THE ENDOSCOPIC SURGICAL TECHNIQUE
“TWO NOSTRILS – FOUR HANDS”

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The authors wish to express their gratitude to the “Laboratory for Human Anatomy and Embryology” of the Free University of Bruxelles where the morphological studies on the nasal and paranasal anatomy were conducted. We owe sincere thanks to the Chief of Service, Prof. Marcel Rooze, who encouraged our research and gave us the valuable opportunity to perform anatomical dissection, and to Mr Emile Godetroid, Chief of the Technical Staff, for his constant and most effective assistance.

The authors owe a great debt of gratitude to Prof. Manfred Tschabitscher, Chief of the Center for Anatomy and Cell Biology at the Medical University of Vienna, Austria, for his advice and assistance in conducting some of the anatomical studies presented in this publication.

Our special thanks are addressed to Dr. Ariane Papalexiou-Palma for her assistance in organizing and managing the “Andreas Vesalius” courses. Most of the figures shown in this brochure were taken during these courses.
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

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1st edition 2007
© 2015 EndoPress® GmbH
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Phone: +49 (0) 74 61/1 45 90
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Editions in languages other than English and German are in preparation. For up-to-date information, please contact EndoPress® GmbH at the address shown above.

Design and Composing:
EndoPress® GmbH, Germany

Printing and Binding:
Straub Druck + Medien AG
Max-Planck-Straße 17, 78713 Schramberg, Germany

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ISBN 978-3-89756-124-3
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### Instrument Set for the Endoscopic Surgical Technique “Two Nostrils – Four Hands”

Extracts from the following catalogs:
- ENDOSCOPES and INSTRUMENTS for ENT and TELEPRESENCE,
- IMAGING SYSTEMS, DOCUMENTATION and ILLUMINATION
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. 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 Simon 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.

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.

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).

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 dura-plasty.

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 topographical 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 parasepal trans-sphenoidal unilateral approach to the sellar region with 3 hands.

ss = sphenoid sinus
pe = posterior ethmoid
ae = anterior ethmoid
s = nasal septum
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.
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

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 sphenethmoid 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 circular bite cutting punch or Citelli forceps (Figs. 8–10).
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 sphenoethmoidal recess 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.

Anatomical landmarks:
- choanal margin
- tail of the superior turbinate
- sphenooid 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 sphenopalatine artery may be encountered; this is electrocoagulated with bipolar forceps beneath the tail of the superior 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,
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).
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.
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. 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
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; st = 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
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
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 sphenoid wall.

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.

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.
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 a trans-ethmoidal-pterigoid-sphenoidal approach. 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 pterygomaxillary 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.

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 paracervical 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 perioseal dural layer is incised, and the tumor is removed (Figs. 41–43).

Anatomical landmarks:
- varying according to the type of sphenoid (sellar, presellar, conchal):
  - bony prominence covering both paracervical carotid arteries
  - depression of the wall of the clivus
  - bony prominence of the cavernous carotid 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.
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.

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

Triks:
- 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 surrounding 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, cribiform 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 duralplasty

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,
- removal of the anterior cranial 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, cribiform 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 duralplasty

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.

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

Risks:

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

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 (3a), 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
et = ethmoid
mt = middle turbinate
it = inferior turbinate
st = superior turbinate

st = superior turbinate
4.0 Cranoendoscopic 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 cranoendoscopic 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).

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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

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Fig. 47
Macroscopic coronal section of an anatomical specimen at the level of the frontal sinus. The structures that can be removed in a cranoendoscopic 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 transection 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

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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

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Fig. 49
Macroscopic axial section of an anatomical specimen. The structures that can be removed in a cranoendoscopic 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
- lca = internal carotid artery
- ms = maxillary sinus
- mcf = middle cranial fossa

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Fig. 50
Macroscopic axial section of an anatomical specimen. The structures that can be removed in a cranoendoscopic 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

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Fig. 51
Macroscopic sagittal section of an anatomical specimen. The structures that can be removed in a cranoendoscopic 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).

### 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 transected 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 transection 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 transections 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.

### 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 transected 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.
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 mucoperiosteum 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).
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 multi-layer 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.
s = 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 quadrant anopsia 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).

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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 sphon 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 late deficits 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.

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.

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 field testing 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. Intrahesellar 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 impregnation. * = 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, ophthalmological 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).
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. 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
smp = septal mucoperichondrium
mt = middle turbinate

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

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 Maxillectomy

Clinical Findings and Surgery
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.

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.

Fig. 90
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Preoperative endoscopy demonstrates a neoplasm completely occupying the right nasal fossa.

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.

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.

Fig. 93
Endoscopic view, 45° endoscope, diam. 4 mm, right nasal fossa. Horseshoe incision to elevate a sinonasal subperiosteal layer.

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.

*= tumor mass
ms = maxillary sinus
s = nasal septum
mt = middle turbinate
of = olfactory cleft
s = nasal septum

*= 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 transection 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 mucoperichondrium.
- **Smp** = septal mucoperichondrium

**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 rhinorhea 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 herniation. 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 meningoencephalochalosin 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 3% 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 mucoperiosteal 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.

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.

ms = maxillary sinus
ss = sphenoid sinus
tf = temporal fascia

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 = ethmoido-sphenoidal planum
po = periorbit
ms = maxillary sinus
ss = sphenoid sinus
tf = temporal fascia
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.

\[
\begin{align*}
\text{pc} & = \text{pericranial graft} \\
\text{ch} & = \text{choana} \\
\text{ss} & = \text{sphenoid sinus}
\end{align*}
\]

**Post-operative course**

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


Other articles published by the same authors:
Instrument Set for Endoscopic Surgical Technique
“Two Nostrils – Four Hands”

Extracts from the following catalogs:
ENDOSCOPES and INSTRUMENTS for ENT and TELEPRESENCE,
IMAGING SYSTEMS, DOCUMENTATION and ILLUMINATION
HOPKINS® Telescopes – autoclavable
diameter 2.7 mm / 4 mm, length 18 cm

7230 AA–CA
7229 AA–CA

It is recommended to check the suitability of the product for the intended procedure prior to use.
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diameter 3 mm, length 14 cm

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autoclavable,
fiber optic light transmission incorporated,
color code: green

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

HOPKINS® Lateral Telescope 70°,
enlarged view, diameter 3 mm, length 14 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: yellow

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

Wire Tray for Cleaning, Sterilization and Storage
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

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

---

**403341 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

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*Optional Accessories:

MTP 031229-10 Single-use tubing set.

For use with KARL STORZ CLEARVISION® II. Sterile, 10 per pack

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Irrigation Sheath for use with CLEARVISION® II System

**Irrigation Sheath**, proximally reinforced for use with Adjustable Holder 28272 RKB

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Elevators, Curettes and Knives

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

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<tr>
<td>651010</td>
<td>STAMMBERGER RHINOFORCE® II Forceps, cupped jaws, vertical opening, 65° upturned, cupped jaws diameter 3 mm, with cleaning connector, working length 12 cm</td>
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<td>651020</td>
<td>Same, horizontal opening</td>
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STAMMBERGER Punch

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  Cleaning Tool, for circular cutting punches type 651050 / 651055 / 60 / 65, double-ended, length 14 cm
HOSEMAN Frontal Sinus/Recess Punch
HOSEMAN Sphenoid Punch
with integrated irrigation channel

HOSEMAN 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

HOSEMAN 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

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

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

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

Same, 45° upturned
BLAKESLEY-CASTELNUOVO **RHINOFORCE® II Nasal Forceps**

*end of sheath 25° upturned*

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

449212 Same, jaws upturned 45°

449213 Same, curved to left

RHINOFORCE® II Miniature Nasal Forceps

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

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

CASTELNUOVO RHINOFORCE® II Miniature Nasal Forceps, left side opening

CASTELNUOVO RHINOFORCE® II Miniature Nasal Forceps, right side opening

HEUWIESER Antrum Grasping Forceps

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

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  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  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
STAMMBERGER Antrum Punch

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

459052

Same, left side downward and forward cutting

459052

CASTELNUOVO TAKE-APART® Bipolar Forceps

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

462020

NEW
CASTELNUOVO Frontal Sinus Probe and Positioning Instrument

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

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

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

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  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

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
RHINOFORCE® II Nasal Forceps

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  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  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**

![Round Knife](image)

- **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

![Round Knife](image)

- **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

![Suction Curette](image)

- **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 20100032 and HOPKINS® telescopes series 7230, for visual observation or for connection to **KARL STORZ** Endovision® video cameras
Antrum Cannulas

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

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<td>FERGUSON-CASTELNUOVO <strong>Suction Tube</strong>, without cut-off hole, with stylet,</td>
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<td>FRANK-PASQUINI <strong>Suction Tube</strong>, angu lar, tip curved upwards, ball end,</td>
<td>Luer, diameter 2.4 mm, working length 13 cm</td>
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<td>FRANK-PASQUINI <strong>Suction Tube</strong>, angular, tip curved downwards</td>
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<tr>
<td>649182 BU</td>
<td>FERGUSON-CASTELNUOVO <strong>Suction Tube</strong>, with cut-off hole and mandrel, with</td>
<td>calibration markings, lateral opening downwards, diameter 2.5 mm,</td>
</tr>
<tr>
<td></td>
<td>FRANK-PASQUINI <strong>Suction Tube</strong>, angular, tip curved upwards, ball end,</td>
<td>working length 15 cm</td>
</tr>
<tr>
<td>649183</td>
<td>FERGUSON <strong>Suction Tube</strong>, with cut-off hole and stylet, Luer, 10 Fr.,</td>
<td>working length 15 cm</td>
</tr>
<tr>
<td></td>
<td>FRANK-PASQUINI <strong>Suction Tube</strong>, angular, tip curved downwards</td>
<td></td>
</tr>
</tbody>
</table>
Instrument Set for Endonasal Dacryocystorhinostomy according to Prof. CASTELNUOVO

- **CASTELNUOVO Dissector, 90°, right, double curved, length 19.5 cm**
- **Same, left, double curved**
- **CASTELNUOVO Dissector, 45°, right, double curved, length 19.5 cm**
- **Same, left, double curved**
- **CASTELNUOVO Knife, round, 45°, horizontal, diameter 2 mm, double curved, length 19.5 cm**
- **Same, vertical, diameter 2 mm, double curved**
- **CASTELNUOVO Palpation Probe, 90°, double curved, length 19.5 cm**
Knives, Elevator, Hook and WILDER Dilator
BOWMAN Lachrymal Probe, Light Transmission Probe

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>748000</td>
<td>Surgical Handle, Fig. 7, length 16.5 cm, for Blades 208010 – 15, 208210 – 15</td>
</tr>
<tr>
<td>208215</td>
<td>Blade, Fig. 15, sterile, package of 100</td>
</tr>
<tr>
<td>660512</td>
<td>Elevator, sharp, curved to right, length 18 cm</td>
</tr>
<tr>
<td>660515</td>
<td>Elevator, sharp, curved to left, length 18 cm</td>
</tr>
<tr>
<td>660521</td>
<td>Hook, 90°, blunt, length 18 cm</td>
</tr>
<tr>
<td>745900</td>
<td>WILDER Dilator, for salivary duct, length 11 cm</td>
</tr>
<tr>
<td>634840</td>
<td>BOWMAN Lachrymal Probe, length 13 cm</td>
</tr>
<tr>
<td></td>
<td>including:</td>
</tr>
<tr>
<td>496 V</td>
<td>Probe, size 0000 – 000</td>
</tr>
<tr>
<td></td>
<td>Probe, size 00 – 0</td>
</tr>
<tr>
<td></td>
<td>Probe, size 1 – 2</td>
</tr>
<tr>
<td>496 V</td>
<td>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</td>
</tr>
</tbody>
</table>
UNIDRIVE® S III ENT SCB/UNIDRIVE® S III ECO
The multifunctional unit for ENT

**Special Features:**

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

System specifications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Order No.</th>
<th>rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shaver mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DrillCut-X® II Shaver Handpiece</td>
<td>40 7120 50</td>
<td>10,000*</td>
</tr>
<tr>
<td>DrillCut-X® II N Shaver Handpiece</td>
<td>40 7120 55</td>
<td>10,000*</td>
</tr>
<tr>
<td><strong>Sinus burr mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DrillCut-X® II Shaver Handpiece</td>
<td>40 7120 50</td>
<td>12,000</td>
</tr>
<tr>
<td>DrillCut-X® II N Shaver Handpiece</td>
<td>40 7120 55</td>
<td>12,000</td>
</tr>
<tr>
<td><strong>High-speed drilling mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DrillCut-X® II Shaver Handpiece</td>
<td>20 7120 33</td>
<td>60,000/100,000</td>
</tr>
<tr>
<td>DrillCut-X® II N Shaver Handpiece</td>
<td>20 7120 33</td>
<td>60,000/100,000</td>
</tr>
<tr>
<td><strong>Drilling mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-Speed Micro Motor</td>
<td>20 7110 33</td>
<td>40,000/80,000</td>
</tr>
<tr>
<td>20 7111 73</td>
<td></td>
<td>40,000/80,000</td>
</tr>
<tr>
<td><strong>Micro saw mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro motor and connecting cable</td>
<td>20 7110 33</td>
<td>15,000/20,000</td>
</tr>
<tr>
<td>20 7111 73</td>
<td></td>
<td>15,000/20,000</td>
</tr>
<tr>
<td><strong>Intranasal drill mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro motor and connecting cable</td>
<td>20 7110 33</td>
<td>60,000</td>
</tr>
<tr>
<td>20 7111 73</td>
<td></td>
<td>60,000</td>
</tr>
<tr>
<td><strong>Dermatome mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro motor and connecting cable</td>
<td>20 7110 33</td>
<td>8,000</td>
</tr>
<tr>
<td>20 7111 73</td>
<td></td>
<td>8,000</td>
</tr>
<tr>
<td><strong>Power supply:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 – 240 VAC, 50/60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(w x h x d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 x 165 x 265 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Two outputs for parallel connection of two motors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrated irrigation pump:</strong></td>
<td>adjustable in 9 steps</td>
<td></td>
</tr>
<tr>
<td><strong>Flow:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Approx. 4,000 rpm is recommended as this is the most efficient suction/performance ratio.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Touch Screen:</th>
<th>UNIDRIVE® S III ENT SCB</th>
<th>UNIDRIVE® S III ECO</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4&quot; / 300 cd/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight:</strong></td>
<td>5.2 kg</td>
<td>4.7 kg</td>
</tr>
<tr>
<td><strong>Certified to:</strong></td>
<td>IEC 601-1 CE acc. to MDD</td>
<td>IEC 60601-1</td>
</tr>
<tr>
<td><strong>Available languages:</strong></td>
<td>English, French, German, Spanish, Italian, Portuguese, Greek, Turkish, Polish, Russian</td>
<td>numerical codes</td>
</tr>
</tbody>
</table>
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

Special features of high-speed micro motor:
- 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

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

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

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**

- 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

**UNIDRIVE® S III ECO**

- 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:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>UNIDRIVE® S III ENT SCB</th>
<th>Dimensions w x h x d</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch Screen</td>
<td>6.4*/300 cd/m²</td>
<td>300 x 165 x 265 mm</td>
<td>5.2 kg</td>
</tr>
<tr>
<td>Flow</td>
<td>9 steps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>100-240 VAC, 50/60 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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

UNIT SIDE

PATIENT SIDE

Two-Pedal Footswitch
Silicone Tubing Set

DrillCut-X® II Shaver Handpiece,
for use with UNIDRIVE® S III
ECO/ENT/NEURO

Shaver Blade
Shaver Blade, curved

Intranasal Drill
Sinus Burr
## Optional Accessories

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>280053</td>
<td>Universal Spray, 6x 500 ml bottles – HAZARDOUS GOODS – UN 1950 including: Spray Nozzle</td>
<td></td>
</tr>
<tr>
<td>280053 C</td>
<td>Spray Nozzle, for the reprocessing of INTRA burr handpieces, for use with Universal Spray 280053 B</td>
<td></td>
</tr>
<tr>
<td>031131-10*</td>
<td>Tubing Set, for irrigation, for single use, sterile, package of 10</td>
<td></td>
</tr>
</tbody>
</table>

---

* mtp medical technical promotion gmbh, Take-Off GewerbePark 46, D-78579 Neuhausen ob Eck, Germany
DrillCut-X® Shaver Handpieces

Special Features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>DrillCut-X® II 40712050</th>
<th>DrillCut-X® II N 40712055</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. 10,000 rpm for shaver blades, max. 12,000 rpm for sinus shaver</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Straight suction channel</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Integrated irrigation channel</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Powerful motor, also suitable for harder materials</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Absolutely silent running, no vibration</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Completely immersible and machine-washable</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LOCK allows fixation of shaver blades and sinus shavers</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Extremely lightweight design</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Optional, ergonomic handle, detachable</td>
<td>-</td>
<td>●</td>
</tr>
<tr>
<td>Can be adapted to navigation tracker</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

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

Optional Accessory:

41 250 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

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

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

Optional Accessory:

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 40712050 and DrillCut-X® II N 40712055

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

40712090 Handle, adjustable, for use with DrillCut-X® II 40712050 and DrillCut-X® II N 40712055
Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

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

Shaver Blades, straight, sterilizable

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

Shaver Blades, curved 35°/40°, sterilizable

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 7120 50 DrillCut-X® II Handpiece</td>
<td></td>
</tr>
<tr>
<td>41204 KKB</td>
<td>40 7120 55 DrillCut-X® II N Handpiece</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
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<td>curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
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Optional Accessory:

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<tr>
<th>Detail</th>
<th>Cleaning Adaptor</th>
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<td>41200 RA</td>
<td>Cleaning Adaptor, Luer-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx</td>
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Shaver Blades, curved for Nasal Sinuses and Skull Base Surgery

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

Shaver Blades, curved 65°, sterilizable

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<tr>
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Optional Accessory:

41200 RA **Cleaning Adaptor**, LUER-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

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

<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>41301 KK</td>
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<td>41301 GN</td>
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<td>41301 LN</td>
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<td>41301 KKSA</td>
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<tr>
<td>41301 KKSB</td>
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<tr>
<td>41301 LSA</td>
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<td>length 12 cm, concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black</td>
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Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

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

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
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<td>length 12 cm</td>
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<tr>
<td>Shaver Blades, curved 35°/40°, <strong>for single use</strong>, sterile, package of 5</td>
<td>41302 KN</td>
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<tr>
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<td>41304 KKFA</td>
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**Shaver Blades, curved**
for Nasal Sinuses and Skull Base Surgery

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

![Shaver Blade Image]

41303 KKB

<table>
<thead>
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<tbody>
<tr>
<td>41303 KNF</td>
<td>40712050 DrillCut-X® II Handpiece 40712055 DrillCut-X® II N Handpiece</td>
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<td>curved 65°, cutting edge concave forwards, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41303 GNB</td>
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<td>curved 65°, cutting edge concave backwards, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
</tbody>
</table>
**Sinus Burrs, curved**
for Nasal Sinuses and Skull Base Surgery

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

![Image of 41305 RN](image)

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

<table>
<thead>
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<th>Detail</th>
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<tbody>
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<td>41304 W</td>
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<td>41303 WN</td>
<td>DrillCut-X® II Handpiece 40712055</td>
<td>curved 55°, cylindric, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-blue</td>
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<td>41305 RN</td>
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<td>curved 15°, bud drill, drill diameter 4 mm, shaft diameter 4 mm, color code: red-black</td>
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<td>41305 DN</td>
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<td>curved 15°, diamond head, drill diameter 3 mm, shaft diameter 4 mm, color code: red-yellow</td>
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<tr>
<td>41305 D</td>
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<td>41305 DW</td>
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<td>DrillCut-X® II N Handpiece 40712055</td>
<td>curved 70°, diamond head, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-yellow</td>
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</tbody>
</table>
Accessories for Shaver

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

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

Same, Transmission 1:2 (80,000 rpm)

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

<table>
<thead>
<tr>
<th>Detail</th>
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<td>649770 G</td>
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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

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

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

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

<table>
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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** 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 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

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

- 20 7120 33
- 252661
- 51 mm
- 5.5 mm
- 71 mm
- 5.5 mm
- 91 mm
- 5.5 mm

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

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
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

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 20712033

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

252671 High-Speed Handpiece, extra long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033

252672 High-Speed Handpiece, super long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033
UNIDRIVE® S III ENT SCB
High-Speed Standard Burrs, High-Speed Diamond Burrs

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

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<th>long</th>
</tr>
</thead>
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<td>350130 L</td>
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<td>4</td>
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<td>350140 L</td>
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<td>350150 M</td>
<td>350150 L</td>
</tr>
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<td>6</td>
<td>350160 M</td>
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<tr>
<td>7</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
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The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>350330 M</td>
<td>350330 L</td>
</tr>
<tr>
<td>4</td>
<td>350340 M</td>
<td>350340 L</td>
</tr>
<tr>
<td>5</td>
<td>350350 M</td>
<td>350350 L</td>
</tr>
<tr>
<td>6</td>
<td>350360 M</td>
<td>350360 L</td>
</tr>
<tr>
<td>7</td>
<td>350370 M</td>
<td>350370 L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>350675 M</td>
</tr>
<tr>
<td>9</td>
<td>350690 M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>350960 M</td>
</tr>
<tr>
<td>9.1</td>
<td>350991 M</td>
</tr>
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<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>350718 M</td>
<td>350718 L</td>
</tr>
<tr>
<td>3</td>
<td>350730 M</td>
<td>350730 L</td>
</tr>
</tbody>
</table>
**UNIDRIVE® S III ENT SCB**

High-Speed Standard Burrs, High-Speed Diamond Burrs

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

![Image of burrs](image)

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>330110 S</td>
<td>330110 M</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>330120 S</td>
<td>330120 M</td>
<td>330120 L</td>
</tr>
<tr>
<td>3</td>
<td>330130 S</td>
<td>330130 M</td>
<td>330130 L</td>
</tr>
<tr>
<td>4</td>
<td>330140 S</td>
<td>330140 M</td>
<td>330140 L</td>
</tr>
<tr>
<td>5</td>
<td>330150 S</td>
<td>330150 M</td>
<td>330150 L</td>
</tr>
<tr>
<td>6</td>
<td>330160 S</td>
<td>330160 M</td>
<td>330160 L</td>
</tr>
<tr>
<td>7</td>
<td>330170 S</td>
<td>330170 M</td>
<td>330170 L</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>330206 S</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>330210 S</td>
<td>330210 M</td>
<td>–</td>
</tr>
<tr>
<td>1.5</td>
<td>330215 S</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>330220 S</td>
<td>330220 M</td>
<td>330220 L</td>
</tr>
<tr>
<td>3</td>
<td>330230 S</td>
<td>330230 M</td>
<td>330230 L</td>
</tr>
<tr>
<td>4</td>
<td>330240 S</td>
<td>330240 M</td>
<td>330240 L</td>
</tr>
<tr>
<td>5</td>
<td>330250 S</td>
<td>330250 M</td>
<td>330250 L</td>
</tr>
<tr>
<td>6</td>
<td>330260 S</td>
<td>330260 M</td>
<td>330260 L</td>
</tr>
<tr>
<td>7</td>
<td>330270 S</td>
<td>330270 M</td>
<td>330270 L</td>
</tr>
</tbody>
</table>
**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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>330330 S</td>
<td>330330 M</td>
<td>330330 L</td>
</tr>
<tr>
<td>4</td>
<td>330340 S</td>
<td>330340 M</td>
<td>330340 L</td>
</tr>
<tr>
<td>5</td>
<td>330350 S</td>
<td>330350 M</td>
<td>330350 L</td>
</tr>
<tr>
<td>6</td>
<td>330360 S</td>
<td>330360 M</td>
<td>330360 L</td>
</tr>
<tr>
<td>7</td>
<td>330370 S</td>
<td>330370 M</td>
<td>330370 L</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>330440 S</td>
</tr>
<tr>
<td>6</td>
<td>330460 S</td>
</tr>
</tbody>
</table>

**LINDEMANN High-Speed Fluted Burrs, 60,000 rpm, for single use, sterile, package of 5**

<table>
<thead>
<tr>
<th>Size in mm (diameter x length)</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter 2.1/11</td>
<td>330511 S</td>
</tr>
<tr>
<td>Diameter 2.3/26</td>
<td>330526 S</td>
</tr>
</tbody>
</table>
### UNIDRIVE® S III ENT SCB

**High-Speed Diamond Burrs**

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

![Image of Diamond Burrs 252671 and 252672]

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>extra long</th>
<th>super long</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>320220 EL</td>
<td>320220 SL</td>
</tr>
<tr>
<td>3</td>
<td>320230 EL</td>
<td>320230 SL</td>
</tr>
<tr>
<td>4</td>
<td>320240 EL</td>
<td>320240 SL</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>extra long</th>
<th>super long</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>320320 EL</td>
<td>320320 SL</td>
</tr>
<tr>
<td>3</td>
<td>320330 EL</td>
<td>320330 SL</td>
</tr>
<tr>
<td>4</td>
<td>320340 EL</td>
<td>320340 SL</td>
</tr>
</tbody>
</table>
Image 1 S Camera System

**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**
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

**IMAGE1 S Camera System**

**Brilliant 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**

TC 200EN

<table>
<thead>
<tr>
<th>Specifications</th>
<th>TC 200EN*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 S CONNECT</strong>, 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:</td>
<td></td>
</tr>
<tr>
<td>*Available in the following languages: DE, ES, FR, IT, PT, RU</td>
<td></td>
</tr>
<tr>
<td><strong>Mains Cord</strong>, length 300 cm</td>
<td></td>
</tr>
<tr>
<td><strong>DVI-D Connecting Cable</strong>, length 300 cm</td>
<td></td>
</tr>
<tr>
<td><strong>SCB Connecting Cable</strong>, length 100 cm</td>
<td></td>
</tr>
<tr>
<td><strong>USB Flash Drive</strong>, 32 GB, USB silicone keyboard, with touchpad, US</td>
<td></td>
</tr>
</tbody>
</table>

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

TC 300

<table>
<thead>
<tr>
<th>Specifications</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 S H3-LINK</strong>, 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:</td>
<td></td>
</tr>
<tr>
<td><strong>Mains Cord</strong>, length 300 cm</td>
<td></td>
</tr>
<tr>
<td><strong>Link Cable</strong>, length 20 cm</td>
<td></td>
</tr>
</tbody>
</table>

**Camera System**

Supported camera heads/video endoscopes: TH 100, TH 101, TH 102, TH 103, TH 104, TH 106 (fully compatible with IMAGE1 S), 22220055-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220085-3 (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.
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

IMAGE1 S Camera Heads

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

**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 IMAGE1 HUB™ HD/HD

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>IMAGE1 S H3-Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 100</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 114 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>270 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
</tr>
</tbody>
</table>

**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 IMAGE1 HUB™ HD/HD

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>IMAGE1 S H3-ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 104</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 100 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>299 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
</tr>
</tbody>
</table>
Monitors

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

26" FULL HD Monitor, wall-mounted with VESA 100 adaption, color systems PAL/NTSC, max. screen resolution 1920 x 1080, image format 16:9, power supply 100–240 VAC, 50/60 Hz including:

External 24 VDC Power Supply
Mains Cord
Monitors

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
</tbody>
</table>

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:

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

**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

**Including:**
- **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**

**Monitor Swivel 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

**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

**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

**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