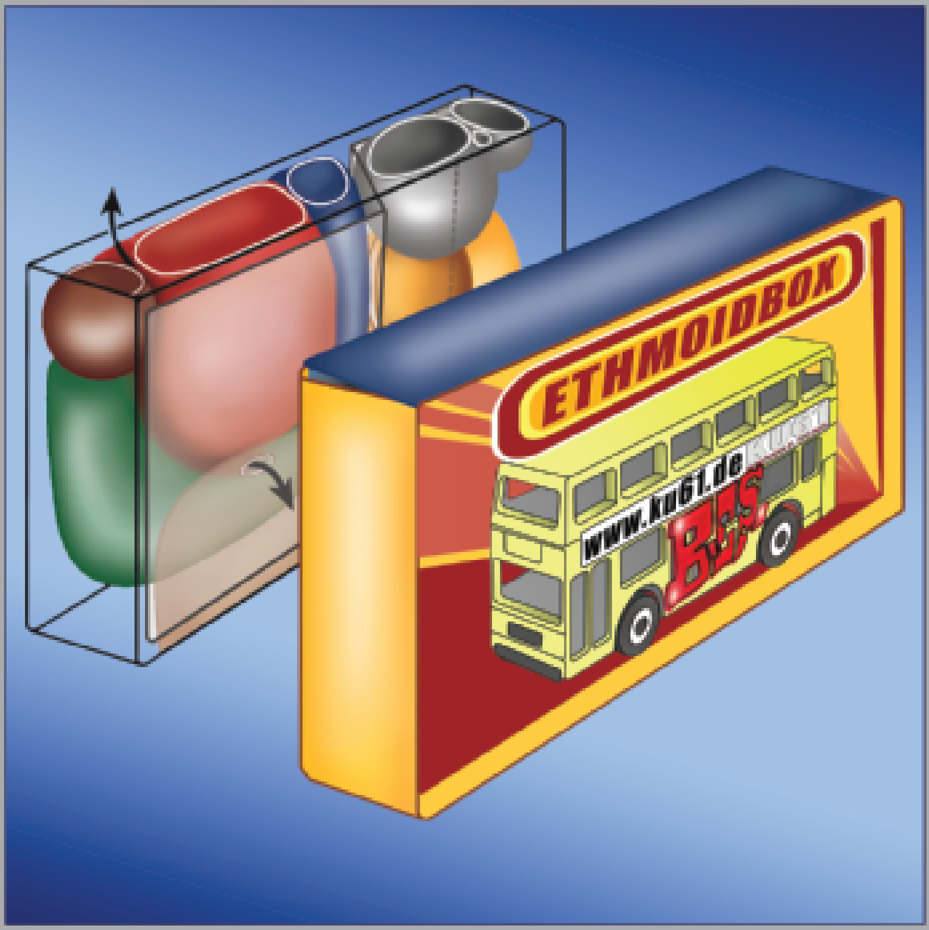
B.E.E.S.

BIOSTATIC ENDOSCOPIC ETHMOID SURGERY



Prof. **Hans BEHRBOHM,** M.D.
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Emil Zuckerkandl (1848—1910)
(Photo: Prof. Daniel Simmen, Zurich, Switzerland)

Introduction

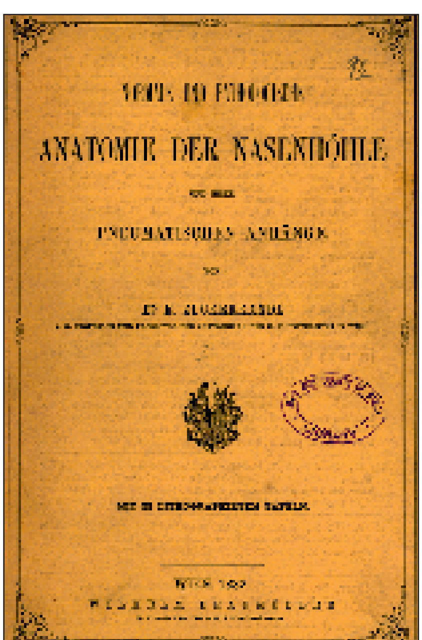
Historical Considerations

After initially pursuing a career as a virtuoso violinist, *Emil Zuckerkandl* (1849–1910) became an extraordinary professor of anatomy at 31 years of age, without having to present the customary postdoctoral credentials. In 1882 *Zuckerkandel* became a full professor in Graz, Austria, and six years later he assumed the first anatomy chair in Vienna. The poet *Arthur Schnitzler* studied medicine in Vienna and shared a vivid memory of *Zuckerkandl* in his autobiography, *Youth in Vienna,* describing him as "*… a pale young man with a dark goatee and black eyes. In his academic robes he closely resembled one of those anatomists familiar to us from the famous Rembrandt portraits, while the legendary stories of his rakish youth, filled with drinking and fencing, seemed to hover about him."* He also had a reputation for "*… going straight to work from some tavern or perhaps even from the arms of a beautiful woman and launching directly into his daily routine, teaching and studying with prodigious energy far into the night.*"

This intense drive for scientific knowledge surely formed the basis for his pamphlet on *Normal and Pathologic Anatomy of the Nasal Cavity and its Pneumatic Appendages,* published in 1882. In this work, *Zuckerkandl* was the first author to give a detailed anatomical description of the ethmoid bone and all the paranasal sinuses, thus creating a scientific basis for understanding their anatomy. He also drew attention to specific structures and narrow passageways that contribute to the pathogenesis of rhinosinusitis and are still relevant today – such as the ethmoid infundibulum and variants in the pneumatization and curvature of the middle nasal turbinate.

He described in detail the cellular anatomy of the ethmoid labyrinth, noting that *"…the ethmoid bulla is highly variable in its development, and its importance rests not only on its relationship to the middle turbinate. An ethmoid cell belonging to the lower portion of the labyrinth, the ethmoid bulla presents a convex medial surface to the nasal cavity and is bounded laterally by the lamina papyracea of the ethmoid bone or may be separated from it by another, intervening ethmoid cell…"*

Zuckerkandl's writings on the variability of the middle turbinate included the following: *"The variations relate both to the shape and size of the [middle] turbinate. The turbinate may be so markedly curved that it occludes the olfactory groove and engages against the nasal septum. The transformation of the anterior end of the turbinate into a large bony bulla is a common occurrence and was even described in the past century by Giovanni Santorini in his 'Observationes anatomicae'. In cases of this kind, the turbinate contains a cavity, at times even subdivided by a septum, that communicates openly with the middle meatus."*



ZUCKERKANDL E: *Normal and Pathologic Anatomy of the Nasal Cavity and its Pneumatic Appendages.* Vol. 2, Vienna. Wilhelm Braumüller (1892, 1893).

In his groundbreaking work on *"The Role of the Lateral Nasal Wall in the Pathogenesis, Diagnosis and Treatment of Recurrent and Chronic Rhinosinusitis" (1987), Walter Messerklinger (1920–2001)* begins by reviewing the anatomical discoveries of *Zuckerkandl, Hajek, Grünwald, Peter, Killian,* and *Flottes* on the cellular structures of the lateral nasal wall before addressing their importance in the pathogenesis of rhinogenic sinusitis. At the *International Conference on Sinus Disease, Terminology, Staging and Therapy held in Princeton, New Jersey,* in 1993, *Stammberger et al. (1997)* presented a paper titled *"Anatomical Terminology and Nomenclature of Paranasal Sinus Surgery"* in which they created a uniform, consistent nomenclature for the anatomy of the ethmoid bone.

While discoveries on the anatomy of specific cellular structures in the ethmoid bone gave rise to important pathogenetic considerations, an endoscopic diagnostic concept, and a subsequent approach to functional endoscopic sinus surgery (F.E.S.S.), to date there have been no fundamental studies on the stabilizing function of the principal ethmoid cells.

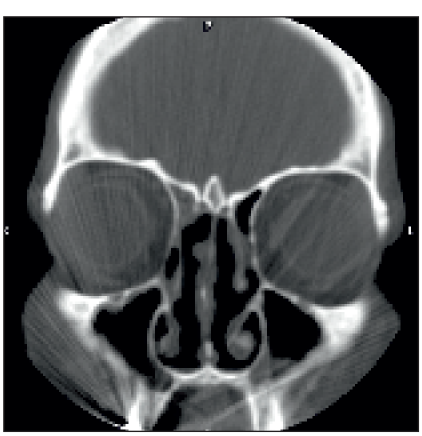
Prof. Stammberger (2002) has repeatedly emphasized the importance of an atraumatic surgical technique, particularly in endoscopic surgery of the frontal sinuses, noting that *"…an aggressive technique with the radical removal of mucosa from these small ethmoid passageways will quickly lead to scarring and stenosis. Not infrequently, traumatic surgical manipulations in this region will promote the development of frontal sinus symptoms that did not exist prior to surgery…"*

Walter Messerklinger (1920—2001), Chairman of the Department of Otorhinolaryngology, Graz University Hospital (1959—1990), seen at a professional gala in Vienna in 1990.

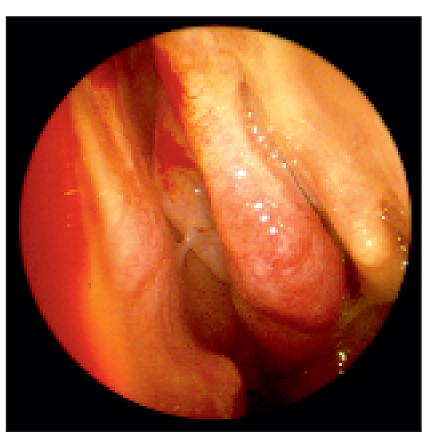
Statement of Problem

Lack of awareness of the biostatic importance of some important cellular structures of the ethmoid bone, such as the *ethmoid bulla* and *middle turbinate,* have led to careless handling of these structures during sinus surgery. The practice of F.E.S.S. at many centers has devolved into a "monomaniacal" clearing of ethmoid cells without taking into account the specific anatomical problems in the individual case and often without actually meeting the requirements of minimal invasiveness. The extent of ethmoid resection is often described in terms of an anterior or posterior *ethmoidectomy,* and endoscopes are not always used during the ethmoid dissection.

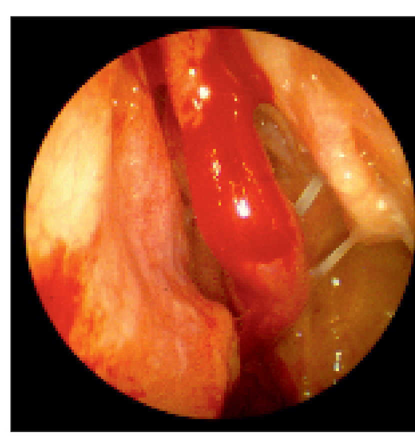
Prof. Messerklinger (second from right) with colleagues in Vienna in 1990.



Coronal CT scan documents high-grade stenosis of the exenterated ethmoid labyrinth 2 years after surgery for recurrent frontal sinusitis.



Lateralization of the middle turbinate is a frequent consequence of ethmoidectomy.



Appearance following medialization and trimming of the middle turbinate.

The results: Occasional postoperative CT scans obtained for various indications (they are not routinely necessary) have shown the following typical problems:

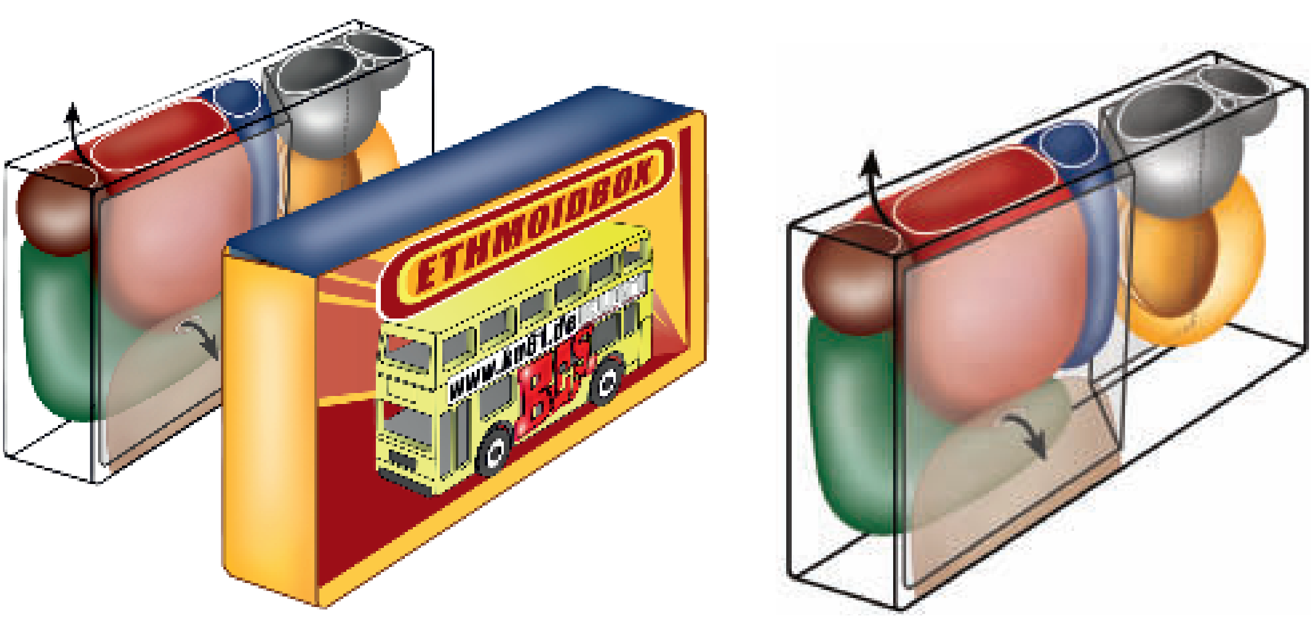
- Significant scarring and contraction may occur after a complete ethmoidectomy.
- These effects can obstruct surgically created drainage routes from the frontal and maxillary sinuses.
- The middle turbinate is very susceptible to postoperative lateralization.
- Mucosal lesions are associated with a high risk of synechia formation and ethmoid atelectasis.

The most important postulate of *F.E.S.S.* in the treatment of patients with recurrent rhinosinusitis is the improvement of ventilation and drainage, which is essential for mucosal regeneration. This can be accomplished only by taking into account biostatic principles, which must be applied in order to achieve the main goal: adequate and permanent postoperative patency of the ethmoid sinuses.

Establishing drainage from the frontal sinuses will be ineffective if postoperative contraction of the ethmoid causes lateralization of the middle turbinate and possible synechia formation, leading to stenosis of the drainage pathway.

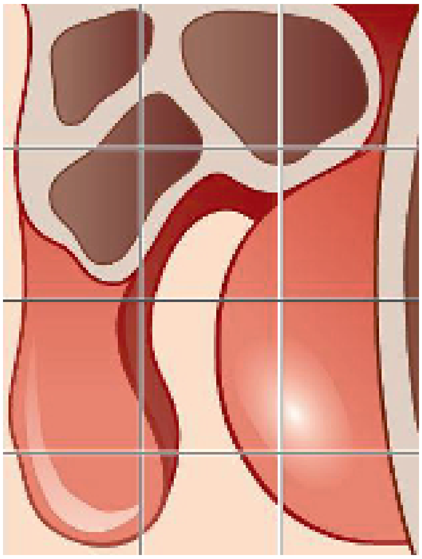
Biostatic principles

- In simplified terms, the ethmoid bone has the approximate size and shape of a matchbox stood on edge. The width of the "matchbox" is variable and depends on the degree of ethmoid pneumatization and on the variable symmetry of the ethmoid cells.
- The supporting structure of the ethmoid bone, which forms cavities to maintain ventilation and drainage of the maxillary and frontal sinuses, shows varying patterns of pneumatization.

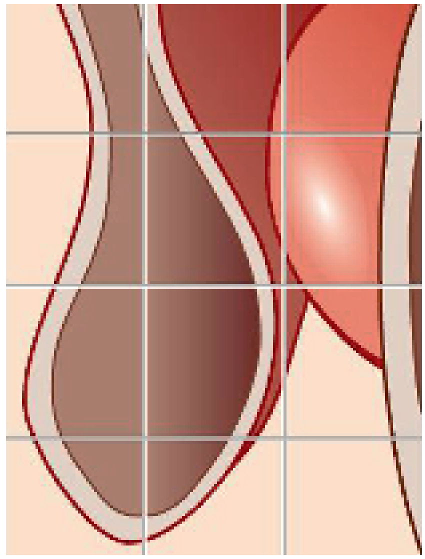


The ethmoid "matchbox." The principal supporting structures of the anterior ethmoid are the *ethmoid bulla* (**red**) and the *middle turbinate* with its basal lamina, which separates the anterior and posterior ethmoid cells and stabilizes the width of the ethmoid bone.
Other structures:
brown = Agger nasi cell
green = Uncinate process
blue = Retrobullar cell
gray and **yellow** = Posterior ethmoid cells
shading = Ethmoid infundibulum and frontal recess.

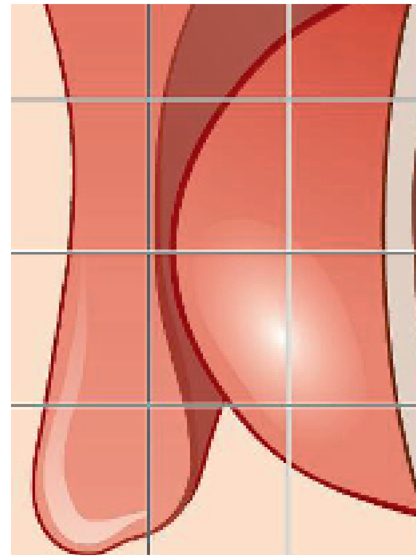
The Main Pneumatization Patterns of the Ethmoid Bone



Interlamellar cells.



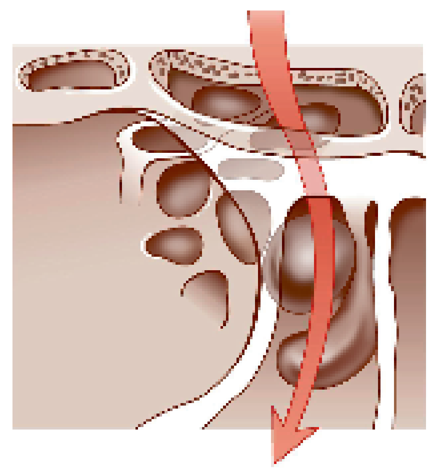
Concha bullosa.



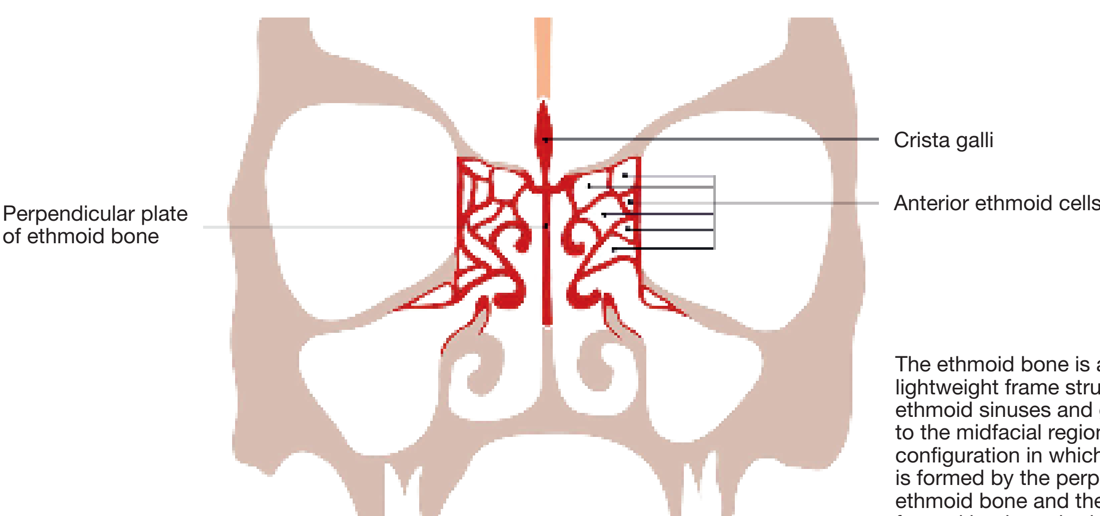
Large ethmoid bulla.

The ethmoid bone has a variable width. A complementary relationship exists between the ethmoid bulla and a possible concha bullosa in the middle turbinate. Both structures should be viewed as a functional complex whose complete removal leads to atelectasis of the ethmoid bone.

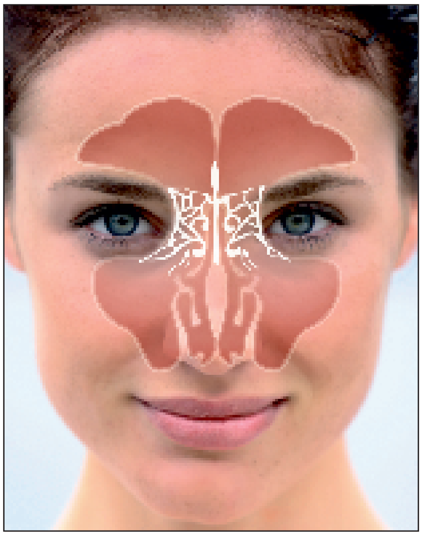
- From an architectural standpoint, the ethmoid bone can be described as a *suspended lightweight construction.* While the massive archworks of the inner and outer tables of the skull maintain patency of the frontal infundibulum, this function is performed in the ethmoid bone by a combination of *domes* and *horizontal struts.* The struts and pillars never terminate blindly, but maintain the space and distance between the orbits on the one hand and between the skull base, vomer, and ultimately the maxilla on the other.



Bony framework of the frontal infundibulum.



The ethmoid bone is a suspended, lightweight frame structure that forms the ethmoid sinuses and gives central support to the midfacial region. It has a T-shaped configuration in which the *vertical* member is formed by the perpendicular plate of the ethmoid bone and the *horizontal* member is formed by the paired ethmoid labyrinths.



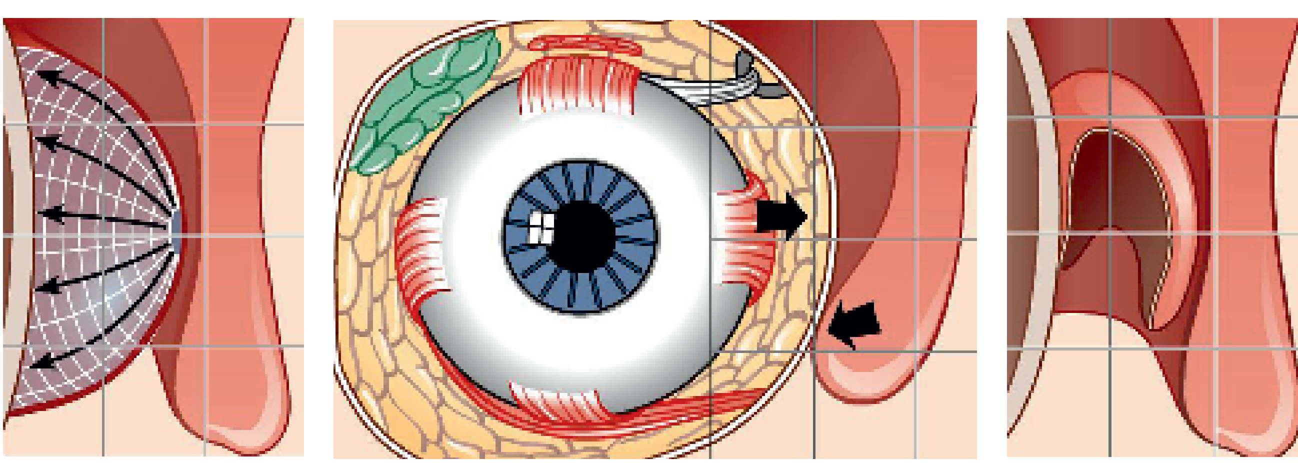
We can explain the biostatic function of the ethmoid labyrinth by looking at two clinically important structures: the *ethmoid bulla* and the *middle turbinate.*

Ethmoid bulla

- The ethmoid bulla arises by pneumatization from the basal lamina of the second ethmoturbinate and is usually the largest of the anterior ethmoid cells. The bulla lamella forms the posterior wall of the frontal recess when it attaches to the skull base; otherwise a suprabullar recess is formed. When strongly pneumatized, the bulla may narrow the frontal recess to a ductlike structure that has contributed to the now-obsolete term "nasofrontal duct."
- The middle turbinate is part of the ethmoid bone and may be pneumatized in any of its parts, such as the head and neck. When the head of the middle turbinate is pneumatized, it forms the *concha bullosa.* The concha bullosa is an anatomical variant and generally does not have pathogenic significance. *Interlamellar* cells are a special variant caused by pneumatization of the vertical lamella of the middle turbinate. The middle turbinate is an important aerodynamic structure for ventilating the olfactory groove and paranasal sinuses. It has three points of attachment: the anterior neck of the turbinate attaches to the lateral edge of the cribriform plate, the central part attaches to the lamina papyracea, and the posterior part inserts laterally at the level of the pterygoid process. The basal lamina of the middle turbinate is of special importance for several reasons. It forms a kind of "watershed" for the drainage of secretions from the anterior and posterior ethmoid, and it is an important horizontal supporting structure that contributes to the formation of the sinus cavities. By stabilizing the head of the turbinate, the basal lamina helps to maintain the patency of the ethmoid sinuses. Destabilization of the basal lamina leads to "kinking" and lateralization of the turbinate head, deflects airflow away from the olfactory groove, and causes loss of ethmoid volume.

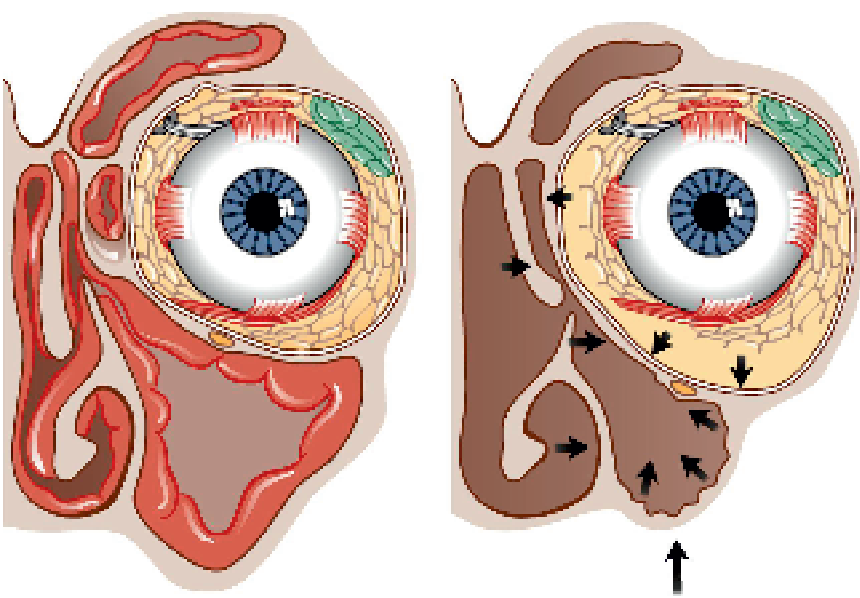
The ethmoid bone and voice

The fine trabecular structure of the ethmoid bone is an important factor in the production and self-perception of vocal resonance. Voice modulation also relies upon the vibrating and damped "strings" of the ethmoid sinuses. B.E.E.S. can lead to an improvement in dynamic vocal range and voice resonance.



The ethmoid bulla is perched on the medial orbital wall like an architectural dome. A complete anterior ethmoidectomy promotes medialization of the lamina papyracea and lateralization of the middle turbinate. This tendency can be counteracted by preserving the lamella or upper cap of the ethmoid bulla.

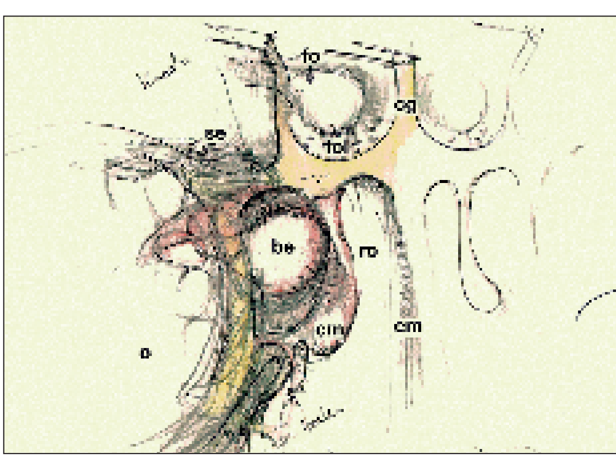
Removing the parietal mucosa from the paranasal sinuses can cause severe scarring and luminal obliteration. The *Caldwell-Luc* radical antrostomy, for example, could result in almost complete obliteration of the maxillary sinus with maxillary deformity and orbital floor depression due to typical wound healing effects in the concavities of the paranasal sinuses. *Wigand (1977, 1981, 1989)* made repeated references to these phenomena, which result from severe centripetal shrinkage and luminal narrowing due to appositional bone growth and scar formation. Essentially the same processes must take place in the ethmoid sinuses when the parietal mucosa is removed along with all internal supporting cellular structures.



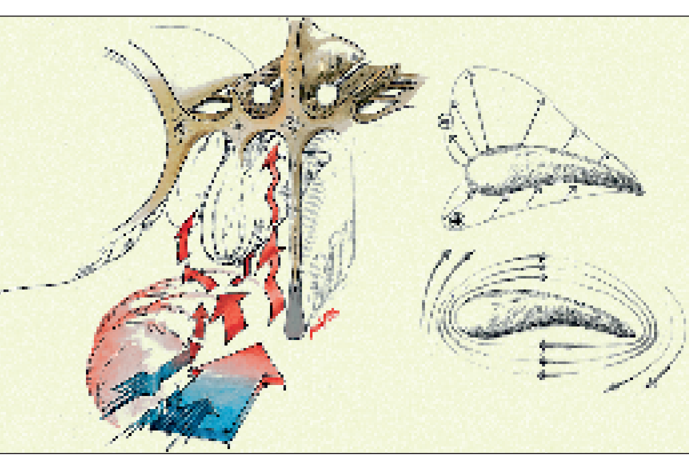
Wound healing and contraction effects following removal of the parietal mucosa from the ethmoid and maxillary sinuses. The effects include high-grade stenoses and lateralization of the middle turbinate and uncinate process.

The ethmoid bone and olfaction

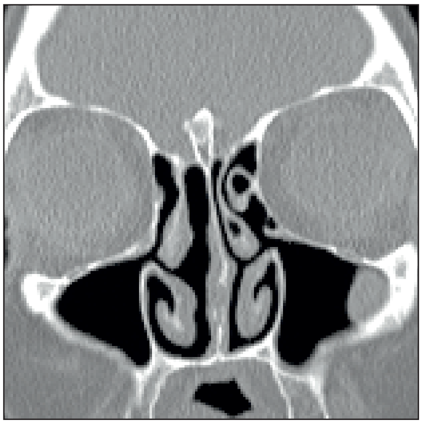
The alignment of the middle turbinate is crucial for ventilation of the olfactory groove. The turbinate has the shape of an airfoil suspended between three points of attachment. For effective ventilation of the olfactory groove, a positive pressure must develop along the lateral lamella of the middle turbinate and a negative pressure along the medial lamella. The negative pressure on the “lee” side of the middle turbinate draws the inspired air up into the olfactory fossa.



The peripheral human olfactory organ.
fo – olfactory fossa, **cg** – crista galli, **be** – ethmoid bulla, **cm** – middle turbinate, **o** – orbit, **se** – ethmoid sinus, **bo** – olfactory bulb, **fol** – olfactory fibers, **ro** – olfactory groove with olfactory epithelium, **sn** – nasal septum.



The principles of fluid dynamics underlying nasal airflow and olfactory perception.

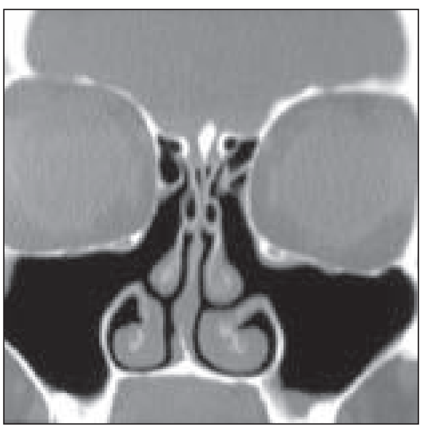


Coronal CT scan of a woman who underwent a previous complete right ethmoidectomy and B.E.E.S. in which the upper cap of the ethmoid bulla was preserved.

Hypothesis

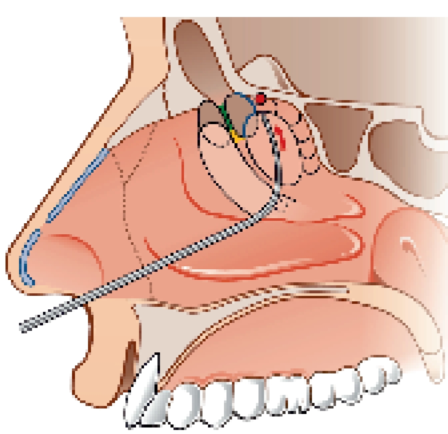
Today, endoscopic surgery of the paranasal sinuses has assumed a broad range of indications. Based on our own experience, we feel that strict distinctions should be drawn among the subsets of indications described below in order to fully utilize the potential of differentiated microsurgery and prevent postoperative stenosis.

- Acute recurrent rhinosinusitis is marked by inflammatory exacerbations, typically involving the frontal and maxillary sinuses. Complete anterior ethmoidectomy should never be considered a routine procedure. If exenteration of the anterior ethmoid is required, the surgeon should make every effort to preserve the lamella or the upper cap of the ethmoid bulla in order to prevent narrowing of the anterior ethmoid and frontal recess. The parietal mucosa of the lamina papyracea, anterior skull base, and middle turbinate should be preserved. Enlarging the frontal recess in a type I to IIb drainage procedure is easily accomplished under vision with a 45° endoscope while preserving the bulla lamella. Infundibular and agger nasi cells that obstruct the frontal recess can be removed by using the *"uncapping the egg"* technique of *Stammberger,* which involves a posterior-to-anterior dissection. A maximum amount of mucosa should be preserved in the frontal recess. The basal lamina of the middle turbinate may be trephined over a circumscribed area, but it should not be fractured.
- Chronic rhinosinusitis with nasal polyps or sinonasal polyposis currently represents a large subset of indications for endoscopic sinus surgery. Both biomechanical and immunologic factors contribute significantly to the pathogenesis of chronic rhinosinusitis. Based on regional variations in the texture of the ethmoid sinus mucosa, such as an abundance of glands on the anterior surface of the bulla, sites of predilection exist for the development of polyps. These polyps destroy the ethmoid cells and their infrastructure. Due to pressure effects from the polyps and the absence of scar contractures with an intact parietal mucosa, sinus contraction does not occur. Typically, moreover, these patients rarely complain of headaches. Cell remnants that have already been destroyed should be removed at operation, and the parietal mucosa on the lamina papyracea, skull base and middle turbinate, for example, should be preserved.

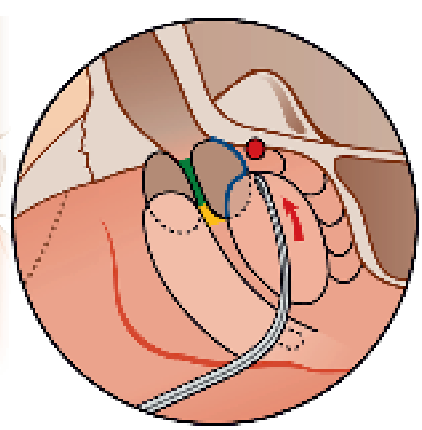


Medialized middle turbinates. The bulla lamellae have been preserved on both sides.

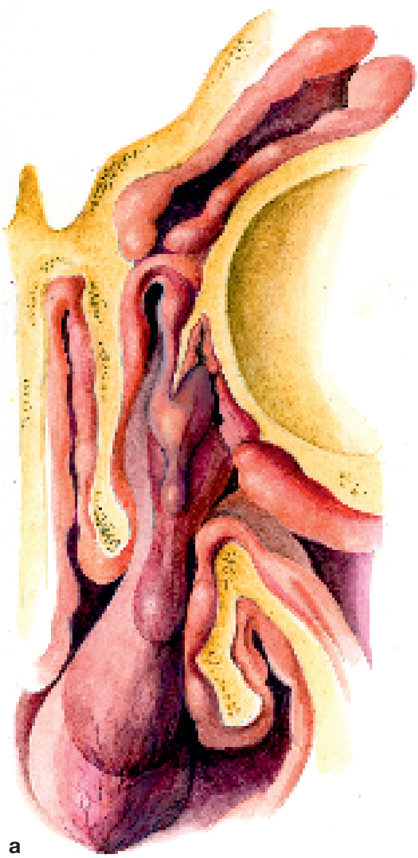
Coronal CT one year after bilateral medialization of the middle turbinates.

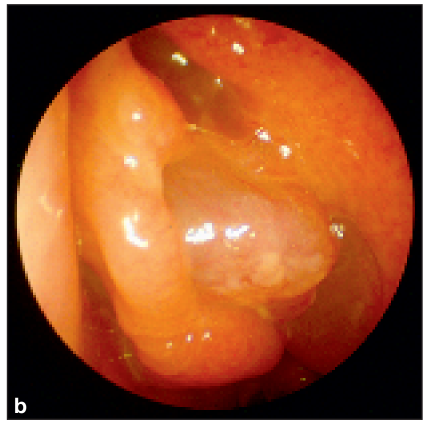


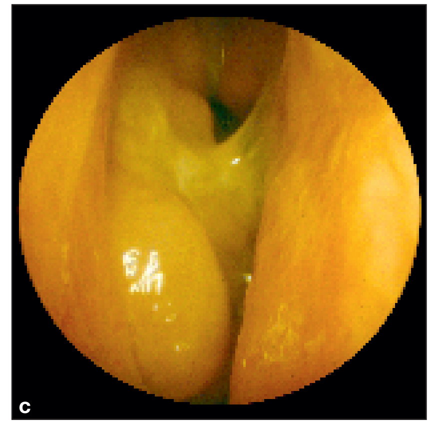
Principle of enlarging the frontal recess, illustrated here in a patient with infundibular or agger nasi cells.

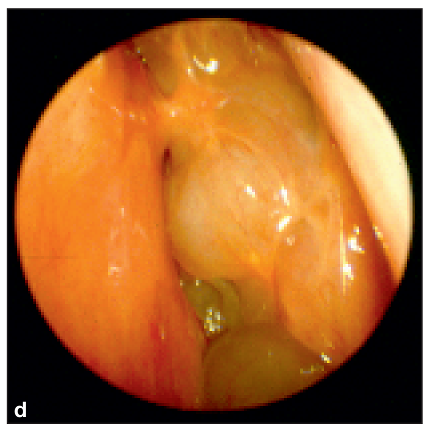


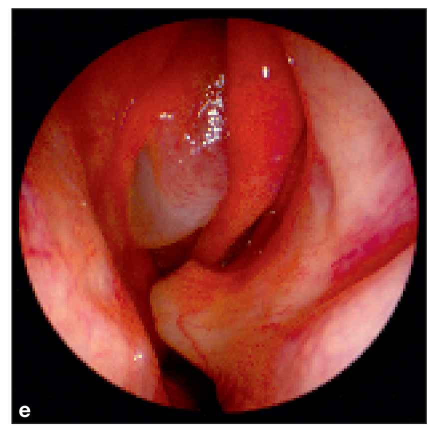
The basal lamina (**green**) of the ethmoid bulla is preserved. The anterior ethmoidal artery usually runs approximately 2 mm behind the bulla lamella.

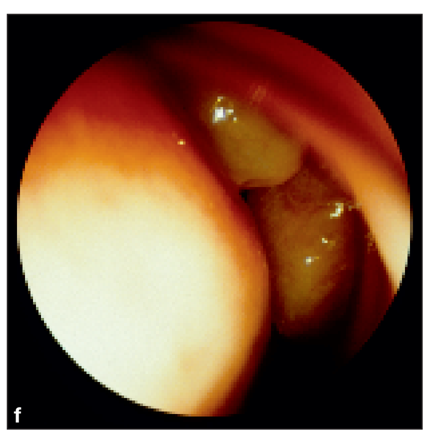


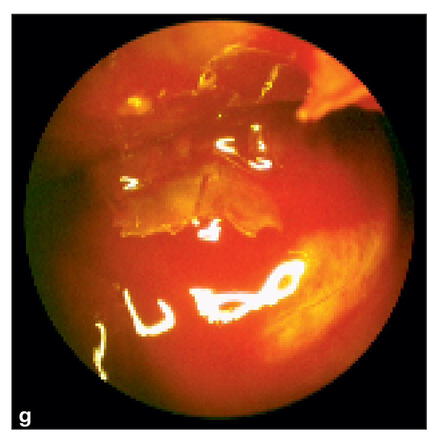


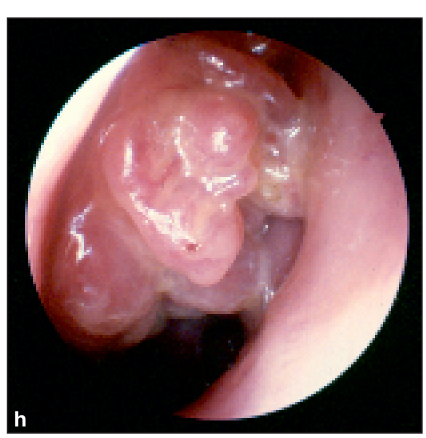












Legend

a A “nasal polyp” may arise from the mucosa on the anterior wall of the ethmoid bulla.

b Nasal polyps most commonly originate in the ethmoid sinuses and descend from there into the nasal cavity. They destroy the infrastructure of the ethmoid sinus while keeping the sinus open by their mass effect.

c Polyps combined with viscous mucus are a sign of eosinophil-associated disease (usually asthma with analgesic intolerance).

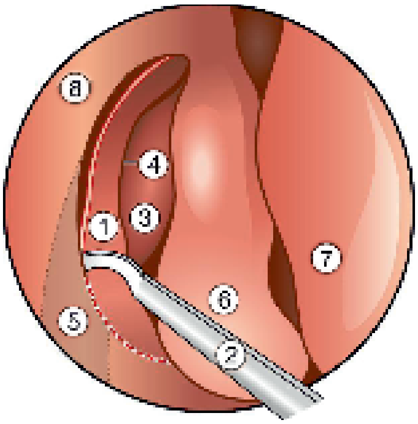
d Scarred, indurated nasal polyps following numerous operations.

e Treatment with modern topical steroids can shrink nasal polyps to this approximate level.

f Ethmoid polyps protruding into the ethmoid infundibulum.

g Nasal polyp protruding from an ethmoid cell.

h Typical appearance of an inverted papilloma arising from the head of the middle turbinate.



Ethmoid infundibulotomy:
① Medial infundibular wall,
② Sickle knife, ③ Ethmoid bulla,
④ Semilunar hiatus, ⑤ Nasolacrimal canal,
⑥ Middle turbinate, ⑦ Nasal septum,
⑧ Agger nasi.

Surgical Concept

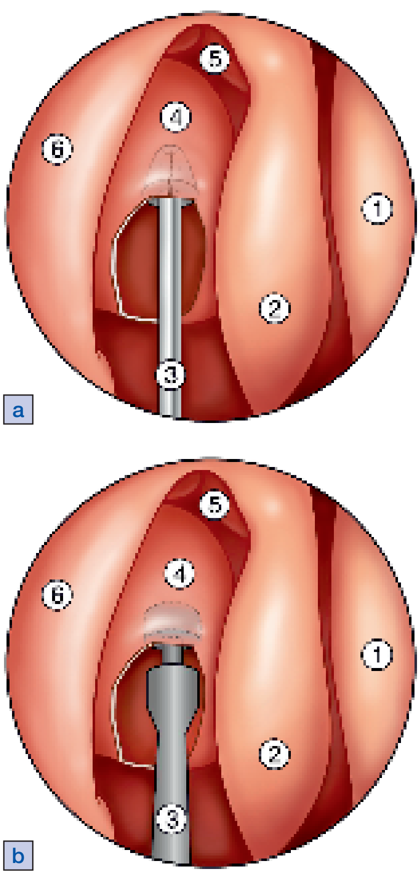
Ethmoid Infundibulotomy

The standard procedure for opening the ethmoid bone is an ethmoid infundibulotomy that includes complete and atraumatic removal of the uncinate process.

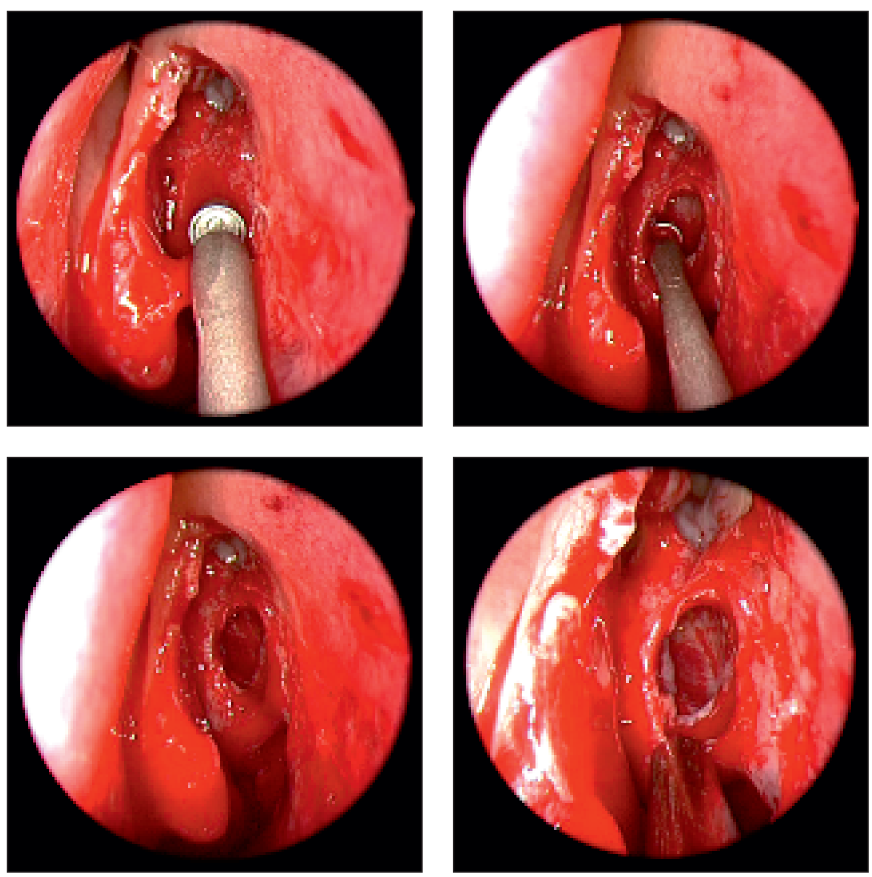
The uncinate process is sharply released at its poles with endoscopic scissors. The lateral infundibular wall is removed, exposing the anterior wall of the ethmoid bulla.

Bullotomy

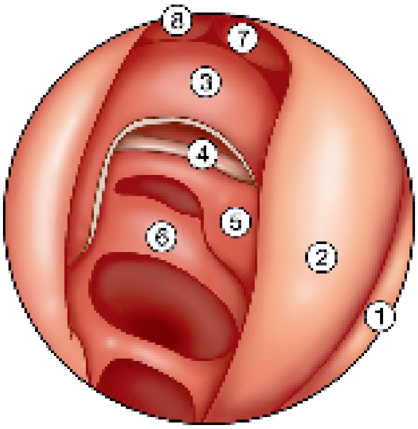
The anterior wall of the ethmoid bulla is trephined with a special instrument, the *bullotome,* or with a straight blunt suction tip or sphenoid sinus punch (small), for example. The portions of the anterior wall or bulla that are removed will depend on the mucosal pathology.



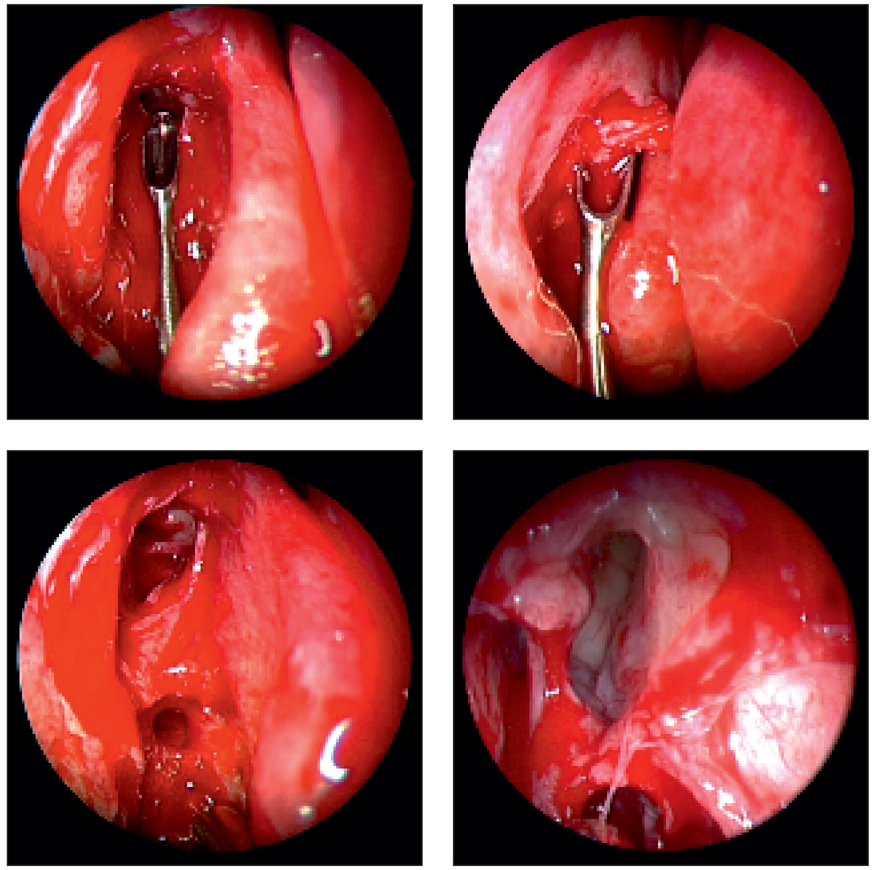
Trephination of the anterior wall of the ethmoid bulla is done with the bullotome (**a**) or a small, circular sphenoid sinus punch (**b**).
① Nasal septum,
② Middle turbinate,
③ Circular punch,
④ Ethmoid bulla,
⑤ Frontal recess,
⑥ Lateral nasal wall.



Bullotomy with the circular punch.



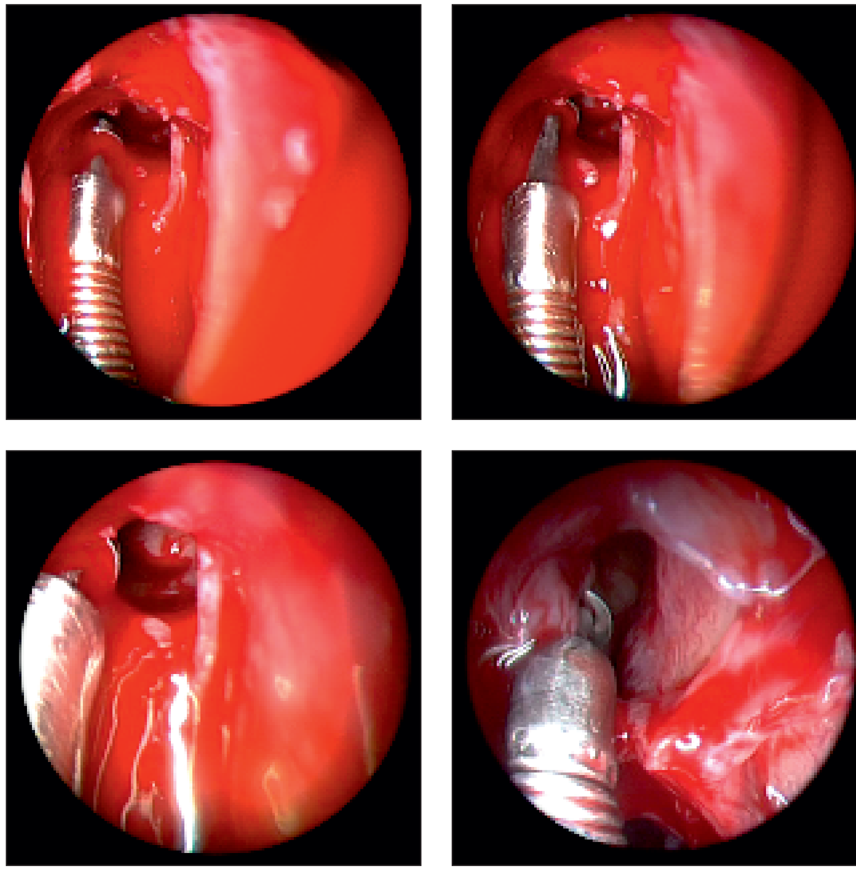
View of the skull base following bullotomy.
① Nasal septum
② Middle turbinate
③ Ethmoid bulla
④ Anterior ethmoidal artery
⑤ Posterior lamella of ethmoid bulla
⑥ Basal lamina of middle turbinate
⑦ Frontal recess
⑧ Terminal recess.



The frontal recess is enlarged with a curette.

Enlarging the Frontal Recess

The frontal recess is located by following the lamella or upper cap of the ethmoid bulla. It is enlarged with the curved dissector (see instrument set in Appendix, pp. 22) or *Kuhn-Bolger* curette by removing infundibular or agger nasi cells.



The floor of the frontal sinus is removed with a punch.

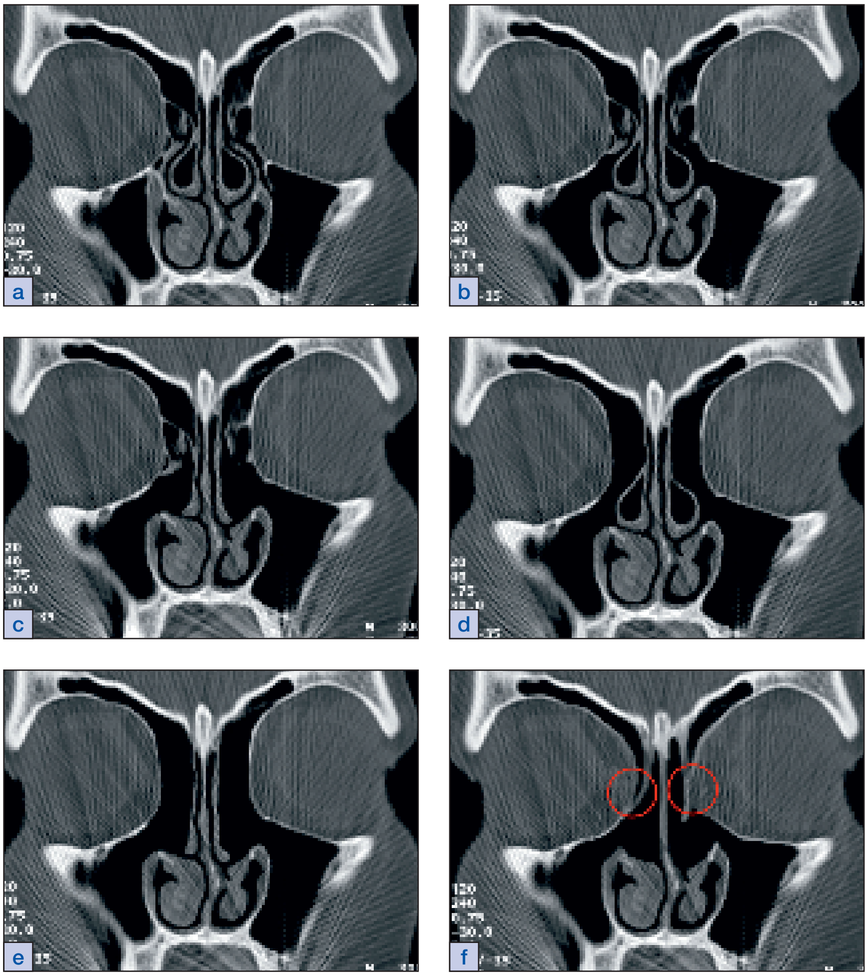
The frontal sinus can also be opened more widely with the frontal sinus punch by removing portions of the frontal sinus floor, depending on the intended goal of the operation.

Summary

For endoscopic sinus surgery to be effective, the surgeon must first formulate an operative plan that is based on the individual history and a CT analysis of internal ethmoid anatomy and which takes into account the stabilizing function of the principal ethmoid structures. Surgery that is oriented entirely toward sinus exenteration cannot address the problems of chronic recurrent rhinosinusitis and may even cause further airflow compromise. Biometric data are available on this issue; they are currently undergoing mathematical analysis and will be published in the near future.

Annotations on the B.E.E.S. Philosophy

Main Therapeutic Options in B.E.E.S.



The individual biostatics of the ethmoid bone should be analyzed by the physician, as they form the starting point for planning the operation. The coronal CT scans shown here illustrate various therapeutic options that are consistent with the biostatic philosophy of ethmoid surgery:

a) Acute recurrent rhinosinusitis with inflammatory exacerbations involving the frontal and maxillary sinuses on both sides. The patient does not have nasal airway obstruction.

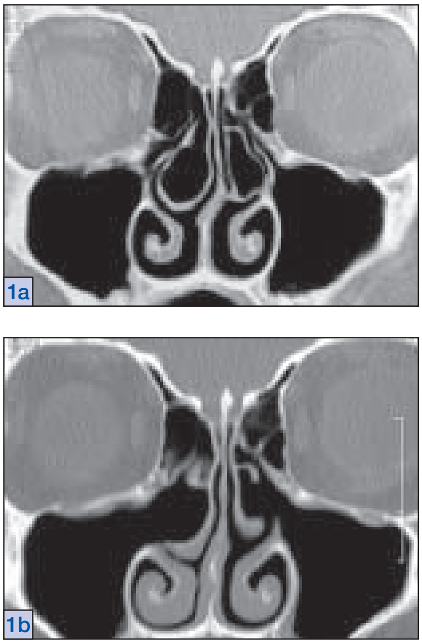
b) Bilateral infundibulotomy.

c) Bilateral infundibulotomy and partial turbinectomy.

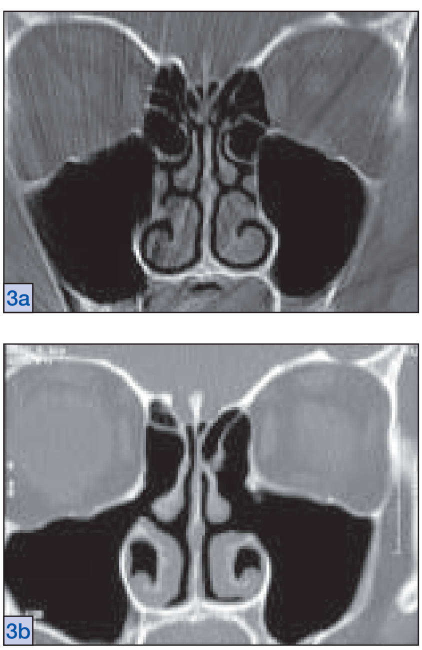
d) Bilateral infundibulotomy and anterior ethmoidectomy.

e) Bilateral infundibulotomy, anterior ethmoidectomy, and partial turbinectomy. This variant predisposes to the situation in **f**.

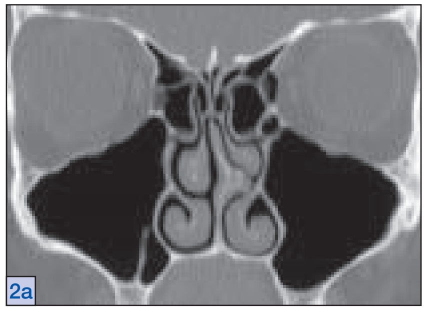
f) Shrinkage of the exenterated ethmoid has led to medialization of the orbit and lateralization of the middle turbinate on the right side with synechia formation and ethmoid atelectasis on the left side.



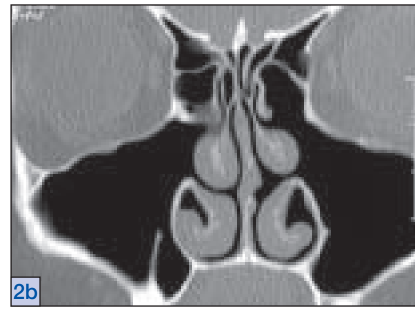
Coronal CT scans, preoperative (**a**) and 1 year postoperative (**b**).



Coronal CT scans, preoperative (**a**) and 1 year postoperative (**b**).



Preoperative coronal CT scan.



Coronal CT scan 1 year after surgery.

Clinical Cases

Woman 20 years of age with nasal airway obstruction and acute recurrent bilateral rhinosinusitis predominantly affecting the maxillary sinuses.

Preoperative CT (**Fig. 1a**) shows a deviated septum with spurring toward the left side and large conchae bullosae on both sides. Slight mucosal swelling is noted in the anterior ethmoid.

Operation: Surgery consists of partial bilateral middle turbinectomy, preserving portions of the upper lateral curve and upper lamina. It includes a bilateral infundibulotomy, bullotomy, supraturbinate antrostomy, and submucous septoplasty.

Postoperative CT, one year later (**Fig. 1b**) shows the lateral partial bilateral turbinectomy preserving the turbinate trim, position, and sites of attachment (see p. 16, removal of the frontal sinus floor with a punch).

Woman 53 years of age with nasal airway obstruction and recurrent bouts of acute bilateral maxillary and frontal sinusitis.

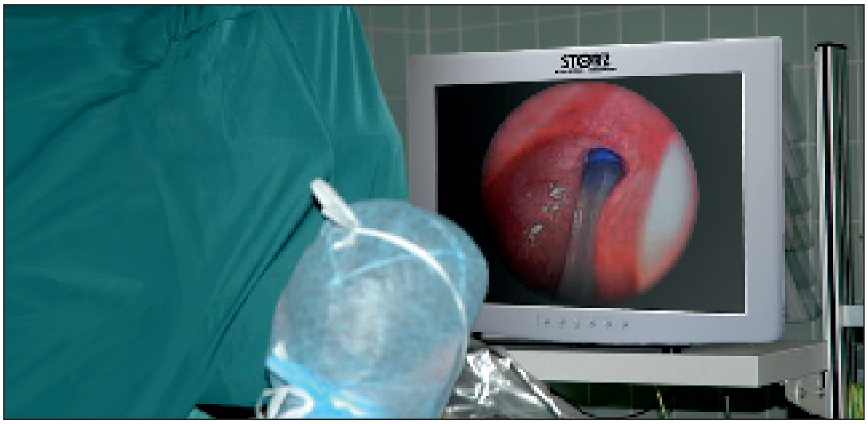
Preoperative CT (**Fig. 2a**) shows a septal spur on the left side, bilateral hyperplasia of the inferior turbinates, and minimal mucosal swelling in the anterior ethmoid.

Operation: Surgery consists of an infundibulotomy, bullotomy, and supraturbinate antrostomy on both sides. The frontal recess is enlarged anteriorly to the bulla lamella, which is preserved. The procedure also includes a septoplasty and bilateral strip turbinectomy.

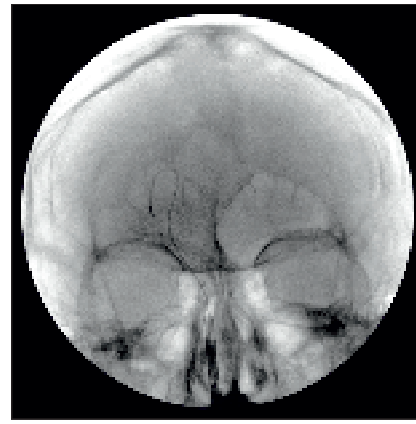
Postoperative CT, one year later (**Fig. 2b**) documents broad, bilateral supraturbinate antrostomies with medialization of the nasal septum. The upper portion of the turbinate-bulla complex has been preserved, and the middle turbinate has been stabilized in an optimum position.

Principle of stabilizing the turbinate position

Postoperative CT scan (**b**) illustrates the principle of stabilizing the turbinate position by preserving the lamella or upper cap of the ethmoid bulla as an essential maneuver for “trimming the turbinate.”



The guide catheter is positioned under endoscopic control.

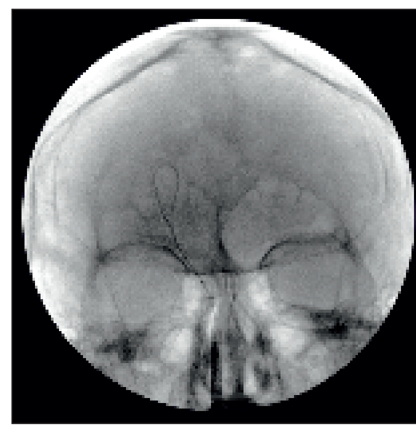


The guide catheter has been introduced into the right frontal sinus.

Catheter-Based Balloon Dilatation of the Sinus Ostia

The technique of *balloon sinuplasty* originated in the U.S. It applies a proven tool for coronary vascular dilatation, first used in 1977, to the restoration of sinus drainage.

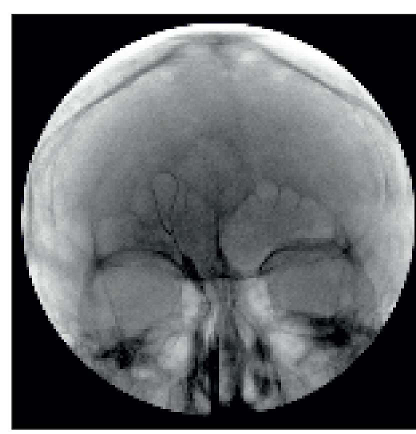
In *balloon sinuplasty,* a guide catheter is advanced endoscopically to the stenotic ostium under visualization with a HOPKINS® 0° telescope (4 mm diameter, length 18 cm). A flexible guidewire is then passed through the catheter into the sinus, and the balloon catheter is introduced over the guidewire. Its position can be checked fluoroscopically by two radiopaque dots at the ends of the balloon. Then the balloon is gradually inflated under manometric control to dilate the ostium.



The balloon catheter is positioned at the level of the stenotic right frontal recess.

Hybrid Operations

Hybrid operations are procedures in which endoscopic microsurgery of the paranasal sinuses is combined with balloon dilatation in one sitting. We have had good results with a combination of *biostatic ethmoid surgery* (B.E.E.S.) and balloon dilatation for the following indications.



The balloon is inflated to dilate the frontal recess.

Indications for hybrid operations

- Acute recurrent inflammations
- Barosinusitis
- Empyema
- Coagulation disorders and other systemic diseases that would contraindicate other types of surgery)
- Restenosis
- Situations that warrant a combination of B.E.E.S. and balloon dilatation

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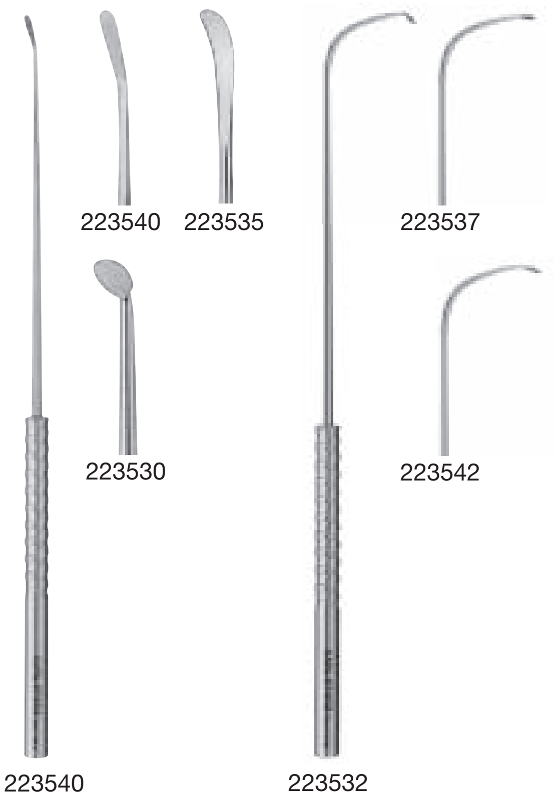
Recommended Instrument Set for Biostatic Endoscopic Ethmoid Surgery

FESS Instruments

Dissector for Dissection in the Area of Paranasal Sinuses, Skullbase and Temporal Bone
BEHRBOHM **Bullotome**



223530 BEHRBOHM **Dissector,** for dissection in the area of paranasal sinuses, skullbase and temporal bone, sharp, flat long spatula, tip angled 15°, with round handle, size 2 mm, length 17 cm

223535 **Same,** slightly curved spatula, with round handle, size 3 mm

223540 **Same,** round spatula, tip angled 45°, with round handle, size 3 mm

223532 **Dissector,** for dissection in the area of paranasal sinuses, skullbase and temporal bone, curved, sharp, flat long spatula, tip angled 15°, with round handle, size 2 mm, length 17 cm

223537 **Same,** slightly curved spatula, with round handle, size 3 mm

223542 **Same,** round spatula, tip angled 45°, with round handle, size 3 mm

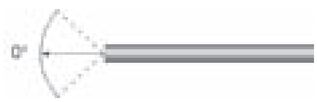
529505

529505 BEHRBOHM **Bullotome,** suction tube with conical tip, sharp, with cut-off hole and stylet, angular, outer diameter 5 Fr., working length 10 cm, length 17.5 cm

HOPKINS® II Telescopes

for Diagnosis, Surgery and Treatment of Nose and Paranasal Sinuses, diameter 4 mm, length 18 cm

7230 AA – CA

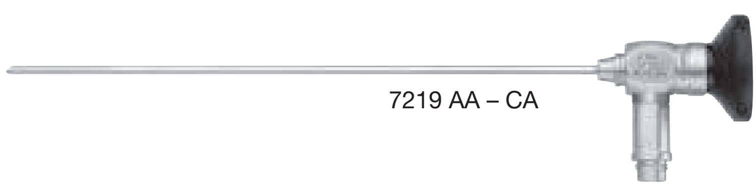


7230 AA **HOPKINS II® Straight Forward Telescope 0°,**
enlarged view, diameter 4 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: green

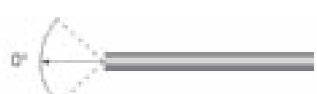
7230 BA **HOPKINS II® Forward-Oblique Telescope 30°,**
enlarged view, diameter 4 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: red

7230 FA **HOPKINS II® Forward-Oblique Telescope 45°,**
enlarged view, diameter 4 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: black

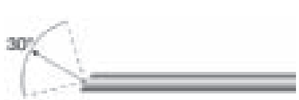
7230 CA **HOPKINS II® Lateral Telescope 70°,**
enlarged view, diameter 4 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: yellow



7219 AA – CA



7219 AA **HOPKINS® Straight Forward Telescope 0°,**
diameter 2.7 mm, length 18 cm, **autoclavable,**
fiber optic light transmission incorporated,
color code: green



7219 BA **HOPKINS® Forward-Oblique Telescope 30°,**
diameter 2.7 mm, length 18 cm, **autoclavable,**
fiber optic light transmission incorporated,
color code: red

7219 FA **HOPKINS® Forward-Oblique Telescope 45°,**
diameter 2.7 mm, length 18 cm, **autoclavable,**
fiber optic light transmission incorporated,
color code: black

7219 CA **HOPKINS® Lateral Telescope 70°,**
diameter 2.7 mm, length 18 cm, **autoclavable,**
fiber optic light transmission incorporated,
color code: yellow

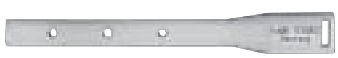
FESS Instruments

Accessories

723770 STAMMBERGER **Telescope Handle,** flat, standard model, length 11 cm, for use with HOPKINS® Straight Forward Telescopes 0° with diameter 4 mm and length 18 cm

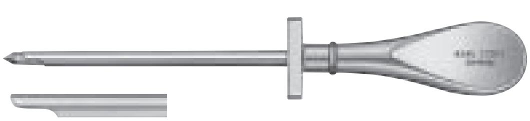
723772 STAMMBERGER **Telescope Handle,** round, standard model, length 11 cm, for use with HOPKINS® Telescopes 30° – 120° with diameter 4 mm and length 18 cm

723774 STAMMBERGER **Telescope Handle,** round, length 11 cm, for use with HOPKINS® Telescopes with diameter 1.9/2.7 mm and length 18 cm

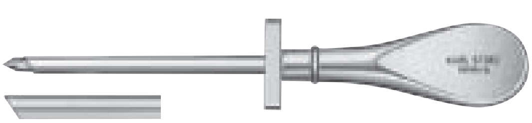


723750 A **Protection Tube,** for HOPKINS® Telescopes with length 11 cm

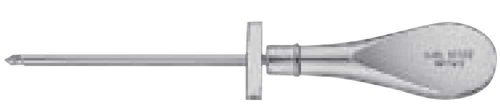
723750 B **Protection Tube,** for HOPKINS® Telescopes with length 18 cm



723005 A **Trocar and Cannula for Sinuscopy,** fenestrated beak, outer diameter 5 mm, length of the cannula 8.5 cm, for use with HOPKINS® Telescopes with diameter 4 mm



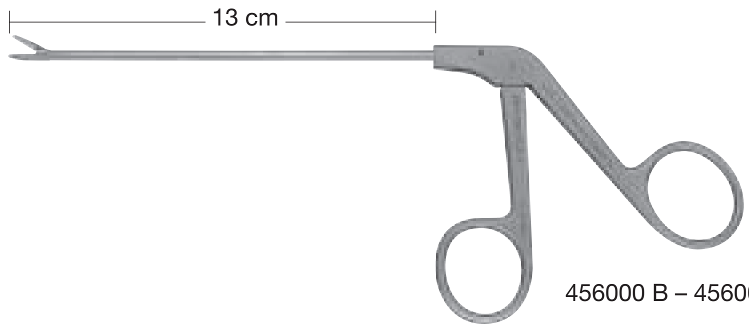
723005 B **Trocar and Cannula for Sinuscopy,** oblique beak, outer diameter 5 mm, length of the cannula 8.5 cm, for use with HOPKINS® Telescopes with diameter 4 mm



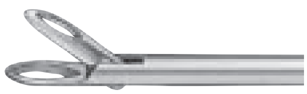
723103 B **Trocar and Cannula for Sinuscopy,** oblique beak, outer diameter 3.3 mm, length of the cannula 7.5 cm, for use with HOPKINS® Telescopes with diameter 2.7 mm

FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base



456000 B – 456003 B

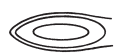


456001 B – 456003 B

456000 B

456001 B

456002 B



456003 B

456000 B	BLAKESLEY **RHINOFORCE® II Nasal Forceps,** straight, size 0, working length 13 cm
456001 B	**Same,** size 1
456002 B	**Same,** size 2
456003 B	**Same,** size 3

456500 B – 456502 B

456500 B

456501 B

456502 B

456500 B	BLAKESLEY-WILDE **RHINOFORCE® II Nasal Forceps,** 45° upturned, size 0, working length 13 cm
456501 B	**Same,** size 1
456502 B	**Same,** size 2

456801 B – 456803 B

456801 B

456802 B

456803 B

456801 B	BLAKESLEY-WILDE **RHINOFORCE® II Nasal Forceps,** 90° upturned, size 1, working length 13 cm
456802 B	**Same,** size 2
456803 B	**Same,** size 3

456601 B

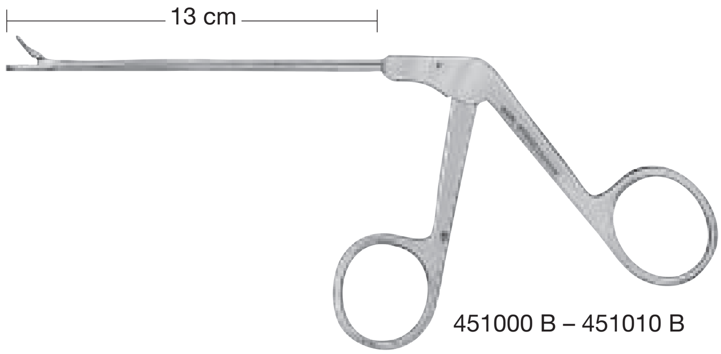
456601 B

456601 B

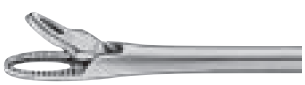
456601 B	BLAKESLEY-WILDE **RHINOFORCE® II Nasal Forceps,** 45° upturned, handle in right horizontal position, size 1, working length 13 cm

FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base



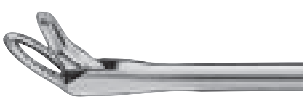
451000 B – 451010 B



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

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

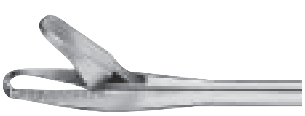
451002 B **Same,** size 2, width 4 mm

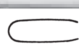


451500 B GRÜNWALD-HENKE **RHINOFORCE® II Nasal Forceps,** 45° upturned, through-cutting, tissue-sparing, BLAKESLEY shape, size 0, width 3 mm, working length 13 cm

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

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





Größe 1

Größe 2

452001 B MACKAY-GRÜNWALD **RHINOFORCE® II Nasal Forceps,** through-cutting, tissue-sparing, straight, delicate, 8 x 3 mm, size 1, working length 13 cm

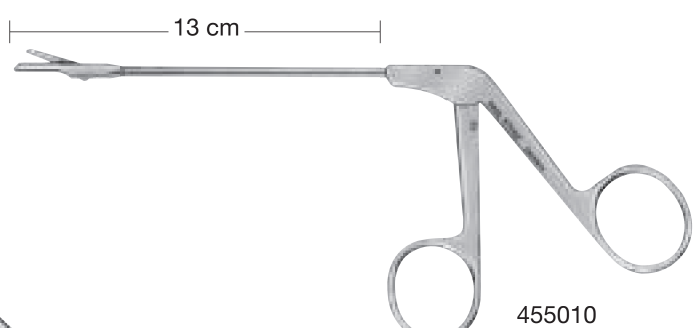
452002 B **Same,** 11.5 x 3.5 mm, size 2

Größe 1

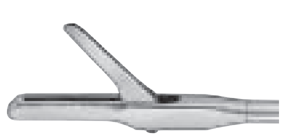
Größe 2

452501 B MACKAY-GRÜNWALD **RHINOFORCE® II Nasal Forceps,** through-cutting, tissue-sparing, 45° upturned, delicate, 8 x 3 mm, size 1, working length 13 cm

452502 B **Same,** 11.5 x 3.5 mm, size 2



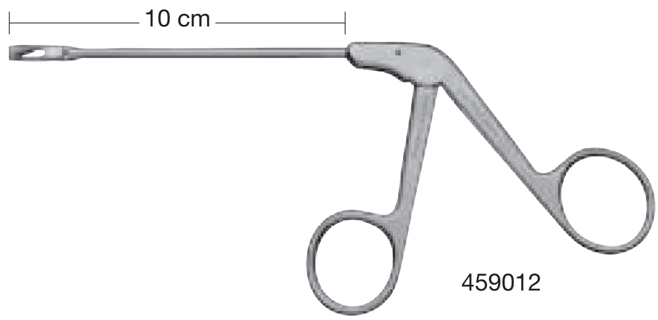
455010



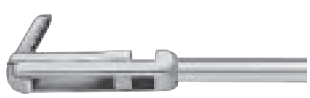
455010 STRUYCKEN **RHINOFORCE® II Nasal Cutting Forceps,** working length 13 cm

FESS Instruments

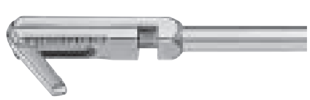
for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base



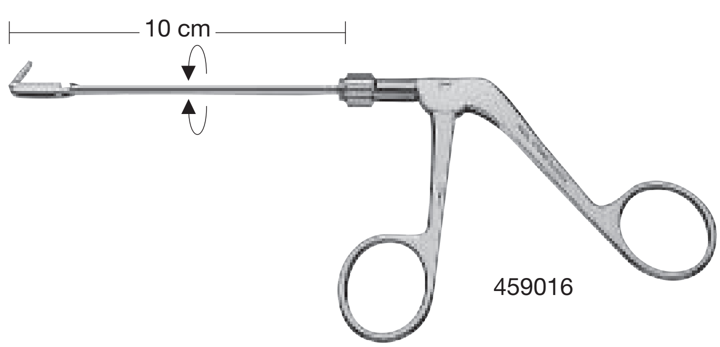
459010 STAMMBERGER **RHINOFORCE® II Antrum Punch,**
upside backward cutting, working length 10 cm

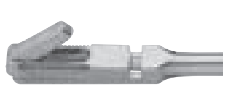


459011 **Same,** right side backward cutting

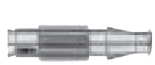


459012 **Same,** left side backward cutting





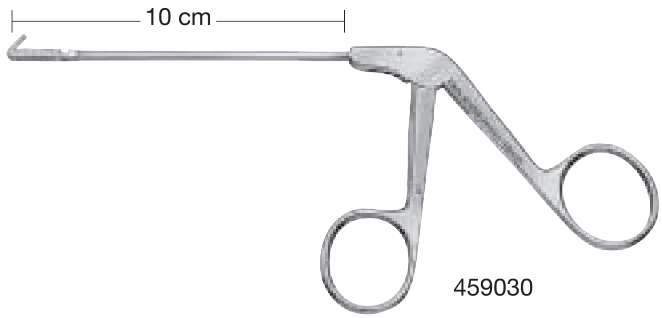
459016 STAMMBERGER **RHINOFORCE® Antrum Punch,**
backward cutting, sheath 360° rotatable,
with fixing screw, take apart, working length 10 cm,
for use with cleaning adaptor 459015 LL

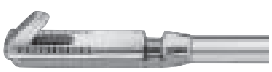


459015 LL **Cleaning Adaptor**

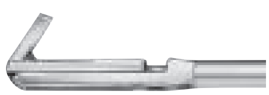
FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base



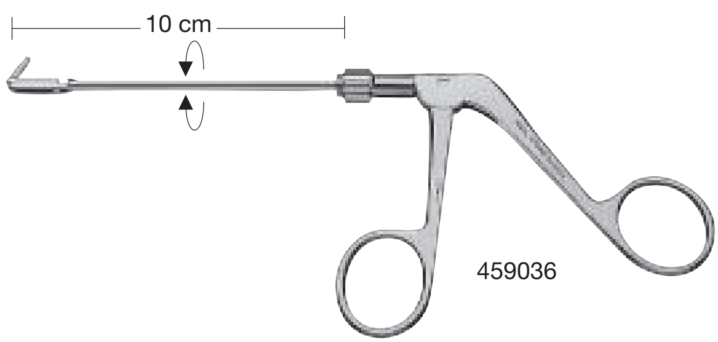


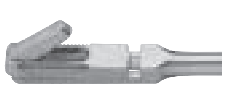
459030 STAMMBERGER **RHINOFORCE® II Antrum Punch,** small pediatric size, slender, upside backward cutting, working length 10 cm



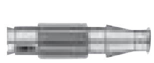
459031 **Same,** right side backward cutting

459032 **Same,** left side backward cutting





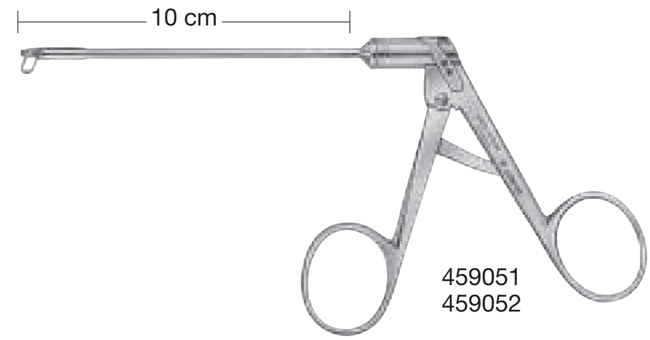
459036 STAMMBERGER **RHINOFORCE® Antrum Punch,** small pediatric size, slender, backward cutting, sheath 360° rotatable, with fixing screw, take apart, working length 10 cm, for use with cleaning adaptor 459015 LL



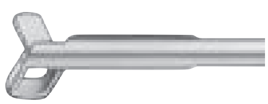
459015 LL **Cleaning Adaptor**

FESS Instruments

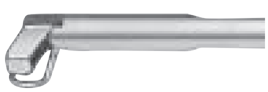
for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base



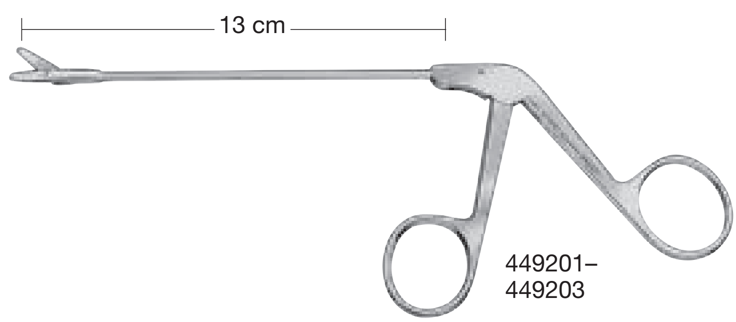
459051
459052



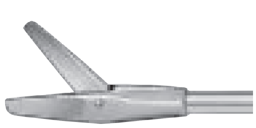
459051 STAMMBERGER **Antrum Punch,**
right side downward and forward cutting,
working length 10 cm



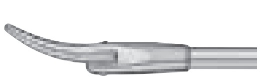
459052 **Same,** left side downward and forward cutting



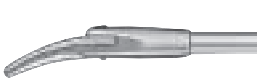
449201–
449203



449201 **RHINOFORCE® II Nasal Scissors,**
straight, working length 13 cm



449202 **Same,** curved to right



449203 **Same,** curved to left

FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base

651050 STAMMBERGER **Punch,** circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 4.5 mm, working length 18 cm

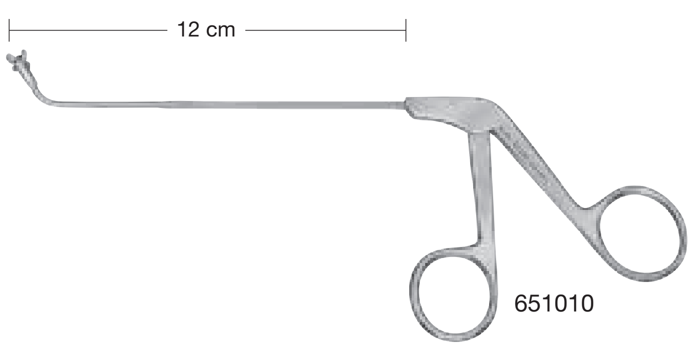
651055 **Same,** diameter 3.5 mm

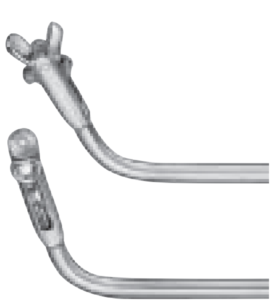
651060 STAMMBERGER **Punch,** circular cutting, 65° upturned, for frontal sinus recess, diameter 3.5 mm, working length 17 cm

651065 **Same,** diameter 4.5 mm

651061 STAMMBERGER **Punch,** egg-shaped tip, circular cut, 90° cutting direction, tip diameter 3.5 mm, sheath 65° upturned, for frontal sinus recess, working length 17 cm

651066 **Same,** diameter 4.5 mm



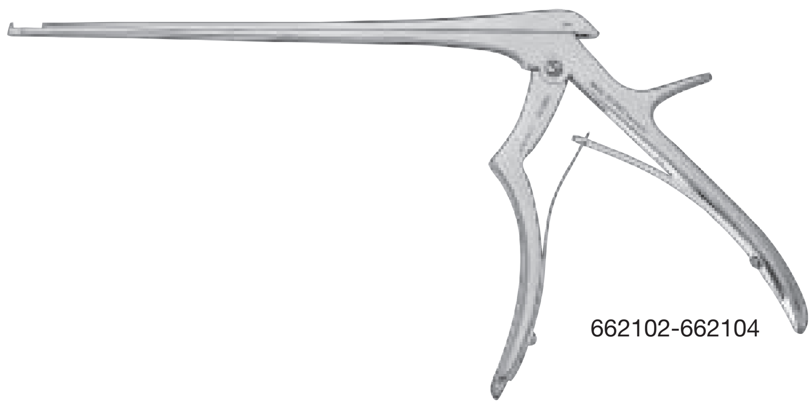


651010 STAMMBERGER **RHINOFORCE® II Forceps,** cupped jaws, vertical opening, 65° upturned, cupped jaws diameter 3 mm, working length 12 cm

651020 **Same**, horizontal opening

Nose Sinuses

Microscopic/Endoscopic Surgery in the Area of Paranasal Sinuses, Skull Base and Pituitary Surgery

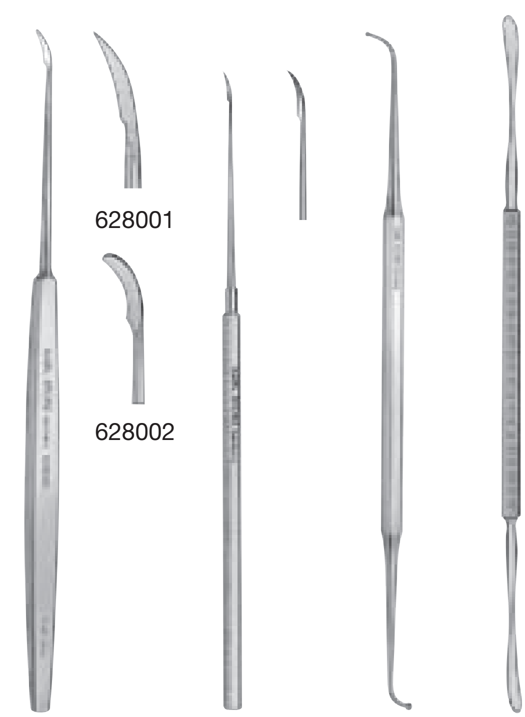


662102 KERRISON **Micro Punch,** rigid, 90° upbiting,
not through-cutting, size 2 mm, working length 17 cm

662104 **Same,** size 4 mm

FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base

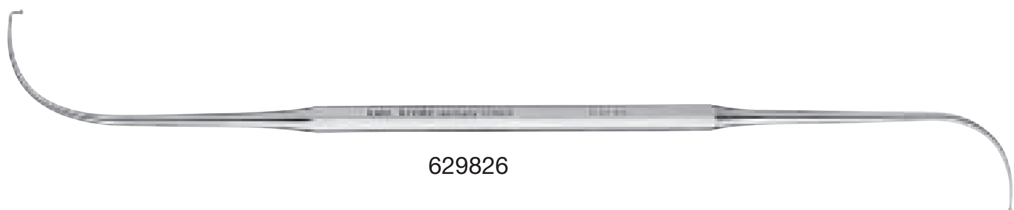


628001 – 628002 223300 629820 474000

628001	**Sickle Knife,** pointed, length 19 cm
628002	**Same,** round, double-cutting
223300	PLESTER **Sickle Knife,** double-cutting, standard model, slightly curved, length 16 cm
629820	**Probe,** double-ended, maxillary sinus ostium seeker, ball-shaped ends diameter 1.2 and 2 mm, length 19 cm
474000	FREER **Elevator,** double-ended, length 20 cm

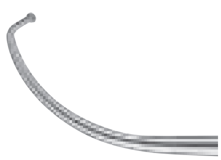
FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base

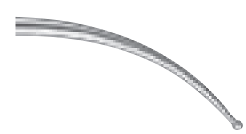


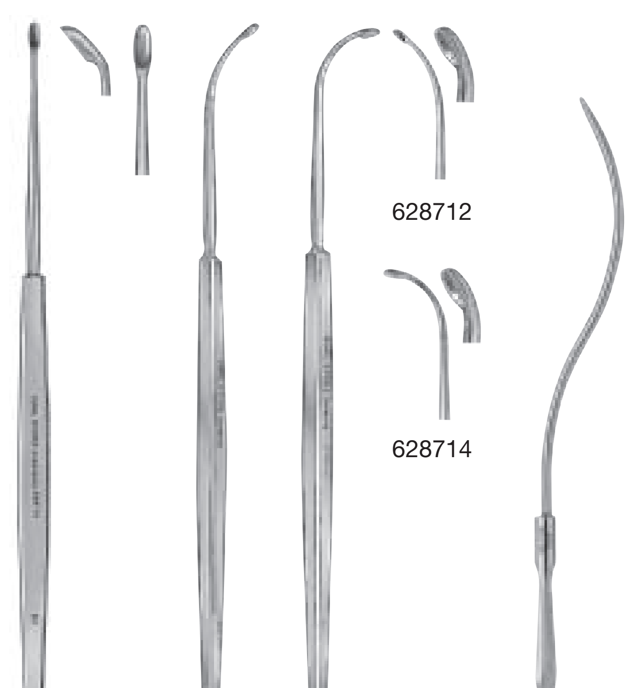
629826

629826 KUHN **Frontal Sinus Seeker,** double-ended, No. 2, both sides curved 90°, one tip straight, one tip reverse angle, length 22 cm



629830 **Same,** No. 6, both sides curved 77°





628712

628714

628702 628712 628714 641430 641450

628702 **Antrum Curette,** oblong, small size, length 19 cm

628712 KUHN-BOLGER **Frontal Sinus Curette,** small, oblong, 55° curved, forward cutting, length 19 cm

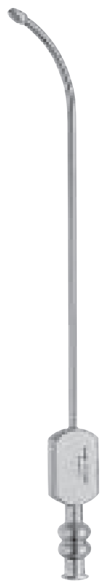
628714 **Same,** 90° curved

641430 BEHRBOHM **Frontal Sinus Bougie,** S-shaped, size 2, outer diameter 3 mm, length 16.5 cm

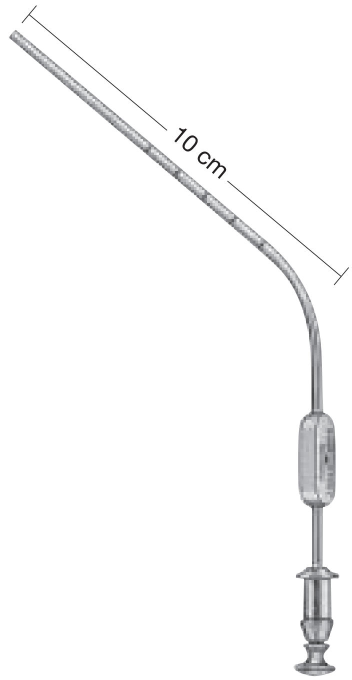
641450 **Same,** size 4, outer diameter 5 mm

FESS Instruments

for Endoscopic Diagnosis, Surgery and Postoperative Treatment of Paranasal Sinuses and Anterior Skull Base



586325 –
586340



529305 –
529309

586325 v. EICKEN **Antrum Cannula,** LUER-Lock, long curved,
outer diameter 2.5 mm, working length 11 cm, length 15 cm

586330 **Same,** outer diameter 3 mm

586340 **Same,** outer diameter 4 mm

529305 FRAZIER **Suction Tube,** with mandrin and cut-off hole,
with distance markings at 5 – 9 cm, 5 Fr., working length 10 cm

529307 **Same,** 7 Fr.

529309 **Same,** 9 Fr.

UNIDRIVE® ENT and UNIDRIVE® ECO

One unit – six functions

- **Shaver system for surgery of the paranasal sinuses and anterior skull base**
- **Sinus Burr**
- **Drill**
- STAMMBERGER-SACHSE **Intranasal Drill**
- **Micro Saw**
- **Dermatome**

UNIDRIVE® ENT

The high-end solution for excellent handling and convenience in the OR

Special features:

With touch screen

- Color display
- Choice between several display languages
- Functions displayed in words
- Clearly defined operating elements
- Set values of the last session are stored
- Automatic error message via text display

UNIDRIVE® ECO

The functional and cost-effective alternative meeting the same high quality standards

Special features:

With push-button control panel

- Straightforward function selection via limited menu options
- Encoded function display (numerical code)
- Clearly defined operating elements
- Easy to use due to push-button controls
- Set values of the last session are stored
- Automatic error message via numerical code

UNIDRIVE® ENT and UNIDRIVE® ECO

Constant motor speed
- Microprocessor-controlled motor speed
- Preselected parameters are maintained during drilling
- Continuously adjustable speed of rotation
- Maximum speed of rotation can be preset

Integrated irrigation pump
- Microprocessor-controlled flow rate
- Quick and easy connection of the tubing set
- Flow rate can be controlled from the sterile area via footswitch
- Flow rate adjustable from 6–125 ml/min

2 motor outputs
- Simultaneous connection of 2 motors
- Active output can be selected from the sterile area via footswitch

Arguments in favor of both motor systems

Saves time

- 2 motors can be connected simultaneously
  ▶ no plugging or unplugging during the operation
- Automatic display of error messages
  ▶ no time-consuming error tracing in the operating room
- Exact reading and adjustment of motor speed
- Preselected parameters can be stored
  ▶ set-point values for motor speed and flow rate do not need to be readjusted with each new procedure
- Quick and easy connection of the tubing set to the pump

Relieves OR personnel

- The time for preparation prior to surgery is considerably reduced by standardization
- Irrigation flow rate and motor speed adjustable via footswitch
- Easy to use due to clearly structured design and optimized function selection
- Personnel can use the time saved for other tasks
- User can control multiple functions from the sterile area via footswitch

Saves money

- Only one unit required to perform six functions
- Most of the available shaver blades, burrs and drills are reuseable
  ▶ enables perfect hygienic reprocessing
- EC micro motor is compatible with various INTRA drill handpieces

UNIDRIVE® ENT and UNIDRIVE® ECO

Common technical specifications of both systems:

Mode		Handpiece No.	Motor speed (max.) rpm
Shaver mode			
Operation mode:	oscillating		
Max. rev. (rpm):	in conjunction with Micro Shaver Handpiece	**40** 7110 35	3,000*
	in conjunction with Paranasal Sinus Shaver Handpiece	**40** 7110 39	7,000*
	in conjunction with DrillCut-X Shaver Handpiece	**40** 7110 40	7,000*
Sinus Burr mode			
Operation mode:	rotating		
Max. rev. (rpm):	in conjunction with DrillCut-X Shaver Handpiece	**40** 7110 40	12,000
Drilling mode			
Operation mode:	counter clockwise or clockwise		
Max. rev. (rpm):	in conjunction with EC Micro Motor	**20** 7110 32	40,000
	and Connecting Cable	**20** 7110 72	
Micro Saw mode			
Max. rev. (rpm):	in conjunction with EC Micro Motor	**20** 7110 32	20,000
	and Connecting Cable	**20** 7110 72	
Intranasal Drill mode			
Max. rev. (rpm):	in conjunction with EC Micro Motor	**20** 7110 32	60,000
	and Connecting Cable	**20** 7110 72	
Dermatome mode			
Max. rev. (rpm):	in conjunction with EC Micro Motor	**20** 7110 32	8,000
	and Connecting Cable	**20** 7110 72	
Power supply:	100-120, 230-240 VAC, 50/60 Hz		
Dimensions: (w x h x d)	304 x 164 x 263 mm		
Two outputs for parallel connection of two motors			
Integrated irrigation pump			
Flow rate:	6-125 ml/min, adjustable in 8 steps		

* Approx. 3000 rpm is recommended as this is the most efficient suction/performance ratio.

Technical differences between both systems:

	UNIDRIVE® ENT	UNIDRIVE® ECO
Touch Screen:	6.4" / 300 cd/m²	
Weight:	6.1 kg	6.0 kg
Certified to:	IEC 60-1 CE acc. to MDD	IEC 60601-1
Selectable display languages:	English, French, German, Spanish, Italian, Portuguese, Greek, Turkish	numerical codes

UNIDRIVE® ENT

20 7116 20-1

40 7116 01-1 **UNIDRIVE® ENT**

consisting of:

20 7116 20-1	**UNIDRIVE® ENT with KARL STORZ Communication Bus System** ®, power supply: 100 – 240 VAC, 50/60 Hz
400 A	**Mains Cord**
20 0126 30	**Two-Pedal Footswitch,** two-stage, with proportional function
20 7116 40	**Silicone Tubing Set,** for irrigation, sterilizable
20 7116 21	**Clip-Set,** for use with tubing set **20** 7116 40
20 0901 70	**SCB Connecting Cable,** length 100 cm
031131-01*	**Disposable tubing set,** sterile

UNIDRIVE® ECO

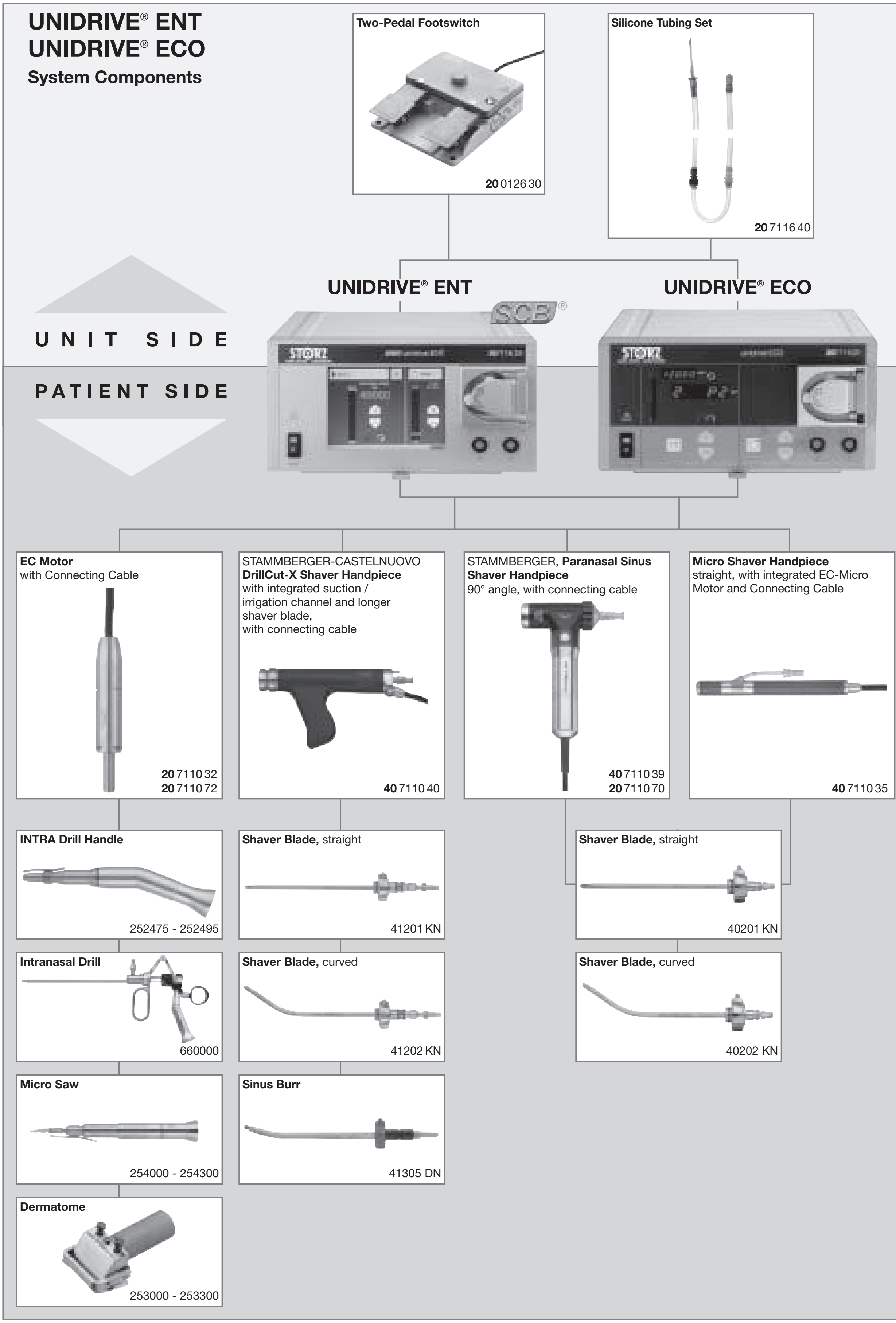
20 711420

40 711401 **UNIDRIVE® ECO**

consisting of:

20 711420	**UNIDRIVE® ECO**, power supply: 100 – 240 VAC, 50/60 Hz
400 A	**Mains Cord**
20 0126 30	**Two-Pedal Footswitch,** two-stage, with proportional function
20 7116 40	**Silicone Tubing Set,** for irrigation, sterilizable
20 7116 21	**Clip-Set,** for use with tubing set **20** 7116 40

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


UNIDRIVE® ENT
UNIDRIVE® ECO
System Components
Two-Pedal Footswitch
20 0126 30
Silicone Tubing Set
20 7116 40
UNIDRIVE® ENT
SCB®
UNIDRIVE® ECO
UNIT SIDE
PATIENT SIDE
STORZ
EC Motor
with Connecting Cable
20 7110 32
20 7110 72
STAMMBERGER-CASTELNUOVO
DrillCut-X Shaver Handpiece
with integrated suction / irrigation channel and longer shaver blade, with connecting cable
40 7110 40
STAMMBERGER, Paranasal Sinus Shaver Handpiece
90° angle, with connecting cable
40 7110 39
20 7110 70
Micro Shaver Handpiece
straight, with integrated EC-Micro Motor and Connecting Cable
40 7110 35
INTRA Drill Handle
252475 - 252495
Shaver Blade, straight
41201 KN
Shaver Blade, straight
40201 KN
Intranasal Drill
660000
Shaver Blade, curved
41202 KN
Shaver Blade, curved
40202 KN
Micro Saw
254000 - 254300
Sinus Burr
41305 DN
Dermatome
253000 - 253300

Shaver Handpieces

Special Features:

- **Strong and reliable suction**
- **Smooth operation**
- **Cuts the tissue without ripping; therefore less bleeding**
- **360° rotating shaver blade**
- **Graduated outer sheath**
- **All handpieces are fully autoclavable**
- **For use with both straight or curved paranasal shaver blades and sinus burrs**

STAMMBERGER-CASTELNUOVO **DrillCut-X Shaver Handpiece**

DrillCut-X Handpiece 40 7110 40

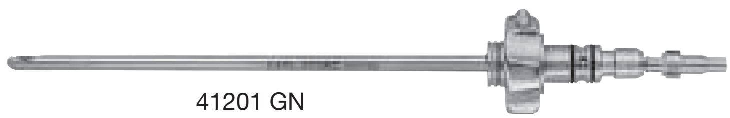
- **Ergonomically formed, angled handpiece, optimally fits the hand**
- **Oscillating operation mode for shaver blades, max. 7,000 rpm**
- **Rotating mode for sinus shavers, max. 12,000 rpm**
  Drilling speed of 3,000 rpm is recommended as this provides the most efficient suction.
- **Central straight suction channel and integrated irrigation prevents ablated material from getting trapped**
- **Very powerful motor, also suitable for removing harder material**
- **Very quiet operation, low vibration**
- **Special lubrication holes for easy maintenance**
- **With LOCK for save connection of shaver blades and sinus burrs**
- **Fully immersible and machine-washable**

40 7110 40 STAMMBERGER-CASTELNUOVO **DrillCut-X Shaver Handpiece,** for use with UNIDRIVE® ENT

Shaver Blades, straight

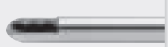
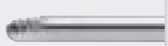
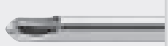
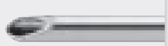
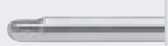
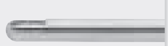
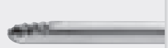
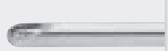
for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece



41201 GN

Shaver Blades, straight, sterilizable

Detail	**for use with** **40** 7110 40 **DrillCut-X™ Shaver Handpiece**	**Suction Shaver Blade** length 12 cm
	41201 KN	serrated cutting edge, diameter 4 mm, color code: blue-red
	41201 KK	double serrated cutting edge, diameter 4 mm, color code: blue-yellow
	41201 GN	concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green
	41201 LN	concave cutting edge, rectangular cutting window, diameter 4 mm, color code: blue-black
	41201 SN	straight cutting edge, diameter 4 mm, color code: blue-blue
	41201 KSA	serrated cutting edge, diameter 3 mm, color code: blue-red
	41201 KKSA	double serrated cutting edge, diameter 3 mm, color code: blue-yellow
	41201 LSA	concave cutting edge, rectangular cutting window, diameter 3 mm, color code: blue-black

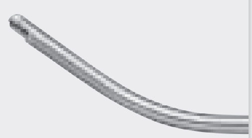
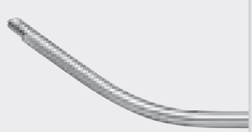
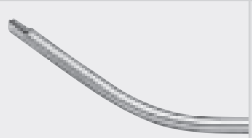
Shaver Blades, curved

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece

41204 KKB

Shaver Blades, 35°/40° curve, sterilizable

Detail	**for use with**	**Suction Shaver Blade** length 12 cm
	40 7110 40 **DrillCut-X™ Shaver Handpiece**	
	41202 KN	35° curve, cutting edge serrated backward, diameter 4 mm, color code: blue-red
	41204 KKF	40° curve, cutting edge serrated forward, double serrated, diameter 4 mm, color code: blue-yellow
	41204 KKB	40° curve, cutting edge serrated backward, double serrated, diameter 4 mm, color code: blue-yellow
	41204 KKFA	40° curve, cutting edge serrated forward, double serrated, diameter 3 mm, color code: blue-yellow
	41204 KKBA	40° curve, cutting edge serrated backward, double serrated, diameter 3 mm, color code: blue-yellow

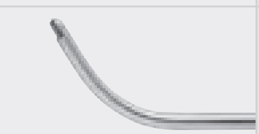
Shaver Blades, curved

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece

41203 KKF

Shaver Blades, 65° curve, sterilizable

Detail	for use with 40 7110 40 DrillCut-X™ Shaver Handpiece	Suction Shaver Blade length 12 cm
	41203 KNF	65° curve, cutting edge serrated forward, diameter 4 mm, color code: blue-red
	41203 KNB	65° curve, cutting edge serrated backward, diameter 4 mm, color code: blue-red
	41203 KKF	65° curve, cutting edge serrated forward, double serrated, diameter 4 mm, color code: blue-yellow
	41203 KKB	65° curve, cutting edge serrated backward, double serrated, diameter 4 mm, color code: blue-yellow
	41203 KKFA	65° curve, cutting edge serrated forward, double serrated, diameter 3 mm, color code: blue-yellow
	41203 KKBA	65° curve, cutting edge serrated backward, double serrated, diameter 3 mm, color code: blue-yellow
	41203 GNF	65° curve, cutting edge serrated forward, oval cutting window, diameter 4 mm, length 12 cm, color code: blue-green
	41203 GNB	65° curve, cutting edge serrated backward, oval cutting window, diameter 4 mm, color code: blue-green

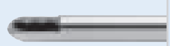
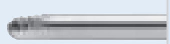
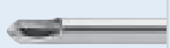
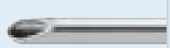
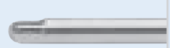
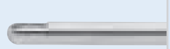
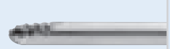
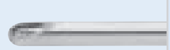
Shaver Blades, straight

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece

41301 KK

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

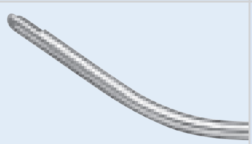
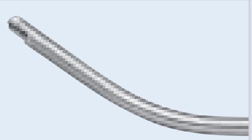
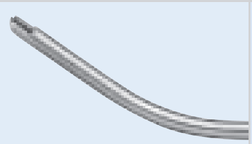
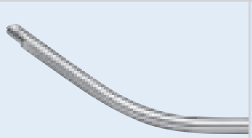
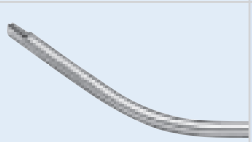
Detail	for use with **40 711 40 DrillCut-X™ Shaver Handpiece**	**Suction Shaver Blade** length 12 cm
	41301 KN	serrated cutting edge, diameter 4 mm, color code: blue-red
	41301 KK	double serrated cutting edge, diameter 4 mm, color code: blue-yellow
	41301 GN	concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green
	41301 LN	concave cutting edge, rectangular cutting window, diameter 4 mm, color code: blue-black
	41301 SN	straight cutting edge, diameter 4 mm, color code: blue-blue
	41301 KSA	serrated cutting edge, diameter 3 mm, color code: blue-red
	41301 KKSA	double serrated cutting edge, diameter 3 mm, color code: blue-yellow
	41301 LSA	concave cutting edge, rectangular cutting window, diameter 3 mm, color code: blue-black

Shaver Blades, curved

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece

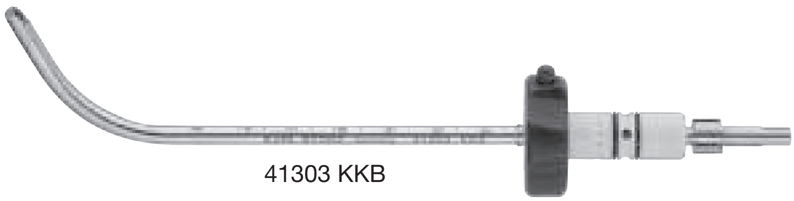
Shaver Blades, 35°/40° curve, sterile, for single use, package of 5

Detail	for use with **40 7110 40** **DrillCut-X™** **Shaver Handpiece**	**Suction Shaver Blade** length 12 cm
	41302 KN	35° curve, cutting edge serrated backward, diameter 4 mm, color code: blue-red
	41304 KKF	40° curve, cutting edge serrated forward, double serrated, diameter 4 mm, color code: blue-yellow
	41304 KKB	40° curve, cutting edge serrated backward, double serrated, diameter 4 mm, color code: blue-yellow
	41304 KKFA	40° curve, cutting edge serrated forward, double serrated, diameter 3 mm, color code: blue-yellow
	41304 KKBA	40° curve, cutting edge serrated backward, double serrated, diameter 3 mm, color code: blue-yellow

Shaver Blades, curved

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece



41303 KKB

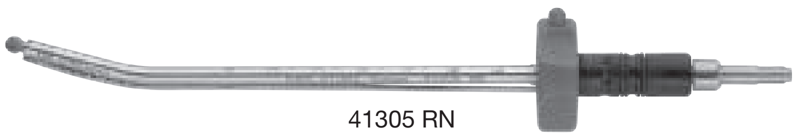
Shaver Blades, 65° curve, sterile, for single use, package of 5

Detail	for use with 40 7110 40 DrillCut-X™ Shaver Handpiece	Suction Shaver Blade length 12 cm
	41303 KNF	65° curve, cutting edge serrated forward, diameter 4 mm, color code: blue-red
	41303 KNB	65° curve, cutting edge serrated backward, diameter 4 mm, color code: blue-red
	41303 KKF	65° curve, cutting edge serrated forward, double serrated, diameter 4 mm, color code: blue-yellow
	41303 KKB	65° curve, cutting edge serrated backward, double serrated, diameter 4 mm, color code: blue-yellow
	41303 KKFA	65° curve, cutting edge serrated forward, double serrated, diameter 3 mm, color code: blue-yellow
	41303 KKBA	65° curve, cutting edge serrated backward, double serrated, diameter 3 mm, color code: blue-yellow
	41303 GNF	65° curve, cutting edge serrated forward, oval cutting window, diameter 4 mm, length 12 cm, color code: blue-green
	41303 GNB	65° curve, cutting edge serrated backward, oval cutting window, diameter 4 mm, color code: blue-green

Sinus Burrs, curved NEW

for Nasal Sinuses and Skull Base Surgery

For use with DrillCut-X™ Shaver Handpiece



41305 RN

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

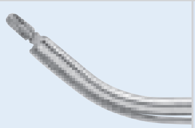
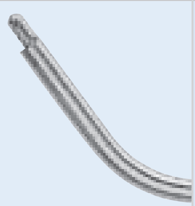
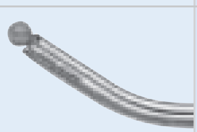
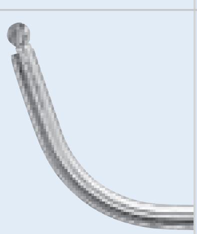
Detail	for use with **40 7110 40 DrillCut-X™ Shaver Handpiece**	**Sinus Burrr** length 12 cm
	41304 W	40° curve, cylindric, drill diameter 3 mm, shaft diameter 4 mm, color code: red-blue
	41303 WN	55° curve, cylindric, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-blue
	41305 RN	15° curve, bud drill, drill diameter 4 mm, shaft diameter 4 mm, color code: red-black
	41305 DN	15° curve, diamond head, drill diameter 3 mm, shaft diameter 4 mm, color code: red-yellow
	41305 D	15° curve, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow
	41305 DW	40° curve, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow
	41303 DT	70° curve, diamond head, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-yellow

IMAGE1™ HD hub *NEW*

HD hub Camera Control Unit

- **Genuine FULL HD (High Definition) is guaranteed by a maximum resolution and the consistent use of the native 16:9 aspect ratio throughout the entire image chain, from image capture, signal transmission to display**
- **HD-compatible endoscopic video camera systems must be equipped with a CCD chip supporting the 16:9 input format and require that image capture is performed at a resolution of 1920 x 1080 pixels**

The benefits of FULL HD (High Definition) for medical applications are:

- **5 times higher input resolution of the camera delivers more detail and depth of focus**
- **Using 16:9 format during image acquisition enlarges the field of view**
- **The 16:9/16:10 format of the widescreen monitor supports ergonomic viewing**
- **Enhanced color brilliance for optimal diagnosis**
- **Progressive scan technology provides a steady, flicker-free display and helps eliminate eyestrain and fatigue**

22 2010 11U102

22 2010 11U102 **IMAGE1™ HD hub Camera Control Unit** (CCU)

for use with IMAGE1™ HD and standard one- and three-chip camera heads, max. resolution 1920 x 1080 pixels, with integrated **KARL STORZ-SCB®** and integrated Image Processing Module, color system **PAL/NTSC,** power supply 100 – 240 VAC, 50/60 Hz

consisting of:

22 2010 20U102	**IMAGE1™ HD hub (with SDI) Camera Control Unit**
400 A	**Mains Cord**
400 B	**Mains Cord, US-version**
3 x 536 MK	**BNC/BNC Video Cable,** length 180 cm
547 S	**S-Video (Y/C) Connecting Cable,** length 180 cm
20 2032 70	**Special RGB Connecting Cable**
2x **20** 2210 70	**Connecting Cable,** for controlling peripheral units, length 180 cm
20 0400 86	**DVI Connecting Cable,** length 180 cm
20 0901 70	**SCB Connecting Cable,** length 100 cm
20 2002 31U	**Keyboard,** with English character set

Specifications:

Signal-to-noise ratio	AGC	Video output	Input
IMAGE1™ Three-chip camera systems ≥ 60 dB	Microprocessor-controlled	- Composite signal to BNC socket - S-Video signal to 4-pin Mini DIN socket (2x) - RGB signal to D-Sub socket - DV signal to DV socket (only IMAGE1™ with DV module) - SDI signal to BNC socket (only IMAGE1™ with SDI module) (2x) - HD signal to DVI-D socket (2x)	Keyboard for title generator, 5-pin DIN socket

Control output /input	Dimensions w x h x d (mm)	Weight (kg)	Power supply	Certified to:
- KARL STORZ-SCB® at 6-pin Mini DIN socket (2x) - 3.5 mm stereo jack plug (ACC 1, ACC 2), - Serial port at RJ-11	305 x 89 x 335	2.95	100-240 VAC, 50/60 Hz	IEC 601-1, 601-2-18, CSA 22.2 No. 601, UL 2601-1 and CE acc. to MDD, protection class 1/CF

IMAGE1™ HD NEW

HD Camera Head

22 2200 50-3/**22** 2201 50-3

22 2200 50-3	**50 Hz**	**IMAGE1™ H3, Three-Chip HD Camera Head**

max. resolution 1920 x 1080 pixel, Progressive Scan, 50 Hz,
with 2 freely programmable Camera Head buttons,
with integrated Parfocal-Zoom focal length f = 14 – 30 mm (2x),
for use with color system **PAL**

22 220150-3	**60 Hz**	**IMAGE1™ H3, Three-Chip HD Camera Head**

max. resolution 1920 x 1080 pixel, Progressive Scan, 60 Hz,
with 2 freely programmable Camera Head buttons,
with integrated Parfocal-Zoom focal length f = 14 – 30 mm (2x),
for use with color system **NTSC**

Specifications:

IMAGE1™ HD Camera Heads	**H3**
50 Hz	**22** 2200 50-3
60 Hz	**22** 22201 50-3
Image sensor	3x ¼" CCD chip
Pixels output signal (H x V)	1920 x 1080
Resolution (pixels)	1920 x 1080
Dimensions	Diameter 31-48 mm, length 114 mm
Weight	210 g
Min. sensitivity	F1.4/1.9 lux
Lens	Integrated Parfocal Zoom Lens, f = 14-28 mm

Standard IMAGE1™ camera heads may also be connected to IMAGE1™ HD hub camera control unit (CCU).

IMAGE1™ HD *NEW*

HD Flat Screen

<table>
<tr><th rowspan="2">KARL STORZ HD Flat Screens
Color systems PAL/NTSC</th><th rowspan="2">Version</th><th rowspan="2">Order No.</th><th>Screen diagonal</th><th>Max. screen resolution</th><th colspan="7">Video input</th></tr>
<tr><th>58.5 cm (23")</th><th>1920 x 1200</th><th>Composite signal to BNC socket</th><th>S-Video to 4-pin Mini DIN socket</th><th>RGB to 5x BNC socket</th><th>VGA to 15-pin HD-D-Sub socket</th><th>SDI to BNC socket</th><th>HD-SDI to BNC socket</th><th>DVI to DVI-D socket</th></tr>
<tr><td></td><td>Wall mounted with VESA 100-adaption</td><td>9523 NB</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td><td rowspan="2">●</td></tr>
<tr><td></td><td>Desktop with pedestal</td><td>9523 N</td></tr>
</table>

9523 NB **23" KARL STORZ HD Flat Screen**
image format 16:10, wall-mounted with VESA 100-adaption, color systems **PAL/NTSC,** max. screen resolution 1920 x 1200, video inputs: composite, S-Video, RGB, VGA, SDI, and DVI, brightness 500 cd/m², contrast ratio 700:1, power supply 100 – 240 VAC, 50/60 Hz
consisting of:
9523 NG **23" HD Flat Screen**
9523 PS **External 24 VDC Power Supply**
400 A **Mains Cord**

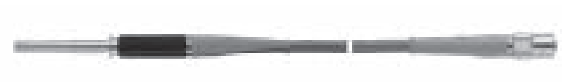
9523 N **23" KARL STORZ HD Flat Screen**
image format 16:10, desktop with pedestal, color systems **PAL/NTSC,** max. screen resolution 1920 x 1200, video inputs: composite, S-Video, RGB, VGA, SDI, and DVI, brightness 500 cd/m², contrast ratio 700:1, power supply 100 – 240 VAC, 50/60 Hz
consisting of:
9523 NG **23" HD Flat Screen**
9523 PS **External 24VDC Power Supply**
400 A **Mains Cord**
9419 NSF **Pedestal**

Specifications:

Brightness	Max. viewing angle	Video input	Pixel distance	Contrast ratio	Input signal level
500 cd/m²	178° vertical	- Composite signal to BNC socket - S-Video signal to 4-pin Mini DIN socket - RGB signal to 5 x BNC sockets - SDI signal to BNC socket - HD-SDI signal to BNC socket - DVI signal to DVI-D socket	0.258 mm	700:1	0.7 Vpp

Rated power	Operating conditions	Storage	Relative humidity	Dimensions in w x h x d (mm)	Power supply	Certified to:
80 Watt	0-40 °C	-20-60 °C	5-85 %, non-condensing	546 x 366 x 98	100-240 VAC	EN 60601-1, protection class IPX 1

Cold Light Fountains and Accessories



495 NT **Fiber Optic Light Cable,**
diameter 2.5 mm, length 180 cm

495 NTW **Fiber Optic Light Cable,**
diameter 2.5 mm, length 180 cm,
with 90° deflection to the light source

495 NTX **Same,** length 230 cm

Cold Light Fountain HALOGEN 150

20 1123 01 **Cold Light Fountain HALOGEN 150,**
power supply:
100/120/230/240 VAC, 50/60 Hz,
including:
400 A **Mains Cord**

103 **HALOGEN Spare Lamp,**
150 watt, 15 volt

Cold Light Fountain XENON NOVA® 175

20 131501 **Cold Light Fountain XENON NOVA® 175**
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
400 A **Mains Cord**

20 132026 **XENON Spare Lamp,** only,
175 watt, 15 volt

Cold Light Fountain XENON 300 ®

20 133101-1 **Cold Light Fountain XENON 300 ®**
with built-in antifog air-pump, and integrated
KARL STORZ Communication Bus System ®
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
400 A **Mains Cord**
610 AFT **Silicone Tubing Set,** autoclavable,
length 250 cm
20 0901 70 ® **Connecting Cord,**
length 100 cm

20 133027 **Spare Lamp Module XENON**
with heat sink, 300 watt, 15 volt

20 133028 **XENON Spare Lamp,** only,
300 watt, 15 volt

KARL STORZ AIDA® DVD-M

Independent “all-in-one” System

Special features:

- **Digital storage of still images, video and audio files (with HD Option storage of still images in FULL HD quality 1920 x 1080)**
- **Digital alternative to video printers, video recorders and dictaphone**
- **Compact design**
- **Simple and intuitive operation**
- **Allows storage on DVD, CD-ROM, USB Stick or Network, multisession and multipatient**
- **HD-DVI (associated with the HD Option), SDI, S-Video (Y/C) and composite input**
- **All video signals are through-patchable to the video monitor**
- **Printing of still images with ink jet printers possible**
- **External touch screen (accessory) confirms to EN 60601-1**
- **Compatible to the KARL STORZ Communication Bus (SCB) and to the OR1™ connect series**

20 2045 01-140 **KARL STORZ AIDA® DVD-M with Smartscreen™,**
color system PAL/NTSC, power supply 100 – 240 VAC, 50/60 Hz,
consisting of:

20 2040 20-140	**AIDA DVD-M** with integrated DVD/CD recorder and integrated touch screen
400 A	**Mains Cord**
400 B	**Mains Cord,** US version
536 MK	**BNC Connecting Cables,** length 180 cm
547 S	**S-VHS (Y/C) Connecting Cable,** length 180 cm
2x **20** 0400 83	**Adaptor,** BNC-Cinch
20 0400 84	**Serial Interface Cable,** length 20 cm
20 0400 85	**DVI Connecting Cable,** length 20 cm
20 0400 88	**USB Extension Cable,** length 7.5 m

20 2045 20-1 **KARL STORZ AIDA® DVD-M without Smartscreen™,**
color system PAL/NTSC, power supply 100 – 240 VAC, 50/60 Hz,
consisting of:

20 2040 20-140	**AIDA DVD-M** with integrated DVD/CD recorder
400 A	**Mains Cord**
400 B	**Mains Cord,** US version
536 MK	**BNC Connecting Cables,** length 180 cm
547 S	**S-VHS (Y/C) Connecting Cable,** length 180 cm
2x **20** 0400 83	**Adaptor,** BNC-Cinch
20 0400 88	**USB Extension Cable,** length 7.5 m

20 2000 75 **KARL STORZ AIDA® DVD-M HD Kit Option,**
power supply 100 – 240 VAC, 50/60 Hz,
consisting of:

20 2000 72	**AIDA DVD-M HD Box,** incl. power supply unit and mains cord
20 2000 73	**USB Connecting Cable,** length 180 cm
536 MK	**BNC Connecting Cable,** length 180 cm
20 0400 86	**DVI-D Connecting Cable,** length 180 cm
20 2000 74	**USB Hub**
20 2040 77-01	**AIDA DVD-M Software Upgrade for HD compatibility**
2x 28003 TE	**Power Cord Adapter**

Basic Equipment Cart

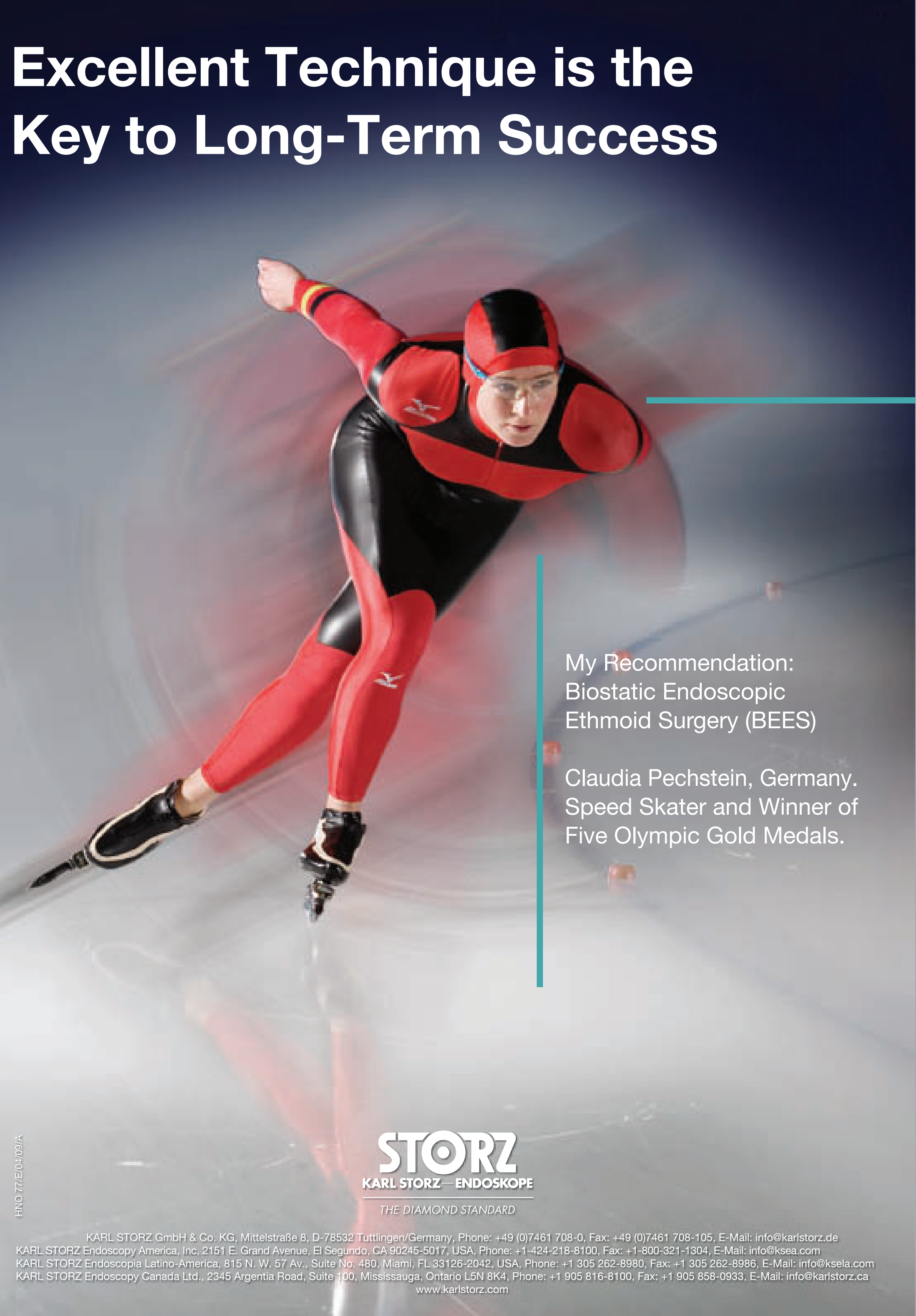
29005 LAP

29005 LAP **Basic Equipment Cart,**
rides on 4 antistatic dual wheels,
2 equipped with locking brakes,
3 fixed shelfs, one with handles,
main switch at vertical beam,
integrated cable conduits in vertical beams,
drawer unit with lock,
3 horizontal cable conduits,
one with cable winding,
two with 4-times electrical sub-distributer,
1 set of non-sliding stands for units,
1 TFT-Monitor arm (VESA 75/100),
1 camera holder,
8 power cords (50 cm),
2 equipment rails,
1 CO_2-bottle holder, max. diameter 155 mm,
Isolation transformer 230 VAC (50/60 Hz)
with 8 sockets and earth potential and
earth leakage monitor (2000 VA),

Dimensions:
Videocart 730 x 1470 x 716 mm (w x h x d),
shelf: 630 x 480 mm (w x d),
caster diameter: 150 mm

Notes:

Notes:


Excellent Technique is the
Key to Long-Term Success
My Recommendation:
Biostatic Endoscopic
Ethmoid Surgery (BEES)
Claudia Pechstein, Germany.
Speed Skater and Winner of
Five Olympic Gold Medals.
HNO 77/E/04/09/A
STORZ
KARL STORZ—ENDOSKOPE
THE DIAMOND STANDARD
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KARL STORZ Endoscopy America, Inc, 2151 E. Grand Avenue, El Segundo, CA 90245-5017, USA, Phone: +1-424-218-8100, Fax: +1-800-321-1304, E-Mail: info@ksea.com
KARL STORZ Endoscopia Latino-America, 815 N. W. 57 Av., Suite No. 480, Miami, FL 33126-2042, USA, Phone: +1 305 262-8980, Fax: +1 305 262-8986, E-Mail: info@ksela.com
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