short, straight, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33
252692	**High-Speed Handpiece,** medium, straight, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33

UNIDRIVE® S III ENT SCB

High-Speed Handpieces, malleable, slim, angled, 60,000 rpm

For use with High-Speed Drills, shaft diameter 1 mm
and with High-Speed Micro Motor 20 7120 33

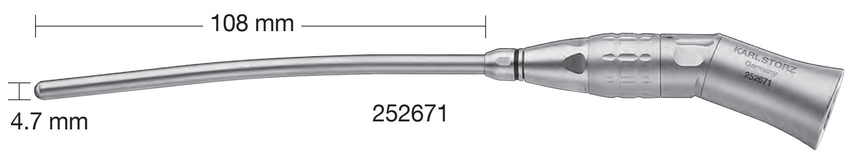
60,000 rpm
diameter 4.7 mm



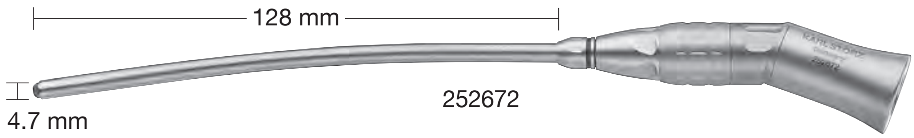
malleable

The handpieces have malleable shafts that can be bent up to 20° according to user requirements.

20 7120 33



252671



252672

252671	**High-Speed Handpiece,** extra long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33
252672	**High-Speed Handpiece,** super long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor **20** 7120 33

UNIDRIVE® S III ENT SCB

High-Speed Standard Burrs, High-Speed Diamond Burrs

For use with High-Speed Handpieces, 100,000 rpm

100,000 rpm
diameter 7.5 mm


252681


252682

	**High-Speed Standard Burrs, 100,000 rpm, for single use, sterile, package of 5**	
Diameter in mm	**medium**	**long**
1	350110 M	–
2	350120 M	350120 L
3	350130 M	350130 L
4	350140 M	350140 L
5	350150 M	350150 L
6	350160 M	350160 L
7	350170 M	350170 L

	**High-Speed Diamond Burrs, 100,000 rpm, for single use, sterile, package of 5**	
Diameter in mm	**medium**	**long**
1	350210 M	–
2	350220 M	350220 L
3	350230 M	350230 L
4	350240 M	350240 L
5	350250 M	350250 L
6	350260 M	350260 L
7	350270 M	350270 L

UNIDRIVE® S III ENT SCB

**High-Speed Diamond Burrs, High-Speed Acorn,
High-Speed Barrel Burrs, High-Speed Neuro Fluted Burrs**

For use with High-Speed Handpieces, 100,000 rpm

100,000 rpm
diameter 7.5 mm


252681


252682

High-Speed Coarse Diamond Burrs, 100,000 rpm, for single use, sterile, package of 5

Diameter in mm	medium	long
3	350330 M	350330 L
4	350340 M	350340 L
5	350350 M	350350 L
6	350360 M	350360 L
7	350370 M	350370 L

High-Speed Acorn, 100,000 rpm, for single use, sterile, package of 5

Diameter in mm	medium
7.5	350675 M
9	350690 M

High-Speed Barrel Burrs, 100,000 rpm, for single use, sterile, package of 5

Diameter in mm	medium
6	350960 M
9.1	350991 M

High-Speed Neuro Fluted Burrs, 100,000 rpm, for single use, sterile, package of 5

Diameter in mm	medium	long
1.8	350718 M	350718 L
3	350730 M	350730 L

UNIDRIVE® S III ENT SCB

High-Speed Standard Burrs, High-Speed Diamond Burrs

For use with High-Speed Handpieces, 60,000 rpm

60,000 rpm
diameter 5.5 mm


252661


252662


252663


252691


252692

High-Speed Standard Burrs, 60,000 rpm, for single use, sterile, package of 5

Diameter in mm	short	medium	long
1	330110 S	330110 M	–
2	330120 S	330120 M	330120 L
3	330130 S	330130 M	330130 L
4	330140 S	330140 M	330140 L
5	330150 S	330150 M	330150 L
6	330160 S	330160 M	330160 L
7	330170 S	330170 M	330170 L

High-Speed Diamond Burrs, 60,000 rpm, for single use, sterile, package of 5

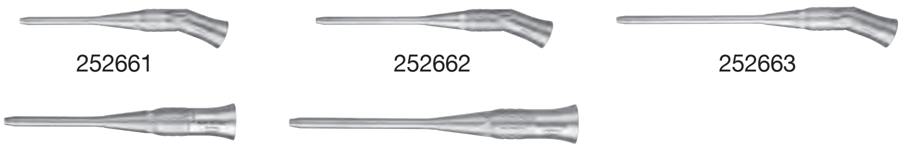
Diameter in mm	short	medium	long
0.6	330206 S	–	–
1	330210 S	330210 M	–
1.5	330215 S	–	–
2	330220 S	330220 M	330220 L
3	330230 S	330230 M	330230 L
4	330240 S	330240 M	330240 L
5	330250 S	330250 M	330250 L
6	330260 S	330260 M	330260 L
7	330270 S	330270 M	330270 L

UNIDRIVE® S III ENT SCB

High-Speed Diamond Burrs, High-Speed Cylinder Burrs,
LINDEMANN **High-Speed Fluted Burrs**

For use with High-Speed Handpieces, 60,000 rpm

60,000 rpm
diameter 5.5 mm



252661 252662 252663

252691 252692

	**High-Speed Coarse Diamond Burrs, 60,000 rpm, for single use, sterile, package of 5**		
Diameter in mm	**short**	**medium**	**long**
3	330330 S	330330 M	330330 L
4	330340 S	330340 M	330340 L
5	330350 S	330350 M	330350 L
6	330360 S	330360 M	330360 L
7	330370 S	330370 M	330370 L

	**High-Speed Cylinder Burrs, 60,000 rpm, for single use, sterile, package of 5**
Diameter in mm	**short**
4	330440 S
6	330460 S

	LINDEMANN **High-Speed Fluted Burrs, 60,000 rpm, for single use, sterile, package of 5**
Size in mm (diameter x length)	**short**
Diameter 2.1/11	330511 S
Diameter 2.3/26	330526 S

UNIDRIVE® S III ENT SCB

High-Speed Diamond Burrs

For use with High-Speed Handpieces, 60,000 rpm

60,000 rpm
diameter 4.7 mm

252671

252672

	**High-Speed Diamond Burrs, 60,000 rpm, for single use, sterile, package of 5**	
Diameter in mm	**extra long**	**super long**
2	320220 EL	320220 SL
3	320230 EL	320230 SL
4	320240 EL	320240 SL

	**High-Speed Coarse Diamond Burrs, 60,000 rpm, for single use, sterile, package of 5**	
Diameter in mm	**extra long**	**super long**
2	320320 EL	320320 SL
3	320330 EL	320330 SL
4	320340 EL	320340 SL

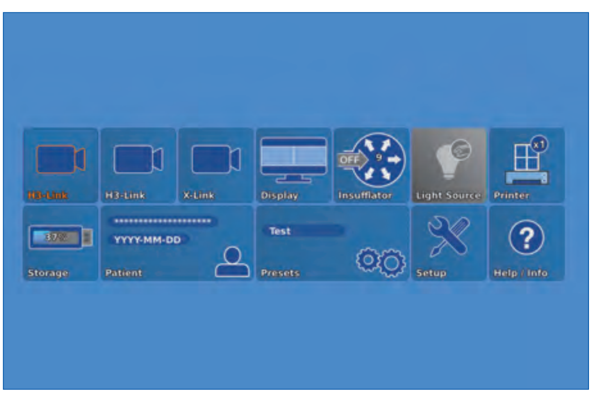
IMAGE1 S Camera System *NEW*

Economical and future-proof

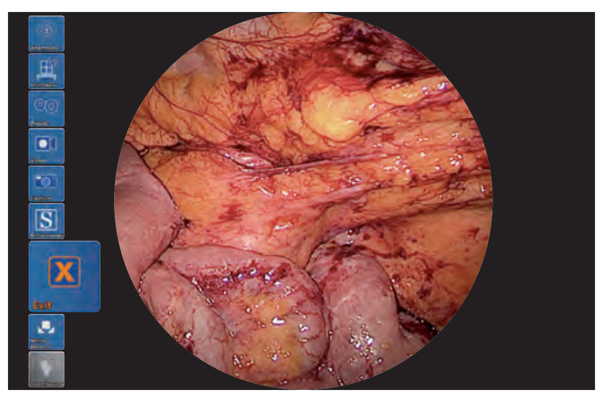
- **Modular concept for flexible, rigid and 3D endoscopy as well as new technologies**
- **Forward and backward compatibility with video endoscopes and FULL HD camera heads**
- **Sustainable investment**
- **Compatible with all light sources**

Innovative Design

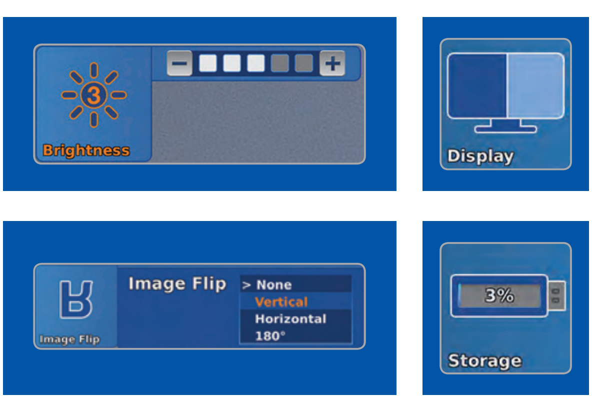
- **Dashboard: Complete overview with intuitive menu guidance**
- **Live menu: User-friendly and customizable**
- **Intelligent icons: Graphic representation changes when settings of connected devices or the entire system are adjusted**
- **Automatic light source control**
- **Side-by-side view: Parallel display of standard image and the Visualization mode**
- **Multiple source control: IMAGE1 S allows the simultaneous display, processing and documentation of image information from two connected image sources, e.g., for hybrid operations**



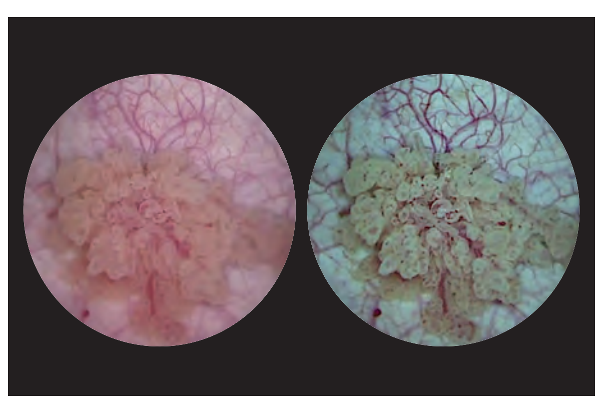
Dashboard



Live menu



Intelligent icons

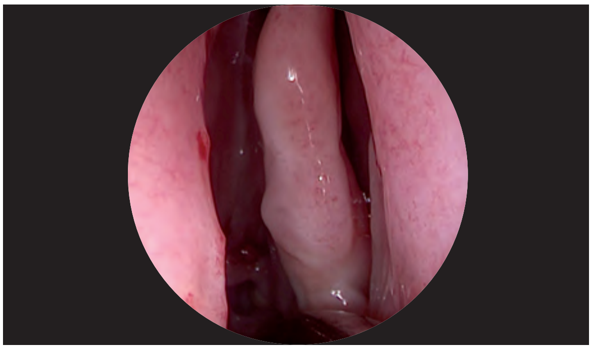


Side-by-side view: Parallel display of standard image and Visualization mode

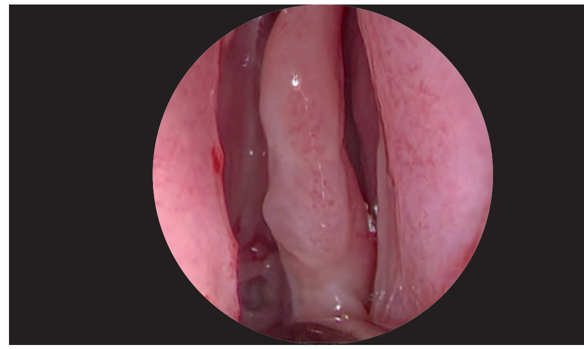
IMAGE1 S Camera System NEW

Brillant Imaging

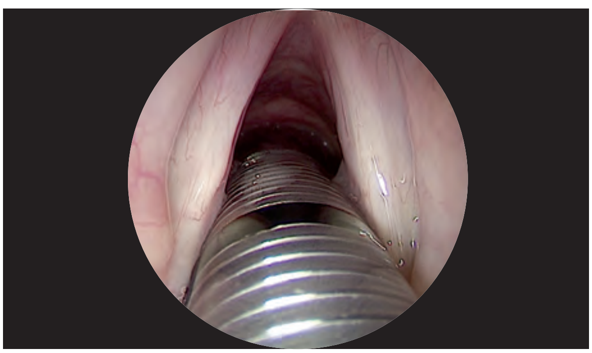
- **Clear and razor-sharp endoscopic images in FULL HD**
- **Natural color rendition**
- **Reflection is minimized**
- **Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting**



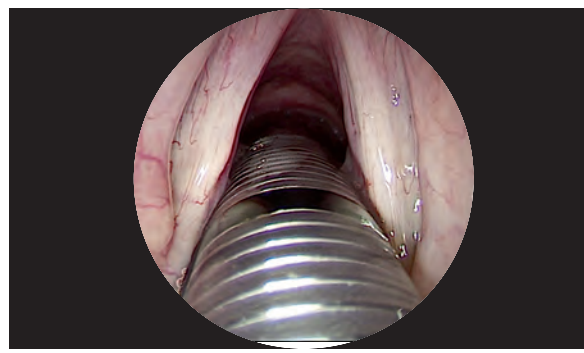
FULL HD image



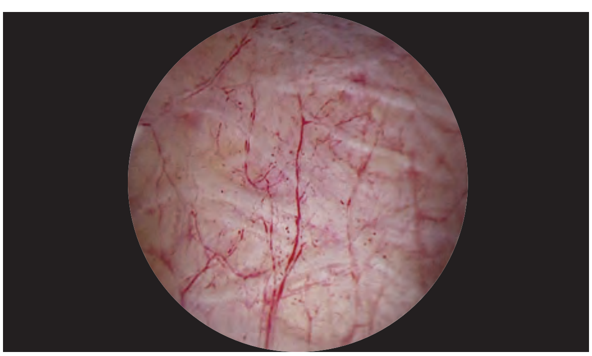
CLARA



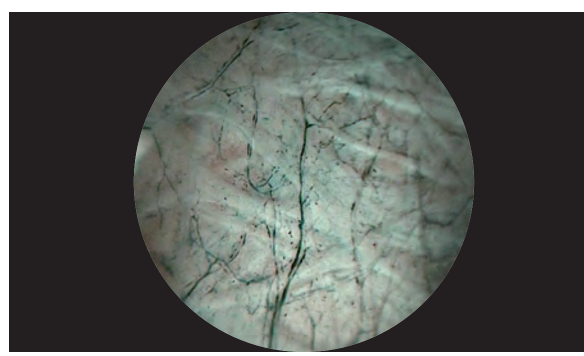
FULL HD image



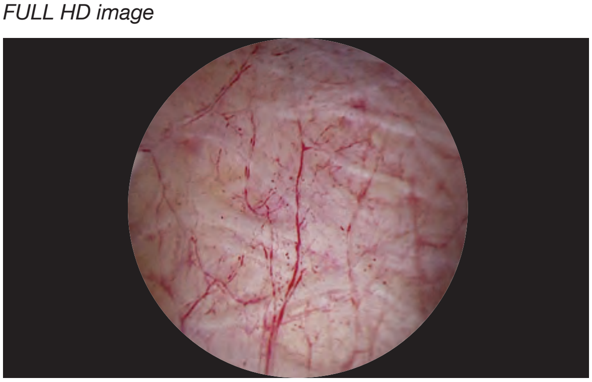
CHROMA



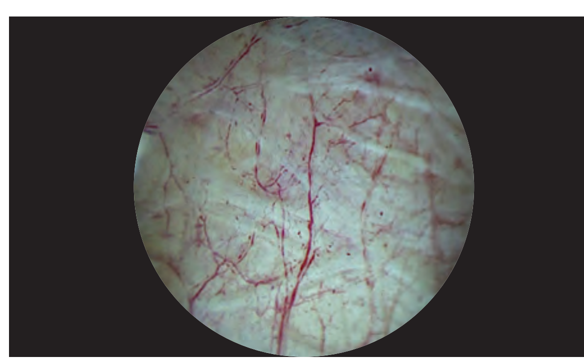
FULL HD image



*SPECTRA A**



FULL HD image



*SPECTRA B***

* *SPECTRA A:* **Not for sale in the U.S.**
** *SPECTRA B:* **Not for sale in the U.S.**

IMAGE1 S Camera System NEW

IMAGE1 S

TC 200EN

TC 200EN* **IMAGE1 S CONNECT**, connect module, for use with up to 3 link modules, resolution 1920 x 1080 pixels, with integrated KARL STORZ-SCB and digital Image Processing Module, power supply 100–120 VAC/200–240 VAC, 50/60 Hz
including:
Mains Cord, length 300 cm
DVI-D Connecting Cable, length 300 cm
SCB Connecting Cable, length 100 cm
USB Flash Drive, 32 GB, USB silicone keyboard, with touchpad, US

***Available in the following languages:** DE, ES, FR, IT, PT, RU

Specifications:

HD video outputs	- 2x DVI-D - 1x 3G-SDI
Format signal outputs	1920 x 1080p, 50/60 Hz
LINK video inputs	3x
USB interface SCB interface	4x USB, (2x front, 2x rear) 2x 6-pin mini-DIN

Power supply	100–120 VAC/200–240 VAC
Power frequency	50/60 Hz
Protection class	I, CF-Defib
Dimensions w x h x d	305 x 54 x 320 mm
Weight	2.1 kg

For use with IMAGE1 S
IMAGE1 S CONNECT Module TC 200EN

TC 300

TC 300 **IMAGE1 S H3-LINK,** link module, for use with IMAGE1 FULL HD three-chip camera heads, power supply 100–120 VAC/200–240 VAC, 50/60 Hz,
for use with IMAGE1 S CONNECT TC 200EN
including:
Mains Cord, length 300 cm
Link Cable, length 20 cm

Specifications:

Camera System	**TC 300 (H3-Link)**
Supported camera heads/video endoscopes	TH 100, TH 101, TH 102, TH 103, TH 104, TH 106 (fully compatible with IMAGE1 S) **22** 2200 55-3, **22** 2200 56-3, **22** 2200 53-3, **22** 2200 60-3, **22** 2200 61-3, **22** 2200 54-3, **22** 2200 85-3 (compatible without IMAGE1 S technologies CLARA, CHROMA, SPECTRA*)
LINK video outputs	1x
Power supply	100–120 VAC/200–240 VAC
Power frequency	50/60 Hz
Protection class	I, CF-Defib
Dimensions w x h x d	305 x 54 x 320 mm
Weight	1.86 kg

* *SPECTRA A:* **Not for sale in the U.S.**
** *SPECTRA B:* **Not for sale in the U.S.**

IMAGE1 S Camera Heads *NEW*

For use with IMAGE1 S Camera System
IMAGE1 S CONNECT Module TC 200EN, IMAGE1 S H3-LINK Module TC 300
and with all IMAGE 1 HUB™ HD Camera Control Units

TH 100

TH 100 — **IMAGE1 S H3-Z Three-Chip FULL HD Camera Head,** 50/60 Hz, IMAGE1 S compatible, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15–31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE 1 HUB™ HD/HD

Specifications:

IMAGE1 FULL HD Camera Heads	IMAGE1 S H3-Z
Product no.	TH 100
Image sensor	3x ⅓" CCD chip
Dimensions w x h x d	39 x 49 x 114 mm
Weight	270 g
Optical interface	integrated Parfocal Zoom Lens, f = 15–31 mm (2x)
Min. sensitivity	F 1.4/1.17 Lux
Grip mechanism	standard eyepiece adaptor
Cable	non-detachable
Cable length	300 cm

TH 104

TH 104 — **IMAGE1 S H3-ZA Three-Chip FULL HD Camera Head,** 50/60 Hz, IMAGE1 S compatible, **autoclavable,** progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15–31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE 1 HUB™ HD/HD

Specifications:

IMAGE1 FULL HD Camera Heads	IMAGE1 S H3-ZA
Product no.	TH 104
Image sensor	3x ⅓" CCD chip
Dimensions w x h x d	39 x 49 x 100 mm
Weight	299 g
Optical interface	integrated Parfocal Zoom Lens, f = 15–31 mm (2x)
Min. sensitivity	F 1.4/1.17 Lux
Grip mechanism	standard eyepiece adaptor
Cable	non-detachable
Cable length	300 cm

Monitors

9619 NB

9619 NB

19" HD Monitor,
color systems **PAL/NTSC,** max. screen resolution 1280 x 1024, image format 4:3, power supply 100–240 VAC, 50/60 Hz, wall-mounted with VESA 100 adaption,
including:
External 24 VDC Power Supply
Mains Cord

9826 NB

9826 NB

26" FULL HD Monitor,
wall-mounted with VESA 100 adaption,
color systems **PAL/NTSC,**
max. screen resolution 1920 x 1080,
image fomat 16:9,
power supply 100–240 VAC, 50/60 Hz
including:
External 24 VDC Power Supply
Mains Cord

Monitors

KARL STORZ HD and FULL HD Monitors	19"	26"
Wall-mounted with VESA 100 adaption	9619 NB	9826 NB
Inputs:		
DVI-D	●	●
Fibre Optic	–	–
3G-SDI	–	●
RGBS (VGA)	●	●
S-Video	●	●
Composite/FBAS	●	●
Outputs:		
DVI-D	●	●
S-Video	●	–
Composite/FBAS	●	●
RGBS (VGA)	●	–
3G-SDI	–	●
Signal Format Display:		
4:3	●	●
5:4	●	●
16:9	●	●
Picture-in-Picture	●	●
PAL/NTSC compatible	●	●

Optional accessories:

9826 SF **Pedestal,** for monitor 9826 NB
9626 SF **Pedestal,** for monitor 9619 NB

Specifications:

KARL STORZ HD and FULL HD Monitors	19"	26"
Desktop with pedestal	optional	optional
Product no.	9619 NB	9826 NB
Brightness	200 cd/m² (typ)	500 cd/m² (typ)
Max. viewing angle	178° vertical	178° vertical
Pixel distance	0.29 mm	0.3 mm
Reaction time	5 ms	8 ms
Contrast ratio	700:1	1400:1
Mount	100 mm VESA	100 mm VESA
Weight	7.6 kg	7.7 kg
Rated power	28 W	72 W
Operating conditions	0–40°C	5–35°C
Storage	-20–60°C	-20–60°C
Rel. humidity	max. 85%	max. 85%
Dimensions w x h x d	469.5 x 416 x 75.5 mm	643 x 396 x 87 mm
Power supply	100–240 VAC	100–240 VAC
Certified to	EN 60601-1, protection class IPX0	EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2

Data Management and Documentation

KARL STORZ AIDA® – Exceptional documentation

The name AIDA stands for the comprehensive implementation of all documentation requirements arising in surgical procedures: A tailored solution that flexibly adapts to the needs of every specialty and thereby allows for the greatest degree of customization.

This customization is achieved in accordance with existing clinical standards to guarantee a reliable and safe solution. Proven functionalities merge with the latest trends and developments in medicine to create a fully new documentation experience – AIDA.

AIDA seamlessly integrates into existing infrastructures and exchanges data with other systems using common standard interfaces.

WD 200-XX* **AIDA Documentation System,**
for recording still images and videos,
dual channel up to FULL HD, 2D/3D,
power supply 100-240 VAC, 50/60 Hz

including:

USB Silicone Keyboard, with touchpad
ACC Connecting Cable
DVI Connecting Cable, length 200 cm
HDMI-DVI Cable, length 200 cm
Mains Cord, length 300 cm

WD 250-XX* **AIDA Documentation System,**
for recording still images and videos,
dual channel up to FULL HD, 2D/3D,
including SMARTSCREEN® (touch screen),
power supply 100-240 VAC, 50/60 Hz

including:

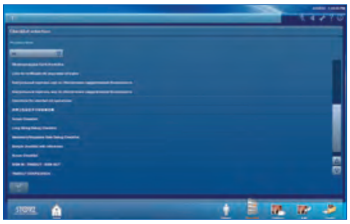
USB Silicone Keyboard, with touchpad
ACC Connecting Cable
DVI Connecting Cable, length 200 cm
HDMI-DVI Cable, length 200 cm
Mains Cord, length 300 cm

*XX Please indicate the relevant country code (DE, EN, ES, FR, IT, PT, RU) when placing your order.

Workflow-oriented use

Patient

Entering patient data has never been this easy. AIDA seamlessly integrates into the existing infrastructure such as HIS and PACS. Data can be entered manually or via a DICOM worklist. ll important patient information is just a click away.

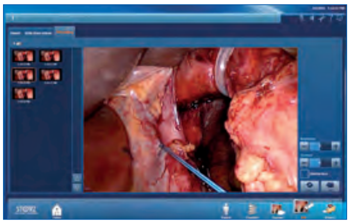


Checklist

Central administration and documentation of time-out. The checklist simplifies the documentation of all critical steps in accordance with clinical standards. All checklists can be adapted to individual needs for sustainably increasing patient safety.

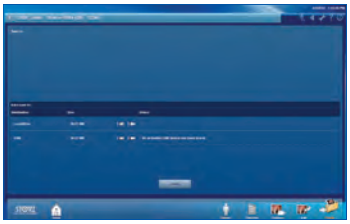
Record

High-quality documentation, with still images and videos being recorded in FULL HD and 3D. The Dual Capture function allows for the parallel (synchronous or independent) recording of two sources. All recorded media can be marked for further processing with just one click.



Edit

With the Edit module, simple adjustments to recorded still images and videos can be very rapidly completed. Recordings can be quickly optimized and then directly placed in the report.
In addition, freeze frames can be cut out of videos and edited and saved. Existing markings from the Record module can be used for quick selection.



Complete

Completing a procedure has never been easier. AIDA offers a large selection of storage locations. The data exported to each storage location can be defined. The Intelligent Export Manager (IEM) then carries out the export in the background. To prevent data loss, the system keeps the data until they have been successfully exported.

Reference

All important patient information is always available and easy to access. Completed procedures including all information, still images, videos, and the checklist report can be easily retrieved from the Reference module.

Accessories for Video Documentation

495 NL	**Fiber Optic Light Cable,** straight connector, diameter 3.5 mm, length 180 cm
495 NA	**Same,** length 230 cm

Cold Light Fountain XENON 300 SCB

20133101-1	**Cold Light Fountain XENON 300 SCB** with built-in antifog air-pump, and integrated KARL STORZ Communication Bus System SCB power supply: 100 – 125 VAC/220 – 240 VAC, 50/60 Hz including: **Mains Cord** **SCB Connecting Cord,** length 100 cm
20133027	**Spare Lamp Module XENON** with heat sink, 300 watt, 15 volt
20133028	**XENON Spare Lamp,** only, 300 watt, 15 volt

Cold Light Fountain XENON NOVA® 300

20134001	**Cold Light Fountain XENON NOVA® 300,** power supply: 100–125 VCA/220–240 VAC, 50/60 Hz including: **Mains Cord**
20132028	**XENON Spare Lamp,** only, 300 watt, 15 volt

Equipment Cart

UG 220

UG 220

Equipment Cart
wide, high, rides on 4 antistatic dual wheels
equipped with locking brakes 3 shelves,
mains switch on top cover,
central beam with integrated electrical subdistributors
with 12 sockets, holder for power supplies,
potential earth connectors and cable winding
on the outside,

Dimensions:
Equipment cart: 830 x 1474 x 730 mm (w x h x d),
shelf: 630 x 510 mm (w x d),
caster diameter: 150 mm

inluding:

Base module equipment cart, wide
Cover equipment, equipment cart wide
Beam package equipment, equipment cart high
3x **Shelf,** wide
Drawer unit with lock, wide
2x **Equipment rail,** long
Camera holder

UG 540

UG 540

Monitor Swifel Arm,
height and side adjustable,
can be turned to the left or the right side,
swivel range 180°, overhang 780 mm,
overhang from centre 1170 mm,
load capacity max. 15 kg,
with monitor fixation VESA 5/100,
for usage with equipment carts UG xxx

Recommended Accessories for Equipment Cart

UG 310

UG 310 **Isolation Transformer,**
200 V–240 V; 2000 VA with 3 special mains socket,
expulsion fuses, 3 grounding plugs,
dimensions: 330 x 90 x 495 mm (w x h x d),
for usage with equipment carts UG xxx

UG 410

UG 410 **Earth Leakage Monitor,**
200 V–240 V, for mounting at equipment cart,
control panel dimensions: 44 x 80 x 29 mm (w x h x d),
for usage with isolation transformer UG 310

UG 510

UG 510 **Monitor Holding Arm,**
height adjustable, inclinable,
mountable on left or right,
turning radius approx. 320°, overhang 530 mm,
load capacity max. 15 kg,
monitor fixation VESA 75/100,
for usage with equipment carts UG xxx

with the compliments of

KARL STORZ — ENDOSKOPE