ENDOSCOPIC SKULL BASE AND PITUITARY APPROACHES

A STEP-BY-STEP GUIDE FOR SURGICAL INSTRUCTION AND CADAVERIC DISSECTION

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Table of Contents

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Dr. Vijay K. Anand is a world renowned endoscopic sinus surgeon who was instrumental in developing image guidance in endoscopic sinus surgery and anterior skull base surgery. He graduated from Madras Medical College in India with honors and has won many awards in the field of medicine. He trained at Manhattan Eye Ear and Throat Hospital in Otolaryngology and currently is the Director of the Rhinology lab and postgraduate education in Rhinology at Weill Medical College of Cornell University and New York Presbyterian Hospital in New York. The Rhinology lab which has been funded by numerous private foundations is dedicated to research in basic and clinical sciences. He was the President of the American Rhinologic Society in 1995 and has been a pioneer in the development of endoscopic sinus surgery and its extended applications. He has published widely in the field of Rhinology including the recently published textbook on Practical Endoscopic Skull Base Surgery (Plural Publishing Inc.). Dr. Anand has been the Course Director and has conducted more than 35 courses in Advanced Endoscopic Sinus surgery at the Weill Medical College of Cornell University. He is the recipient of the Outstanding Teacher Award in Rhinology from the American Rhinological Society. He is a sought after speaker in the field of Rhinology and is a Clinical Professor of Otolaryngology at the Weill Medical College of Cornell University in New York as well as co-director of the Institute for Minimally Invasive Skull Base and Pituitary Surgery.

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.

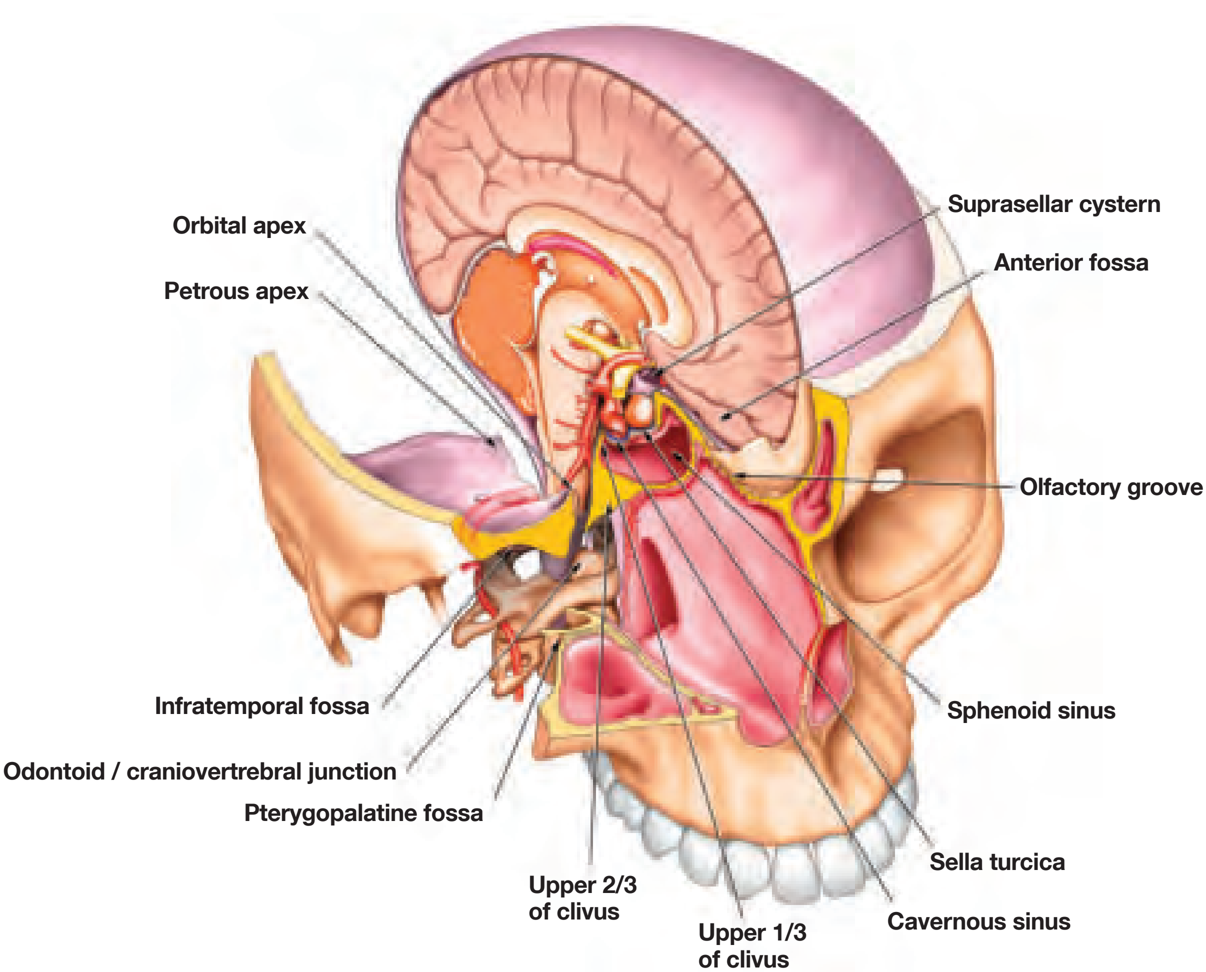
This laboratory manual is intended as a guide for cadaveric dissection which will serve as an introduction to the surgical exercises. We find it useful to think about the endoscopic skull base approaches as a combination of three factors – ① a target, ② a skull base approach and ③ a nasal corridor. The 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 transethmoidal, 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

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

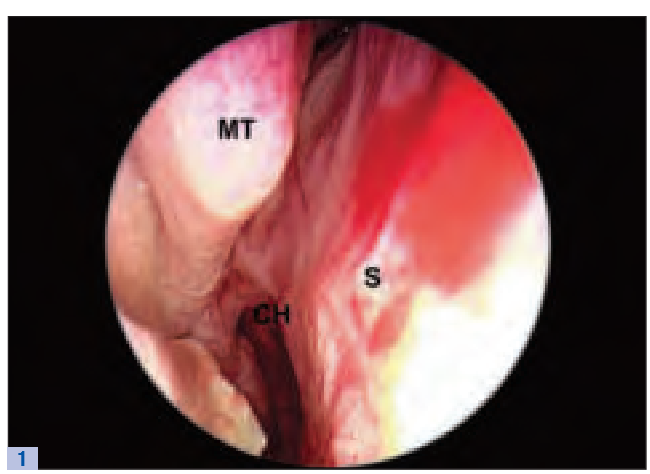
+ The transethmoidal transorbital approach involves opening the anterior and lateral walls of the sphenoid sinus.
* The transmaxillary transpterygoidal approach involves opening the ethmoid and sphenoid sinuses as well.



Transsphenoidal Corridor

The transsphenoidal corridor offers an approach to the sphenoid sinus which is the gateway to the sella, the planum spheniodale, 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**).



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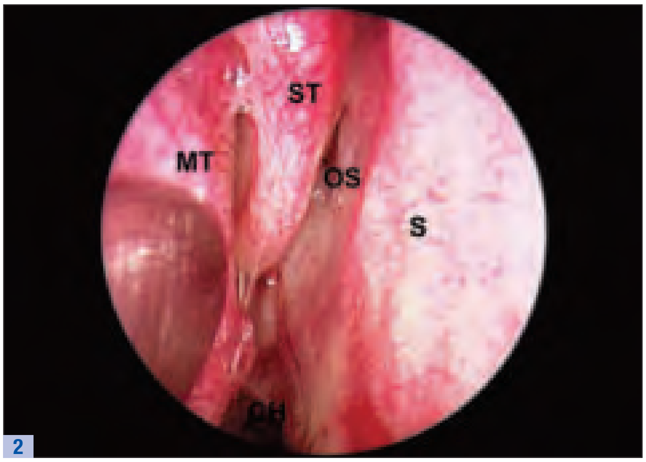

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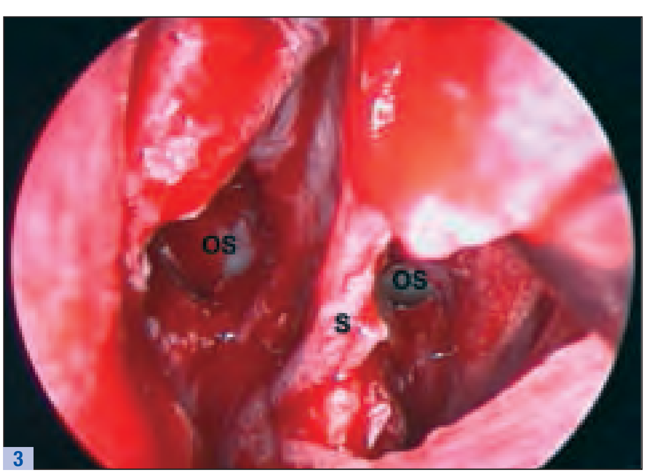
Step 2 Identify the ostia of the sphenoid sinuses bilaterally (**OS**). These are found 1.5 cm above the choana (**CH**), just below the superior turbinates (**ST**). Below the ostium is the sphenoethmoidal recess (**Fig. 2**). If a nasoseptal flap is being harvested, this must be done at the beginning 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 infero-laterally (**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**).



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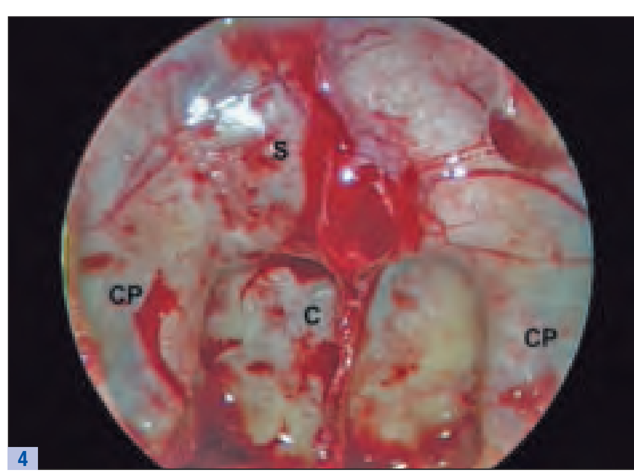

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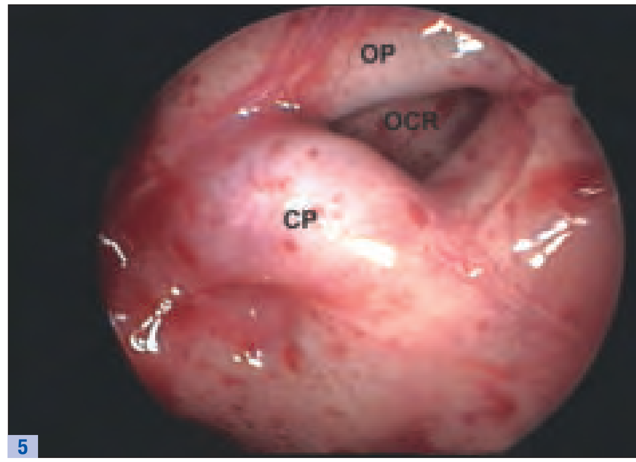
Step 7 Identify the anatomy on the lateral wall of the sphenoid sinus, such as the optic protuberance (**OP**), the carotid protuberance (**CP**) and the opticocarotid recess (**OCR**) (**Fig. 5**).



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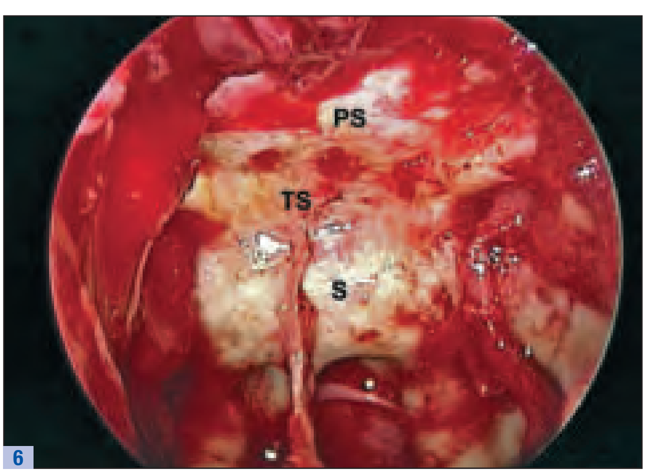
Step 8 Identify the tuberculum sellae (**TS**) and planum sphenoidale (**PS**) above the sella (**S**) (**Fig. 6**).

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**).



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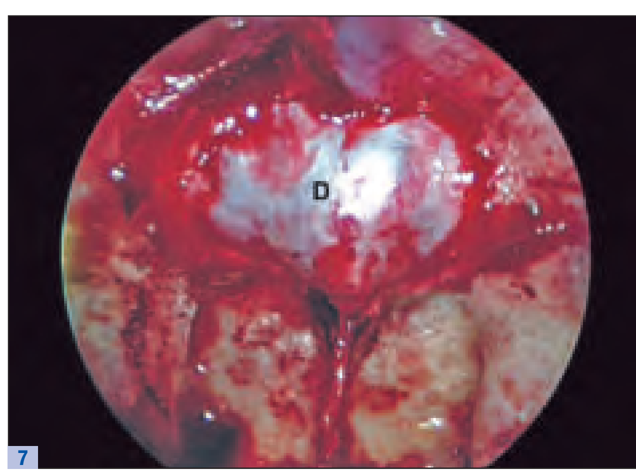

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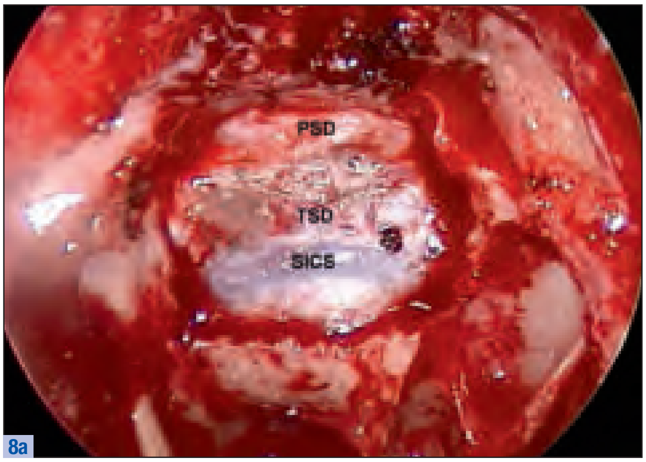

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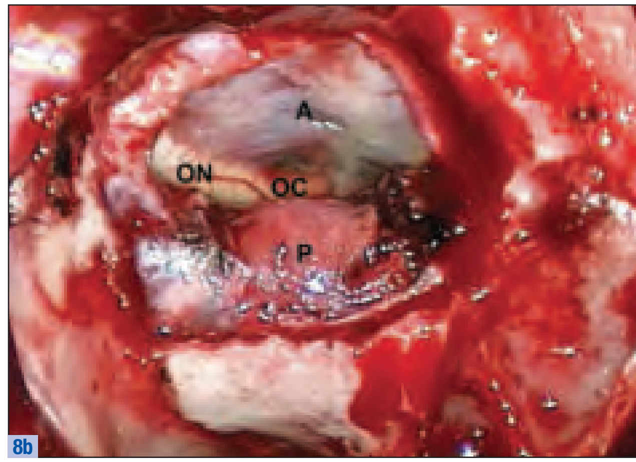

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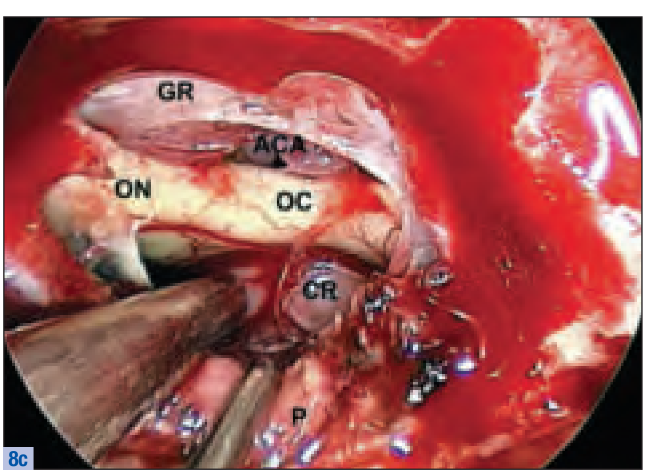
Step 10 Transtuberculum, Transplanum Approach: Drill through the tuberculum sellae and planum sphenoidale to expose the dura of the tuberculum sella (**TSD**) and planum sphenoiale (**PSD**). Open the dura above and below the superor intercavernous sinus (**SICS**) and then cauterize and cut the SICS 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 chaism 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**), fornices (**F**) and foramena of Monro (**FM**) (**Figs. 8a–d**).



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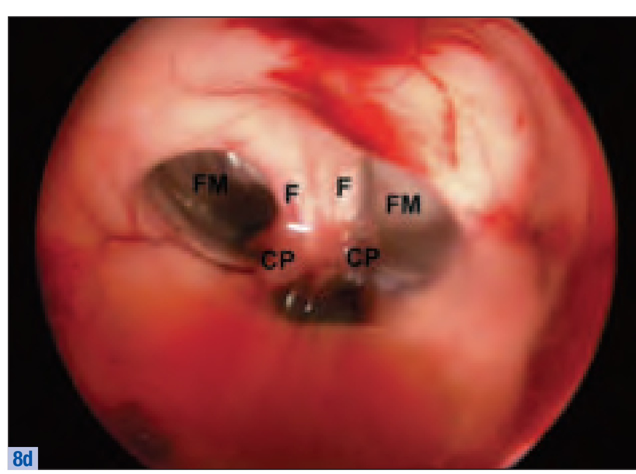

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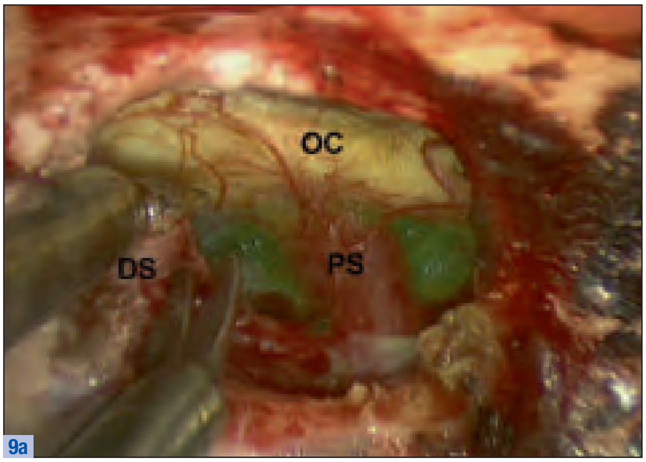

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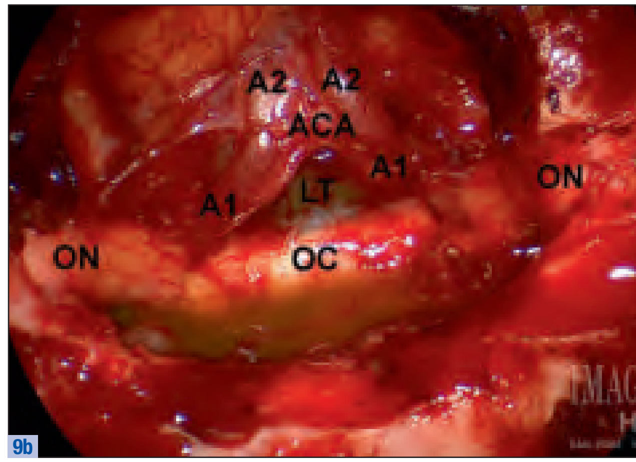
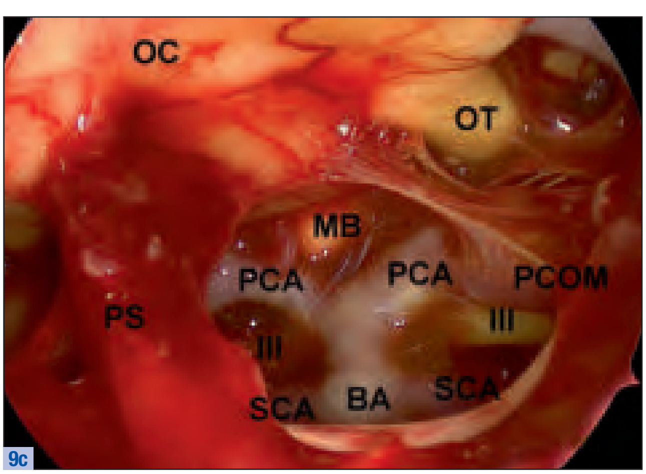


9b

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**).



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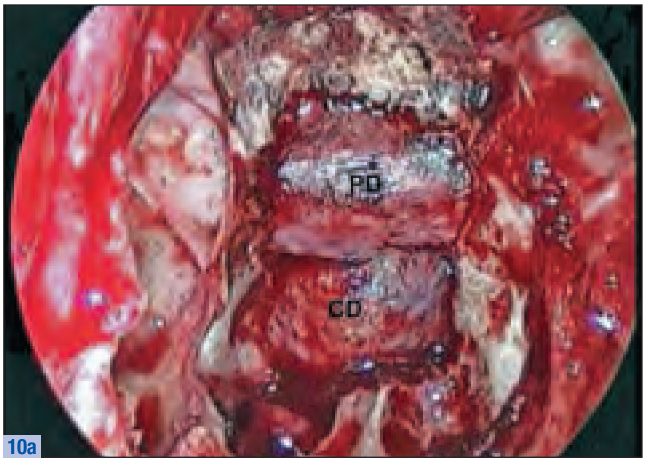

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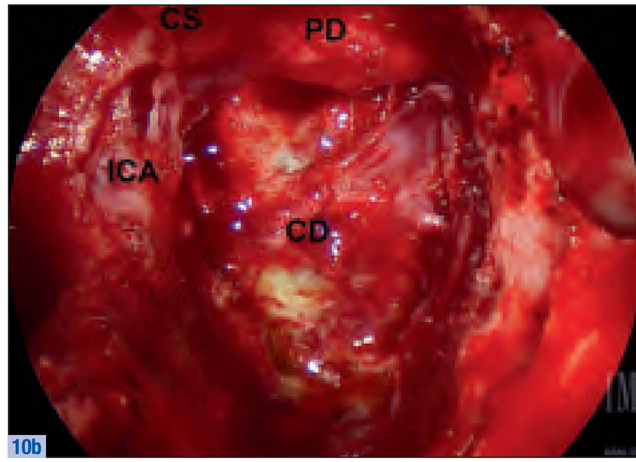
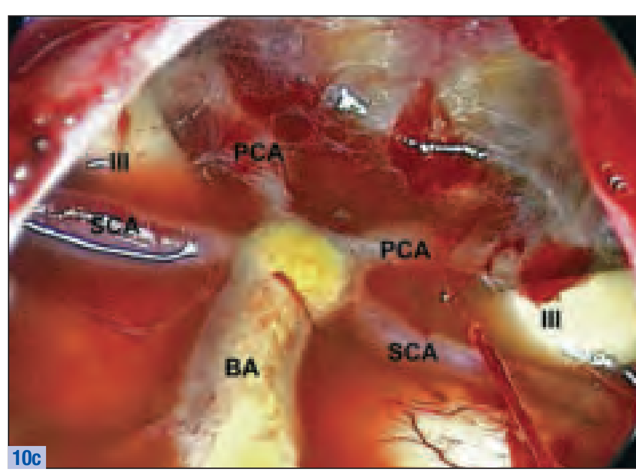


10b

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**).



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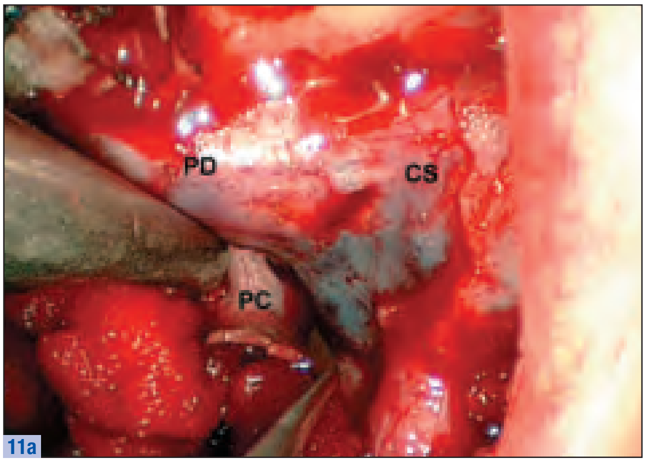

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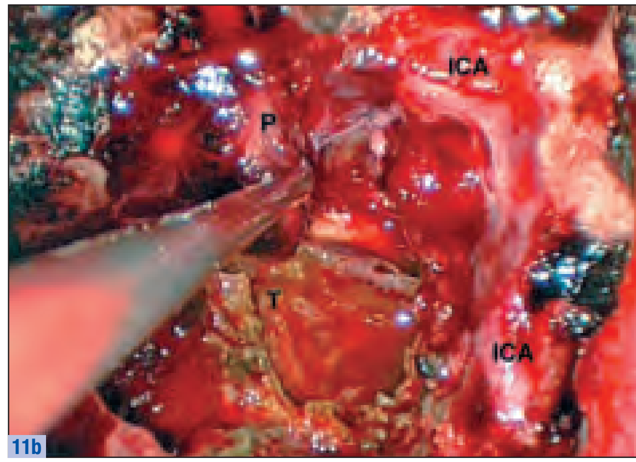
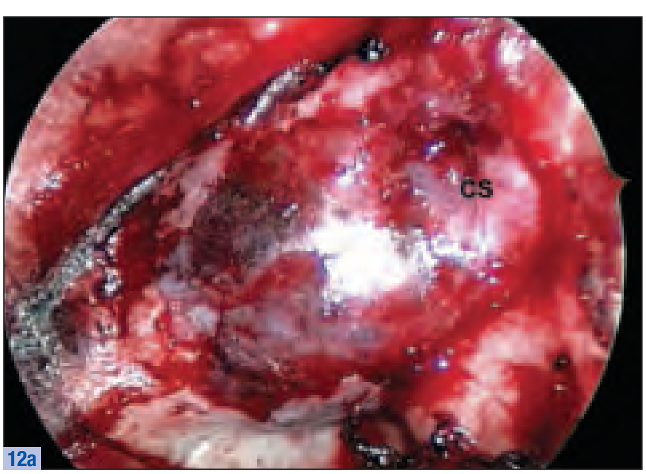


11b

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**).



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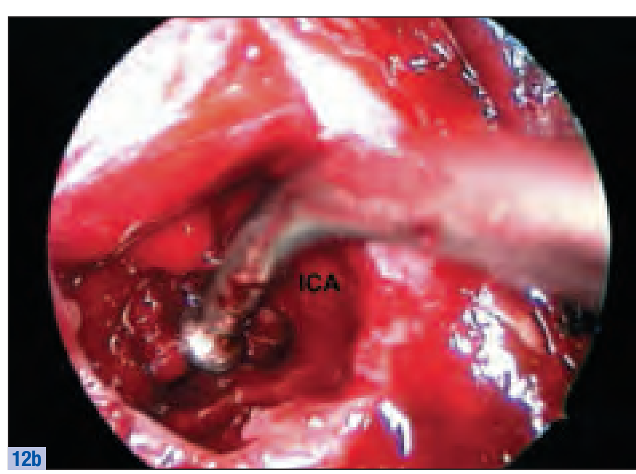
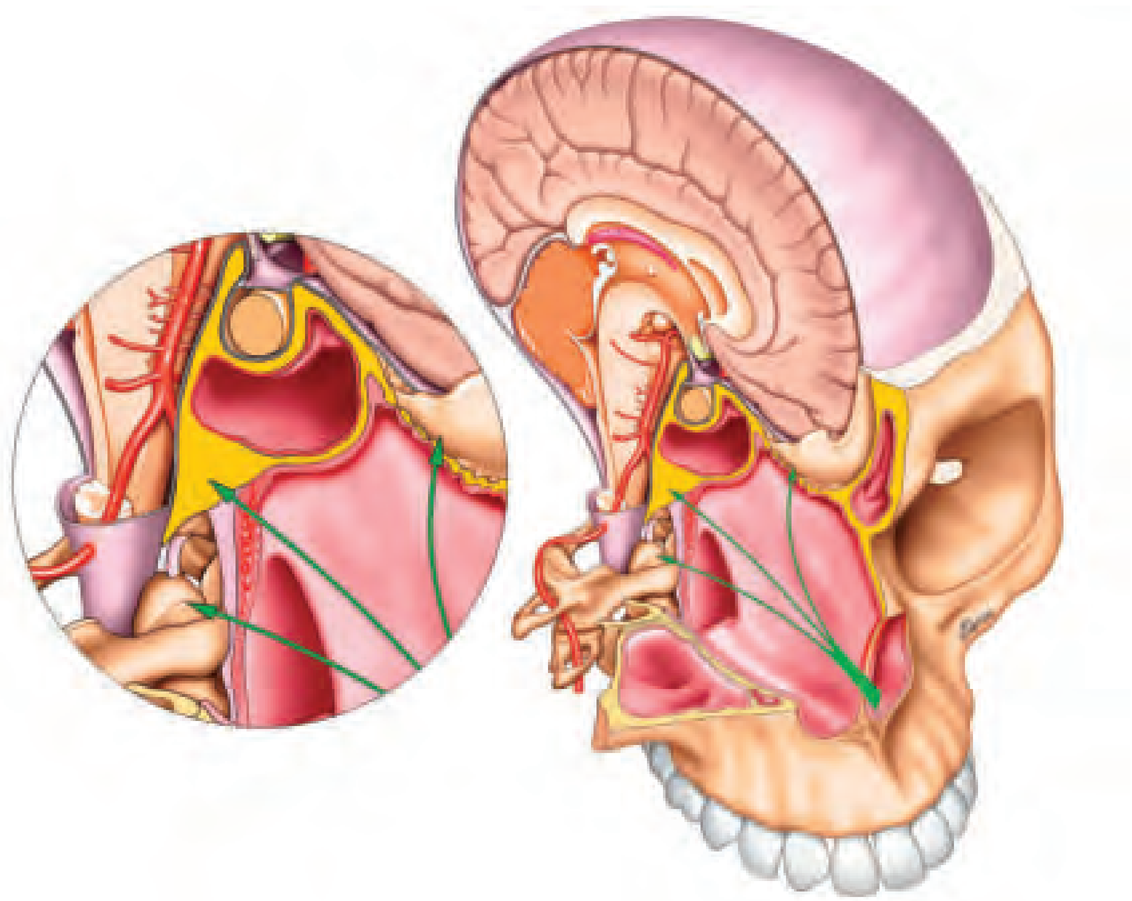
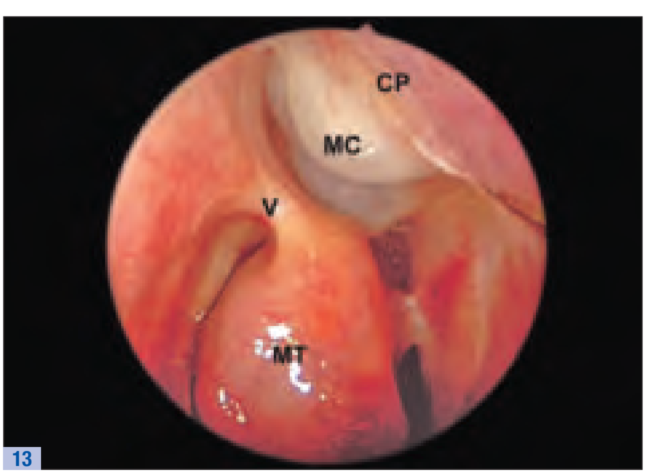


12b

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.

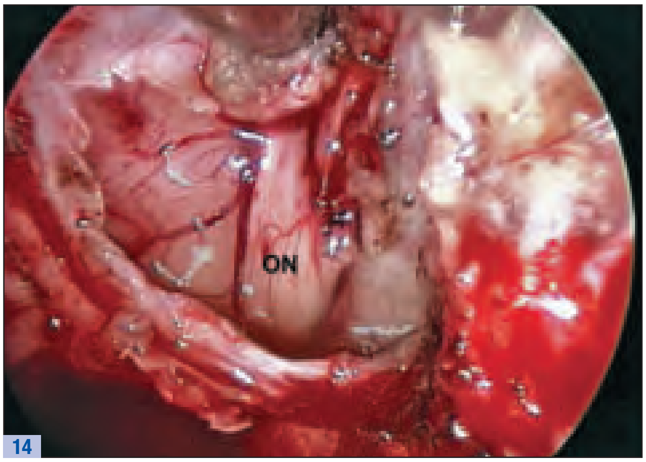




13

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**).



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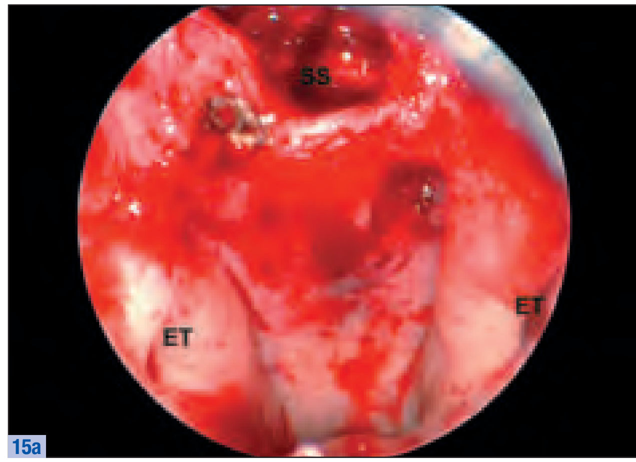


15a

Step 3 **Transcribriform Approach:** Remove the mucosa underlying the cribriform 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**).

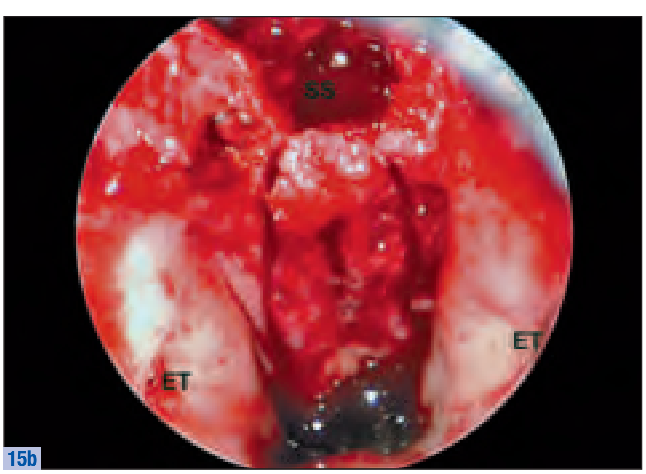
Step 4 Identify the choana and approach the nasopharynx.

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**).



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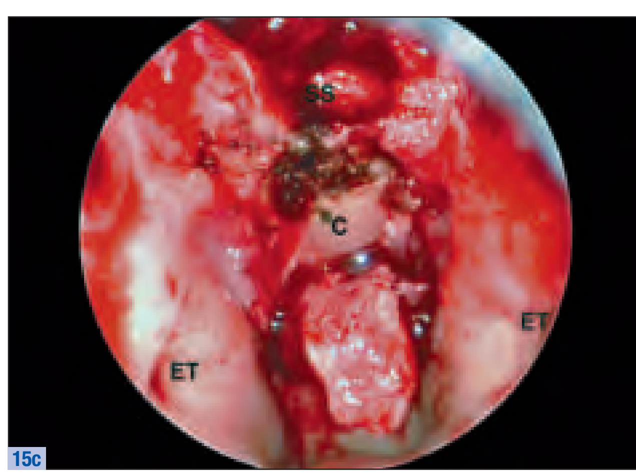

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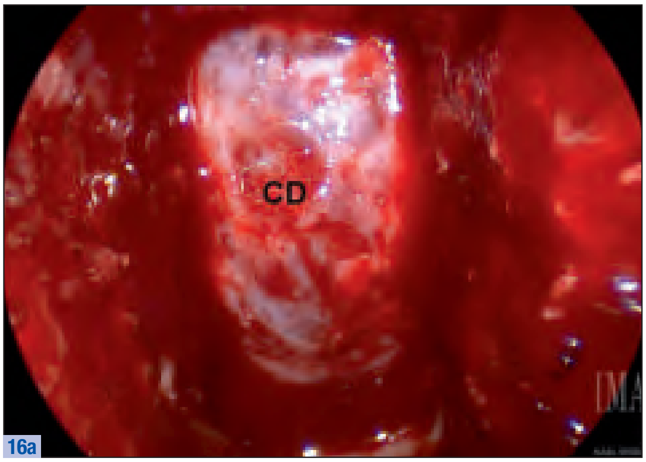

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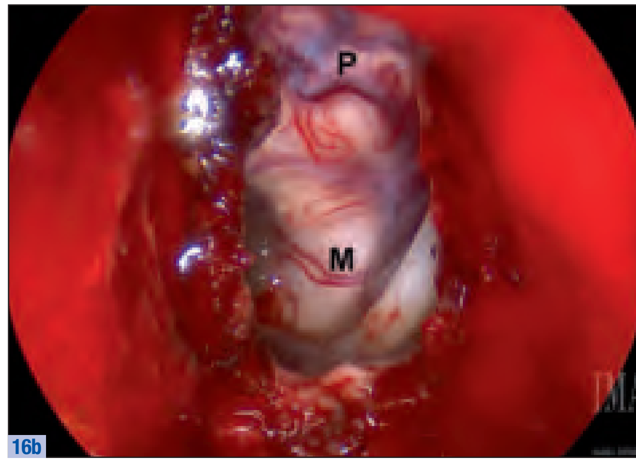


16b

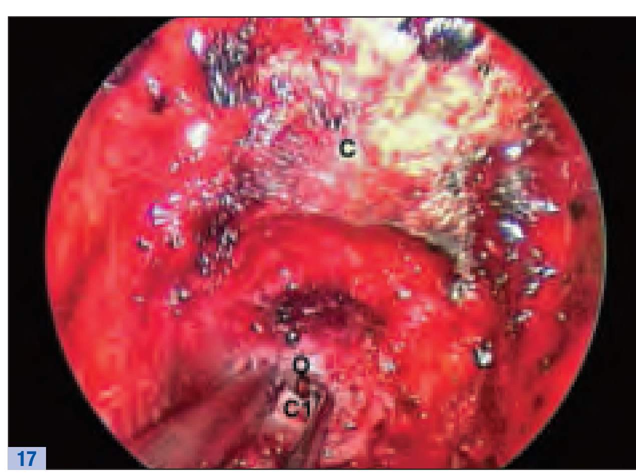
Step 9 Drill the clivus (**C**) to expose the clival dura (**CD**) (**Fig. 16a**).

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 craniovertebral junction.

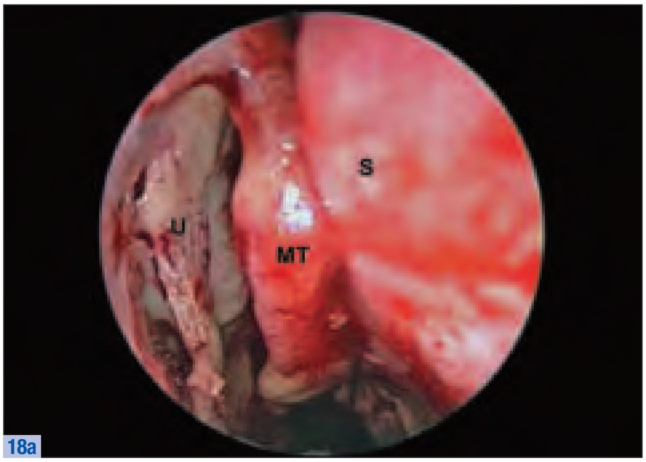


17

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.



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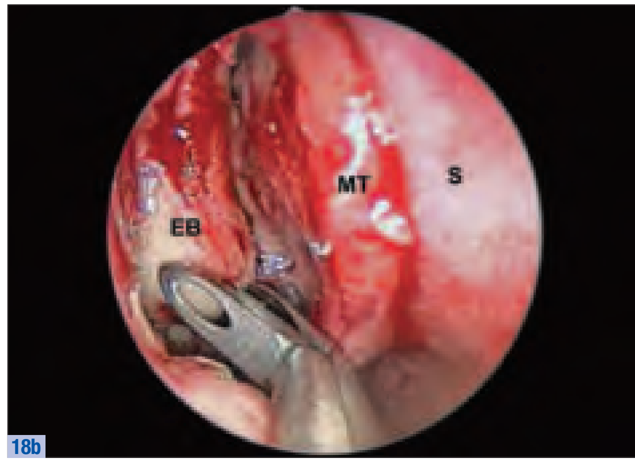


18b

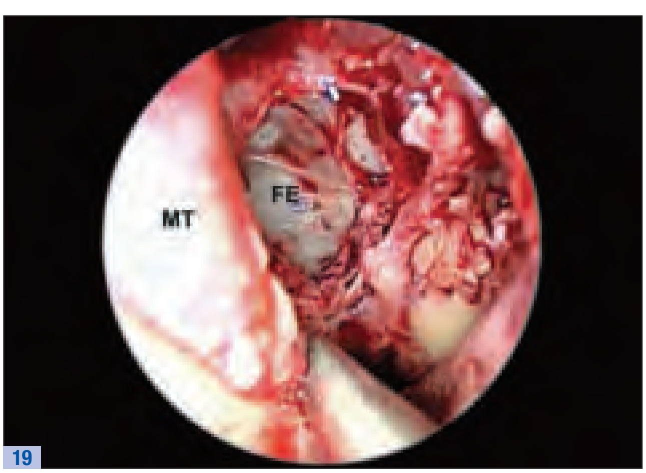
Step 2 Working lateral to the septum (**S**) and middle turbinate (**MT**), identify the uncinate process (**U**) and starting with an uncinectomy and infundibulotomy, identify the ethmoidal bulla (**EB**) (**Figs. 18a, b**).

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.



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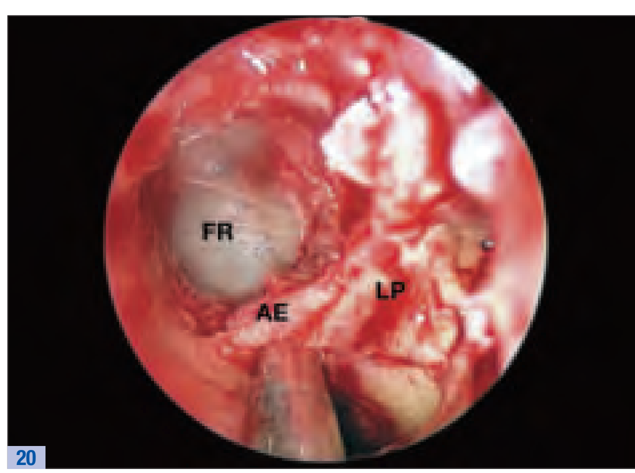

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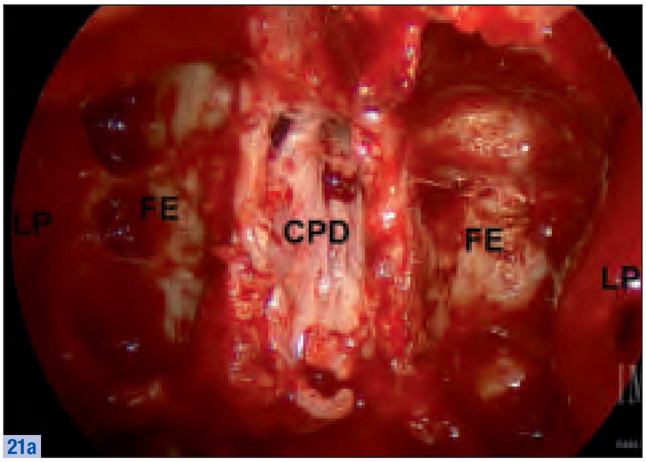

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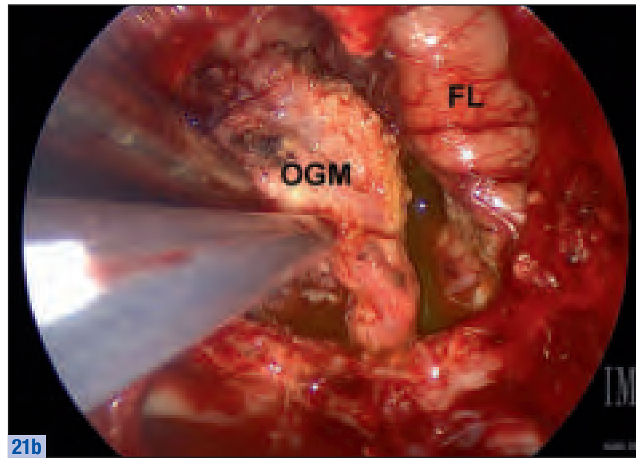
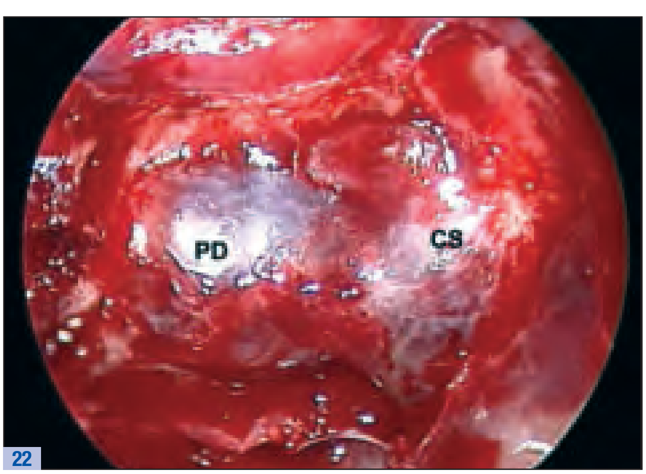


21b

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 ethmnoidalis (**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**).



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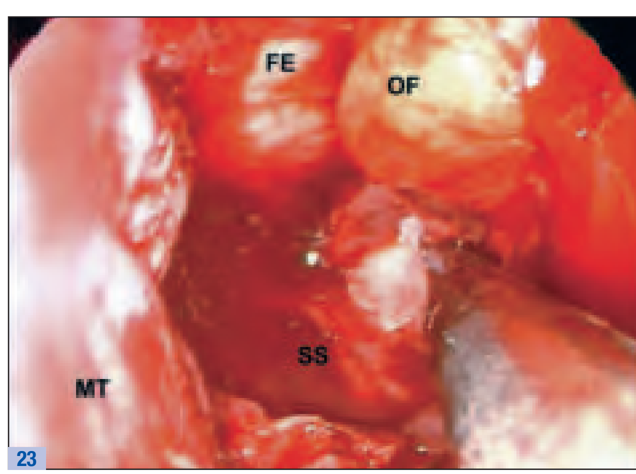
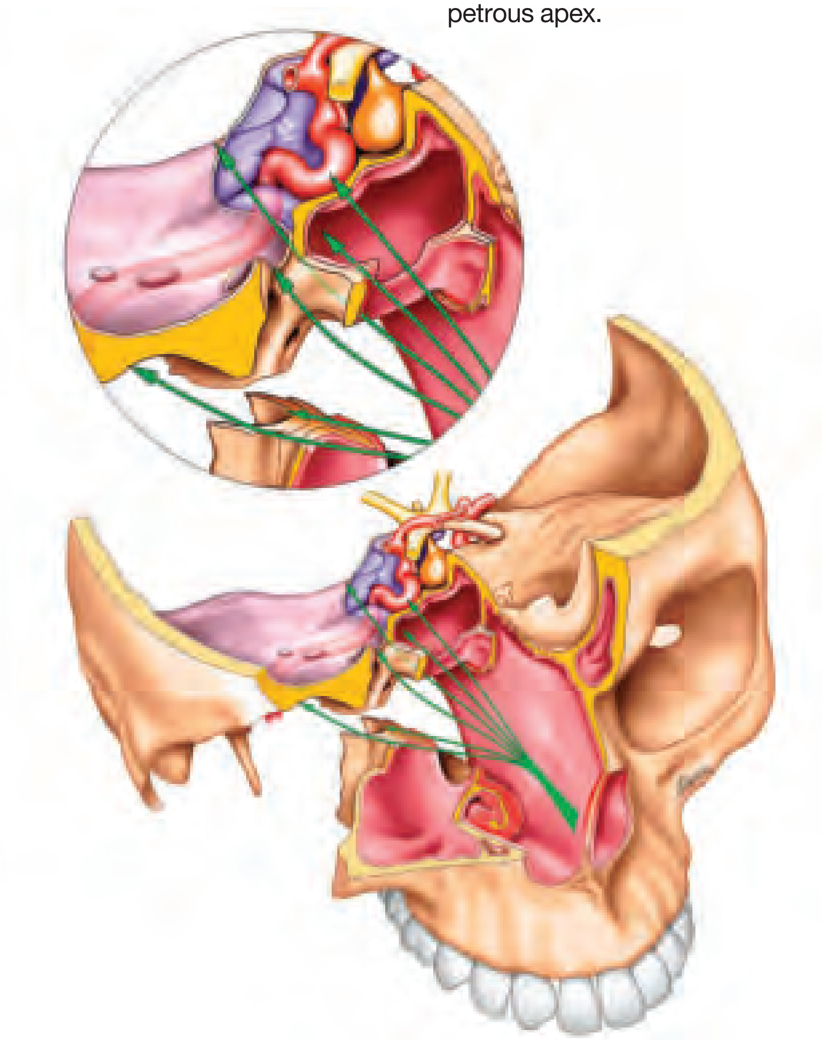
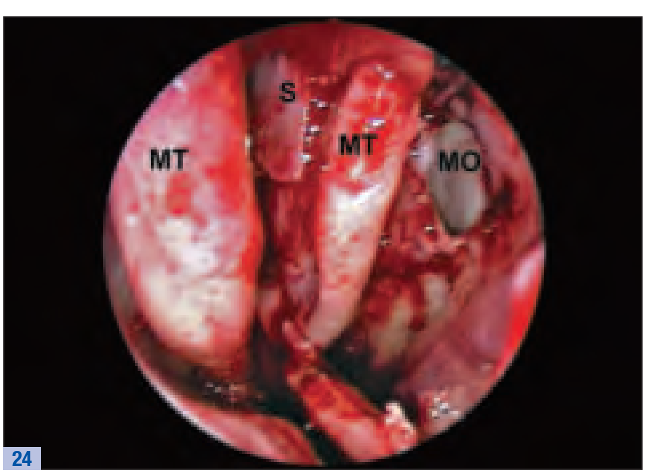


23

Transmaxillary Corridor

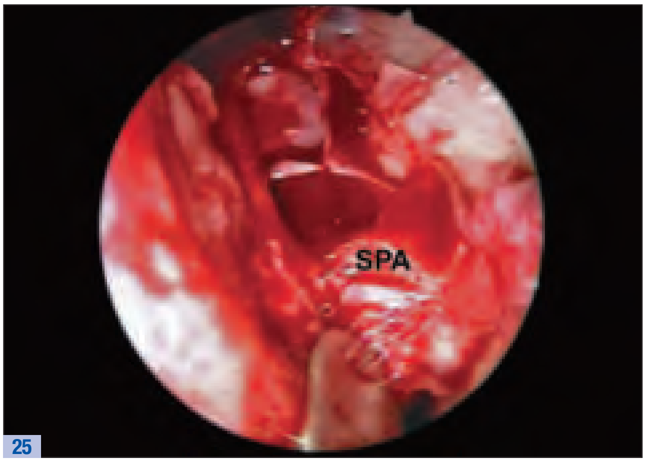
The transmaxillary corridor is used to reach the maxilla, pterygopalatine fossa, lateral sphenoid sinus and cavernous sinus, Meckel's cave, infratemporal fossa and petrous apex.





24

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**).



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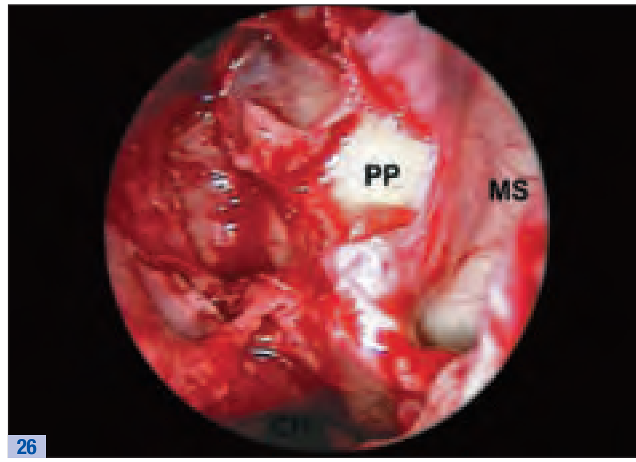


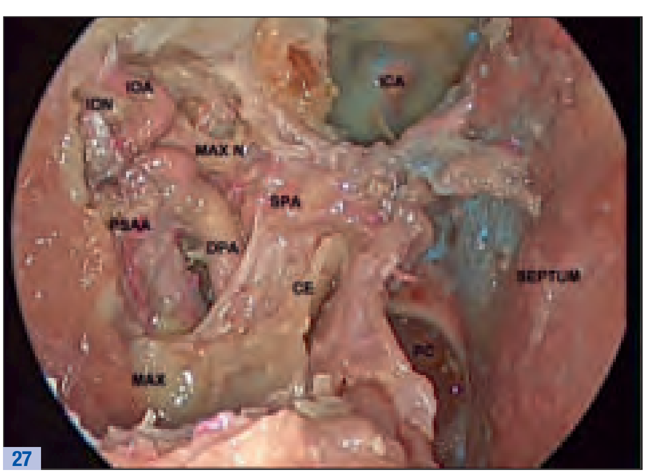
26

Step 2 Enlarge the posterior ridge of the maxillary sinus ostium and dissect the anterior vertical process of the pterygoid plate (**PP**) of the palatine 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 posteroi 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 cana (**VN**) which can be followed posterioly toward the ICA and the foramen rotundum (**FR**) which can be followed towards Meckel's cave and the middle fossa (**Fig. 28**).



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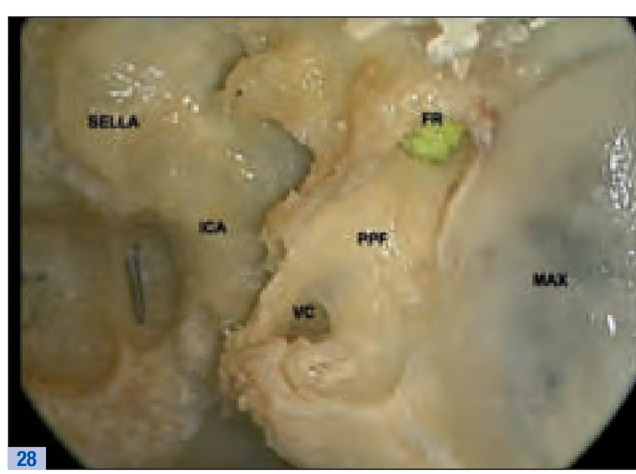

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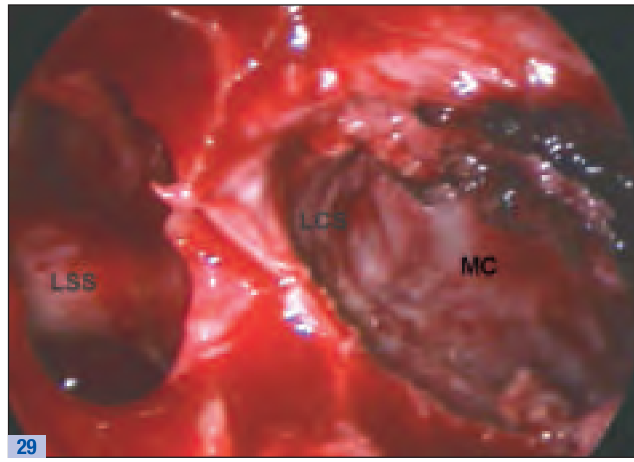

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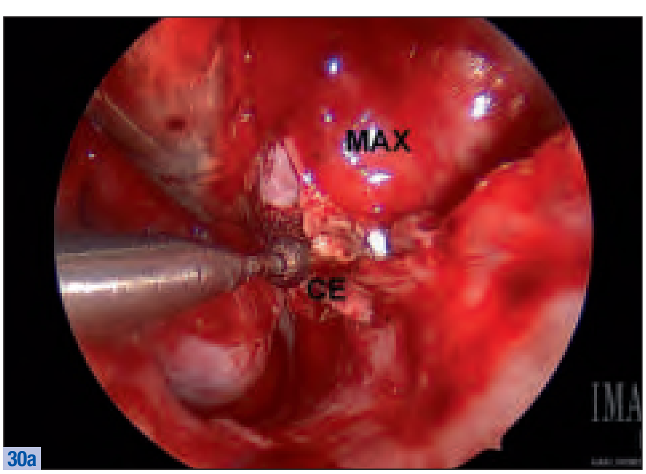
Step 6 Further drilling of the lateral wall of the sphenoid sinus and the medial pterygoid bone exposes the lateral sphenoid sinus (**LSS**) and Meckel's cave (**MC**) superiorly and the petrous apex inferiorly (**Fig. 29**).

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**).



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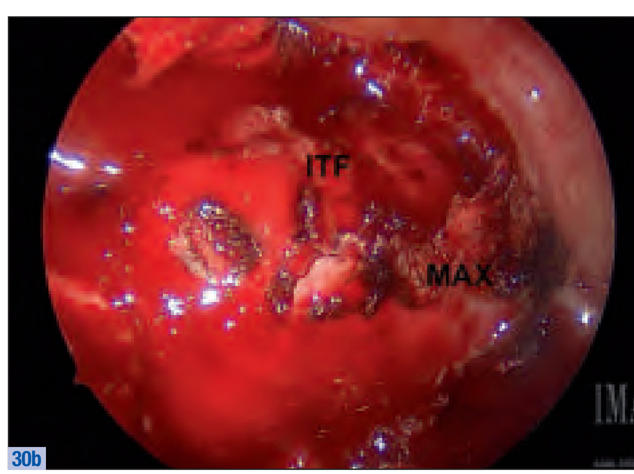
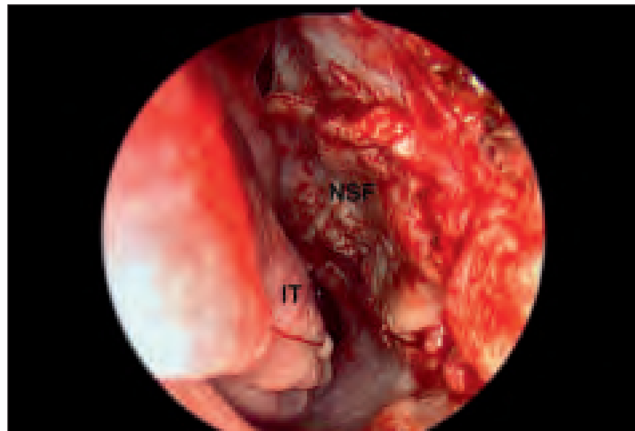


30b

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 cribriform 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 spheno-palatine artery (**Fig. 31**).



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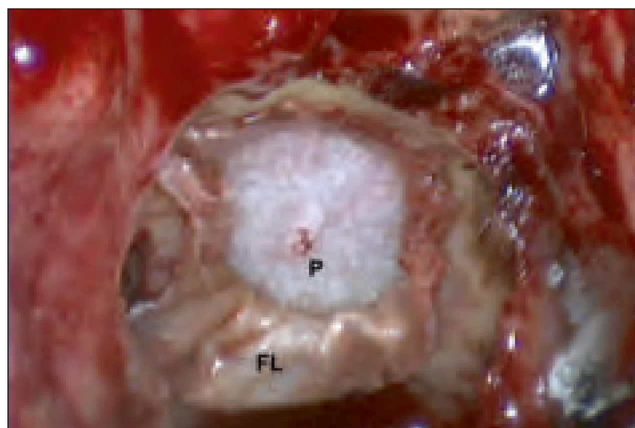
Step 2 **The Gasket-Seal Closure:** A piece of fascia lata (**FL**) is harvested, which is approximately 1 cm larger in diameter than the defect in the skull base. This graft is placed over the defect in the skull and then countersunk with a piece of vomer or Medpor® implant material (**P**) (Porex Surgical 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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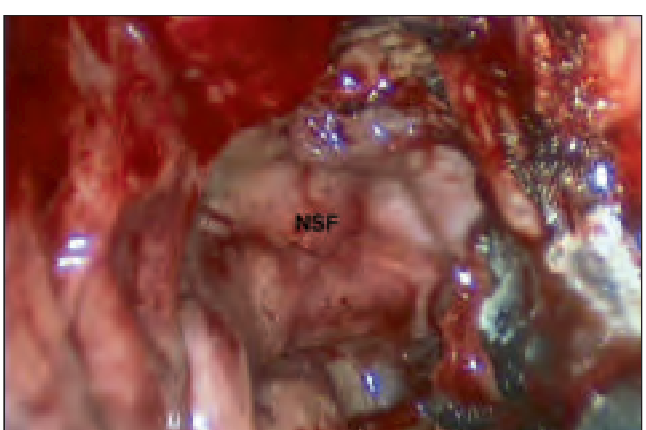

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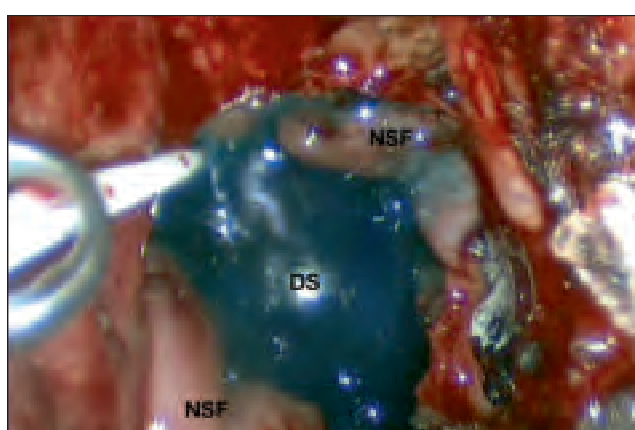

32c

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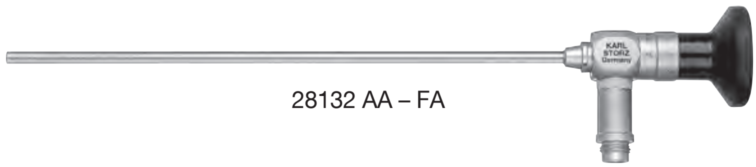
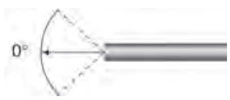


28132 AA – FA



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enlarged view, diameter 4 mm, length 18 cm,
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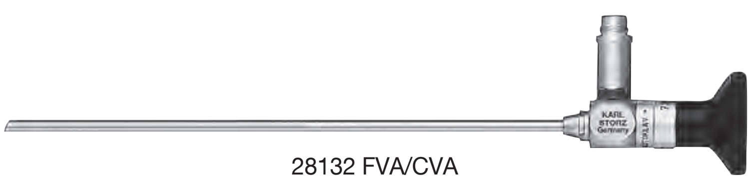

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fiber optic light transmission incorporated,
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28132 CVA **HOPKINS® Telescope 70°,**
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autoclavable,
connection for fiber optic light cable upward,
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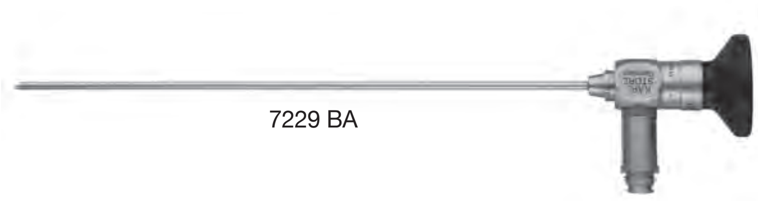
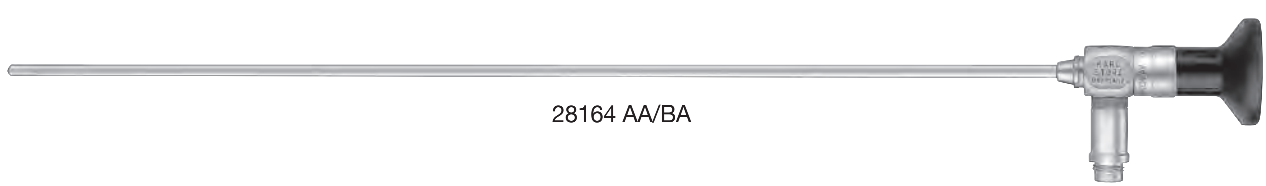


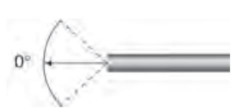
7229 BA

7229 BA **HOPKINS® Forward-Oblique Telescope 30°,**
enlarged view, diameter 2.7 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: red

Diameter 4 mm, length 30 cm



28164 AA/BA



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enlarged view, diameter 4 mm, length 30 cm,
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for Fixation of Flexible and Rigid Endoscopes

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to clamp to the OR table,
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angle adjustment of the articulated stand

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reinforced version, L-shaped,
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KARL STORZ CLEARVISION® II System

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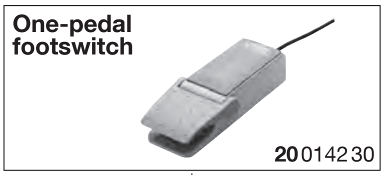
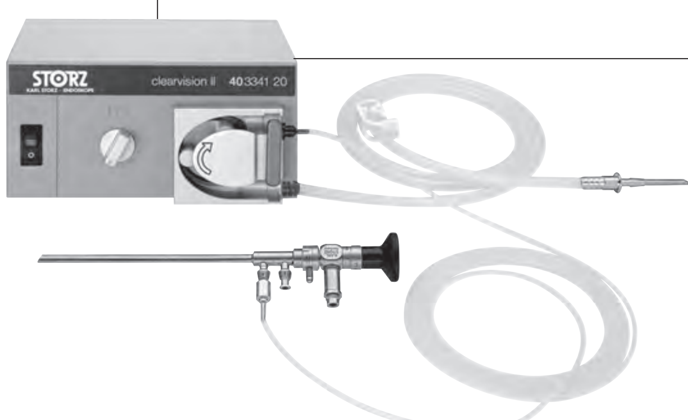
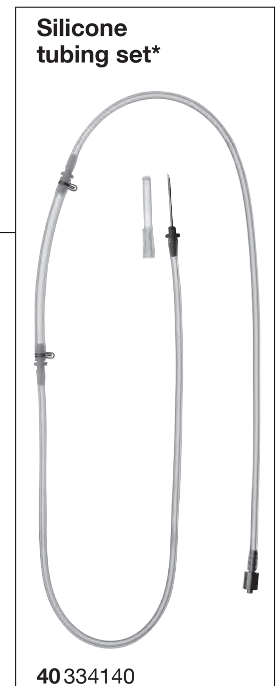


UNIT SIDE

PATIENT SIDE





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power supply 100 – 240 VAC, 50/60 Hz
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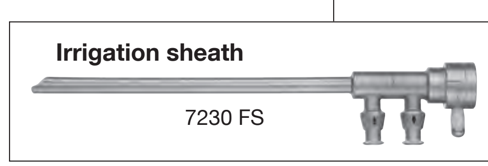

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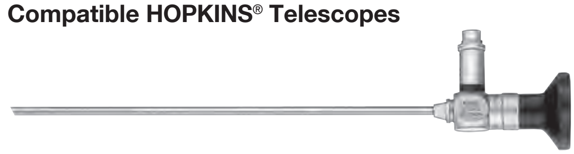
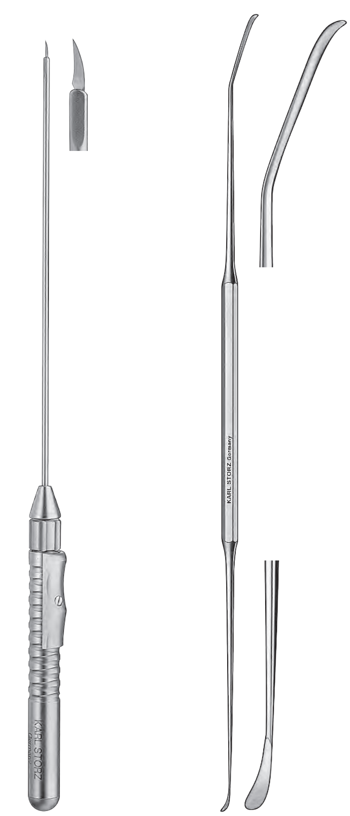


Detail	Order No.	Outer Diameter	Working length	Order No.	View	Outer Diameter	Working length
	7230 AS	4.8 x 6.0 mm	14 cm	7230 AA	0°	4.0 mm	18 cm
	7230 BS	4.8 x 6.0 mm	14 cm	7230 BA	30°	4.0 mm	18 cm
	7230 FS	4.8 x 6.0 mm	14 cm	7230 FA	45°	4.0 mm	18 cm
	7230 CS	4.8 x 6.0 mm	14 cm	7230 CA	70°	4.0 mm	18 cm
	7220 AS	3.7 x 4.8 mm	10 cm	7220 AA	0°	3.0 mm	14 cm
	7220 BS	3.7 x 4.8 mm	10 cm	7220 BA	30°	3.0 mm	14 cm
	7220 FS	3.7 x 4.8 mm	10 cm	7220 FA	45°	3.0 mm	14 cm
	7220 CS	3.7 x 4.8 mm	10 cm	7220 CA	70°	3.0 mm	14 cm
	7219 AS	3.5 x 4.7 mm	14 cm	7229 AA	0°	2.7 mm	18 cm
	7219 BS	3.5 x 4.7 mm	14 cm	7229 BA	30°	2.7 mm	18 cm
	7219 FS	3.5 x 4.7 mm	14 cm	7229 FA	45°	2.7 mm	18 cm
	7219 CS	3.5 x 4.7 mm	14 cm	7229 CA	70°	2.7 mm	18 cm

Probes, Elevators, Knifes and Currettes

629820 628712 479100 474000 474001 629830 628714 628001

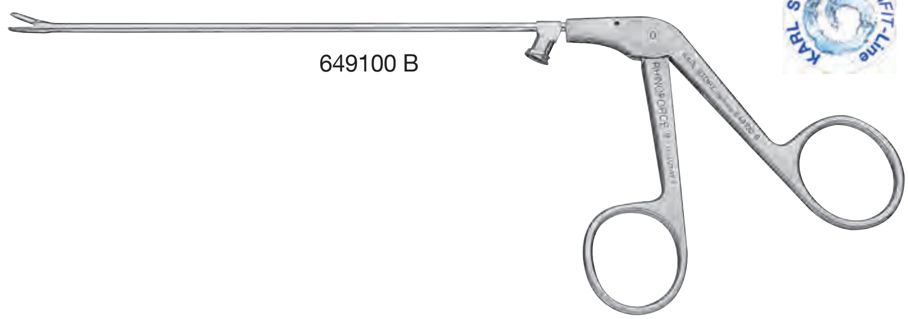
629820	**Probe,** double-ended, maxillary sinus ostium seeker, ball-shaped ends diameter 1.2 and 2 mm, length 19 cm
628712	KUHN-BOLGER **Frontal Sinus Curette,** 55° curved, oval, forward cutting, length 19 cm
479100	COTTLE **Elevator,** double-ended, semisharp and blunt, graduated, length 20 cm
474000	FREER **Elevator,** double-ended, semisharp and blunt, length 20 cm
474001	FREER **Suction Elevator,** with stylet, length 19 cm
629830	KUHN **Frontal Ostium Seeker,** double-ended, No. 6, both sides curved 77°, one tip straight, other tip reverse angle, length 22 cm
628714	KUHN-BOLGER **Frontal Sinus Curette,** 90° curved, oval, forward cutting, length 19 cm
628001	**Sickle Knife,** pointed, length 19 cm
28164 KK	de DIVITIIS-CAPPABIANCA **Scalpel,** with retractable blade, length 23 cm including: **Handle**, **Outer Sheath**, **Micro Knife,** sickle-shaped
28164 EC	CASTELNUOVO **Elevator,** double-ended, blunt end angled, semisharp end slightly curved, graduated, length 26 cm



28164 KK 28164 EC

RHINOFORCE® II Ethmoid Forceps

working length 17 cm



649100 B

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

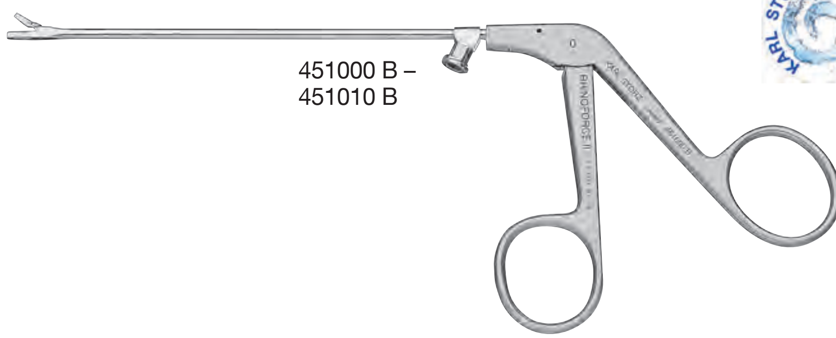
649110 B BLAKESLEY-WILDE **RHINOFORCE® II Ethmoid Forceps,** 45° curved upwards, size 0,
with cleaning connector, working length 16 cm

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**

through-cutting



451000 B –
451010 B

451000 B 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

451001 B **Same,** size 1, width 3.5 mm

451002 B **Same,** size 2, width 4 mm

451010 B 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

451500 B 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

451501 B **Same,** size 1, width 3.5 mm

451502 B **Same,** size 2, width 4 mm

451510 B 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

STRUYCKEN **RHINOFORCE® II Nasal Cutting Forceps**

455010

455010 STRUYCKEN **RHINOFORCE® II Nasal Cutting Forceps,**
with cleaning connector, working length 13 cm

TAKAHASHI **RHINOFORCE® Nasal Forceps**

455500 B

455500 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**
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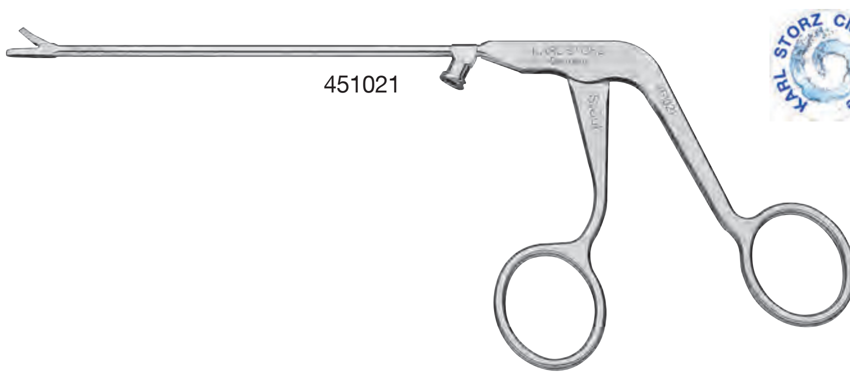
- **Large aperture angle**
- **Flat jaws**
- **Through-cutting and backward-cutting versions also available**



451021

451021 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

451521 **Same,** 45° upturned

RHINOFORCE® II Miniature Nasal Forceps

flat jaws, through-cutting

452831

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

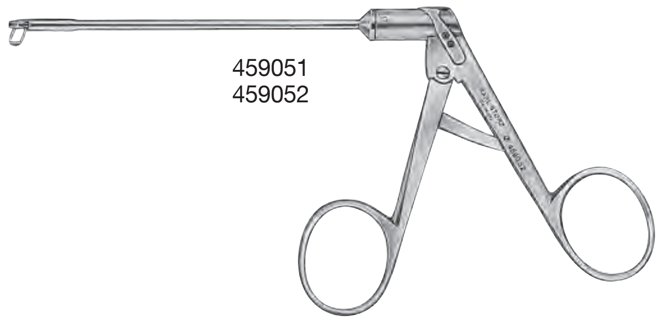
452832 **Same,** jaws 45° upturned

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

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

STAMMBERGER **Antrum Punch**

sidebiting downward and forward cutting



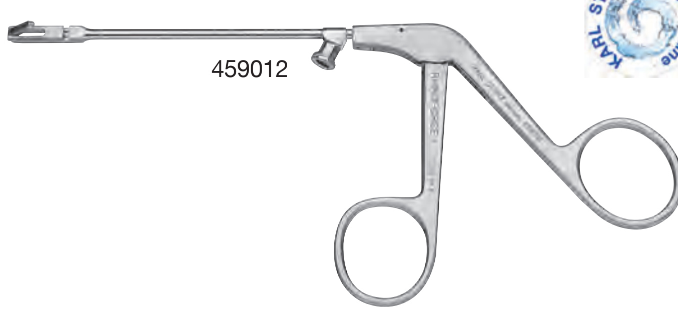
459051
459052

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

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

STAMMBERGER **Antrum Punch**

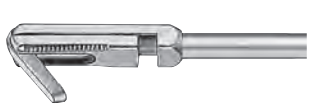
backward cutting



459012

459010 STAMMBERGER **RHINOFORCE® II Antrum Punch,** upside backward cutting, with cleaning connector, working length 10 cm

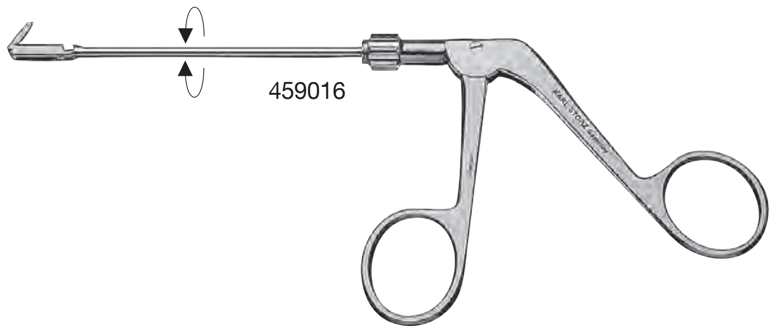
459011 **Same,** right side backward cutting



459012 **Same,** left side backward cutting

STAMMBERGER **Antrum Punch**

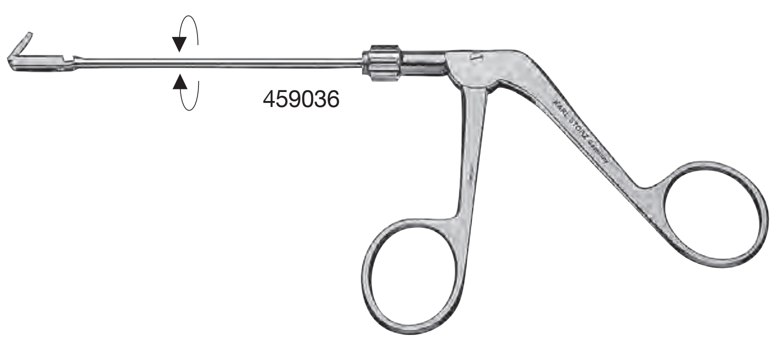
backward cutting



459016 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

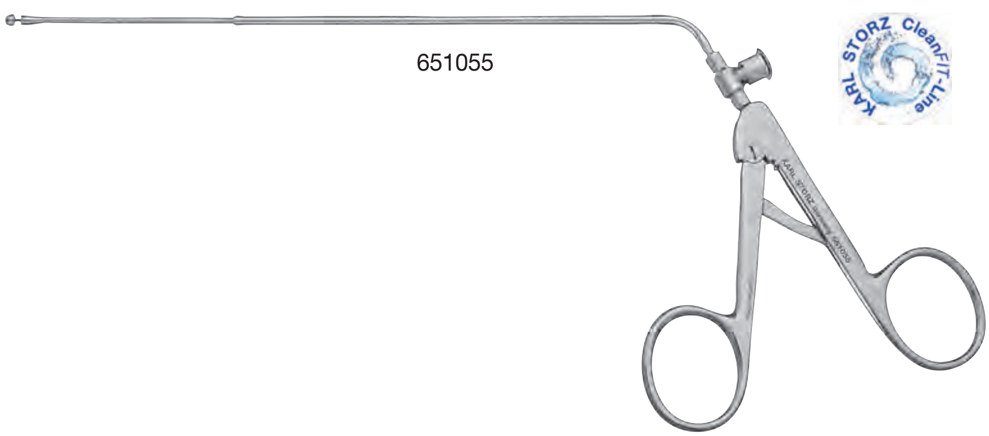


459036 STAMMBERGER **Antrum Punch,** small pediatric size, slender, backward cutting, sheath 360° rotating, with fixing screw, dismantling, working length 10 cm, for use with Cleaning Adaptor 459015 LL

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, arteria carotis and optic nerve osseous canal are virtually impossible**



651055

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

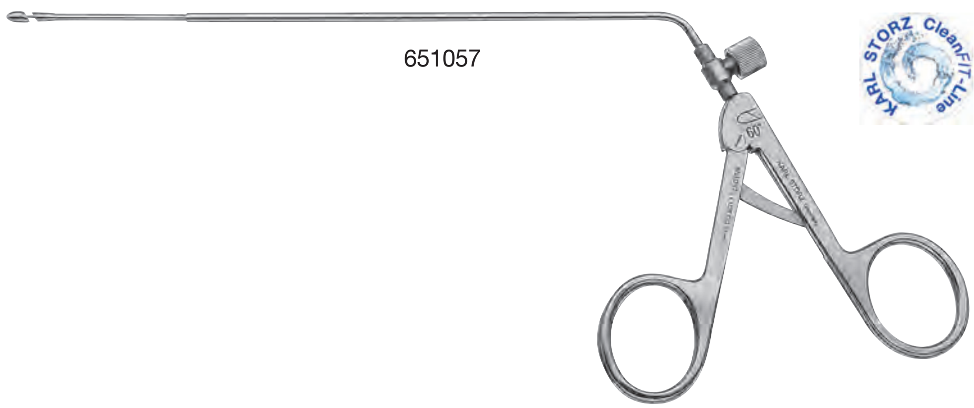
651050 **Same,** diameter 4.5 mm

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

STAMMBERGER **Punches**

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



651057

651057 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

651058 **Same,** circular cut 120°

651053 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

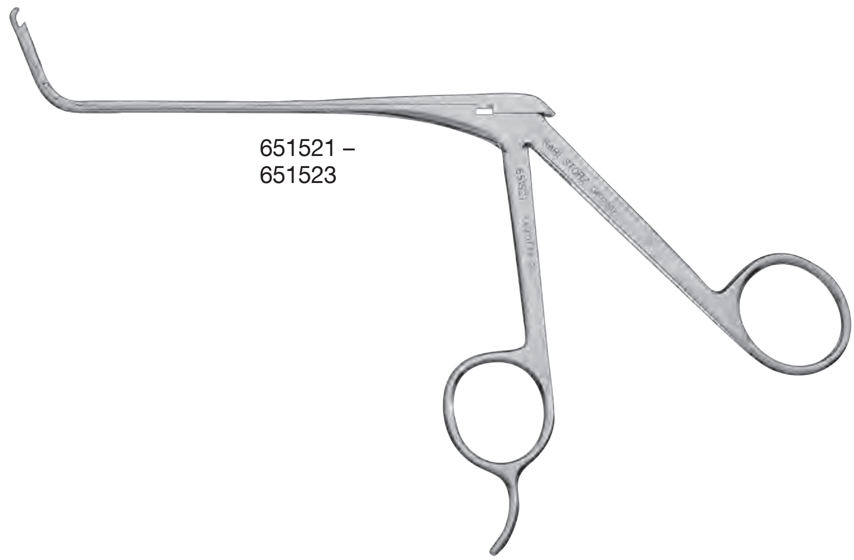
651052 **Same,** circular cut, 60° cutting direction, tip diameter 4.5 mm

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,** tip diameter 4.5 mm

Frontal Sinus Punches

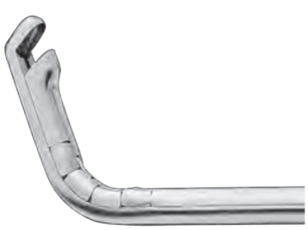
with link chain sheath, backward cutting



651521 –
651523

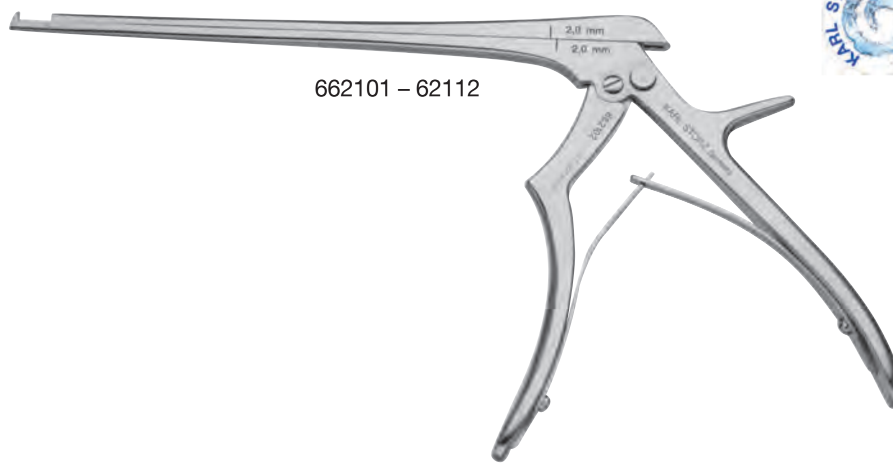
651521 **Frontal Sinus Punch,** with link chain sheath 70° upturned, backward cutting, to reduce the spina nasalis superior, small, jaws 2.5 x 2 mm, working length 13 cm

651522 **Same,** medium (standard size), jaws 3.5 x 3 mm



651523 **Same,** large, jaws 5.5 x 5 mm

KERRISON **Bone Punches**

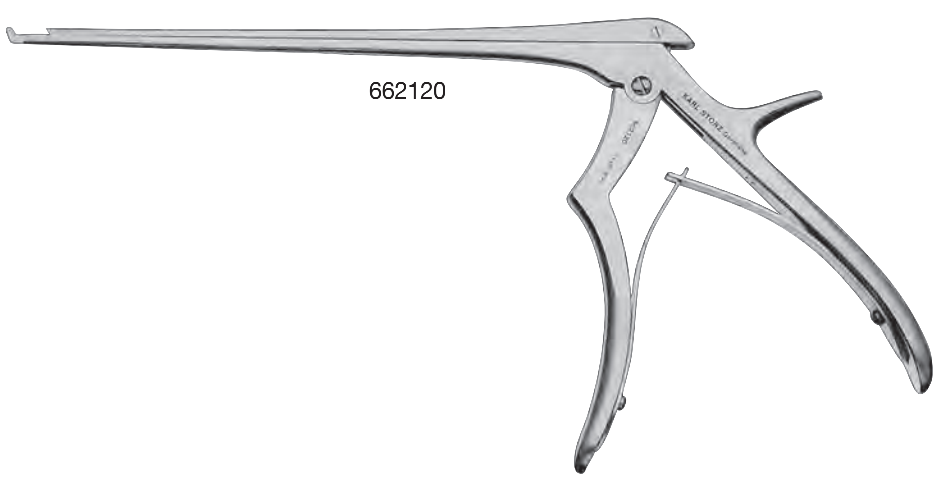


662101 – 62112

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

662102 **Same,** size 2 mm

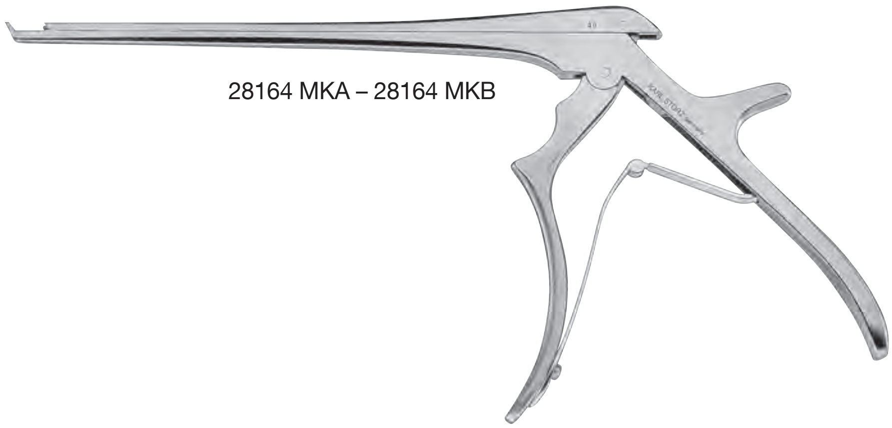
662112 KERRISON **Bone Punch,** detachable, rigid, 90° downbiting, not through-cutting, size 2 mm, working length 17 cm



662120

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

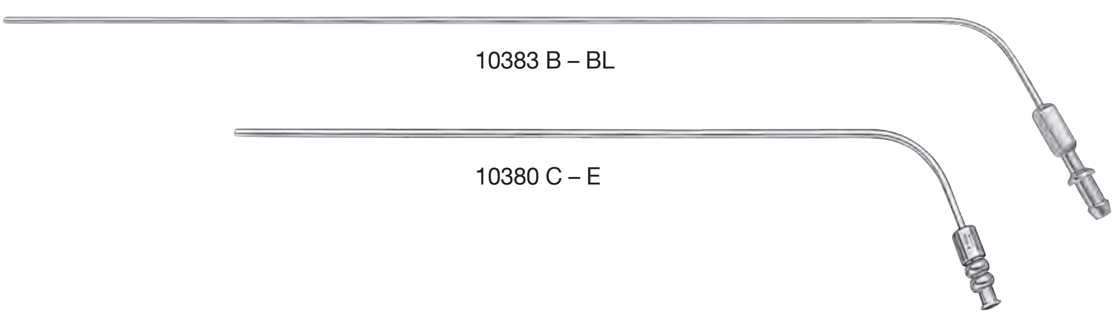
Punches



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

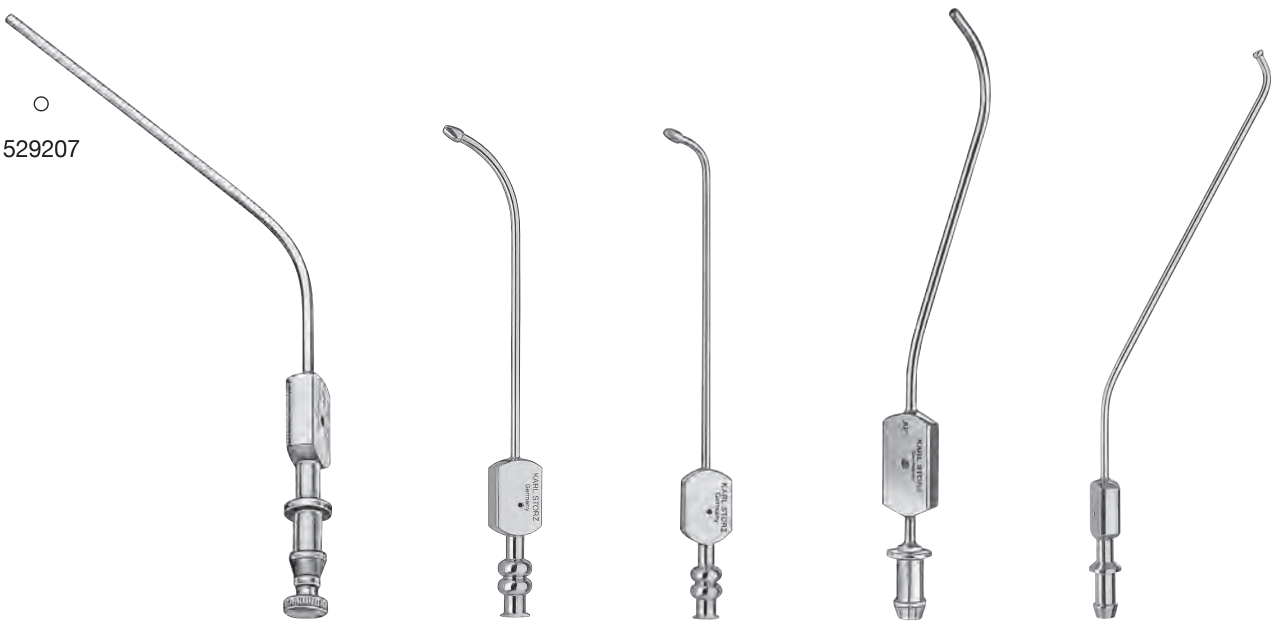


10383 B – BL

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

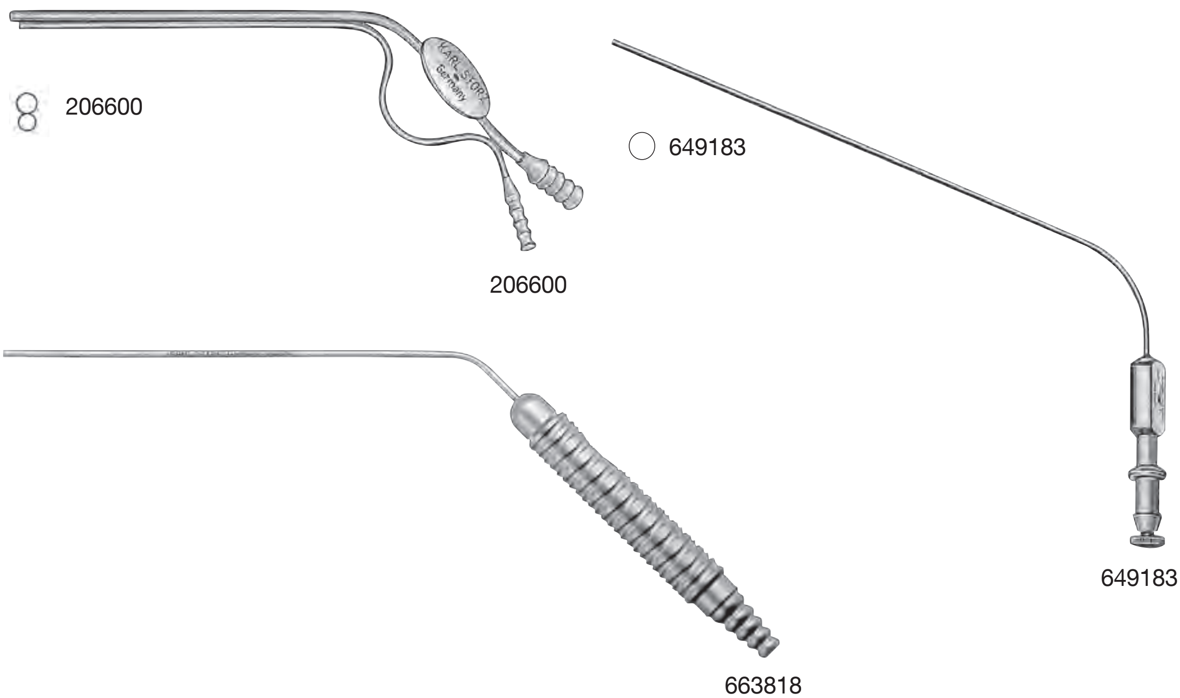


529207 586031 586226 – 586241 641625 662885 – 662886

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



206600 FISCH **Suction and Irrigation Tube,** cylindrical, suction tube outer diameter 2.5 mm, irrigation tube outer diameter 2 mm, working length 9.5 cm

649183 FERGUSON **Suction Tube,** with cut-off hole and stylet, LUER, 10 Fr., working length 15 cm

663818 **Suction Tube,** angular, malleable, with round handle and cut-off hole, diameter 2 mm, working length 13 cm

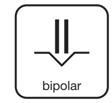
649179 B **Suction Tube,** malleable, with elongated cut-off hole and stylet, LUER, 4 Fr., working length 15 cm

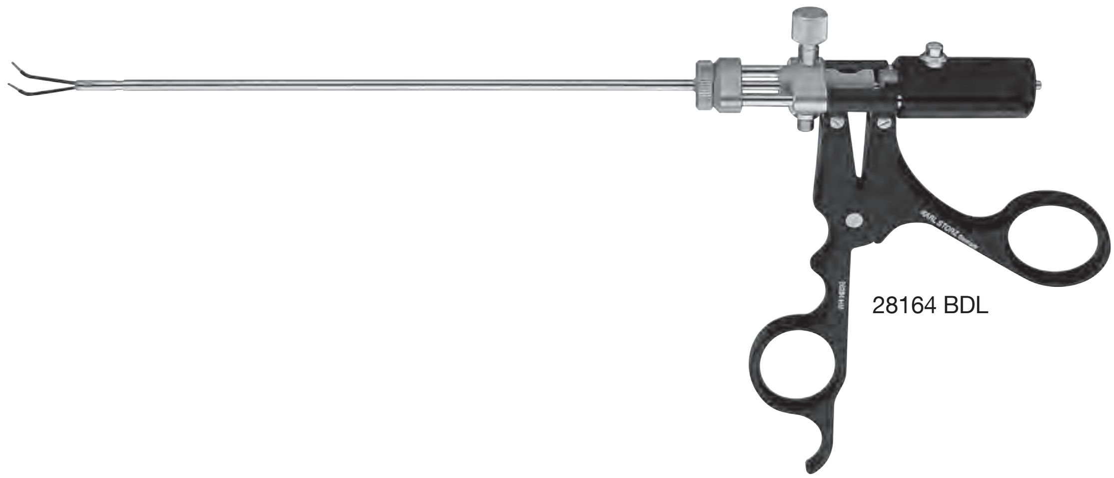
649180 B **Suction Tube,** malleable, with elongated cut-off hole and stylet, LUER, 6 Fr., working length 15 cm

649182 B **Suction Tube,** malleable, with elongated cut-off hole and stylet, LUER, 8 Fr., working length 15 cm

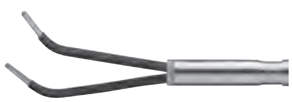
649183 B **Suction Tube,** malleable, with elongated cut-off hole and stylet, LUER, 10 Fr., working length 15 cm

TAKE-APART® Bipolar Forceps





28164 BDL



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

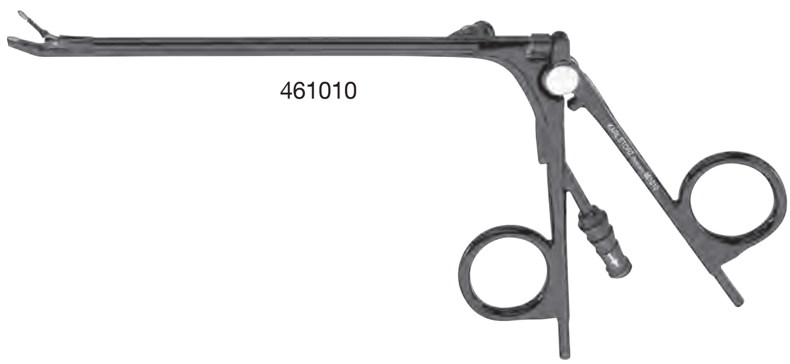
28164 BDD **TAKE-APART® Bipolar Forceps,** width 2 mm, distally angled 45°, horizontal closing, outer diameter 3.4 mm, working length 20 cm, including:
Bipolar Ring Handle
Outer Sheath
Inner Sheath
Forceps Insert

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

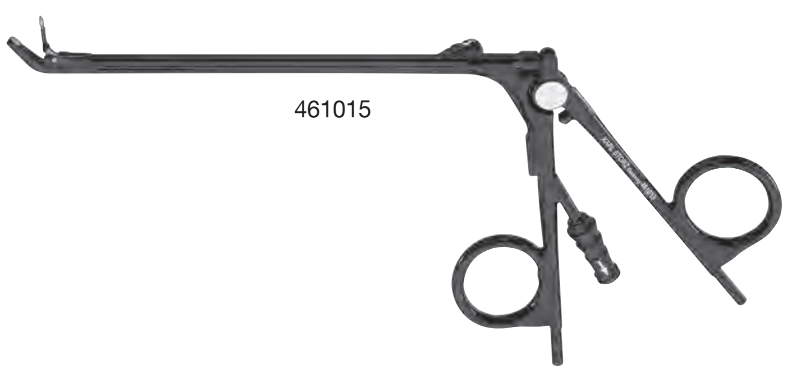
STAMMBERGER **Bipolar Suction Forceps**

bipolar



461010

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

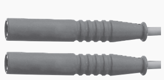
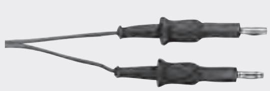
461015 STAMMBERGER **Bipolar Suction Forceps,** 45° upturned, with suction channel, for bipolar coagulation in paranasal areas, working length 12.5 cm, for use with Bipolar High Frequency Cord 847002 E or 847002 A/M/V/U

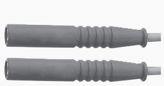
High Frequency Cords

for use with STAMMBERGER **Bipolar Suction Forceps**
Accessories

bipolar

Bipolar High Frequency Cords

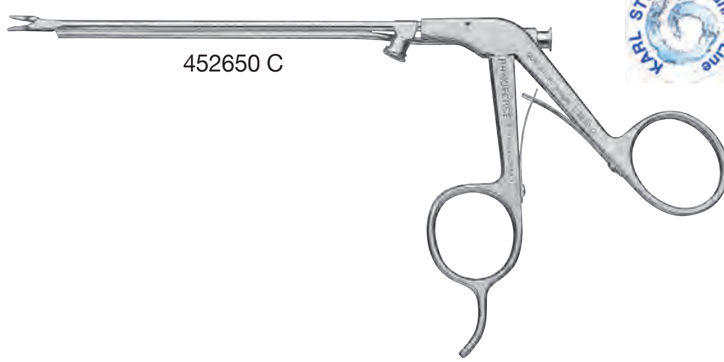
KARL STORZ Instruments	High Frequency Electrosurgery Units		
		847002 E	**Bipolar High Frequency Cord,** for **KARL STORZ** Coagulator 26021 B/C/D, 860021 B/C/D, 27810 B/C/D, 28810 B/C/D, AUTOCON® system (50, 200, 350), AUTOCON® II 400 SCB system (111, 113, 115) and Erbe coagulator, T and ICC series, 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
		847002 M	**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
		847002 A	**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
		847002 V	**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

KARL STORZ Instruments	Standard Forceps Bipolar Cords		
		847002 U	**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

MONTGOMERY-YOUNGS **RHINOFORCE® II Clip Applicator**

for endonasal endoscopic sphenopalatine artery ligature

Winner of the 2006 Cutler Surgical Prize



452650 C

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

unipolar

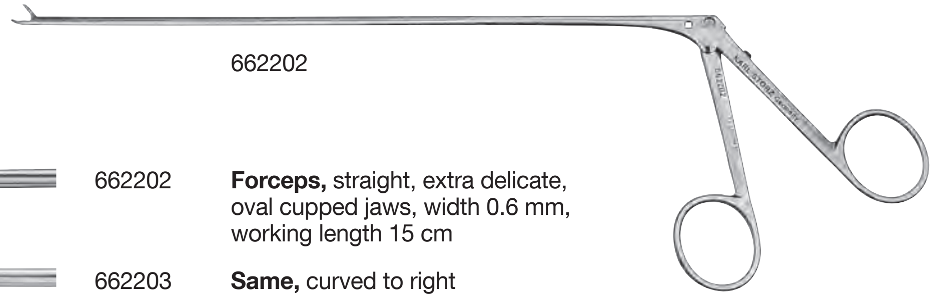
28164 ED

28164 ED **Coagulation Ball Electrode,** diameter 2 mm, laterally curved, working length 13 cm

28164 EF **Same,** diameter 4 mm

Fine and Delicate Instruments

Forceps, working length 15 cm



662202

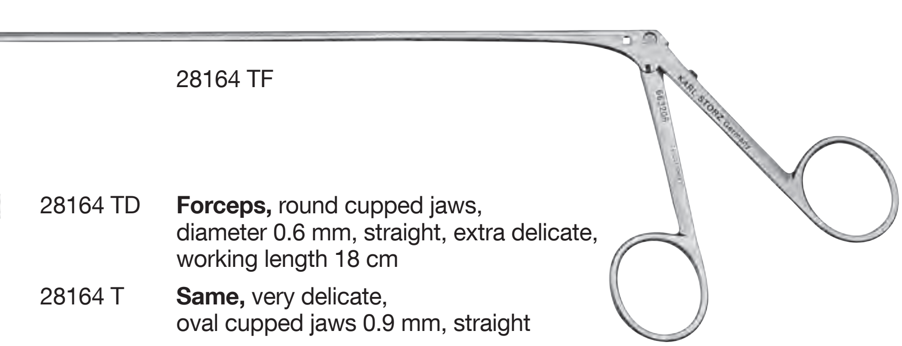
662202 **Forceps,** straight, extra delicate, oval cupped jaws, width 0.6 mm, working length 15 cm

662203 **Same,** curved to right

662204 **Same,** curved to left

662205 **Same,** 45° upturned

Forceps, working length 18 cm



28164 TF

28164 TD **Forceps,** round cupped jaws, diameter 0.6 mm, straight, extra delicate, working length 18 cm

28164 T **Same,** very delicate, oval cupped jaws 0.9 mm, straight

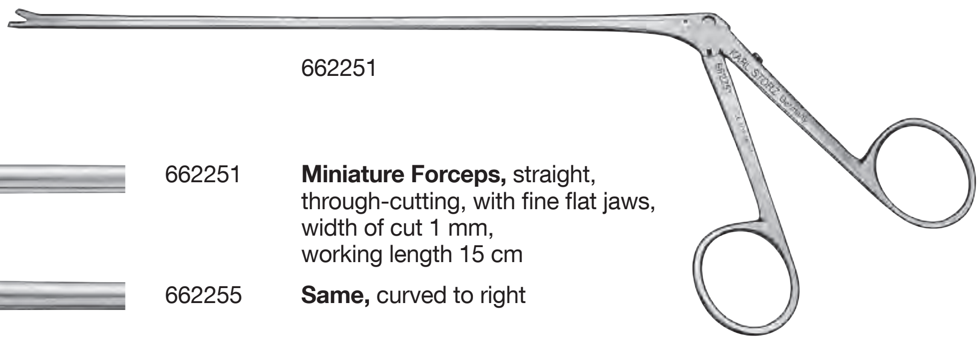
28164 TE **Forceps,** oval cupped jaws, diameter 0.6 mm, curved to right, extra delicate, working length 18 cm

28164 TF **Same,** curved to left

28164 TA **Forceps,** 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

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

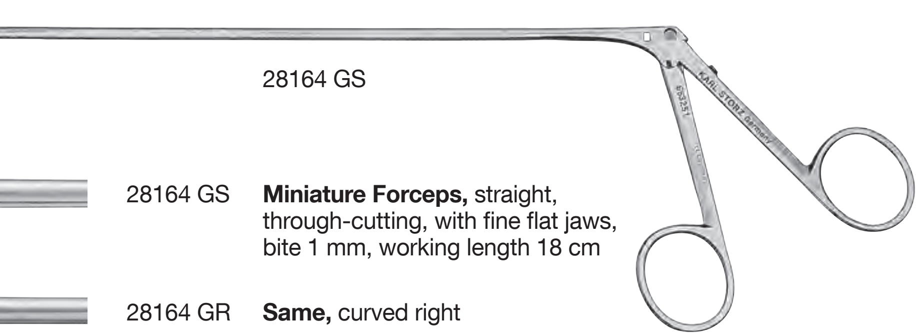
662255 **Same,** curved to right

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

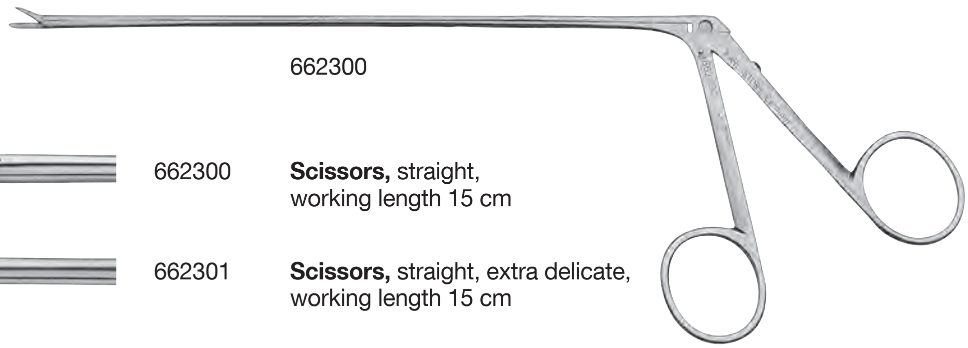
28164 GL **Same,** curved to left

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

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

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

Sellar Stage

Curettes, round spoon

28164 KA

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

28164 KF **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

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

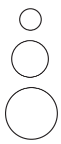
28164 EA CASTELNUOVO **Elevator,** double-ended, semisharp and blunt, length 26 cm

Sellar Stage

Curettes

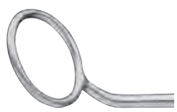
28164 RP

Inner diameter
in 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 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

28164 DA **Dissector,** sharp, tip angled 45°, round spatula,
with round handle, size 2 mm, length 25 cm

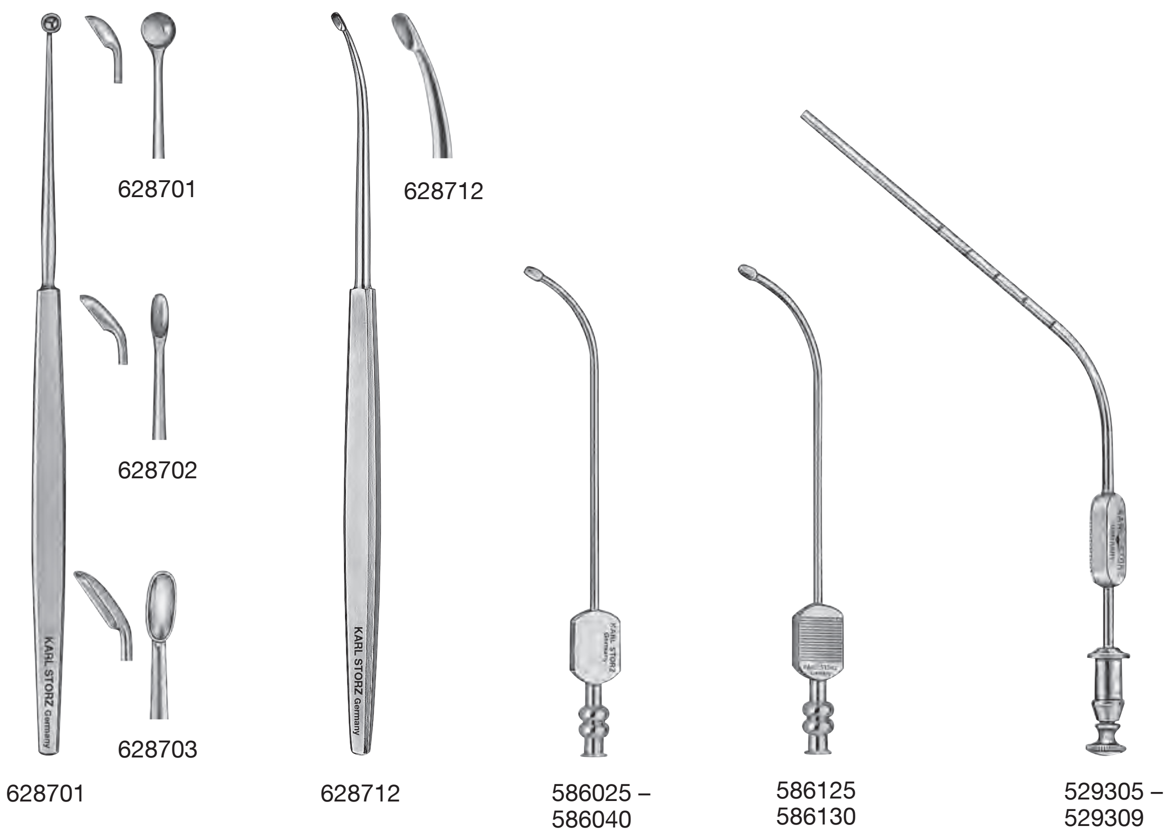
28164 DB **Dissector,** sharp, tip angled 45°, round spatula,
with round handle, size 3 mm, length 25 cm

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, outer diameter 2.5 mm, length 12.5 cm
586030	**Same,** outer diameter 3 mm
586040	**Same,** outer diameter 4 mm
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
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

28164 NBC **Micro Needle Holder,** bayonet-shaped, jaws curved to left, 1 x 6 mm, working length 10 cm

28164 PBE

28164 PBB **Micro Forceps,** bayonet-shaped, spoon, 2 mm, working length 10 cm

28164 PBE **Same,** 4 mm spoon

28164 PBG

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 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°

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

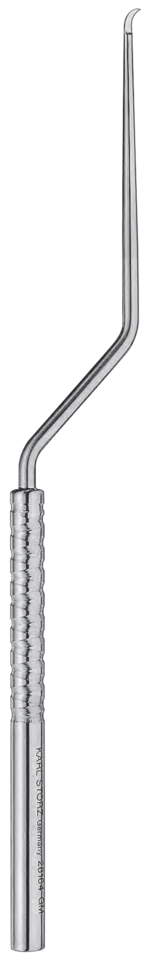
NEW 28164 GKU **Same,** tip angled downwards 45°

NEW 28164 GLL **Ring Curette,** bayonet-shaped, blunt, tip angled to left 90°, outer diameter 3.3 mm, with round handle, working length 15 cm

NEW 28164 GLR **Same,** tip angled to right 90°

Micro Vascular Knife and Dissector

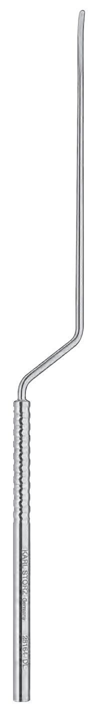
28164 GM



28164 GM

28164 DL

28164 DR



28164 DL

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 NEW

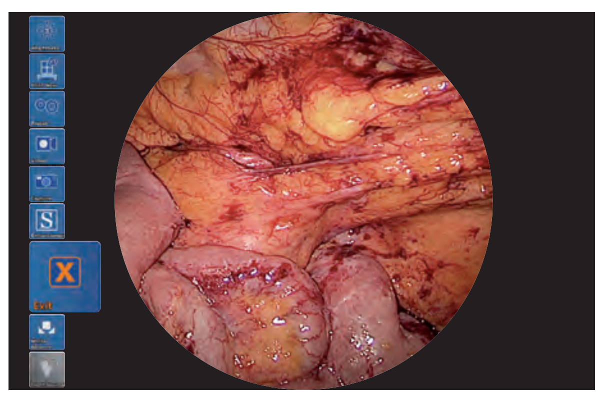
Economical and future-proof

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

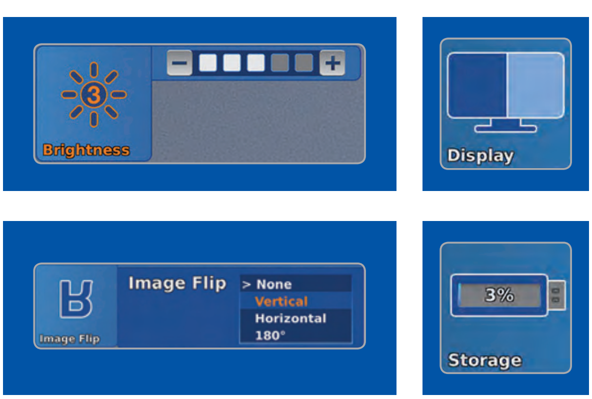
Innovative Design

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

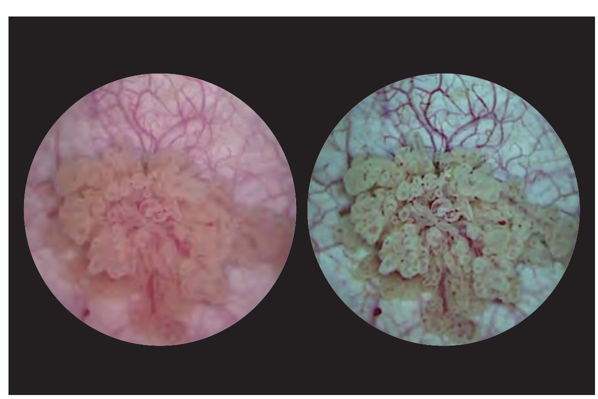
Dashboard



Live menu



Intelligent icons

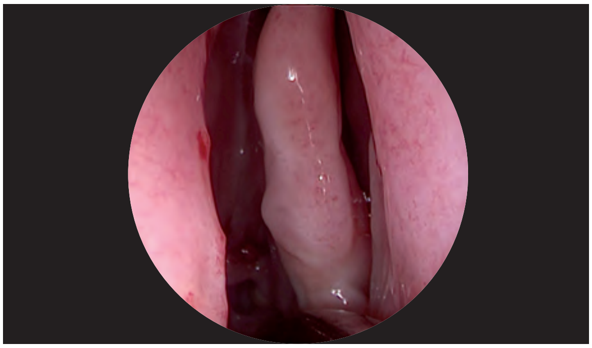


Side-by-side view: Parallel display of standard image and Visualization mode

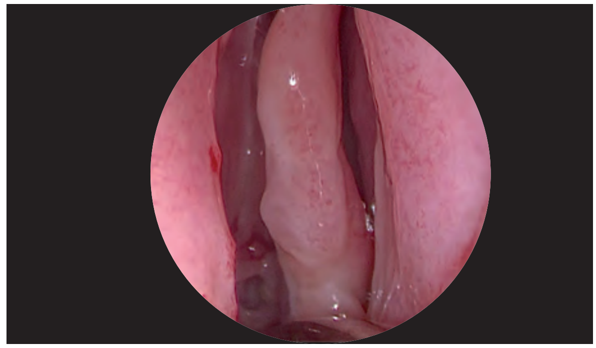
IMAGE1 S Camera System NEW

Brillant Imaging

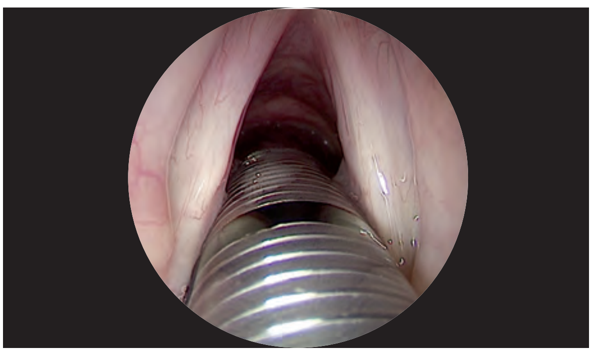
- **Clear and razor-sharp endoscopic images in FULL HD**
- **Natural color rendition**
- **Reflection is minimized**
- **Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting**



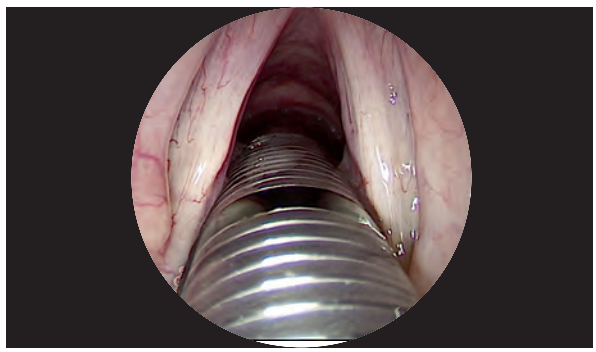
FULL HD image



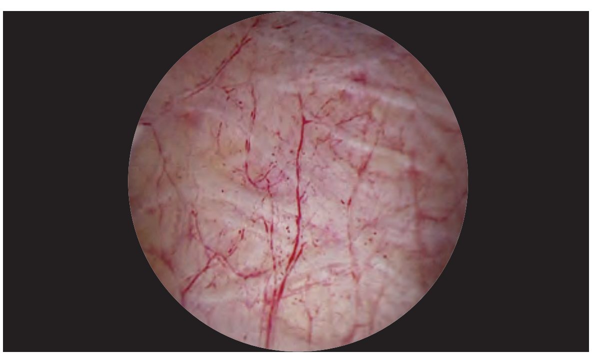
CLARA



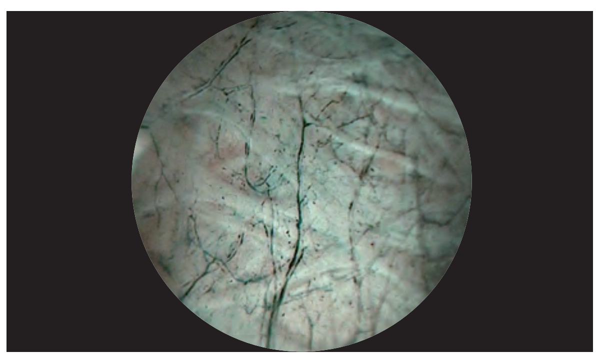
FULL HD image



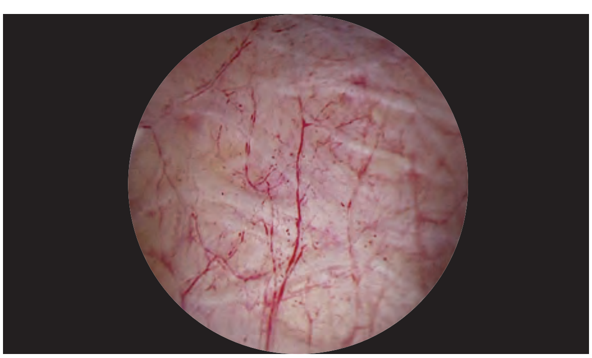
CHROMA



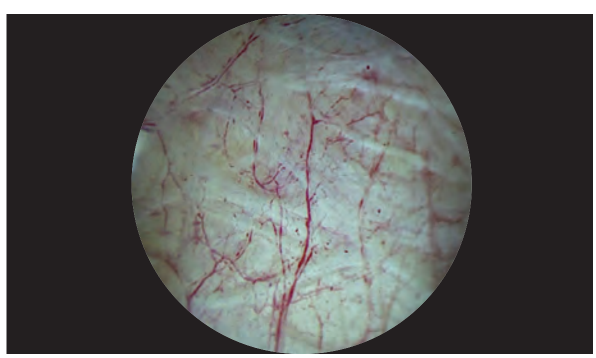
FULL HD image



*SPECTRA A**



FULL HD image



*SPECTRA B***

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

IMAGE1 S Camera System NEW

IMAGE1 S

TC 200EN

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

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

Specifications:

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

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

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

TC 300

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

Specifications:

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

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

IMAGE1 S Camera Heads *NEW*

IMAGE1 S

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:

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

TH 104 **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:

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

Monitors

9619 NB

9619 NB **19" HD Monitor,**
color systems **PAL/NTSC,** max. screen resolution 1280 x 1024, image format 4:3, power supply 100–240 VAC, 50/60 Hz, wall-mounted with VESA 100 adaption,
including:
External 24 VDC Power Supply
Mains Cord

9826 NB

9826 NB **26" FULL HD Monitor,**
wall-mounted with VESA 100 adaption,
color systems **PAL/NTSC,**
max. screen resolution 1920 x 1080,
image fomat 16:9,
power supply 100–240 VAC, 50/60 Hz
including:
External 24 VDC Power Supply
Mains Cord

Monitors

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

Optional accessories:

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

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

Specifications:

KARL STORZ HD and FULL HD Monitors	19"	26"
Desktop with pedestal	optional	optional
Product no.	9619 NB	9826 NB
Brightness	200 cd/m^2 (typ)	500 cd/m^2 (typ)
Max. viewing angle	178° vertical	178° vertical
Pixel distance	0.29 mm	0.3 mm
Reaction time	5 ms	8 ms
Contrast ratio	700:1	1400:1
Mount	100 mm VESA	100 mm VESA
Weight	7.6 kg	7.7 kg
Rated power	28 W	72 W
Operating conditions	0–40°C	5–35°C
Storage	-20–60°C	-20–60°C
Rel. humidity	max. 85%	max. 85%
Dimensions w x h x d	469.5 x 416 x 75.5 mm	643 x 396 x 87 mm
Power supply	100–240 VAC	100–240 VAC
Certified to	EN 60601-1, protection class IPX0	EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2

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
Silicone Tubing Set, autoclavable, length 250 cm
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

KARL STORZ AIDA® compact NEO advanced

Brilliance in documentation

AIDA compact NEO:
Recording screen

AIDA compact NEO:
Patient data

AIDA compact NEO:
Review screen

Data Acquisition

Still images, video sequences and audio comments can easily be recorded during an examination or intervention by pressing the on-screen button, activitating the footswitch, or pressing the camera head button.

All captured data are displayed on the right-hand side as a thumbnail preview to ensure the data have been generated. Patient data can be entered via an onscreen or standard keyboard. The system also offers the possibility to transfer all relevant patient data via a DICOM worklist or a link to the hospital information system (HIS) without requiring manual entry in the patient entry screen.

Flexible Review, Data Storage and Efficient Data Export

Captured still images or video files can easily be viewed, edited, or deleted on-screen before final storage. KARL STORZ AIDA® compact NEO efficiently stores all recorded data on DVD, CD, USB stick, external/internal drive, the relevant network and/or on a FTP server. It is also possible to save the data directly on the PACS and/or HIS servers via HL7/DICOM. Data that cannot be stored successfully remains in a cache until final archiving is possible.

Special Features:

- **SD and HD signal support:**
  – Y/C (S-Video)
  – Composite input
  – DVI-D input
- **Picture-in-Picture function:**
  Display of channel 2 (SD) in channel 1 (FULL HD)
- **Resolution:**
  – Still images 1920 x 1080 and SD
  – Videos 1080p, 720p and SD
- **Interface package (DICOM/H7) included**
- **NEO Secure security software**
- **Recommended applications:**
  – Universal (cart or OR1™ installation)

20 0409 13-EN* **KARL STORZ AIDA® compact NEO advanced**

Documentation system for digital storage of still images,
video sequences and audio files, power supply 115/230 VAC, 50/60 Hz

* **Available in the following languages:**
DE, ES, FR, IT, PT, PL, RU, DK, SE, JP, CN

Equipment Cart

UG 220

UG 220 **Equipment Cart**
wide, high, rides on 4 antistatic dual wheels
equipped with locking brakes 3 shelves,
mains switch on top cover,
central beam with integrated electrical subdistributors
with 12 sockets, holder for power supplies,
potential earth connectors and cable winding
on the outside,

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

inluding:

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

UG 540

UG 540 **Monitor Swifel Arm,**
height and side adjustable,
can be turned to the left or the right side,
swivel range 180°, overhang 780 mm,
overhang from centre 1170 mm,
load capacity max. 15 kg,
with monitor fixation VESA 5/100,
for usage with equipment carts UG xxx

Recommended Accessories for Equipment Cart

UG 310

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

UG 410

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

UG 510

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

Notes: