ENDOSCOPIC SKULL BASE AND PITUITARY APPROACHES
A Step-By-Step Guide for Surgical Instruction and Cadaveric Dissection

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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>7</td>
</tr>
<tr>
<td>Introduction</td>
<td>7</td>
</tr>
<tr>
<td><strong>Endoscopic Skull Base Corridors, Approaches and Targets</strong></td>
<td>8</td>
</tr>
<tr>
<td>Transsphenoidal Corridor</td>
<td>9</td>
</tr>
<tr>
<td>Transnasal Corridor</td>
<td>16</td>
</tr>
<tr>
<td>Transethmoidal Corridor</td>
<td>19</td>
</tr>
<tr>
<td>Transmaxillary Corridor</td>
<td>22</td>
</tr>
<tr>
<td>Closure</td>
<td>25</td>
</tr>
<tr>
<td>Bibliography</td>
<td>26</td>
</tr>
</tbody>
</table>
Dr. Theodore H. Schwartz received his undergraduate and medical degrees from Harvard University where he graduated Magna Cum Laude. After completing his residency and chief residency in Neurosurgery at the Neurological Institute of New York at Columbia-Presbyterian Medical Center, Dr. Schwartz completed advanced fellowship training at Yale-New Haven Medical Center in the surgical treatment of brain tumors and epilepsy. Dr. Schwartz specializes in image-guided minimally invasive surgical techniques such as stereotaxis, endoscopy and image-guided brain mapping, and has received numerous awards and fellowships including the prestigious van Wagenen Fellowship, awarded by the American Association of Neurological Surgeons and the von Humboldt Fellowship, awarded by the German Government. Dr. Schwartz was recently awarded the “Gentle Giant Award” by the Pituitary Network and is on the editorial board for the Journal of Neurosurgery and World Neurosurgery. Dr. Schwartz is a Professor of Neurosurgery, Otorhinolaryngology and Neuroscience and the David and Ursel Barnes Professor of Minimally Invasive Neurosurgery at Weill Cornell Medical Center, New York Presbyterian Hospital. He is the Surgical Director of the Comprehensive Epilepsy Center, as well as the Director of Anterior Skull Base and Pituitary Surgery. His recent textbook publications include Practical Endoscopic Skull Base Surgery (Plural Publishing Inc.) and Endoscopic Pituitary Surgery (Thieme).

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Preface

Endoscopic approaches to the pituitary and skull base are quickly becoming a standard of care in neurosurgery and otolaryngology. The basis for a comprehensive understanding of the applications and limitations of these approaches is best acquired in the laboratory, performing cadaveric dissections. After teaching and participating in several endoscopic skull base dissection courses, we felt there was a need for a dissection manual that could be helpful to guide the surgeon through the various approaches in a step-by-step fashion. For this reason we have tried to make this manual very simple and illustrative. In addition, since the cadaveric anatomy never quite perfectly simulates real intraoperative conditions, we have linked each step with an intraoperative photo as a demonstration. The purpose of the intraoperative photographs are to assist the surgeon in making the cognitive transition from the cadaver laboratory to the operating room.

Introduction

The skull base lies at the anatomic boundary between the fields of neurosurgery and otolaryngology. Surgery in this region has always been a challenge for both disciplines. The success of endoscopic techniques in the management of inflammatory sinus disease has lead to the next step of applying the endoscope to the resection of tumors of the skull base.

This laboratory manual is intended as a guide for cadaveric dissection which will serve as an introduction to the surgical exercises. We find it useful to think about the endoscopic skull base approaches as a combination of three factors – 1 a target, 2 a skull base approach and 3 a nasal corridor. The first aspect of the surgical plan is the target. We have defined 15 separate targets. They are – 1 anterior fossa, 2 olfactory groove, 3 sella, 4 suprasellar cistern, 5 lateral sphenoid sinus, 6 medial cavernous sinus, 7 lateral cavernous sinus, 8 orbital apex, 9 pterygopalatine fossa, 10 Meckel’s cave, 11 infratemporal fossa, 12 petrous apex, 13 upper third of clivus, 14 lower two-thirds of clivus, and 15 odontoid/ventral craniovertebral junction. Some targets have one possible approach, whereas other targets have multiple approaches. The second aspect of the approach involves an understanding of the possible corridors though which one passes on the way to the target. There are four corridors that define the endonasal endoscopic approaches: 1 transnasal, 2 transsphenoidal, 3 tranethmoidal, 4 transmaxillary. These corridors correspond to the nasal sinuses and can be combined to reach a variety of targets. The link between the nasal corridor and the surgical target is the approach.

The purpose of the manual is to describe the various nasal corridors that are presently available to reach intracranial targets through the endonasal skull base approaches and to take the participant though each of these approaches. The division of the endonasal skull base approaches into corridors, approaches and targets provides a framework for instruction.
## Endoscopic Skull Base Corridors, Approaches and Targets

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Approach</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transnasal</td>
<td>Transcribriform</td>
<td>Anterior Fossa/Olfactory Groove Lower 2/3 of Clivus</td>
</tr>
<tr>
<td></td>
<td>Transclival</td>
<td>Odontoid/Craniovertebral Junction</td>
</tr>
<tr>
<td>Transsphenoidal</td>
<td>Transsellar</td>
<td>Sella</td>
</tr>
<tr>
<td></td>
<td>Transtuberculum/Transplanum</td>
<td>Suprasellar Cistern</td>
</tr>
<tr>
<td></td>
<td>Transclival</td>
<td>Upper 1/3 of Clivus</td>
</tr>
<tr>
<td></td>
<td>Transcavernous</td>
<td>Medial Cavernous Sinus</td>
</tr>
<tr>
<td>Transethmoidal</td>
<td>Transfovea Ethmoidalis</td>
<td>Anterior Fossa</td>
</tr>
<tr>
<td></td>
<td>Transorbital *</td>
<td>Orbital Apex</td>
</tr>
<tr>
<td></td>
<td>Transsphenoidal</td>
<td>Cavernous Sinus</td>
</tr>
<tr>
<td>Transmaxillary</td>
<td>Transpterygoidal*</td>
<td>Pterygopalatine Fossa</td>
</tr>
<tr>
<td></td>
<td>Transpterygoidal*</td>
<td>Infratemporal Fossa</td>
</tr>
<tr>
<td></td>
<td>Transpterygoidal*</td>
<td>Petrous Apex</td>
</tr>
<tr>
<td></td>
<td>Transpterygoidal*</td>
<td>Lateral Sphenoid Sinus</td>
</tr>
<tr>
<td></td>
<td>Transpterygoidal*</td>
<td>Lateral Cavernous Sinus</td>
</tr>
<tr>
<td></td>
<td>Transpterygoidal*</td>
<td>Meckel’s Cave</td>
</tr>
</tbody>
</table>

+ The transethmoidal transorbital approach involves opening the anterior and lateral walls of the sphenoid sinus.

* The transmaxillary transpterygoidal approach involves opening the ethmoid and sphenoid sinuses as well.
**Transsphenoidal Corridor**

The transsphenoidal corridor offers an approach to the sphenoid sinus which is the gateway to the sella, the planum sphenoidale, the suprasellar cistern, the intrasphenoidal clivus and medial cavernous sinus. Although a unilateral approach is feasible when removing small pituitary tumors, the bilateral approach is critical for more extensive skull base approaches and eases visualization and instrument manipulation during cadaveric dissection.

**Step 1** Advance the endoscope through each nares and identify the septum (S) medially, the inferior, middle (MT) and superior turbinates laterally and the choana (CH) inferiorly (Fig. 1).
Step 2  Identify the ostia of the sphenoid sinuses bilaterally (OS). These are found 1.5 cm above the choana (CH), just below the superior turbinates (ST). Below the ostium is the sphenoethmoidal recess (Fig. 2). If a nasoseptal flap is being harvested, this must be done at the beginning of the operation (see Closure, p. 25). If not, proceed to Step 3.

Step 3  Remove the posterior nasal septum adjacent to the sphenoid rostrum.

Step 4  Complete a submucous resection of the nasal septum and harvest the bone of the vomer or the perpendicular plate of the ethmoid bone. These specimens can be used to reconstruct the skull base defect.

Step 5  Enlarge the ostia (OS) bilaterally with a mushroom forceps or a drill. Care must be taken not to damage the sphenopalatine artery when opening the ostium inferolaterally (Fig. 3).

Step 6  Identify the sphenoid rostrum and drill the bone until the sphenoid sinus is opened widely. Remove the intersphenoidal septae and identify the sella (S) and the clivus (C) inferiorly. The carotid protuberances (CP) overlie the vertical segment of the carotid artery on each side of the clivus (Fig. 4).
**Step 7** Identify the anatomy on the lateral wall of the sphenoid sinus, such as the optic protuberance (OP), the carotid protuberance (CP) and the opticocarotid recess (OCR) (Fig. 5).

**Step 8** Identify the tuberculum sellae (TS) and planum sphenoidale (PS) above the sella (S) (Fig. 6).

**Step 9** Transsellar Approach: Drill the anterior wall of the sella (S) to expose the dura (D) overlying the pituitary gland. A large opening from carotid protuberance to carotid protuberance is helpful in removing large adenomas. Open the dura in a cruciate fashion to expose the pituitary gland (Fig. 7).
**Step 10 Transtuberculum, Transplanum Approach:**

Drill through the tuberculum sellae and planum sphenoidale to expose the dura of the tuberculum sella (TSD) and planum sphenoidale (PSD). Open the dura above and below the superior intercavernous sinus (SICS) and then cauterize and cut the SICS to expose the optic chiasm (OC), optic nerves (ON) and arachnoid (A) overlying the gyrus rectus (GR). The anterior communicating artery (ACA) can be found above the optic chiasm and the pituitary stalk is below, a common site for craniopharyngiomas (CR). Advancing the endoscope through the floor of the third ventricle will expose the roof of the third ventricle, choroid plexus (CP), fomices (F) and foramen of Monro (FM) (Figs. 8a–d).
Step 11 Tuberculum sellae and planum meningiomas often involve the diaphragma sella (DS), which has to be resected with care taken to preserve the pituitary stalk (PS). Meningiomas, which invade the optic canals must be removed in their entirety. Furthermore, opening of the optic canals is important in achieving this goal. Complete removal of planum meningiomas often exposes the lamina terminalis (LT) as well as the A1, anterior communicating artery (ACA) and A2 branches of the anterior cerebral artery. The view behind the stalk reveals the basilar artery (BA), posterior cerebral arteries (PCA), posterior communicating artery (PCOM), and third cranial nerves (III) arising from the mesencephalon. The optic tract (OT) and mamillary bodies (MB) also come into view (Figs. 9a–c).
Step 12 Transclival Approach (superior 1/3 of clivus): Drill the bone of the clivus to expose the clival dura (CD) below the pituitary dura (PD). The bone over the cavernous sinus (CS) and internal cerebral artery (ICA) can also be removed to expose the ICA in order to reach pathology like chordomas that extend behind the CS and ICA. Opening of the dura, which is done in the shape of a capital “I” to avoid damaging the sixth nerve, exposes the basilar artery (BA), third nerve (III), posterior cerebral arteries (PCA) and superior cerebellar arteries (SCA) in the interpeduncular cistern (Figs. 10a–c).
Step 13 To extend the transsphenoidal, transclival approach more laterally and superiorly to obtain a view behind the pituitary gland and carotid artery, one can remove the posterior clinoid (PC) after removing the bone over the pituitary dura (PD) and cavernous sinus (CS). The bone can be removed over the vertical portion of carotid artery (ICA) to mobilize the ICA laterally. In addition, the pituitary gland (P) is exposed and pushed medially to expose the dura over the posterior clinoid and sellar diaphragma, which can be removed for exposure of the third nerve, ambient cistern, medial temporal lobe and tentorium. This approach is useful for removal of the lateral and superior extend of petroclival meningiomas (T) (Figs. 11a, b).

Step 14 Transcavernous Approach: The bone between the optic nerve and carotid artery, or medial opticocarotid recess can be removed to expose the superomedial aspect of the cavernous sinus (CS). This opening can be extended inferolaterally to expose the carotid siphon (ICA) in the medial cavernous sinus. However, the cavernous sinus is best explored later in the dissection after the ethmoids have been opened through a corridor lateral to the middle turbinate and once the medial pterygoid plate has been removed (Figs. 12a, b).
**Transnasal Corridor**

The transnasal corridor lies medial to the middle turbinate and lateral to the septum. The superior border is the cribriform plate, the inferior border is the palate and posteriorly the nasal corridor extends to the choana, nasopharynx, inferior clivus and odontoid.

**Step 1** Remove the perpendicular plate of the ethmoid bone to expose the cribriform plates bilaterally.

**Step 2** Identify the vertical (V) attachment of the middle turbinate (MT). The cribriform plate (CP) lies medial to the vertical attachment of the middle turbinate and lateral to the septum (which was previously removed). This is a common site for meningoceles (MC) (Fig. 13).
**Step 3** Transcribiform Approach: Remove the mucosa underlying the cribiform plate and drill the plate until paper thin and remove with a curette to expose the dura. Open the dura to expose the olfactory nerves (ON) bilaterally in the olfactory grooves (Fig. 14).

**Step 4** Identify the choana and approach the nasopharynx.

**Step 5** Laterally displace the inferior turbinate bilaterally with a Goldman bar.

**Step 6** Completely remove the vomer. Identify the mucosa of the nasopharynx over the clivus and odontoid and identify the Eustachian tubes (ET) bilaterally (Fig. 15a).

**Step 7** Drill the floor of the sphenoid sinus and identify the vidian nerves laterally. The vidian nerves represent the supero-lateral limits of the transnasal, transclival approach.

**Step 8** Transclival Approach: Elevate a flap of mucosa and fascia at the back of the nasopharynx. This is done in an inverted U-shaped incision to be replaced at the end of the operation. The lateral limits of this flap are the Eustachian tubes (ET). The flap of basopharyngeal fascia is retracted downwards into the oropharynx to expose the clivus (C) and if necessary, the odontoid (Figs. 15b, c).
**Step 9** Drill the clivus (C) to expose the clival dura (CD) (Fig. 16a).

**Step 10** Open the dura in the shape of a capital “I” and cauterize back the edges (Fig. 16b).

**Step 11** Identify the ventral aspect of the pons (P) and medulla (M) as well as the vertebral arteries and basilar artery, which may be visible, depending on how the pathology has displaced the normal anatomy.

**Step 12** Transodontoid Approach: Extend the basopharyngeal fascia opening downwards to expose the odontoid (O) and ring of C1. Transect the atlantooccipital membrane, longus capitis and longus colli muscles (LC) (Fig. 17).

**Step 13** The anterior arch of C1 can be removed to expose the dens which can be removed with a high speed drill after separating it form the apical and alar ligaments to expose the craniocervical junction.
**Transethmoidal Corridor**

The transethmoidal corridor lies lateral to the middle turbinate and is the corridor to the fovea ethmoidalis, orbital apex and lateral sphenoidal sinus. The transethmoid approach is also useful in fully exposing the maxillary sinus and the transpterygoid approach.

*Step 1* Mobilize the middle turbinate medially.
**Step 2** Working lateral to the septum (S) and middle turbinate (MT), identify the uncinate process (U) and starting with an uncinectomy and infundibulotomy, identify the ethmoidal bulla (EB) (Figs. 18a, b).

**Step 3** Complete the uncinectomy superiorly and expose frontal recess.

**Step 4** Penetrate the ethmoidal bulla and complete the ethmoidectomy to expose the fovea ethmoidalis (FE) (Fig. 19).

**Step 5** Identify the anterior ethmoidal artery (AE) at the frontal recess (FR) and transect it after satisfactory clipping of the vessel. It is easily identified at the junction of the lamina papyracea (LP) and the frontal recess (Fig. 20).

**Step 6** Complete the dissection posteriorly, inferiorly and medially to avoid injury to the orbital apex. The middle turbinates can be completely removed to facilitate the exposure.
**Step 7 Transfovea Ethmoidalis Approach:** Once a total bilateral ethmoidectomy is performed and the nasal septum and vertical attachments of the middle turbinates have been removed the cribriform plate dura (CPD) and fovea ethmoidalis (FE) and are exposed between the lamina papyracea (LP) of the medial orbits. Removal of the FE and opening of the dura expose the frontal lobes (FL) which can be seen in this example of removal of an olfactory groove meningioma (OGM) (Figs. 21a, b).

**Step 8 Transcavernous Approach:** Open the anterior wall of the sphenoid sinus and remove bone over the sella to expose the pituitary dura (PD). Additional removal of bone overlying the carotid artery will expose the cavernous sinus (CS) more directly than the transsphenoidal corridor which is medial to the middle turbinate. The use of intraoperative Doppler is often useful to localize the carotid artery within the cavernous sinus (Fig. 22).

**Step 9 Transorbital Approach:** Remove the lamina papyracea to expose the medial wall of the orbit and the periorbital fat (OF). Care must be taken not to damage the medial rectus muscle. The bone removal can extend back into the sphenoid sinus to expose the orbital apex. The medial orbital apex generally presents to the lateral wall of the sphenoid sinus, although in 12–25% a posteriorly located ethmoid air cell or “Onodi cell” will contain the medial orbital apex (Fig. 23).
Transmaxillary Corridor

The transmaxillary corridor is used to reach the maxilla, pterygopalatine fossa, lateral sphenoid sinus and cavernous sinus, Meckel's cave, infratemporal fossa and petrous apex.

Step 1 At this point, the nasal septum (S) and middle turbinates (MT) have been removed. A total ethmoidectomy has been performed. Identify the opening of the maxillary sinus ostium (MO) (Fig. 24).
**Step 2** Enlarge the posterior ridge of the maxillary sinus ostium and dissect the anterior vertical process of the pterygoid plate (PP) of the palate bone to expose the sphenopalatine artery (SPA) and vidian nerve. Transect the sphenopalatine artery (Fig. 25).

**Step 3 Transpterygoidal Approach:** Remove the posterior plate of the palatine bone (PP) and drill the lateral wall of the sphenoid sinus as well as the posterior wall of the maxillary sinus (MS) to expose the pterygopalatine fossa (Fig. 26).

**Step 4** The contents of the pterygopalatine fossa can be identified such as the origin of the sphenopalatine artery (SPA) emerging above the crista ethmoidalis (CE) as well as the descending palatine artery (DPA), posterior superior alveolar artery (PSAA) maxillary nerve (Max N) and infraorbital artery (IOA) and nerve (ION) (Fig. 27).

**Step 5** Exposure of the posterior wall of the pterygopalatine fossa (PPF) reveals the vidian canal (VN) which can be followed posteriorly toward the ICA and the foramen rotundum (FR) which can be followed towards Meckel's cave and the middle fossa (Fig. 28).
**Step 6** Further drilling of the lateral wall of the sphenoid sinus and the medial pterygoid bone exposes the lateral sphenoid sinus (LSS) and Meckel’s cave (MC) superiorly and the petrous apex inferiorly (Fig. 29).

**Step 7** Exposure of the infratemporal fossa (ITF) requires removal of the inferior turbinate, drilling of the crista ethmoidalis (CE) to fully expose the posterior wall of the maxillary sinus (MAX) and then drilling of the pterygo-maxillary fissure. The posterior wall of the maxillary sinus (MAX) is often thinned by the pathology and is easily fractured to reach pathology in the ITF (Figs. 30a, b).
Closure

A watertight closure of the skull base at the conclusion of endoscopic skull base surgery is as critical as the approach and the resection to prevent post-operative CSF leak and meningitis.

**Step 1** Harvesting a Nasoseptal Flap: The nasoseptal flap (NSF) must be harvested at the beginning of the operation. The superior and inferior cuts are made a few millimeters below and above the junction of the septum and cribiform plate and the hard palate respectively. A third vertical cut is made as anterior as possible. Care is taken to preserve the vascular pedicle and the sphenopalatine artery (Fig. 31).

**Step 2** The Gasket-Seal Closure: A piece of fascia lata (FL) is harvested, which is approximately 1 cm larger in diameter than the defect in the skull base. This graft is placed over the defect in the skull and then countersunk with a piece of vomer or Medpor® implant material (P) (Porex Surgical Inc., Newnan, GA, USA) which provides a rigid buttress for the closure. The edges of the FL stick out circumferentially like cauliflower providing a watertight “gasket” seal. The NSF is placed over the gasket seal so that the edges of the NSF extend beyond the FL and lie on the skull base. All mucosa must be removed from behind the NSF to prevent mucocoele formation. The NSF is held in place with a final layer of Tisseel (Baxter) or Duraseal (Covidien) (DS) (Figs. 32a–c).
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**Rotation Socket**
to clamp to the OR table, for European and US standard rails, with lateral clamp for height and angle adjustment of the articulated stand

**Articulated Stand**, reinforced version, L-shaped, with one central clamp for all five joint functions, height 48 cm, swivel range 52 cm, with quick release coupling KSLOCK (female)

**Clamping Jaw**, metal, with axial intake, clamping range 4.8 up to 12.5 mm, with quick release coupling KSLOCK (male), for use with instrument and telescope sheaths
KARL STORZ CLEARVISION® II System
for intra-operative irrigation of the telescope lens

UNIT SIDE

PATIENT SIDE

One-pedal footswitch

Silicone tubing set*

Irrigation sheath

40334101  KARL STORZ CLEARVISION® II Set,
Lens irrigation system for telescopes,
power supply: 100–240 V AC, 50–60 Hz
including:
CLEARVISION® II
Mains Cord
One-pedal Footswitch
Silicone Tubing Set

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

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

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

<table>
<thead>
<tr>
<th>Detail</th>
<th>Order No.</th>
<th>Outer Diameter</th>
<th>Working length</th>
<th>Order No.</th>
<th>View</th>
<th>Outer Diameter</th>
<th>Working length</th>
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<tbody>
<tr>
<td>7230 AS</td>
<td>4.8 x 6.0 mm</td>
<td>14 cm</td>
<td>7230 AA</td>
<td>0°</td>
<td>4.0 mm</td>
<td>18 cm</td>
<td></td>
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<tr>
<td>7230 BS</td>
<td>4.8 x 6.0 mm</td>
<td>14 cm</td>
<td>7230 BA</td>
<td>30°</td>
<td>4.0 mm</td>
<td>18 cm</td>
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<tr>
<td>7230 FS</td>
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<td>14 cm</td>
<td>7230 FA</td>
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<td>18 cm</td>
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<tr>
<td>7230 CS</td>
<td>4.8 x 6.0 mm</td>
<td>14 cm</td>
<td>7230 CA</td>
<td>70°</td>
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<tr>
<td>7220 AS</td>
<td>3.7 x 4.8 mm</td>
<td>10 cm</td>
<td>7220 AA</td>
<td>0°</td>
<td>3.0 mm</td>
<td>14 cm</td>
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<tr>
<td>7220 BS</td>
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<td>10 cm</td>
<td>7220 BA</td>
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<td>14 cm</td>
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<tr>
<td>7220 CS</td>
<td>3.7 x 4.8 mm</td>
<td>10 cm</td>
<td>7220 CA</td>
<td>70°</td>
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<td>14 cm</td>
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<tr>
<td>7219 AS</td>
<td>3.5 x 4.7 mm</td>
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<td>7229 AA</td>
<td>0°</td>
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<td>18 cm</td>
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<tr>
<td>7219 BS</td>
<td>3.5 x 4.7 mm</td>
<td>14 cm</td>
<td>7229 BA</td>
<td>30°</td>
<td>2.7 mm</td>
<td>18 cm</td>
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<tr>
<td>7219 FS</td>
<td>3.5 x 4.7 mm</td>
<td>14 cm</td>
<td>7229 FA</td>
<td>45°</td>
<td>2.7 mm</td>
<td>18 cm</td>
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<tr>
<td>7219 CS</td>
<td>3.5 x 4.7 mm</td>
<td>14 cm</td>
<td>7229 CA</td>
<td>70°</td>
<td>2.7 mm</td>
<td>18 cm</td>
<td></td>
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<tr>
<td>7230 AES</td>
<td>4.8 x 6 mm</td>
<td>14 cm</td>
<td>7230 AE</td>
<td>15°–90°</td>
<td>4 mm</td>
<td>18 cm</td>
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</table>
Probes, Elevators, Knives and Currettes

- **Probe**, double-ended, maxillary sinus ostium seeker, ball-shaped ends diameter 1.2 and 2 mm, length 19 cm
- **KUHN-BOLGER Frontal Sinus Curette**, 55° curved, oval, forward cutting, length 19 cm
- **COTTLE Elevator**, double-ended, semisharp and blunt, graduated, length 20 cm
- **FREER Elevator**, double-ended, semisharp and blunt, length 20 cm
- **FREER Suction Elevator**, with stylet, length 19 cm
- **KUHN Frontal Ostium Seeker**, double-ended, No. 6, both sides curved 77°, one tip straight, other tip reverse angle, length 22 cm
- **KUHN-BOLGER Frontal Sinus Curette**, 90° curved, oval, forward cutting, length 19 cm
- **Sickle Knife**, pointed, length 19 cm
- **de DIVITIIS-CAPPABIANCA Scalpel**, with retractable blade, length 23 cm including:
  - **Handle**
  - **Outer Sheath**
  - **Micro Knife**, sickle-shaped
- **CASTELNUOVO Elevator**, double-ended, blunt end angled, semisharp end slightly curved, graduated, length 26 cm
RHINOFORCE® II Ethmoid Forceps
working length 17 cm

649100 B  BLAKESLEY RHINOFORCE® II Ethmoid Forceps, straight, size 0, with cleaning connector, working length 16 cm
649101 B  Same, size 1
649102 B  Same, size 2

649110 B  BLAKESLEY-WILDE RHINOFORCE® II Ethmoid Forceps, 45° curved upwards, size 0, with cleaning connector, working length 16 cm
649111 B  Same, size 1

649123 B  TAKAHASHI RHINOFORCE® II Ethmoid Forceps, spoon size 4 x 10 mm, with cleaning connector, working length 16 cm
### GRÜNWALD-HENKE/CASTELNUOVO RHINOFORCE® II Nasal Cutting Forceps

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>451000 B</td>
<td>GRÜNWALD-HENKE RHINOFORCE® II Nasal Cutting Forceps, straight, through-cutting, tissue-sparing, BLAKESLEY shape, size 0, width 3 mm, with cleaning connector, working length 13 cm</td>
</tr>
<tr>
<td>451001 B</td>
<td>Same, size 1, width 3.5 mm</td>
</tr>
<tr>
<td>451002 B</td>
<td>Same, size 2, width 4 mm</td>
</tr>
<tr>
<td>451010 B</td>
<td>CASTELNUOVO RHINOFORCE® II Nasal Cutting Forceps, end of sheath 25° upturned, through-cutting, with straight jaws, BLAKESLEY shape, width 3 mm, with cleaning connector, working length 13 cm</td>
</tr>
<tr>
<td>451500 B</td>
<td>GRÜNWALD-HENKE RHINOFORCE® II Nasal Cutting Forceps, 45° upturned, through-cutting, tissue-sparing, BLAKESLEY shape, size 0, width 3 mm, with cleaning connector, working length 13 cm</td>
</tr>
<tr>
<td>451501 B</td>
<td>Same, size 1, width 3.5 mm</td>
</tr>
<tr>
<td>451502 B</td>
<td>Same, size 2, width 4 mm</td>
</tr>
<tr>
<td>451510 B</td>
<td>CASTELNUOVO RHINOFORCE® II Nasal Cutting Forceps, end of sheath 25° upturned, through-cutting, jaws 45° upturned, BLAKESLEY shape, width 3 mm, with cleaning connector, working length 13 cm</td>
</tr>
</tbody>
</table>
STRUYCKEN RHINOFORCE® II Nasal Cutting Forceps

455010

STRUYCKEN RHINOFORCE® II Nasal Cutting Forceps, with cleaning connector, working length 13 cm

TAKAHASHI RHINOFORCE® Nasal Forceps

455000 B

TAKAHASHI RHINOFORCE® Nasal Forceps, straight, working length 13 cm
SilCut® Instruments

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

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 1, with cleaning connector, working length 13 cm

Same, 45° upturned
RHINOFORCE® II Miniature Nasal Forceps

**flat jaws, through-cutting**

- **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 45° upturned
- **452833** Same, sheath curved 30°, straight jaws
- **452834** Same, sheath curved 30°, jaws 45° upturned
**STAMMBERGER Antrum Punch**

**sidebiting downward and forward cutting**

459051 459052

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

459051

Same, left side downward and forward cutting

459052

**STAMMBERGER Antrum Punch**

**backward cutting**

459010

STAMMBERGER RHINOFORE® II Antrum Punch, upside backward cutting, with cleaning connector, working length 10 cm

459010

Same, right side backward cutting

459011

Same, left side backward cutting

459012
STAMMBERGER Antrum Punch
backward cutting

STAMMBERGER Antrum Punch, backward cutting, sheath 360° rotatable, with fixing screw, dismantling, working length 10 cm, for use with Cleaning Adaptor 459015 LL

STAMMBERGER Antrum Punch
pediatric size, backward cutting

STAMMBERGER Antrum Punch, small pediatric size, slender, backward cutting, sheath 360° rotating, with fixing screw, dismantling, working length 10 cm, for use with Cleaning Adaptor 459015 LL
STAMMBERGER Circular Cutting Punch

Special features:
- Unique design
- For enlarging openings in the sphenoid frontal wall
- Circular cutting punch mechanism allows cutting in a full circle of 360° without rotating the instrument as required with a conventional punch forceps
- No interference with other instruments simultaneously used in the nose (e.g. endoscope, suction tube)
- Available in 2 sizes: diameter 3.5 and 4.5 mm, punch head 4-fold LASER-welded
- Integrated irrigation channel

Multipurpose use:
- In addition to abrading procedures applied to the sphenoid frontal wall, bony ethmoid septa, pieces of nasal concha and other thin bony bridges can also be cut away
- Extremely useful for treatment of choanal atresia
- Blunt punching head reduces injuries
- If used correctly by punching exclusively in the sagittal axis, traumata of vital structures, e.g. cranium, carotid artery and optic nerve osseous canal are virtually impossible

651055 STAMMBERGER Punch, circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 3.5 mm, with cleaning connector, working length 18 cm

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

651065 Same, diameter 4.5 mm

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

Egg-shaped tip, for opening the ethmoid cells and the sphenoid sinus

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>651057</td>
<td>STAMMBERGER Punch, egg-shaped tip, circular cut, 60° cutting direction from distal above to proximal below, tip diameter 3.5 mm, straight sheath, for sphenoid, ethmoid and choanal atresia, with cleaning connector, working length 18 cm</td>
</tr>
<tr>
<td>651058</td>
<td>Same, circular cut 120°</td>
</tr>
<tr>
<td>651053</td>
<td>STAMMBERGER Punch, egg-shaped tip, circular cut, 120° cutting direction from distal below to proximal above, tip diameter 4.5 mm, straight sheath, for sphenoid, ethmoid and choanal atresia, with cleaning connector, working length 18 cm</td>
</tr>
<tr>
<td>651052</td>
<td>Same, circular cut, 60° cutting direction, tip diameter 4.5 mm</td>
</tr>
<tr>
<td>651061</td>
<td>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</td>
</tr>
<tr>
<td>651066</td>
<td>Same, tip diameter 4.5 mm</td>
</tr>
</tbody>
</table>
Frontal Sinus Punches
with link chain sheath, backward cutting

651521 – 651523

*Frontal Sinus Punch*, with link chain sheath 70° upturned, backward cutting, to reduce the spina nasalis superior, small, jaws 2.5 x 2 mm, working length 13 cm

651521

*Same*, medium (standard size), jaws 3.5 x 3 mm

651522

*Same*, large, jaws 5.5 x 5 mm

651523
KERRISON Bone Punches

662101  KERRISON Bone Punch, detachable, rigid, 90° upbiting, not through-cutting, size 1 mm, working length 17 cm

662102  Same, size 2 mm

662112  KERRISON Bone Punch, detachable, rigid, 90° downbiting, not through-cutting, size 2 mm, working length 17 cm

662120  KERRISON Bone Punch, detachable, rigid, upbiting 40° forward, size 0.7 mm, working length 17 cm
Punches

28164 MKA – 28164 MKB

28164 MKA  KERRISON Bone Punch, detachable, rigid, upbiting 60° forward, size 1 mm, working length 17 cm

28164 MKB  Same, size 2 mm

Suction Tubes

10383 B – BL

10380 C – E

10383 B  Suction Tube, with cut-off hole, diameter 3 mm, working length 35 cm
10383 BL  Same, diameter 5.5 mm
10380 C  Suction Tube, diameter 2 mm, working length 25 cm
10383 D  Same, diameter 3 mm
10383 E  Same, diameter 4 mm
Suction Tubes and Antrum Cannulas

- **529207** FRAZIER Suction Tube, with cut-off hole and stylet, angled, outer diameter 7 Fr./2 mm, working length 10 cm, total length 17.5 cm
- **586031** v. EICKEN Antrum Cannula, Luer-Lock, with cut-off hole, long curved, outer diameter 3 mm, length 12.5 cm
- **586226** v. EICKEN Antrum Cannula, Luer-Lock, with cut-off hole, short curved, outer diameter 2.5 mm, length 12.5 cm
- **586241** Same, outer diameter 4 mm
- **641625** Suction Tube, for frontal sinus, with cut-off hole, Luer, outer diameter 2.5 mm, length 14.5 cm
- **662885** FRANK-PASQUINI Suction Tube, angular, tip curved upwards, ball end, with grip plate and cut-off hole, Luer, diameter 3 mm, working length 13 cm
- **662886** Same, tip curved downwards
### Suction Tubes and Irrigation Tube

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>206600</td>
<td>FISCH Suction and Irrigation Tube, cylindrical, suction tube outer diameter 2.5 mm, irrigation tube outer diameter 2 mm, working length 9.5 cm</td>
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<tr>
<td>649183</td>
<td>FERGUSON Suction Tube, with cut-off hole and stylet, LUER, 10 Fr., working length 15 cm</td>
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<tr>
<td>663818</td>
<td>Suction Tube, angular, malleable, with round handle and cut-off hole, diameter 2 mm, working length 13 cm</td>
</tr>
<tr>
<td>649179 B</td>
<td>Suction Tube, malleable, with elongated cut-off hole and stylet, LUER, 4 Fr., working length 15 cm</td>
</tr>
<tr>
<td>649180 B</td>
<td>Suction Tube, malleable, with elongated cut-off hole and stylet, LUER, 6 Fr., working length 15 cm</td>
</tr>
<tr>
<td>649182 B</td>
<td>Suction Tube, malleable, with elongated cut-off hole and stylet, LUER, 8 Fr., working length 15 cm</td>
</tr>
<tr>
<td>649183 B</td>
<td>Suction Tube, malleable, with elongated cut-off hole and stylet, LUER, 10 Fr., working length 15 cm</td>
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</tbody>
</table>
TAKE-APART® Bipolar Forceps

28164 BDL  TAKE-APART® Bipolar Forceps, with fine jaws, width 1 mm, distally angled 45°, vertical closing, outer diameter 3.4 mm, working length 20 cm, including:
- Bipolar Ring Handle
- Outer Sheath
- Inner Sheath
- Forceps Insert

28164 BDM  TAKE-APART® Bipolar Forceps, with fine jaws, width 1 mm, distally angled 45°, horizontal closing, outer diameter 3.4 mm, working length 20 cm, including:
- Bipolar Ring Handle
- Outer Sheath
- Inner Sheath
- Forceps Insert

28164 BDD  TAKE-APART® Bipolar Forceps, width 2 mm, distally angled 45°, horizontal closing, outer diameter 3.4 mm, working length 20 cm, including:
- Bipolar Ring Handle
- Outer Sheath
- Inner Sheath
- Forceps Insert

28164 BDG  TAKE-APART® TAN Bipolar Coagulation Forceps, size 3.4 mm, working length 20 cm, including:
- Bipolar Ring Handle
- Outer Sheath
- Inner Sheath
- Forceps Insert

26176 LA  Bipolar High Frequency Cord, with 2x 4 mm banana plug for KARL STORZ Coagulator 26020 XA/XB and Valleylab, length 300 cm
STAMMBERGER **Bipolar Suction Forceps**

**461015**

STAMMBERGER **Bipolar Suction Forceps**, 15° upturned, with suction channel, for bipolar coagulation in paranasal areas, working length 12.5 cm, for use with Bipolar High Frequency Cord 847002 E or 847002 A/M/V/U

**461010**

STAMMBERGER **Bipolar Suction Forceps**, 15° upturned, with suction channel, for bipolar coagulation in paranasal areas, working length 12.5 cm, for use with Bipolar High Frequency Cord 847002 E or 847002 A/M/V/U

**461015**

STAMMBERGER **Bipolar Suction Forceps**, 45° upturned, with suction channel, for bipolar coagulation in paranasal areas, working length 12.5 cm, for use with Bipolar High Frequency Cord 847002 E or 847002 A/M/V/U
## High Frequency Cords

for use with STAMMBERGER Bipolar Suction Forceps

### Accessories

<table>
<thead>
<tr>
<th>KARL STORZ Instruments</th>
<th>High Frequency Electrosurgery Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>847002 E</td>
<td>Bipolar High Frequency Cord, for KARL STORZ Coagulator 26021 B/C/D, 860021 B/C/D, 27810 B/C/D, 28810 B/C/D, AUTOCON® system (50, 200, 350), AUTOCON® II 400 SCB system (111, 113, 115) and Erbe coagulator, T and ICC series, with two 2 mm cable sockets for KARL STORZ Bipolar Suction Forceps 461010, 461015 and Bipolar Forceps 8615 A/AS, 28164 BGK, length 450 cm</td>
</tr>
<tr>
<td>847002 M</td>
<td>Bipolar High Frequency Cord, for Martin and Berchtold coagulator, with two 2 mm cable sockets for KARL STORZ Bipolar Suction Forceps 461010, 461015 and Bipolar Forceps 8615 A/AS, 28164 BGK, length 450 cm</td>
</tr>
<tr>
<td>847002 A</td>
<td>Bipolar High Frequency Cord, with 2 x 4 mm banana plug for KARL STORZ coagulator 26020 XA/XB, with two 2 mm cable sockets for KARL STORZ Bipolar Suction Forceps 461010, 461015 and Bipolar Forceps 8615 A/AS, 28164 BGK, length 450 cm</td>
</tr>
<tr>
<td>847002 V</td>
<td>Bipolar High Frequency Cord, for KARL STORZ AUTOCON® II 400 SCB system (112, 114, 116), Valleylab coagulator, with two 2 mm cable sockets for KARL STORZ Bipolar Suction Forceps 461010, 461015 and Bipolar Forceps 8615 A/AS, 28164 BGK, length 450 cm</td>
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</table>

<table>
<thead>
<tr>
<th>KARL STORZ Instruments</th>
<th>Standard Forceps Bipolar Cords</th>
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<tbody>
<tr>
<td>847002 U</td>
<td>Bipolar Universal High Frequency Cord, one side with two 2 mm cable sockets for KARL STORZ Bipolar Suction Forceps 461010, 461015 and Bipolar Forceps 8615 A/AS, 28164 BGK, other side with standard pin for connection to all current forceps bipolar cords, length 40 cm</td>
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</table>
MONTGOMERY-YOUNGS **RHINOFORCE® II Clip Applicator**
for endonasal endoscopic sphenopalatine artery ligature

**Winner of the 2006 Cutlers’ Surgical Prize**

The **Cutlers’ Surgical Prize** is one of the most prestigious annual awards for innovation in the design or application of surgical instruments or techniques. The prize as well as the Clarke medal are awarded by the surgical association and the president of the Royal College of Surgeons of England.

- **452650 A** MONTGOMERY-YOUNGS **RHINOFORCE® II Clip Applicator**, for endonasal endoscopic sphenopalatine artery ligature, with suction channel, handle with spring, straight, with cleaning connector, working length 13 cm, for use with Titanium Clips 8665 T
- **452650 C** *Same*, jaws angled to the right
- **452650 D** *Same*, jaws angled to the left

**Coagulation Ball Electrode**

- **28164 ED**
- **28164 ED** **Coagulation Ball Electrode**, diameter 2 mm, laterally curved, working length 13 cm
- **28164 EF** *Same*, diameter 4 mm
Fine and Delicate Instruments

Forcets, working length 15 cm

- **662202**
  - **Forcets**, straight, extra delicate, oval cupped jaws, width 0.6 mm, working length 15 cm
- **662203**
  - **Same**, curved to right
- **662204**
  - **Same**, curved to left
- **662205**
  - **Same**, 45° upturned

Forcets, working length 18 cm

- **28164 TF**
  - **Forcets**, round cupped jaws, diameter 0.6 mm, straight, extra delicate, working length 18 cm
- **28164 TD**
  - **Same**, very delicate, oval cupped jaws 0.9 mm, straight
- **28164 TE**
  - **Forcets**, oval cupped jaws, diameter 0.6 mm, curved to right, extra delicate, working length 18 cm
- **28164 TF**
  - **Same**, curved to left
- **28164 TA**
  - **Forcets**, oval cupped jaws, diameter 0.9 mm, upturned, extra delicate, working length 18 cm
**Fine and Delicate Instruments**

**Miniature Forceps, working length 15 cm**

662251  
**Miniature Forceps**, straight, through-cutting, with fine flat jaws, width of cut 1 mm, working length 15 cm

662255  
**Same**, curved to right

662256  
**Same**, curved to left

662257  
**Same**, curved upwards

662271  
**Grasping Forceps**, straight, fine-serrated, working length 15 cm

**Miniature Forceps, working length 18 cm**

28164 GS

28164 GS  
**Miniature Forceps**, straight, through-cutting, with fine flat jaws, bite 1 mm, working length 18 cm

28164 GR  
**Same**, curved right

28164 GL  
**Same**, curved to left

28164 GU  
**Same**, curved upwards

663271  
**Grasping Forceps**, straight, fine-serrated, working length 18 cm
Fine and Delicate Instruments

Scissors, working length 15 cm

- **662300** Scissors, straight, working length 15 cm
- **662301** Scissors, straight, extra delicate, working length 15 cm
- **662304** Same, curved to right
- **662305** Same, curved to left
- **662307** Same, 45° curved up

Scissors, working length 18 cm

- **663300** Scissors, straight, working length 18 cm
Sellar Stage
Curettes, round spoon

28164 KA
Curette, round spoon, tip slightly angled, size 1 mm, with round handle, length 25 cm

28164 KB
Curette, round spoon, tip slightly angled, size 2 mm, with round handle, length 25 cm

28164 KC
Curette, round spoon, tip slightly angled, size 3 mm, with round handle, length 25 cm

28164KF
Curette, round spoon, tip highly angled, size 2 mm, with round handle, length 25 cm

28164 KG
Curette, round spoon, tip highly angled, size 3 mm, with round handle, length 25 cm

de DIVITIIS-CAPPABIANCA Suction Curettes, with styplet, round wire – basket-shaped

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

CASTELNUOVO Elevator

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

Curettes

- 28164 RN: CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 3 mm, tip angled 45°, with round handle, length 25 cm
- 28164 RO: CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 5 mm, tip angled 45°, with round handle, length 25 cm
- 28164 RP: CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 7 mm, tip angled 45°, with round handle, length 25 cm
- 28164 RG: CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 5 mm, tip angled 90°, with round handle, length 25 cm
- 28164 RH: Same, inner diameter 7 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 RA: Same, inner diameter 5 mm
- 28164 RC: Same, inner diameter 7 mm
- 28164 RD: CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 5 mm, laterally curved 90° sheath end, with round handle, length 25 cm

Delicate Dissectors and Elevators

- 28164 DA: Dissector, sharp, tip angled 45°, round spatula, with round handle, size 2 mm, length 25 cm
- 28164 DB: Dissector, sharp, tip angled 45°, round spatula, with round handle, size 3 mm, length 25 cm
- 28164 DF: Dissector, sharp, tip angled 15°, flat long spatula, with round handle, size 1.5 mm, length 25 cm
- 28164 DS: Dissector, sharp, tip angled 15°, with round handle, size 2 mm, length 25 cm
- 28164 DM: Dissector, sharp, straight tip, slightly curved spatula, with round handle, size 3 mm, length 25 cm
Antrum Curette, Frontal Sinus Curette, Antrum Cannula and Suction Tube

- **628701** Antrum Curette, round, length 19 cm
- **628702** Same, oblong, small size
- **628703** Same, large size
- **628712** KUHN-BOLGER Frontal Sinus Curette, 55° curved, oval, forward cutting, length 19 cm
- **586025** v. EICKEN Antrum Cannula, LUER-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm
- **586125** v. EICKEN Antrum Cannula, long curved, outer diameter 3 mm
- **529305** FRAZIER Suction Tube, with mandrel and cut-off hole, with distance marking at 5–9 cm, 9 Fr., working length 10 cm
- **529309** FRAZIER Suction Tube, with mandrel and cut-off hole, with distance marking at 5–9 cm, 9 Fr., working length 10 cm
SEPEHRNIA Neurosurgical Micro-Instruments

Needle Holder and Forceps

**28164 NBC**

*Micro Needle Holder*, bayonet-shaped, jaws curved to left, 1 x 6 mm, working length 10 cm

**28164 PBE**

*Micro Forceps*, bayonet-shaped, spoon, 2 mm, working length 10 cm

**28164 PBB**

*Micro Forceps*, bayonet-shaped, spoon, 2 mm, working length 10 cm

**28164 PBE**

*Same*, 4 mm spoon

**28164 PBG**

*Micro Forceps*, bayonet-shaped, spoon horizontal, 2 mm, working length 10 cm

**28164 PBH**

*Same*, 4 mm spoon horizontal
SEPEHRNIA Neurosurgical Micro-Instruments

Scissors

28164 SBC

28164 SBA  **Micro Scissors**, bayonet-shaped, sharp/sharp, cutting edges straight, working length 10 cm

28164 SBB  *Same*, bayonet-shaped, sharp/sharp, left curved

28164 SBC  *Same*, bayonet shaped, blunt/blunt, jaw straight

28164 SBD  *Same*, bayonet shaped, sharp/sharp, jaw curved to right

28164 SBE  *Same*, bayonet shaped, sharp/sharp, jaws horizontal
Dissectores and Ring Curettes

**GAAB Recommended Instruments**

28164 GFO

28164 GBO  **Dissector**, bayonet-shaped, sharp, round spatula, tip angled upwards 45°, with round handle, size 3 mm, working length 15 cm
28164 GBU  **Same**, tip angled downwards 45°

28164 GGO

28164 GFO  **Dissector**, sharp, flat long spatula, tip angled upwards 15°, with round handle, size 1.5 mm, working length 15 cm
28164 GFU  **Same**, tip angled downwards 15°

28164 GGO

28164 GGO  **Ring Curette**, bayonet-shaped, round wire, inner diameter 5 mm, tip angled upwards 90°, with round handle, working length 15 cm
28164 GGU  **Same**, tip angled downwards 90°

28164 GKO

28164 GKO  **Ring Curette**, bayonet-shaped, blunt, tip angled upwards 45°, outer diameter 4 mm, working length 15 cm
28164 GKU  **Same**, tip angled downwards 45°

28164 GLL

28164 GLL  **Ring Curette**, bayonet-shaped, blunt, tip angled to left 90°, outer diameter 3.3 mm, with round handle, working length 15 cm
28164 GLR  **Same**, tip angled to right 90°
Micro Vascular Knife and Dissector

- **28164 GM**: Micro Vascular Knife, bayonet-shaped, curved downwards, length 18.5 cm
- **28164 DL**: Dissector, bayonet-shaped, sharp, curved to left, length 11 cm
- **28164 DR**: Same, curved to right
**IMAGE1 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**
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.
TC 200EN  **IMAGE1 S CONNECT**, connect module, for use with up to 3 link modules, resolution 1920 x 1080 pixels, with integrated KARL STORZ-SCB and digital Image Processing Module, power supply 100–120 VAC/200–240 VAC, 50/60 Hz including:

- **Mains Cord**, length 300 cm
- **DVI-D Connecting Cable**, length 300 cm
- **SCB Connecting Cable**, length 100 cm
- **USB Flash Drive**, 32 GB, USB silicone keyboard, with touchpad, US

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

**Specifications:**

<table>
<thead>
<tr>
<th>HD video outputs</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 2x DVI-D</td>
<td>100–120 VAC/200–240 VAC</td>
</tr>
<tr>
<td>- 1x 3G-SDI</td>
<td>100–120 VAC/200–240 VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Format signal outputs</th>
<th>Power frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920 x 1080p, 50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LINK video inputs</th>
<th>Protection class</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x</td>
<td>I, CF-Defib</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USB interface</th>
<th>Dimensions w x h x d</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x USB, (2x front, 2x rear)</td>
<td>305 x 54 x 320 mm</td>
</tr>
<tr>
<td>2x 6-pin mini-DIN</td>
<td>Weight</td>
</tr>
<tr>
<td></td>
<td>2.1 kg</td>
</tr>
</tbody>
</table>

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

- **Mains Cord**, length 300 cm
- **Link Cable**, length 20 cm

**Specifications:**

<table>
<thead>
<tr>
<th>Camera System</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supported camera heads/video endoscopes</strong></td>
<td>TH 100, TH 101, TH 102, TH 103, TH 104, TH 106 (fully compatible with IMAGE1 S)</td>
</tr>
<tr>
<td></td>
<td>22220055-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220055-3 (compatible without IMAGE1 S technologies CLARA, CHROMA, SPECTRA*)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LINK video outputs</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x</td>
<td>100–120 VAC/200–240 VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power frequency</th>
<th>Protection class</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/60 Hz</td>
<td>I, CF-Defib</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions w x h x d</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>305 x 54 x 320 mm</td>
<td>1.86 kg</td>
</tr>
</tbody>
</table>

* SPECTRA A: Not for sale in the U.S.
** SPECTRA B: Not for sale in the U.S.
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 104

IMAGE1 S H3-ZA 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-ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 104</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3&quot; 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>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 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&quot; CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
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</tr>
<tr>
<td>Weight</td>
<td>299 g</td>
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<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
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<tr>
<td>Min. sensitivity</td>
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<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,**  
with 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 Cable,** 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

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

**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

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

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

**UG 510**  
**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

Please note that the described products in this medium may not be available yet in all countries due to different regulatory requirements.
with the compliments of
KARL STORZ — ENDOSKOPE