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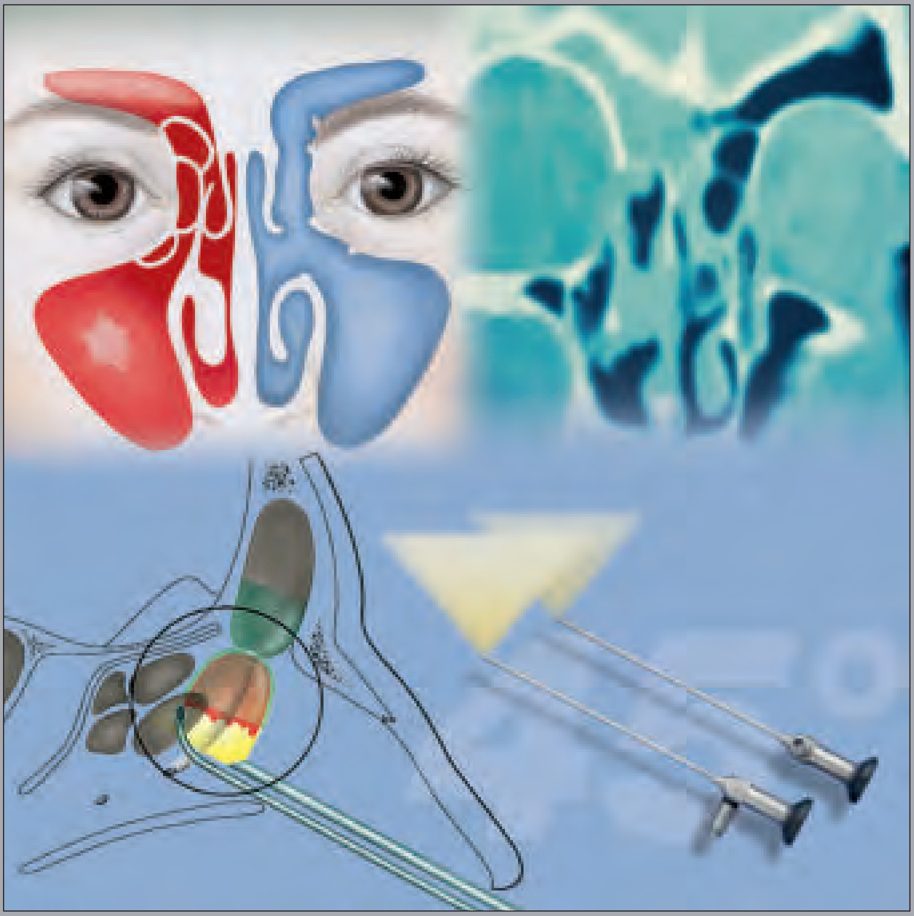
"UNCAPPING THE EGG"

The Endoscopic Approach to Frontal Recess and Sinuses



A Surgical Technique of the Graz University Medical School
by use of the KARL STORZ HOPKINS® 45° Telescopes

Heinz STAMMBERGER

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Contents

Introduction

The endonasal approach to the frontal sinus undoubtedly requires sound anatomical knowledge, highest surgical skills and dexterity. The **frontal recess** is an anatomically very complex structure and can be seen as the ethmoidal ”pre-chamber” to the frontal sinus proper. Its configuration depends on a variety of cells and lamellae with a high degree of individual variation. Almost always disease in the frontal sinus results from underlying disease processes in the clefts of the frontal recess. Rarely ever will inflammatory processes originate in the frontal sinus cavity itself. These findings consequently resulted in diagnosis, conservative and surgical therapeutic measures to focus on these ”pre-chambers” to the frontal sinus. Especially in surgery, the delicate bony structures and the mucosa in the frontal recess region require a very careful, minimally traumatic approach: Overly forceful handling of instruments, traumatising the mucosa or its removal willrapidly lead to granulations, scar and stenosis formation. In these cases postoperative healing will be significantly delayed, local postoperative care must be intensified and patients frequently be seen for follow-up. It is not a rare finding, that following traumatic manipulations in this region patients show frontal sinus problems which were **not** present before. These frontal sinus problems therefore must in part be seen as iatrogenic.

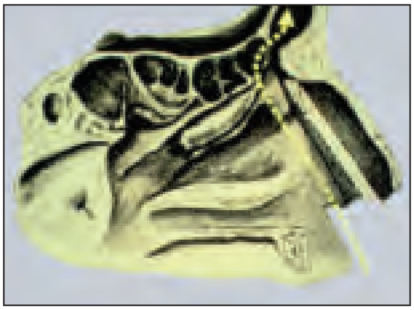


Fig. 1
Original drawing from Halle’s publication from 1906: Drilling away the entire superior nasal spine. Provided Halle already had had telescopes of different angulations, he most likely would have chosen the more physiologic approach dorso-laterally to the nasal spine (dotted line).

Fig. 2
Massive opacification of the frontal sinus bilaterally…

Fig. 3
…resulting from blockage of the frontal recess.

In recent years many surgical schools have recommended to routinely create as large a communication between the frontal recess and the frontal sinus as possible, to avoid the well know tendencies for scarring and stenosis. In our view this has resulted in too frequently used, too radical, too traumatic approaches. These are usually performed with a drill (or curved blades of powered instruments) as so-called "drill-out procedures". According to our experience, these are required for a very small number of special indications only. In this brochure we would like to illustrate how to succeed in the vast majority of cases with significantly less traumatic procedures, "simply" following the anatomy. This surgical approach has been applied by us for almost 3 decades now and has been constantly improved.

According to our experiences, atraumatic functional surgery in the vicinity of the frontal sinus ostium can only be performed using endoscopes of different angulations. This fact is sort of self-explanatory if one studies the topographical anatomy of the region. There is no need to drill away the "nasal beak" (the inner superior nasal spine) if one uses telescopes of different angulations and follows the anatomical route predesigned by nature. In doing so, only thin and delicate bony lamella have to be removed, though in a "delicate surrounding". If one wants to engage in this kind of frontal sinus surgery, it is mandatory that the same principles of care (and I dare to say: of dexterity) are applied as in stapes surgery (D.W. Kennedy).

Following our recommendations KARL STORZ Tuttlingen designed two 45° endoscopes, which allow for an excellent view into the frontal recess, especially if the middle turbinate is preserved.

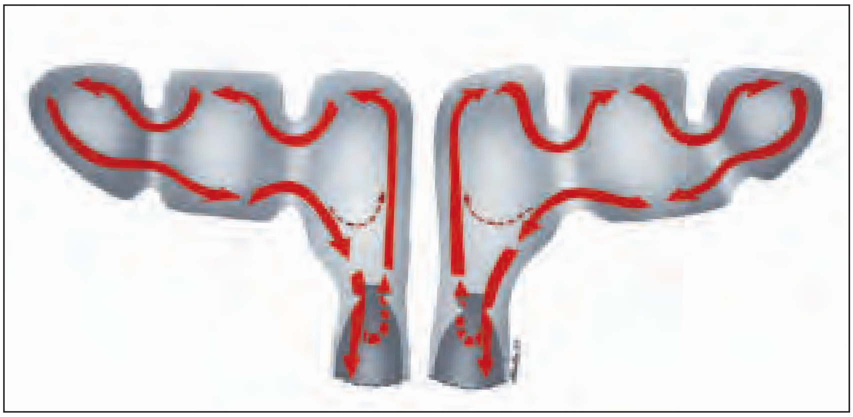


Fig. 4
Mucus transport through frontal sinus and recess. There can be an active transport into the frontal sinus from out of the frontal recess medially.

Anatomy and Pathophysiology of Frontal Recess and Frontal Sinus

The frontal sinus develops from the most anterior and superior parts of the anterior ethmoid: The frontal bone is pneumatised from the frontal recess (Killian). We discourage the use of the term “ductus nasofrontalis, nasofrontal duct”, as a true tubular structure connecting frontal sinus and anterior ethmoid does **not exist.** In a somewhat simplified way, the frontal sinus is nothing else but a cell of the anterior ethmoid, pneumatising the frontal bone. Not surprisingly therefore the frontal sinus depends on its “origin” in the anterior ethmoid with respect to its normal and pathophysiology.

On a sagittal section (**Fig. 5**) the transition of frontal sinus to frontal recess has an hour-glass shape: The floor of the frontal sinus (**sf**) narrows downward like a funnel towards the frontal sinus ostium (**osf**). From here, the frontal recess widenes like an inverted funnel (**rf**). So both structures together can be seen as an hour-glass, with the “waist” at the level of the frontal sinus ostium.

The frontal recess can be significantly influenced and narrowed by a number of structures (**Fig. 6**): **1.**) the uncinate process, **2.**) agger nasi cell(s), **3.**) the ethmoidal bulla, **4.**) other cells of the anterior ethmoid, located in the frontal recess. Frequently, combinations of the variants to be discussed below are encountered in patients suffering from acute or recurrent inflammations of the frontal sinus. In a very schematised and simplified way, all these structures narrow the inferior part of the “hour-glass”, i.e. the frontal recess and thus predispose to recurring problems.

Fig. 5
Sagittal CT demonstrating the basal lamellae:
1 = basal lamella of the uncinate
2 = b. l. of the bulla
3 = b. l. of the middle turbinate
4 = b. l. of the superior turbinate
Note the hourglass configuration of the transition from frontal sinus to frontal recess.

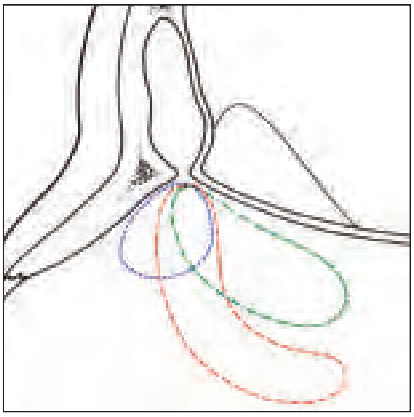


Fig. 6
Schematic drawing of narrowing of frontal recess by agger nasi-cells **(blue),** uncinate process **(red)** and ethmoidal bulla and other anterior ethmoidal cells **(green),** respectively.

Variants of the Uncinate Process

There are three basic configurations of the uncinate process (Fig. 7):

a) In a coronal cut, the uncinate process can extend superiorly, bend laterally and insert at the lamina papyracea (orbitalis). Thus a superior blind (recessus terminalis) of the ethmoidal infundibulum is formed, separating the latter to some degree from the frontal recess.

b) The uncinate process can extend straight superiorly and reach the skull base.

c) It can curve medially and fuse with the insertion of the middle turbinate.

Transitions between these three extremes occur.

If there is a pronounced terminal recess (**Fig. 8b**) reaching extremely far superiorly, the uncinate process with this “cap” can almost fill the frontal recess, even contact the skull base and medially the lateral lamella of the cribriform plate. The clinically significant effect of such a configuration can be impairment or even blockage of ventilation and drainage of the frontal sinus proper.

If the agger nasi region is pneumatised, i. e. agger nasi cells exist, these can expand towards superiorly and posteriorly and thus more or less fill the entire frontal recess with their thin “cap” of bone in an analogous fashion.

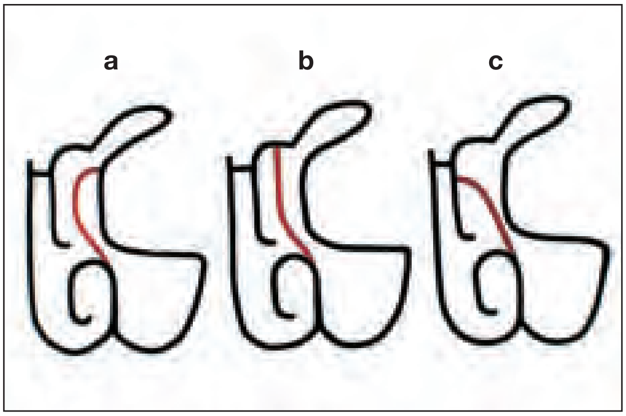


Fig. 7
Anatomical variations of the uncinate process.

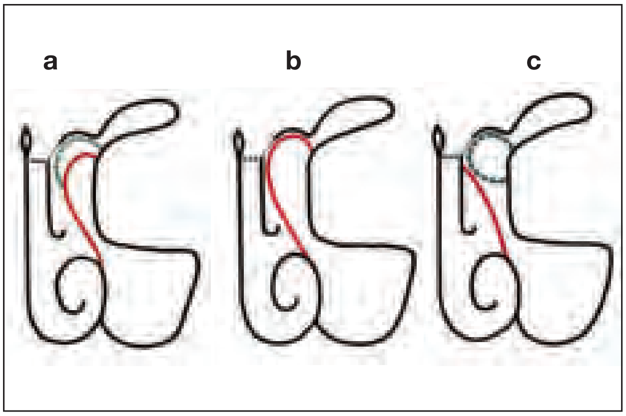


Fig. 8
Narrowing of frontal recess by combinations of variants of uncinate, bulla and agger nasi cells.

The ethmoidal bulla (or other cells of the anterior ethmoid, for instance so-called infundibular cells) may expand into the frontal recess from posterior-inferiorly, i.e. they pneumatise upward and forward and thus with their cranial "cap" of bone may fill the frontal recess. This too, may lead to impairment/stenosis. Not only may combinations of these three basic variants prevail, but cells may develop into the frontal sinus (bulla frontalis, intrafrontal cells) presenting a true challenge for diagnosis and even more, surgical therapy (**Figs. 5–9**).

Figs. 8 and **9** demonstrate some of the possibilities in a schematic fashion and in CT: One can clearly see, that in all cases access to the frontal sinus is blocked by a paper-thin cap of bone with its two mucosal layers.

It is of utmost importance to understand, that access to the frontal sinus ostium is not blocked by the allegedly important "nasal beak". This massive bony structure is only of relevance in patients with extremely narrow dorsum of the nose. Even then, access to the frontal sinus is only impeded medially, next to the nasal septum. Approaching from dorso-laterally, the internal nasal spine very rarely presents an obstacle or a pathophysiologically relevant structure.

Very clearly this situation can be recognised in **Fig. 1** taken from Halle's publication from 1906: It must be assumed that Halle would **not** have chosen this approach, if at that time endoscopes for "looking around the corner" had been available to him. The removal of the very thin bony septations posterolateral to the "nasal beak" would have resulted in a wide and natural passage, via a far less traumatic approach, avoiding unwarranted removal of bone and mucosa.

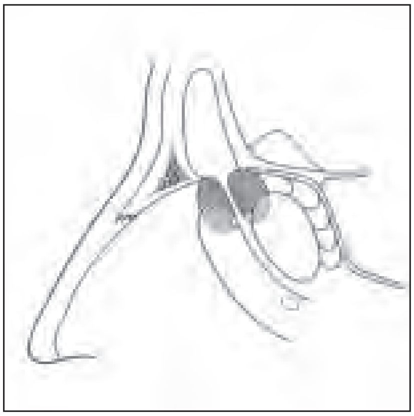


Fig. 10a

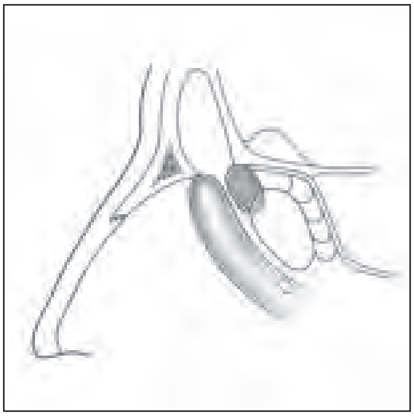


Fig. 10b

Figs. 10 a + b: Schematic drawing of frontal recess narrowed by agger nasi and infundibular cells (**a**), as well as by a terminal recess and infundibular cells (**b**).

Fig. 9a

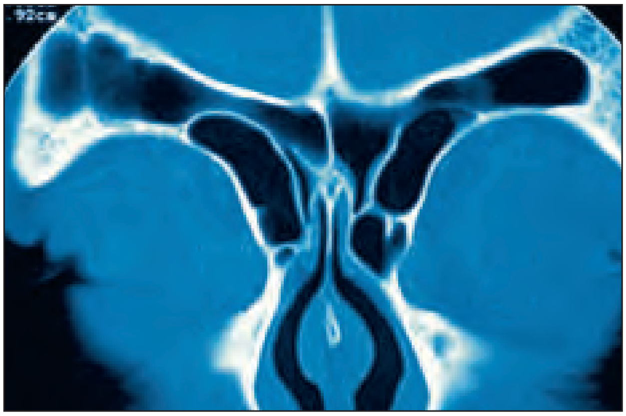


Fig. 9b

Figs. 9a + b: Several cells may be superimposed and narrow the frontal recess, sometimes even reach into the sinus lumen itself as "intrafrontal cells".

If uncinate, bulla and agger nasi cells were resected during endonasal surgery and the frontal sinus ostium is **not visible,** this **almost always** can be traced back to a typical anatomical situation: A thin curved bony "shell" has remained, which may be in contact with the skull base or the lateral lamella of the middle turbinate. This thin bone layer blocks access to the frontal sinus proper, towards its ostium. The technical challenge is to identify and carefully remove this cap of bone. In the vast majority of cases this manoeuvre will expose the level of the frontal sinus ostium. Rarely there is need then to enlarge the latter let alone to drill away the "nasal beak".

For these manipulations simple but delicate instruments are required (**Figs. 12, 13**). With specially curved curettes (according to F. Kuhn) or Giraffe forceps these structures can be removed. All these manoeuvres must be performed under good direct vision and optimal hemostasis. Only in this way true atraumatic surgery is possible. The new KARL STORZ 45° endoscopes were especially developed for this purpose. They offer a crucial "extra"of retrograde upward viewing allowing for a complete inspection of the frontal recess.

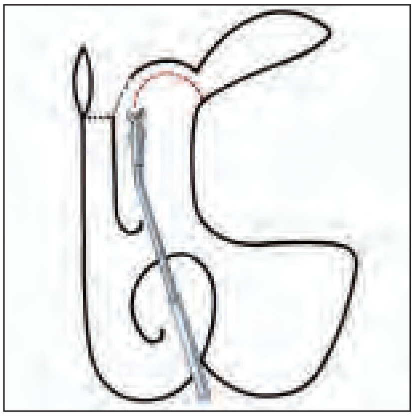


Fig. 12
Removal of an "cap of the egg" with giraffe forceps.

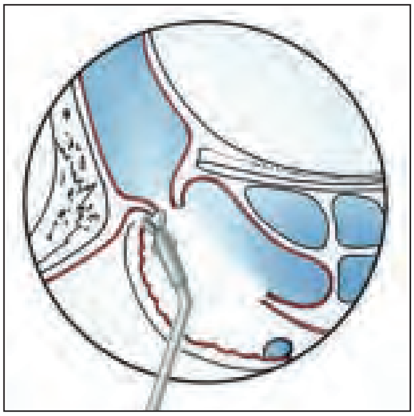


Fig. 13
Remnants of an "egg cap" are identified and carefully removed.

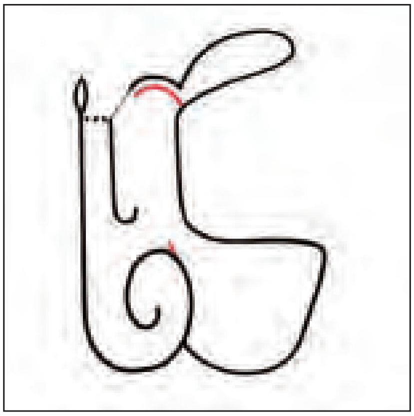


Fig. 11 a

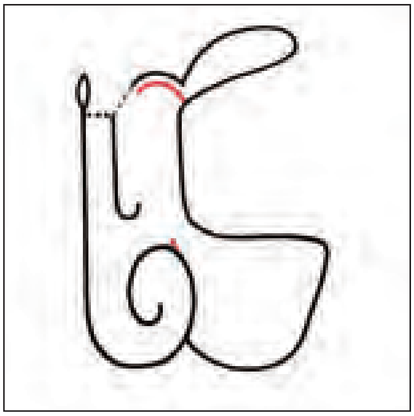


Fig. 11 b

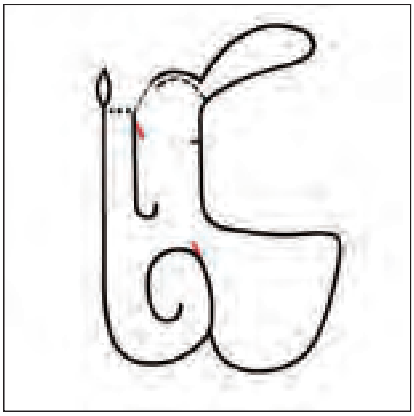


Fig. 11 c

Figs. 11 a–c: Remnants of thin "bone caps" of a terminal recess (**a**), an agger nasi-cell (**b**) and an ethmoidal bulla (**c**), all narrowing access to the frontal sinus.

In the past it was not always possible to achieve this with the well proven 30° telescopes. On the other hand the 45° telescopes are constructed in a way that they still allow for a straight forward view. This is important when inserting the instruments, as at 6.00 o’clock of the visual field the view is almost parallel to the longitudinal axis of the endoscope. This is an advantage over the well proven 70° endoscopes, which do not offer any optical information in the direction of the shaft itself.

One of our favourite instruments for surgery in the frontal recess, especially when removing thin bone caps, is the upbent circular cutting punch (**Fig.14**). With this instrument one can well avoid to expose bare bone which in turn will help to avoid scaring and restenosis. If performed well, this approach leaves behind a wide frontal recess and an open frontal sinus ostium. All walls are covered by mucosa with only minimal areas of bone exposed at the cutting edges of the very thin bony lamella. This considerably shortens the postoperative healing phase.

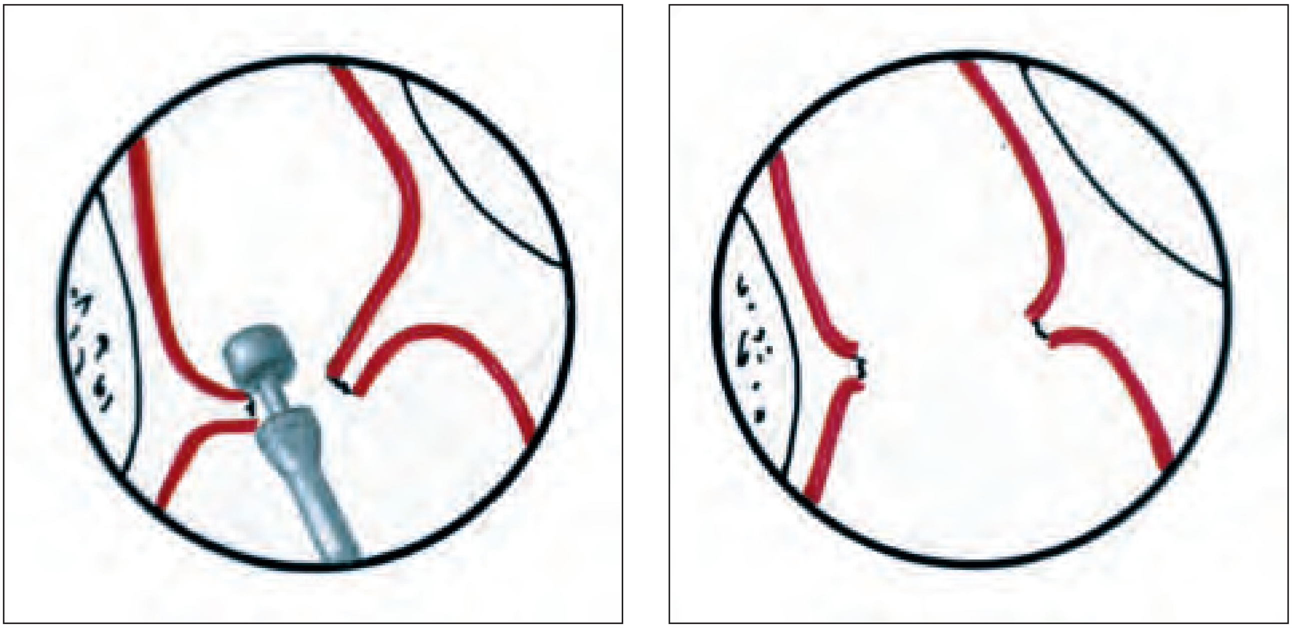


Fig. 14 a **Fig. 14 b**
Schematic drawing demonstrating the use of the upcurved circular cutting punch.

"Uncapping the Egg"

Fig. 15
"The Egg" in an egg holder.

For many years we have been teaching this technique in our endoscopy courses at Graz and have presented the concept of "uncapping the egg" for the first time internationally during the "3rd International Symposium on Advanced FESS" at Cairns/Australia in 1995. "Uncapping the Egg" represents a mnemonic only; the diagrams are very schematic, over-simplified, not to scale – but do point out the main principle.

In a sagittal section, the transition from frontal sinus down to the frontal recess has an hour-glass shape (see page 9), one might as well say: The shape of an egg-holder. The waist corresponds to the level of the frontal sinus ostium. If one now puts a breakfast-egg into the egg-holder, opens and empties it, the lower portion of the "cap of the egg" remains in the egg-holder. If this now is turned upside down, the situation is analoguous to the frontal recess: The superior "empty" part of the egg-holder represents the frontal sinus infundibulum, i.e. the floor of the frontal sinus narrowing towards the ostium. The inferior part of the egg-holder with the cap of the egg represents the frontal recess. The task now is, to remove the eggshell sitting tightly in the "frontal recess". If one succeeds, the walls of the frontal recess are not traumatised, but the passage through frontal recess via frontal sinus ostium into frontal sinus is free (**Figs. 15–18**).

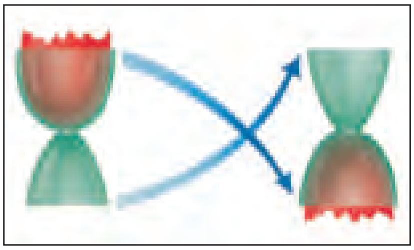


Fig. 16
The egg is uncapped, the contents removed and the egg holder turned upside down.

"Uncapping the Egg" has proven an excellent mnemonic to think of and look for the "eggshells" which usually block the frontal recess in difficult situations. Following these principles and using the new KARL STORZ 45° telescopes, drill-out procedures have remained an absolute rarity amongst thousands of cases we have operated over the years.

Especially the circular cutting punch in its upbent version (**Fig. 18**) allows to enlarge the frontal sinus ostium itself – if required – following the same principles of minimal trauma.

Fig. 17
Superimposing the "inverted" egg holder over the frontal sinus infundibulum and frontal recess, …

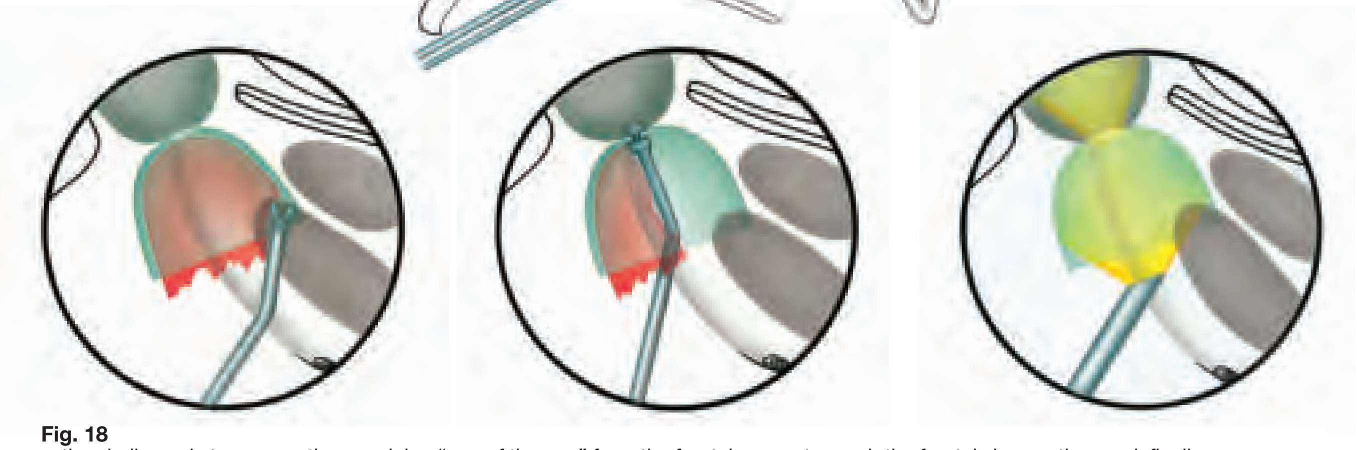


Fig. 18
…the challenge is to remove the remaining "cap of the egg" from the frontal recess to reach the frontal sinus ostium and, finally, the frontal sinus proper.

In **Figs. 19** and **20** postoperative CT-findings demonstrate why these patients suffer from recurring frontal sinus problems: In all cases the surgeons failed to remove (or to identify) the cranial cap of the individual cells or the uncinate process. Looking back at our own learning curve, it is not rare to mistake a pronounced terminal recess or supraorbital ethmoid cell for the frontal sinus proper. The pictures clearly identify the thin bony caps remaining and the resulting narrowing and stenosis which must be taken care of during revision surgery. These pictures furthermore stress the need for exact endoscopic and radiologic diagnosis (axial CT-scans would not show these changes!) in avoiding unwarranted radical surgery using drills.

Fig. 19
Typical postoperative finding: On the left side (of the patient) the bony cap of an agger nasi-cell was not removed, resulting in recurrent frontal sinusitis.

Fig. 20
As before, agger nasi-cells on both sides were not removed sufficiently, resulting in recurrent frontal sinus problems.

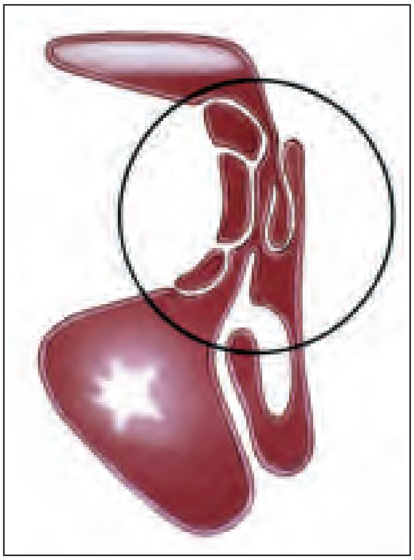


Fig. 21
Schematic drawing of a seriously affected frontal recess.

The main prerequisite for the success of this surgical approach is an atraumatic technique.

Particular care must be taken to avoid any damage to the parietal mucosa, i.e. ideally the walls of the frontal recess should be completely covered with mucosa or at least the basal layers thereof. Areas of denuded bone must be reduced to a minimum. In no case the frontal sinus ostium should be traumatised circularly, let alone mucosa be removed in this region. Inevitably this will lead to scar and stenosis formation. This problem is illustrated in **Figs. 21–24**. Fracturing of the middle turbinate should be avoided by all means, to prevent lateralisation, scaring and stenosis of the frontal recess. The mucosa at the insertion of the middle turbinate should not be traumatised, especially no opposing raw surfaces be created. If a middle turbinate has been destabilised accidentally, the technique illustrated in **Fig. 25** can be used to avoid lateralisation. Stents and drains are not helpful if mucosa has been removed. The process of reepitheliasation and scarring continues for many months!

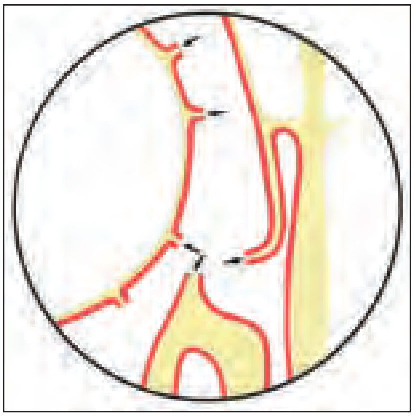


Fig. 22
Ideal postoperative situation: The arrows indicate the resection margins of uncinate process and anterior ethmoidal cells. Only here has bone been minimally exposed, all other walls of the surgical cavity are covered by mucosa.

Fig. 23
A situation like this must be avoided by all means: Significant areas of bone are denuded and no longer covered by mucosa.

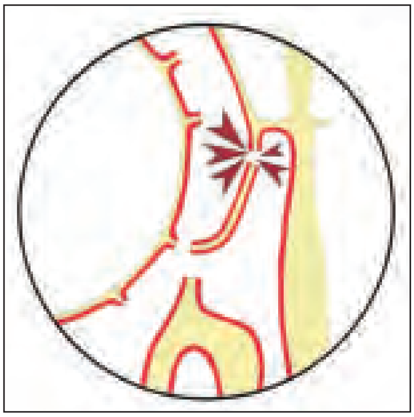


Fig. 24
Fractures of the middle turbinate should strictly be avoided, to prevent lateralisation and ensuing formation of scars and stenosis.

Postoperative Care

In patients who underwent frontal recess/sinus revisions, careful endoscopic postoperative care is of utmost importance. Usually 8–12 days postoperatively we start to aspirate wound secretions and instrumentally remove crust under direct endoscopic vision, using 45° telescopes for these manipulations. No new trauma should be produced during this procedure. The duration of follow-up varies depending on the findings and the underlying disease. Usually this first endoscopic control gives a good impression on whether or not a problem case is at hands requiring frequent follow-ups at short intervals, or whether the patient needs to be followed up at intervals of 4–5 weeks only. Depending on initial underlying pathology, normalisation/stabilisation can be expected after 6 weeks to 6 months.

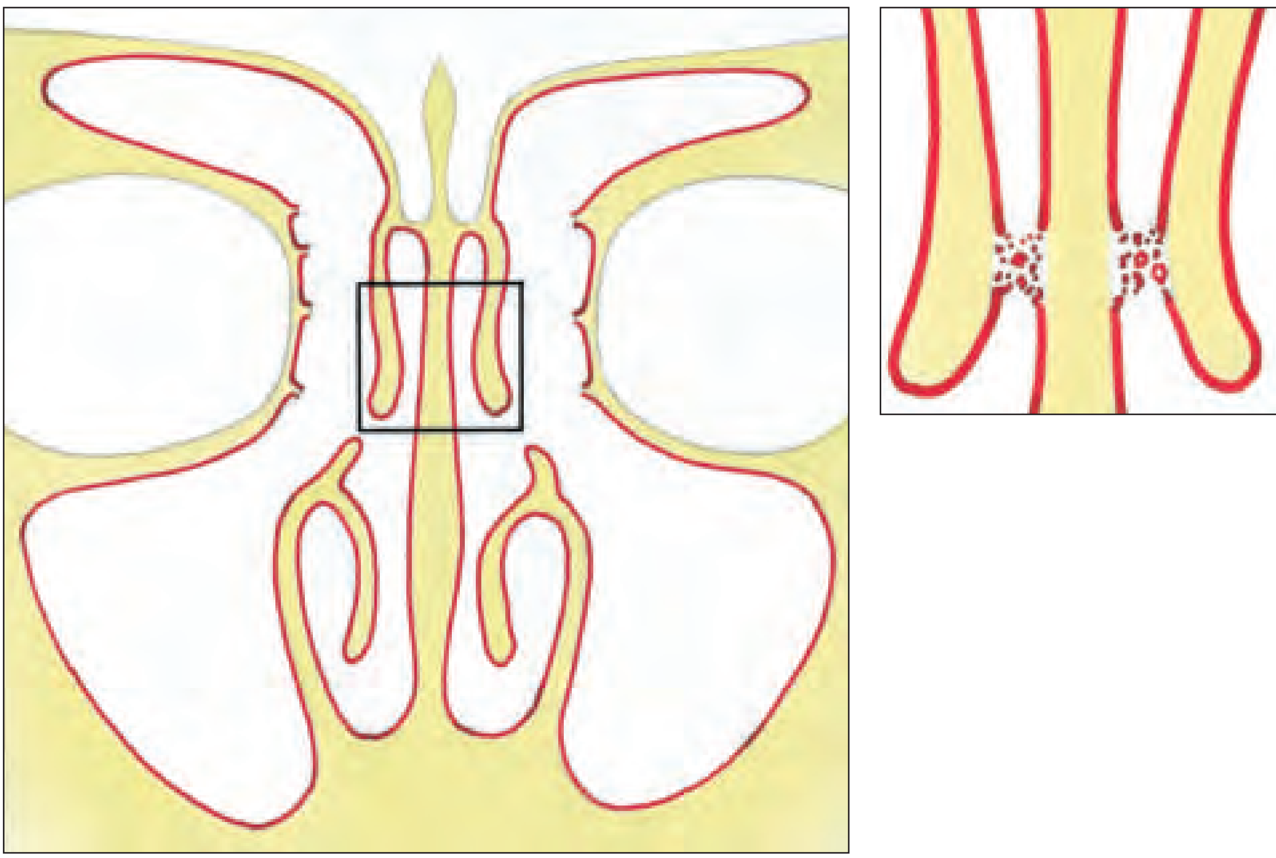


Fig. 25
If a middle turbinate insertion is fractured by accident, it can be stabilised as follows:
Small areas of opposing mucosal surfaces are scarified, inducing circumscribed adhesions.
These scars can – but do not have to – be separated again several weeks later
(following W. Bolger).

Fig. 26
Schematic drawing of the endonasal endoscopic route “around the corner” (yellow broken line) to the frontal sinus, modifying Halle’s depiction from 1906.

Telescopes and Instruments

Fig. 27 demonstrates the features and advantages of the KARL STORZ 45° telescopes: Despite the significant angulation a straight forward view along the shaft axis is yet possible.

This allows to avoid contact with and lesions of mucosa of the septum, the turbinate and other structures and is a definite advantage over the 70° lenses. Compared to the 30° lenses, the new 45° endoscopes significantly enhance the capability for “looking around the corner”. This is a prerequisite for surgical procedures in the difficult topography of the frontal recess and sinus. The surgeon not only has to look **“around the corner”**, but the instruments have to reach **“around the corner”** as well. Endoscope and instrument are inserted almost parallel to the nasal dorsum under (i.e. lateral to) the middle turbinate. From here, the working and viewing direction changes towards superiorly and anteriorly, i.e. in a retrograde fashion when approaching the frontal sinus through the frontal recess. In patients with pronounced supraorbital bulging, this angulation can be almost 90°. Instruments developed for endoscopic surgery of the frontal recess and sinus are designed for this respect. Inserting them through the nostrils requires some training and dexterity, as the tips of the instruments must be guided in an arch to be inserted under the middle turbinate and then retrogradely up and anteriorly. It is especially during these moves that the less experienced (and sometimes: less patient) surgeon finds it difficult to proceed without occasional lesions of the mucosa. Consequent training is mandatory therefore.

Like the 30° telescopes, the 45° telescopes from KARL STORZ are available in two versions: A standard version and one with lateral light cable connection (**Fig. 27**). This latter version offers the following additional advantage: Sometimes the eyepiece of the endoscope must be significantly lowered to allow view towards the frontal sinus ostium. In these cases, the light cable may interfere with the chin of the patient and/or the intubation gear. This interference is largely avoided when using the endoscope with lateral light cable connection. Thus the eyepiece can be lowered an additional 10 centimetres, resulting in an important gain of view towards far anteriorly located frontal sinus ostia.

Fig. 27
The two KARL STORZ HOPKINS® 45° telescopes.

For the same reason upbiting Blakesley forceps have been designed with a horizontal handle (**Fig. 28**). This results in a better angulation during the initial work in the frontal recess.

The delicate "giraffe" forceps are used to remove the delicate bony lamellae ("cap of the egg") from the frontal recess: Frontally oriented segments are grasped with the forward-backward opening forceps, longitudinally oriented bone segments with the laterally (left-right) opening one. If there is need to remove thicker bony segments, through-cutting forceps (**Figs. 29**) are used. Of all the instruments mentioned, we only use the smaller size (size 1) to avoid trauma to the mucosa by trying to insert large instrument tips.

Several years ago we developed the circular cutting punch to resect horizontally oriented thin bony lamellae if required. If we have to enlarge the frontal sinus ostium proper, we almost exlusively do this with circular cutting forceps. The advantage is evident: Cutting and thus removal of bone is possible in all directions (360°), without any need to rotate the shaft or handle of the instrument. Interference with the endoscope thus is minimised.

Fig. 29 a
"Giraffe Neck" Forceps.

Fig. 29 b
Through-cutting BLAKESLEY Nasal Forceps.

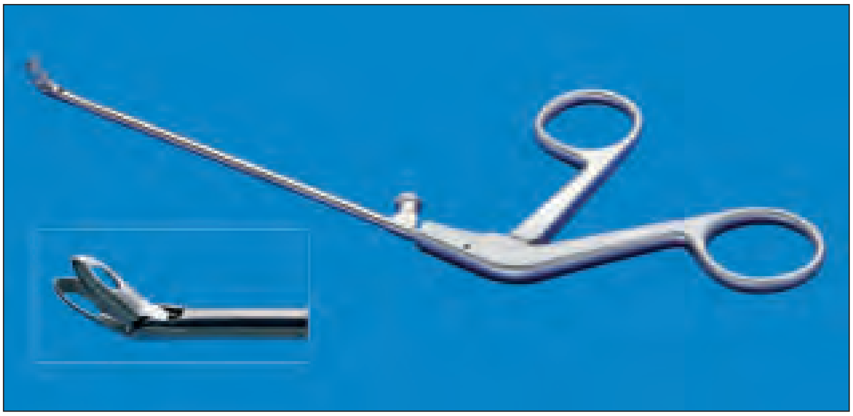


Fig. 28
45° upturned BLAKESLEY-STAMMBERGER Nasal Forceps with handle in right horizontal position.

Fig. 30
Detail of upturned Circular Cutting Punches.


Fig. 1


Fig. 2

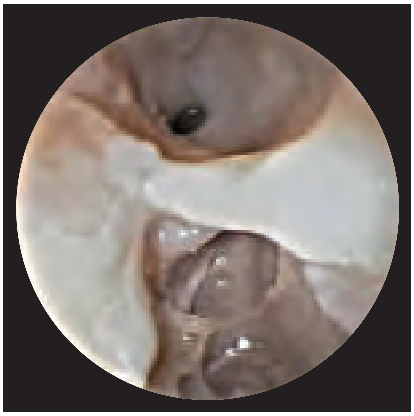


Fig. 3

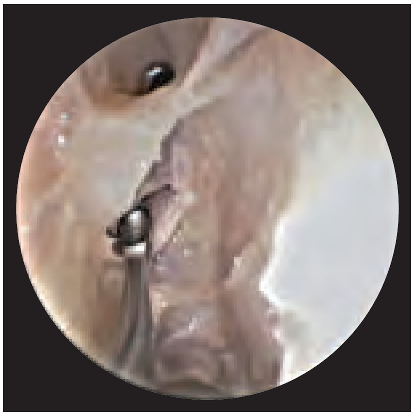


Fig. 4


Fig. 5


Fig. 6

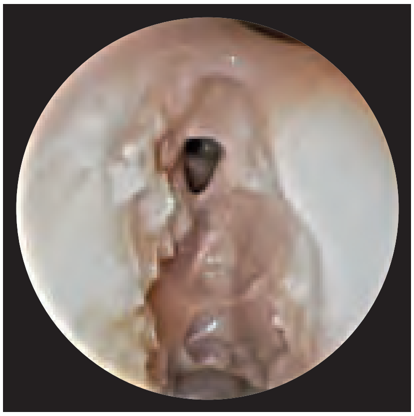


Fig. 7


Fig. 8


Fig. 9

Sequential Digital Photographs Demonstrating some of the Surgical Steps on an Anatomical Specimen with Simple Topography (right side).

Fig. 1: View on the right middle nasal meatus with a **30° telescope.** An anterior and posterior ethmoidectomy have been performed, whereas all of the parietal mucosa was preserved (!). Superior remnants of the bulla lamella have remained, the frontal sinus ostium cannot be visualised.

Fig. 2: The same situation seen through the 45° telescope: Clearly, anterior to the bulla lamella the frontal recess can be visualised, narrowing upwards towards the frontal sinus ostium. The **45° telescope** is advanced into the middle nasal meatus right under the bulla lamella (**Fig. 3**). Clearly, the skull base posterior to the bulla lamella and, at the same time, the frontal sinus ostium high up in the frontal recess become visible. With a curved curette (**Fig. 4**) the remaining parts of the bulla lamella are carefully pushed anteriorly and the skull base behind the lamella becomes visible (**Fig. 5**). Here, the oblique course of the anterior ethmoidal artery can be identified. With an upbiting Blakesley, remnants of the bulla lamella are removed without resection of the parietal mucosal lining (**Fig. 6**). Now, the frontal sinus ostium can be better visualised (**Fig. 7**) and it becomes evident that it was narrowed from dorsally by the bulla lamella. When the latter is removed further, the frontal sinus ostium can be enlarged posteriorly without any problems (**Fig. 8**). If required, in a "real" patient the frontal sinus ostium proper can be enlarged now with an upcurved circular cutting punch **without any need to remove thicker bone areas** (**Figs. 9–11**). A wide access to the frontal sinus ostium results, with the mucosal layer more or less completely intact. There is no region in the frontal recess, where bone is not covered by mucosa. With the 45° telescope not only the roof of the frontal sinus with its small subseptations can be identified, but even the anterior wall (!) be visualised. This demonstrates that a type-II-drainage can be performed endoscopically, without any interference by the "nasal beak/internal superior nasal spine". If required, manipulations inside the frontal sinus proper can be performed through such enlarged access.

The endoscopic technique reaches its limitations however, when attempting to remove ethmoidal cells which have encroached extremely far into the frontal sinus, or when trying to approach extremly far laterally located processes.

The intraoperative sequences documented on the following pages are not intended to represent "ideal cases" but rather everyday unselected situations with all their smaller and larger problems, including diffuse intraoperative bleeding, and difficulty of anatomical orientation.

Fig. 10

Fig. 11

Fig. 12

Fig. 1

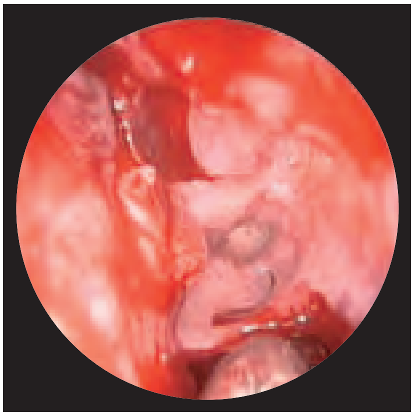


Fig. 2

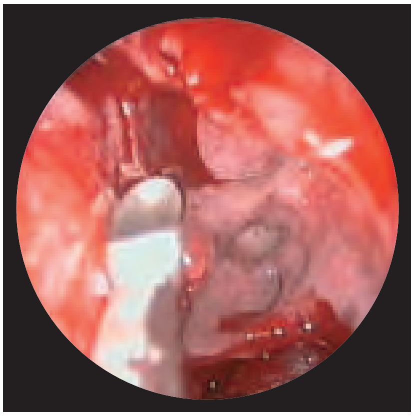


Fig. 3

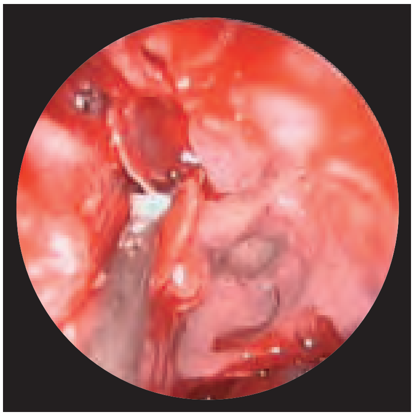


Fig. 4

Fig. 5

Fig. 6

Fig. 7

Case 1

Fig. 1: Typical intraoperative situation: Only the surgeon and the scrub nurse are required for endonasal endoscopic procedures (including tumors and other operations at the anterior skull base). No assistant is necessary. The surgeon can control the position of his endoscopic picture via the smaller monitor, the larger monitor providing information for the scrub nurse, the anesthetists and residents/ registrars and/or visitors.

Fig. 2: Intraoperative situation on the left side: The 45° telescope has been introduced into the middle meatus lateral to the middle turbinate. View is up into the frontal recess. The uncinate process and bulla have been resected. The patient is suffering from massive chronic rhinosinusitis with polyposis (type IV). The frontal sinus ostium cannot be visualised yet. Looking for the “cap of the egg”, a curved curette is introduced and the medial free margin of the bony cap carefully palpated. After identification, the thin bony shell is carefully elevated off the middle turbinate (**Figs. 3, 4**). Clearly one can see now that all which needs to be removed is an eggshell thin bone cap with its bilateral mucosal layer, indeed. This “cap of the egg” is carefully pushed laterally now (**Fig. 5**) and removed with a thin giraffe forceps. This results in a first free view of the frontal sinus ostium (**Fig. 6**), and after aspiration of retained mucus a more or less normal mucosa inside the frontal sinus can be visualised.

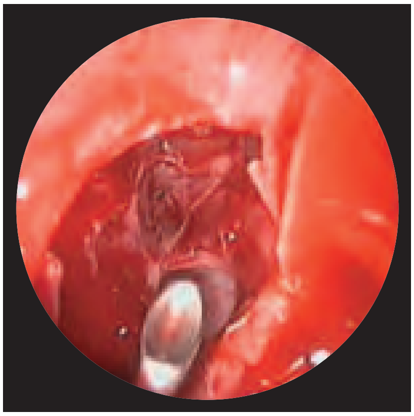


Fig. 1

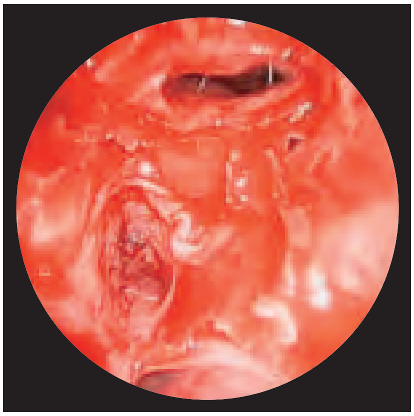


Fig. 2

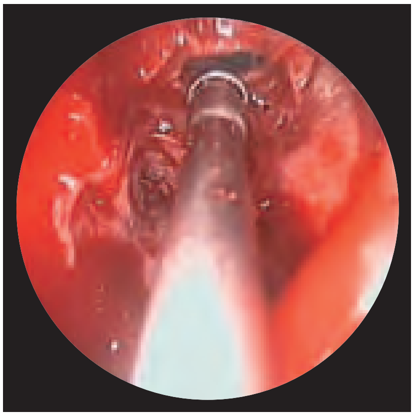


Fig. 3


Fig. 4

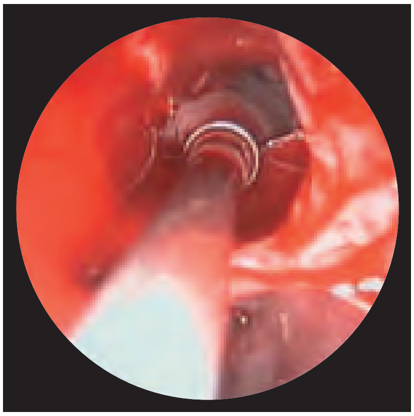


Fig. 5

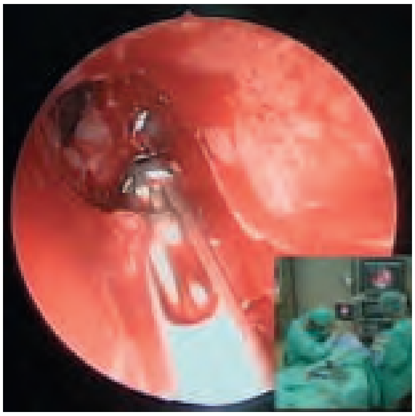


Fig. 6

Case 2

Right side of a patient: The 45° telescope has been introduced under the middle turbinate into the middle meatus behind the suspected "cap of the egg", blocking access to the frontal sinus ostium. The posterior portion of this bone cap has been identified and is gently elevated towards anteriorly (**Fig. 2**). This results in identification of the frontal sinus ostium proper. The latter now is enlarged with the upturned circular cutting forceps (**Fig. 3**), removing further fragments of the "eggshell" of this high reaching agger nasi cell. In **Fig. 4** the precision can be seen resulting from the use of the upcurved circular cutting punch. Now view into the frontal sinus proper is possible (**Fig. 5**). Some minor bony edges are carefully removed out of the frontal recess (**Fig. 6**), leaving the parietal mucosa to cover all of the bony walls. No packing is used in this region nor are stents applied. **Fig. 7** demonstrates the situation encountered at the first endoscopic control 10 days postoperatively, after removal of minor crusts and aspiration of wound secretions. It is time and again surprising to see the rapid recovery and healing following these atraumatic approaches to the frontal sinus. We believe, that preservation of the parietal mucosa and the avoidance of bone exposure contribute significantly to this phenomenon.

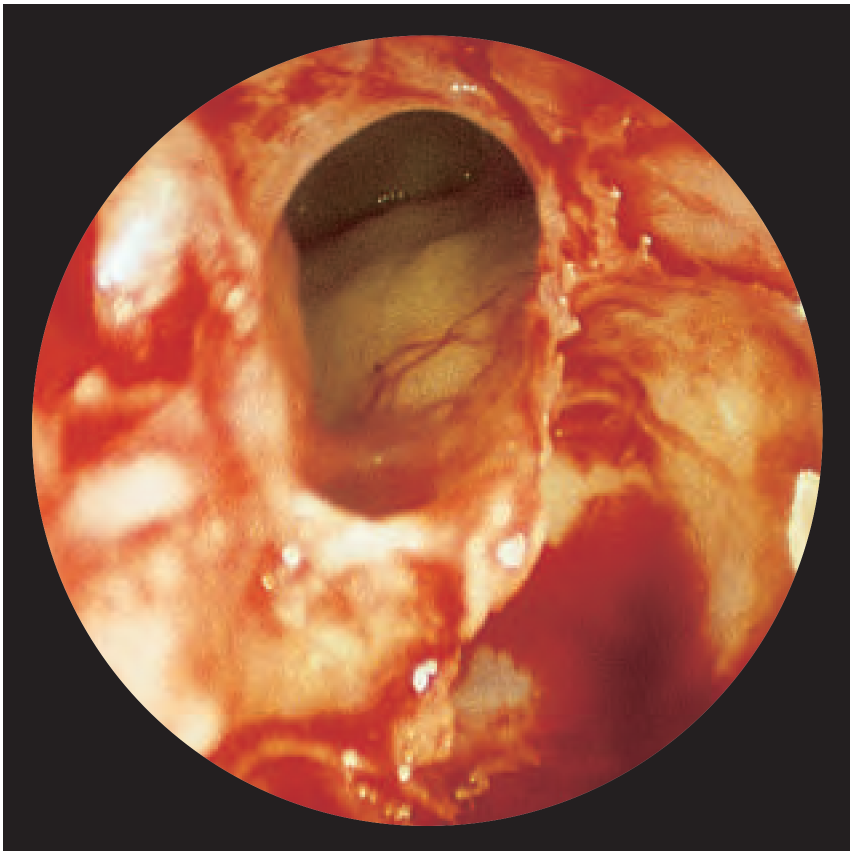


Fig. 7

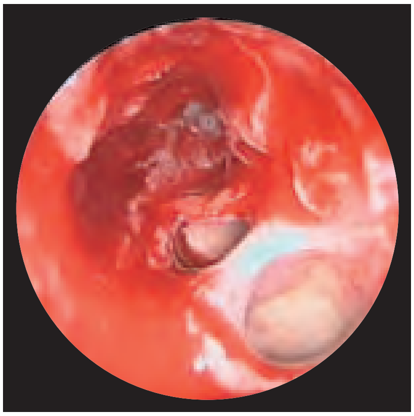


Fig. 1

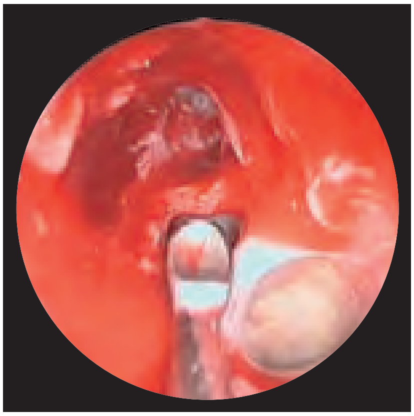


Fig. 2


Fig. 3

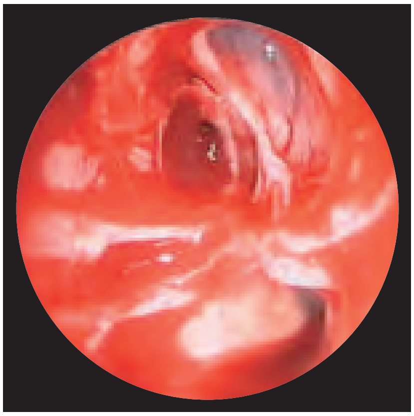


Fig. 4

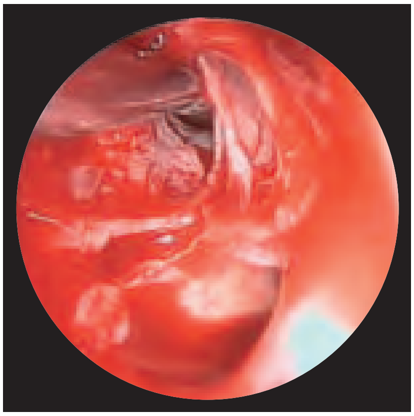


Fig. 5

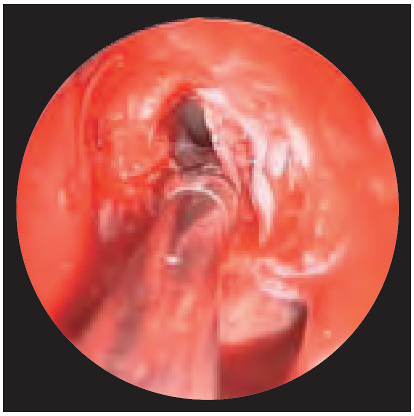


Fig. 6

Case 3

View into the frontal recess, left side, with the 45° endoscope. Clearly one can see the somewhat oblique course of the anterior ethmoidal artery, suspended in an approximately 5 mm long bony mesentery from the skull base. Anterior to the artery a small supraorbital cell can be identified. Anterior to that, a delicate bony "cap" blocks view and access to the frontal sinus. In **Fig. 2**, a curved spoon is carefully introduced between the supraorbital cell and the "bone cap" and the thin bony intersection removed. This does not yet open access to the frontal sinus, but one can recognise the small bony edge of the "cap of the egg" (**Fig. 3**). Further approach is between the latter and the middle turbinate, and the bony wall of this (agger nasi) cell is carefully pushed laterally, thus identifying the way to the frontal sinus ostium proper (**Fig. 4**). In **Fig. 5** one can see how prior to removal of the "egg cap" a malleable suction tube is introduced into the frontal sinus and the retained mucus is aspirated. Now the lumen of the frontal sinus can clearly be identified (**Fig. 6**). Thin remnants of the "egg cap" which had reached significantly into the lumen of the frontal sinus, are removed with a curved circular cutting punch (**Fig. 7**). This results in a free and well epithelialised passage between frontal sinus and recess (**Fig. 8**).

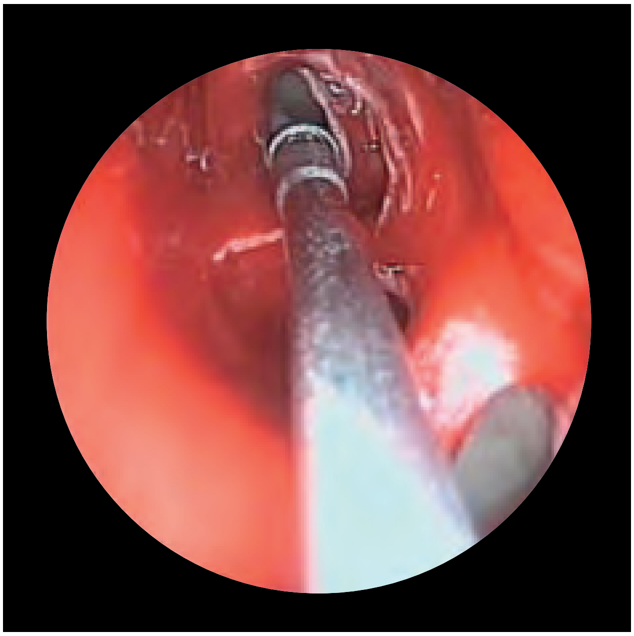


Fig. 7

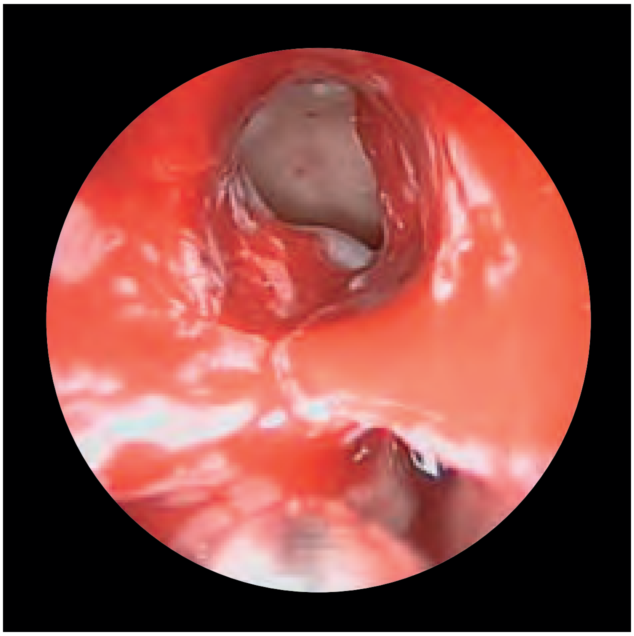


Fig. 8

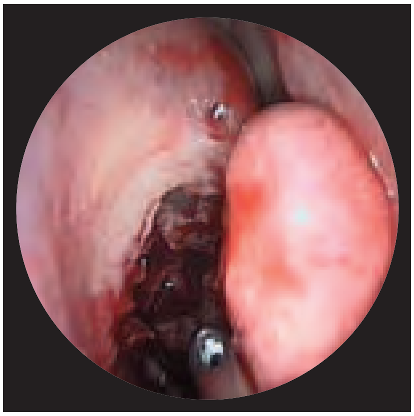


Fig. 1

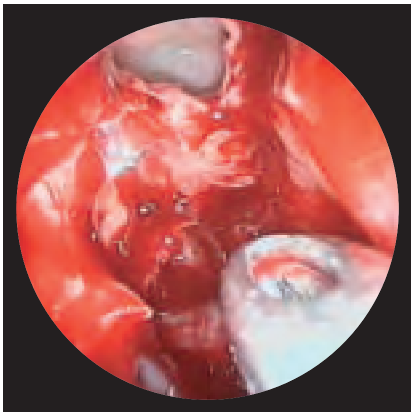


Fig. 2

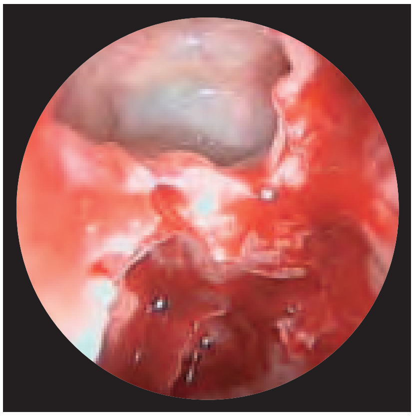


Fig. 3

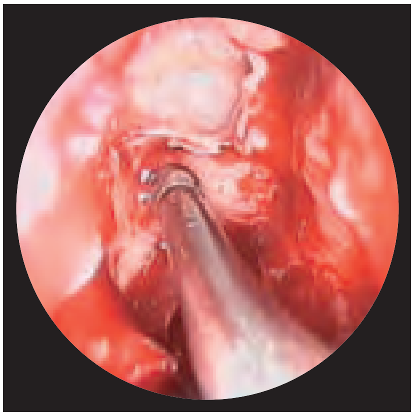


Fig. 4

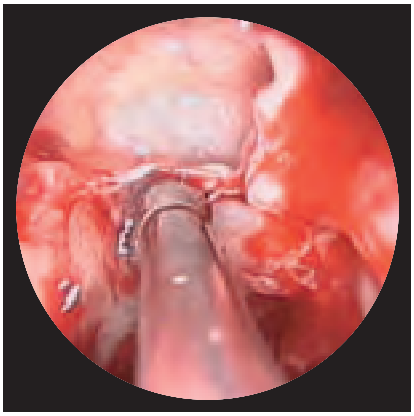


Fig. 5

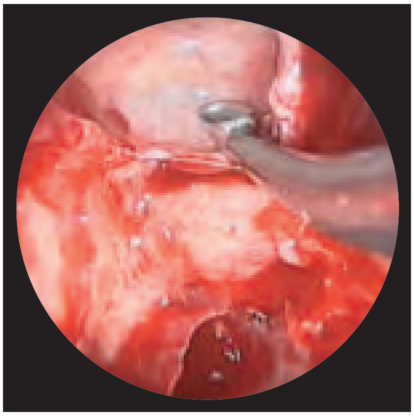


Fig. 6

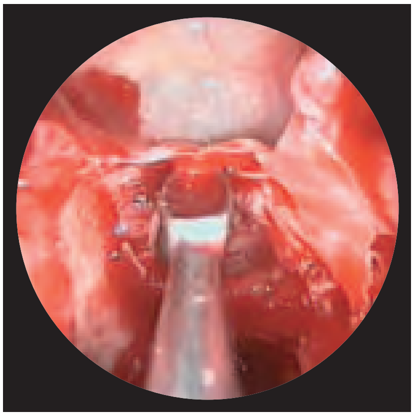


Fig. 7

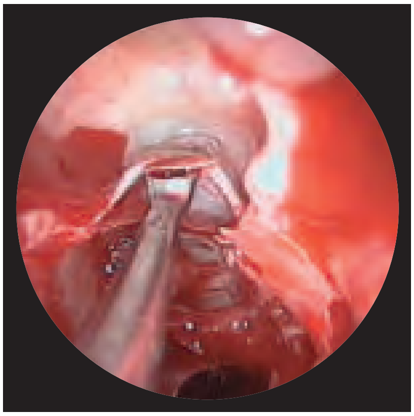


Fig. 8

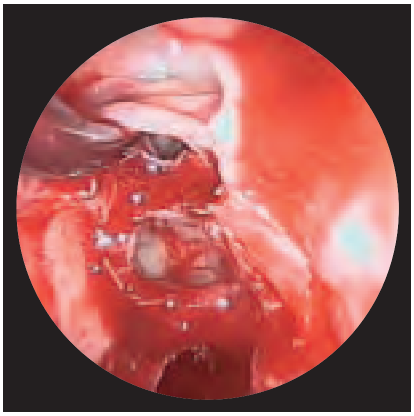


Fig. 9

Case 4

Same patient, right side: The anterior ethmoid has been cleared already, the middle turbinate is in situ and unharmed (**Fig.1**). When a 45° telescope is inserted lateral to the middle turbinate, view is possible into the frontal recess (**Fig. 2**) and onto the anterior skull base. The frontal sinus ostium itself cannot be identified however. At 12.00 o’clock clearly the dome-like roof of an anterior ethmoidal cell can be recognised, apparently reaching into the frontal sinus proper (**Figs. 2** and **3**). With a malleable suction tube the posterior circumference of this cell cap is further delineated (**Figs. 4** and **5**). In **Fig. 6** the curved curette points towards the cell cap which needs to be removed. Clearly, the posterior and medial margin of the latter can be identified. The cell cap together with its mucosa is carefully removed progressing from the back to the front (**Figs. 7** and **8**), and the frontal sinus ostium proper can now clearly be identified (**Figs. 9** and **10**). Remnants of the “cap of the egg” are carefully removed with the upcurved circular cutting punch (**Fig. 11**), resulting in a wide access to the frontal sinus proper (**Fig.12**).

It should be noted that the total opacification of this frontal sinus in the CT-scans was due to the retained mucus only, whereas the mucosa itself does not present with significant pathology. Findings like these further support our use of this surgical technique with its relative atraumatic approach.

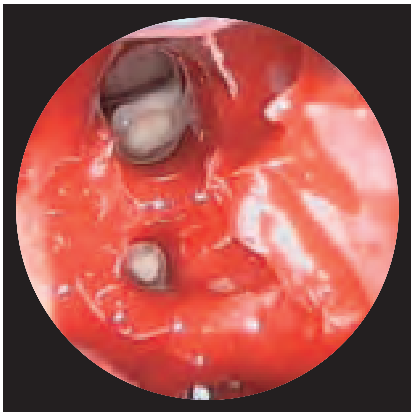


Fig. 10

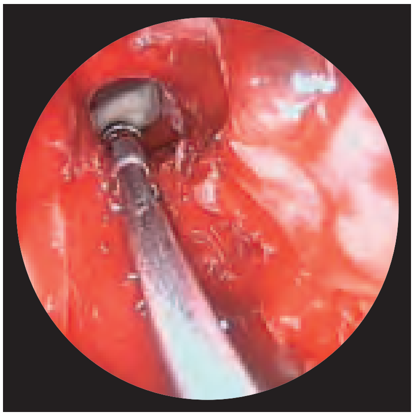


Fig. 11

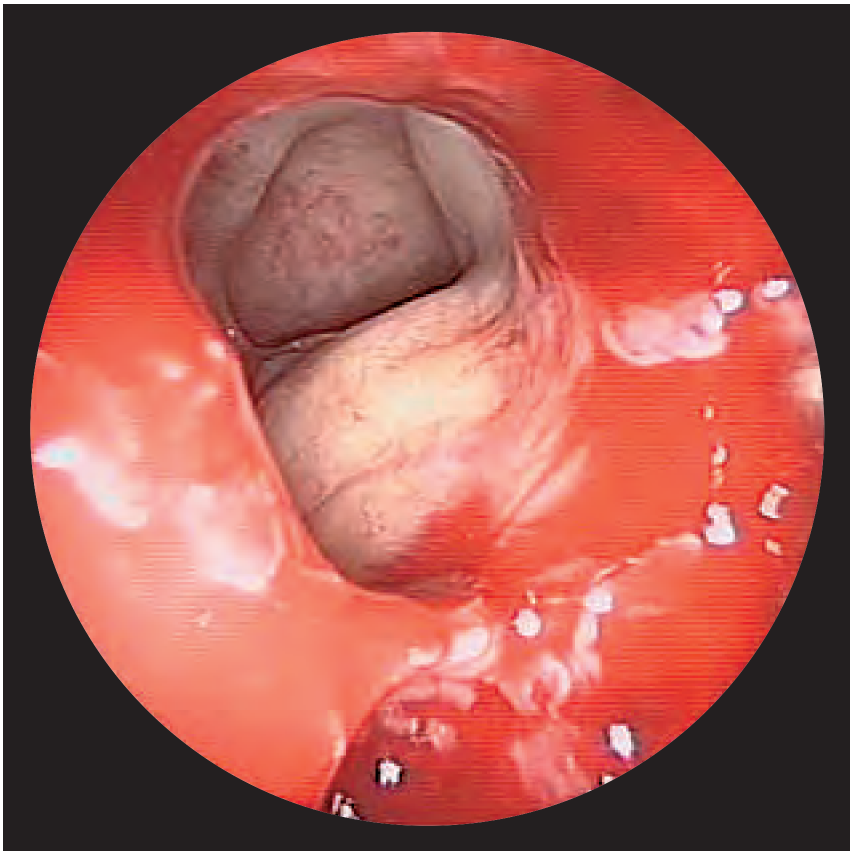


Fig. 12

Conclusion

The endoscopic techniques illustrated in this brochure have been used by us since many years. With these, we have managed to avoid radical endonasal surgery (as well as routine external procedures) by and large. With an average of 400 – 600 patients operated on per year at our department we had to use drill-out techniques in less than 2 per cent. This figure has remained constant over many years and includes revision cases as well. With this, we do not want to dispute the value of “drill-out” procedures. We strongly feel however, that they are required for special, well selected indications only. In the majority of cases one can (re-)establish the natural ventilation and drainage with significantly less radical approaches, following the anatomical “pathways”.

If surgery is performed using the microscope or 0° endoscopes only however, “view around the corner” and exposure of the frontal sinus ostium in many cases is not possible at all: Then, the “nasal beak” has to be drilled away – the natural anatomical access simply is not a straight one!

We feel that the KARL STORZ 45° telescopes are a significant development to further improve and enhance our possibilities of less traumatic, functional surgery of frontal sinus diseases, following the natural anatomical routes.

The KARL STORZ HOPKINS® 45° Telescopes

– Telescopes, Instruments, Units, Video Cameras and Accessories –

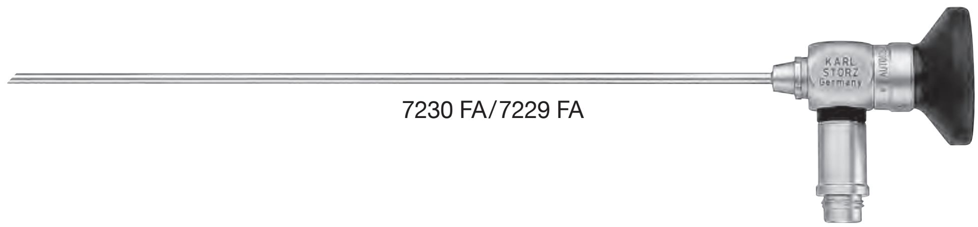
Extracts from the following Catalogs:

ENDOSCOPES AND INSTRUMENTS FOR ENT

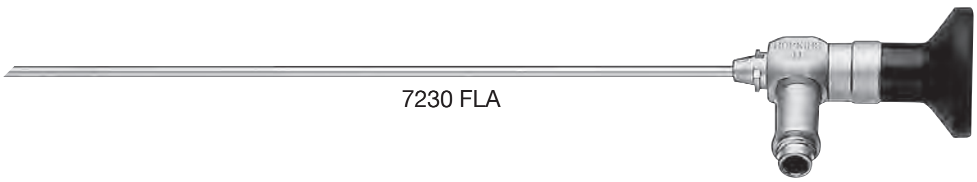
TELEPRESENCE, IMAGING SYSTEMS, DOCUMENTATION – ILLUMINATION

HOPKINS® Telescopes, 45° – autoclavable

diameter 4 mm and 2.7 mm



7230 FA/7229 FA



7230 FLA

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

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

7229 FA **HOPKINS® Forward-Oblique Telescope 45°,**
enlarged view, diameter 2.7 mm, length 18 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: black

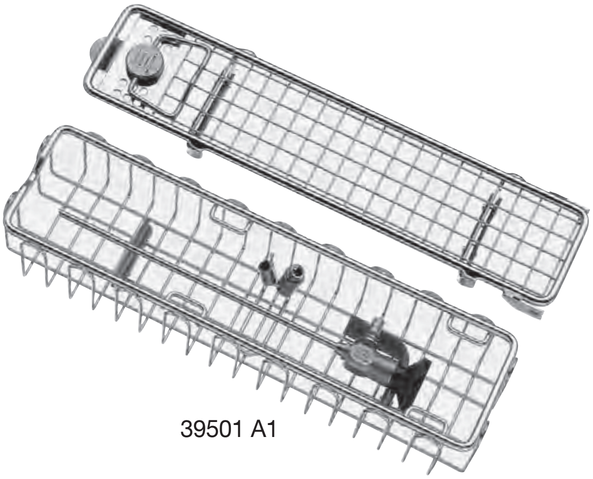
It is recommended to check the suitability of the product for the intended procedure prior to use.

Accessories

for use with HOPKINS® Telescopes

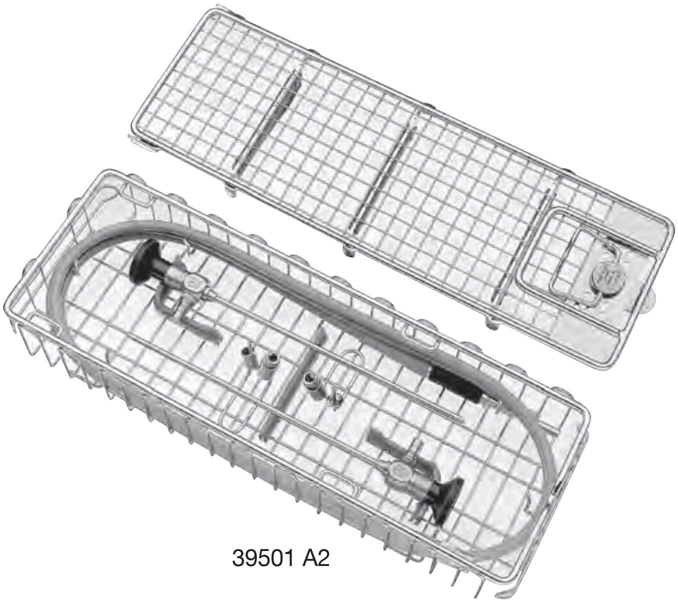
723772 STAMMBERGER **Telescope Handle,** round, standard model, length 11 cm, for use with HOPKINS® Telescopes 30° – 120° with diameter 4 mm and length 18 cm

723750 B **Protection Tube,** working length 19.7 cm, for use with HOPKINS® Telescopes with length 18 cm



39501 A1

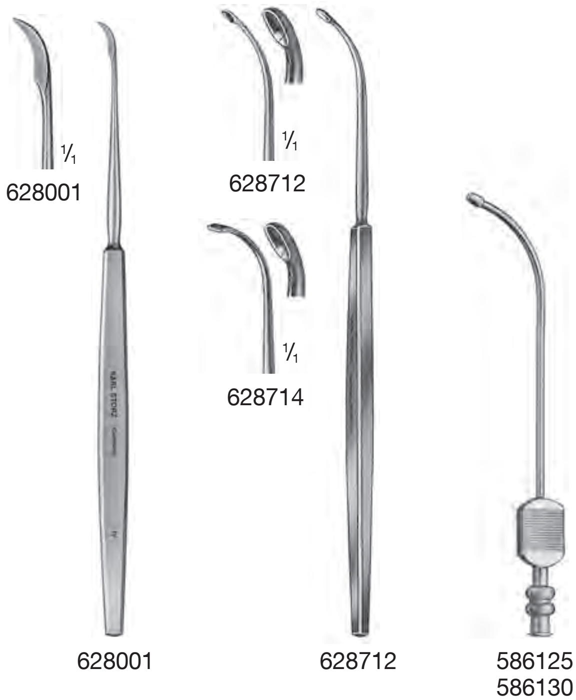
39501 A1 **Wire Tray for Cleaning, Sterilization and Storage** of one rigid endoscope, including holder for light post adaptors, silicone telescope holders and lid, external dimensions (w x d x h): 290 x 80 x 52 mm, for rigid endoscopes with up to 10 mm diameter and 20 cm working length



39501 A2

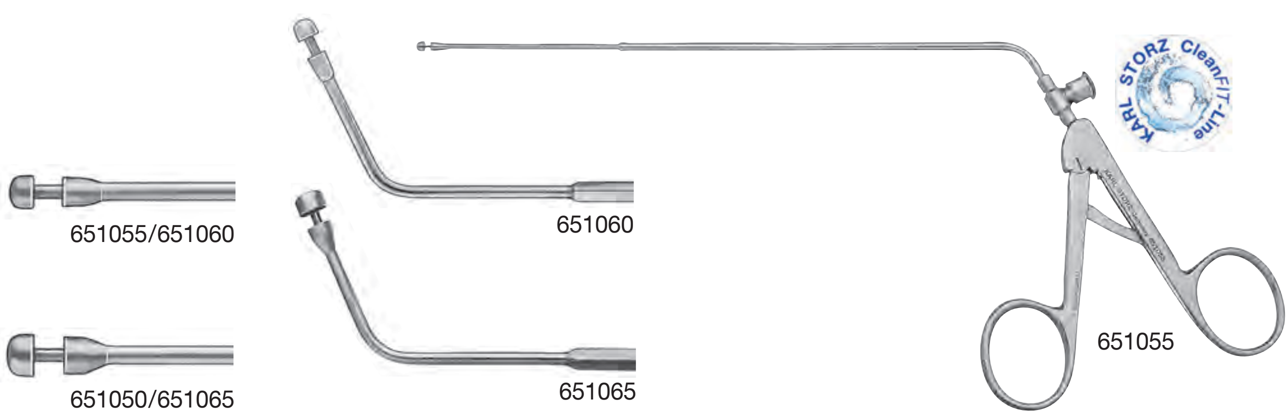
39501 A2 **Wire Tray for Cleaning, Sterilization and Storage** of two rigid endoscopes and one light cable, including holder for adaptors, silicone telescope holders and lid, external dimensions (w x d x h): 352 x 125 x 54 mm, for rigid endoscopes with up to diameter 10 mm and working length 20 cm

Sickle Knife, Frontal Sinus Curettes and Antrum Cannulas



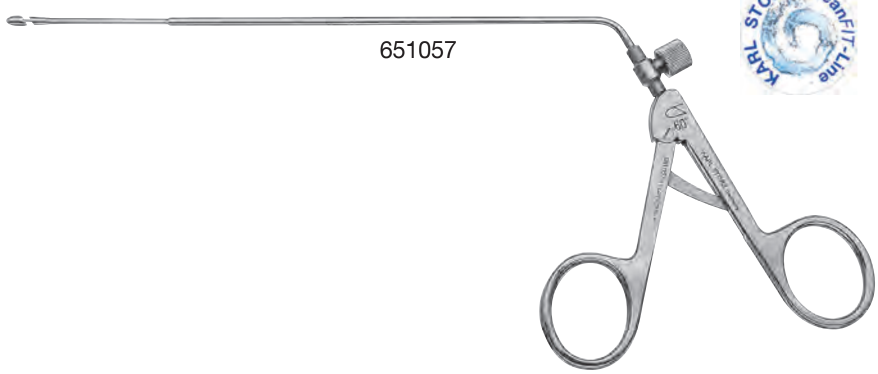
628001	**Sickle Knife,** pointed, length 19 cm
628712	KUHN-BOLGER **Frontal Sinus Curette,** 55° curved, oval, forward cutting, length 19 cm
628714	KUHN-BOLGER **Frontal Sinus Curette,** 90° curved, oval, forward cutting, length 19 cm
586125	v. EICKEN **Antrum Cannula,** LUER-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm
586130	v. EICKEN **Antrum Cannula,** LUER-Lock, long curved, malleable, serrated grip plate, outer diameter 3.0 mm, length 12.5 cm

Circular Cutting STAMMBERGER **Punches**



651050	STAMMBERGER **Punch,** circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 4.5 mm, with cleaning connector, 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, with cleaning connector, working length 17 cm
651065	**Same,** diameter 4.5 mm

Circular Cutting STAMMBERGER **Punches**



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°

651052 STAMMBERGER **Punch,** egg-shaped tip, circular cut, 60° cutting direction from distal above to proximal below, tip diameter 4.5 mm, straight sheath, for sphenoid, ethmoid and choanal atresia, with cleaning connector, working length 18 cm

651053 **Same,** circular cut, 120° cutting direction from distal below to proximal above, tip diameter 4.5 mm

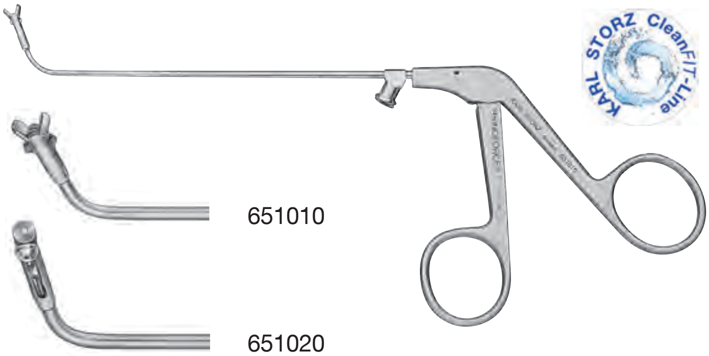
651061 STAMMBERGER **Punch,** egg-shaped tip, circular cut, 90° cutting direction, tip diameter 3.5 mm, sheath 65° upturned, for frontal sinus recess, with cleaning connector, working length 17 cm

651066 **Same,** tip diameter 4.5 mm

651050 R

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

STAMMBERGER **RHINOFORCE® II “Giraffe Neck” Forceps**



651010

651020

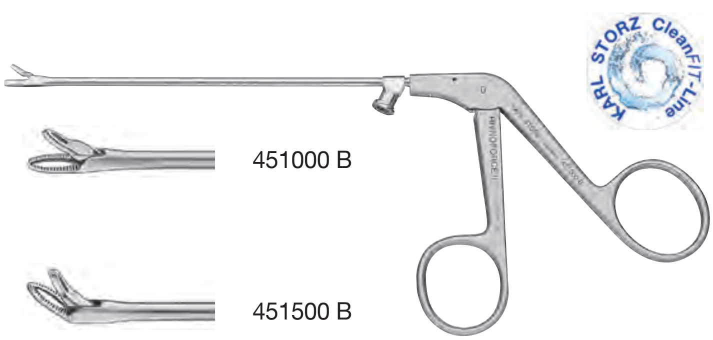
651010	STAMMBERGER **RHINOFORCE® II Forceps, cupped jaws,** vertical opening, 65° upturned, cupped jaws diameter 3 mm, with cleaning connector, working length 12 cm
651020	**Same,** horizontal opening

45° upturned BLAKESLEY-WILDE **RHINOFORCE® II Nasal Forceps**

456601 B

456601 B	BLAKESLEY-WILDE **RHINOFORCE® II Nasal Forceps,** 45° curved to right, size 1, with cleaning connector, working length 13 cm

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



451000 B

451500 B

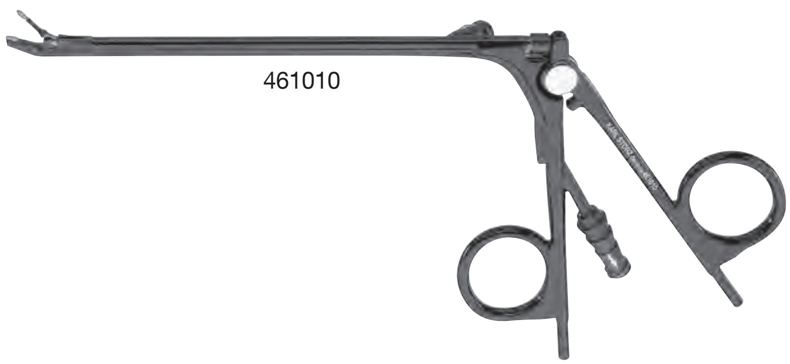
451000 B	GRÜNWALD-HENKE **RHINOFORCE® II Nasal Forceps,** straight, through-cutting, tissue-sparing, BLAKESLEY shape, size 0, width 3 mm, with cleaning connector, working length 13 cm
451500 B	**Same,** 45° upturned

STAMMBERGER **Bipolar Suction Forceps**

bipolar

Indications/Applications:

- **Arterial bleeding (ethmoidal, sphenopalatine and maxillary arteries, turbinate and septum vessels)**
- **Skull base surgery**
- **Oozing hemorrhage from the mucosa edges**
- **Pituitary gland surgery**
- **Vascular processes, i.e. nasopharyngeal fibroma**
- **Epistaxis**
- **Rendu-Osler-Weber disease**
- **Secondary hemorrhage, e.g., from the nasopharynx following adenotomy**
- **Edema prevention, shrinkage of mucosa (for example, posterior end of the turbinate)**
- **Turbinate cauterization**



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

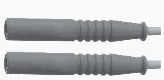
461015

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 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 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, 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, length 450 cm
		847002 A	**Bipolar High Frequency Cord,** with 2x 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, length 450 cm
		847002 V	**Bipolar High Frequency Cord,** for **KARL STORZ** AUTOCON® II system (112, 114, 116), Valleylab coagulator, with two 2 mm cable sockets for **KARL STORZ** Bipolar Suction Forceps 461010, 461015, length 450 cm

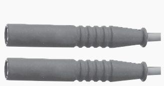
KARL STORZ Instruments	Standard Forceps Bipolar Cords		
		847002 U	**Bipolar Universal High Frequency Cord,** one side with two 2 mm cable sockets for **KARL STORZ** Bipolar Suction Forceps 461010, 461015, other side with standard pin for connection to all current bipolar cables, length 40 cm

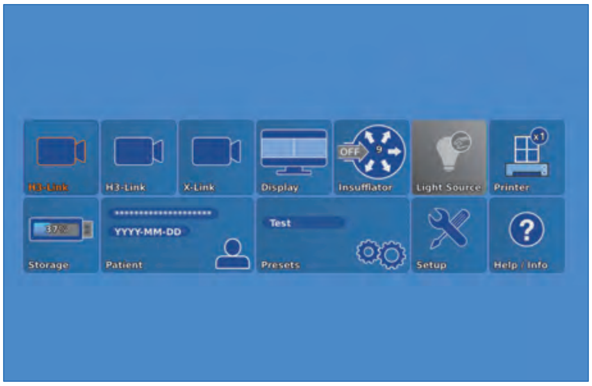
IMAGE1 S Camera System NEW

Economical and future-proof

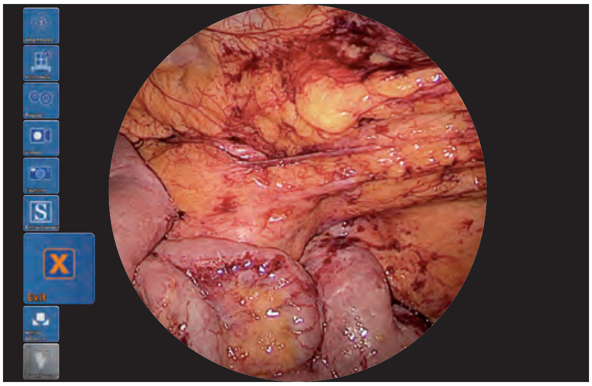
- **Modular concept for flexible, rigid and 3D endoscopy as well as new technologies**
- **Forward and backward compatibility with video endoscopes and FULL HD camera heads**
- **Sustainable investment**
- **Compatible with all light sources**

Innovative Design

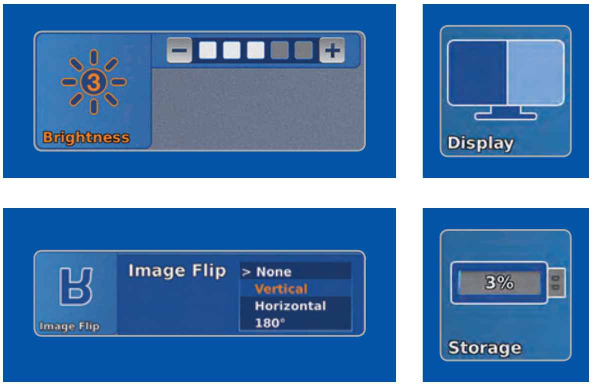
- **Dashboard: Complete overview with intuitive menu guidance**
- **Live menu: User-friendly and customizable**
- **Intelligent icons: Graphic representation changes when settings of connected devices or the entire system are adjusted**
- **Automatic light source control**
- **Side-by-side view: Parallel 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**



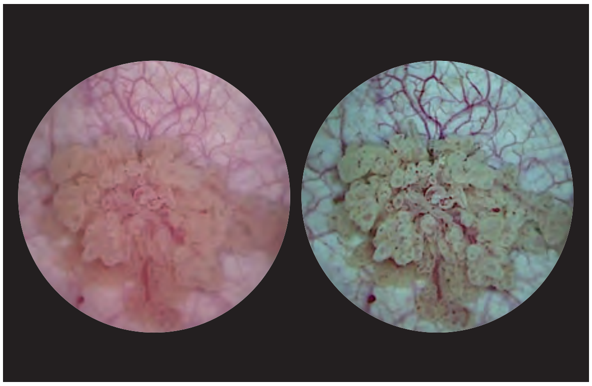
Dashboard



Live menu



Intelligent icons

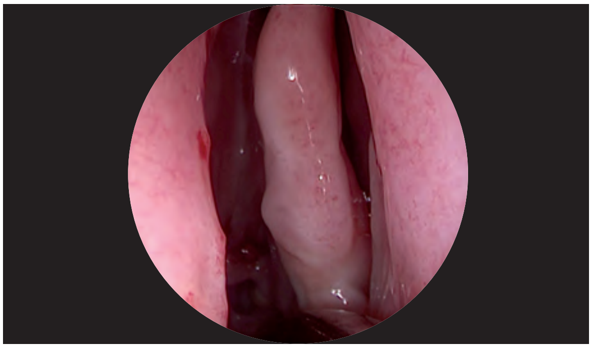


Side-by-side view: Parallel display of standard image and Visualization mode

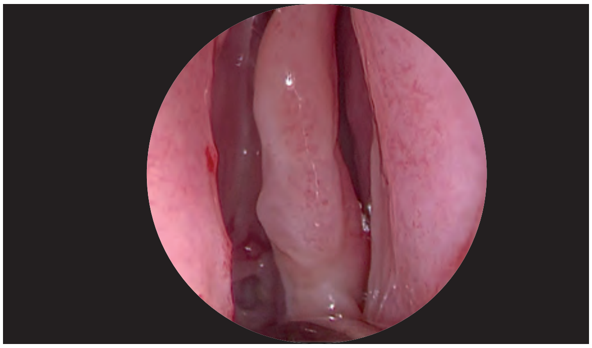
IMAGE1 S Camera System NEW

Brillant Imaging

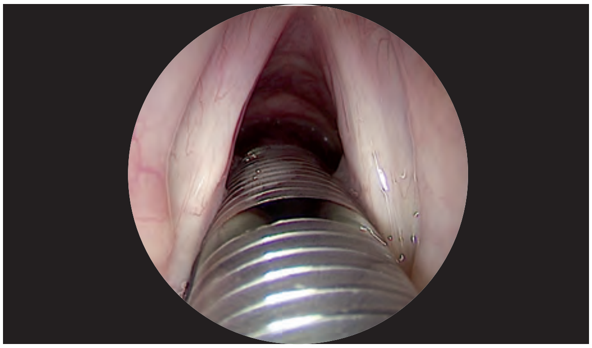
- **Clear and razor-sharp endoscopic images in FULL HD**
- **Natural color rendition**
- **Reflection is minimized**
- **Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting**



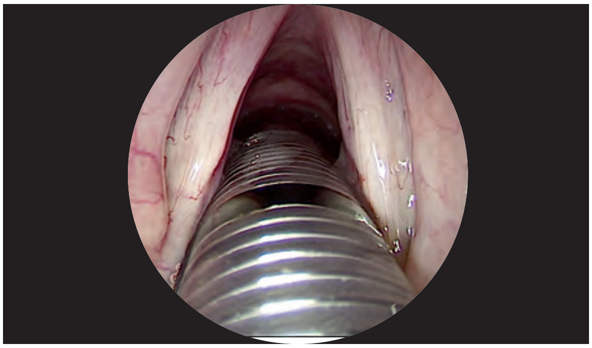
FULL HD image



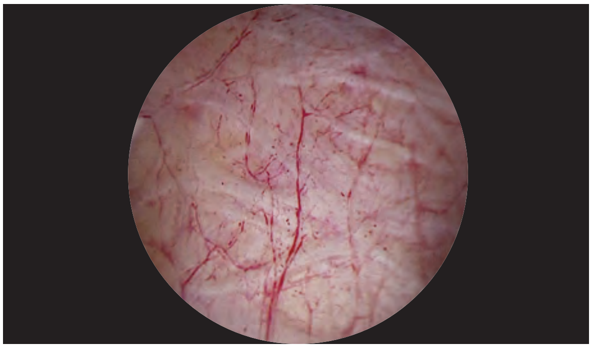
CLARA



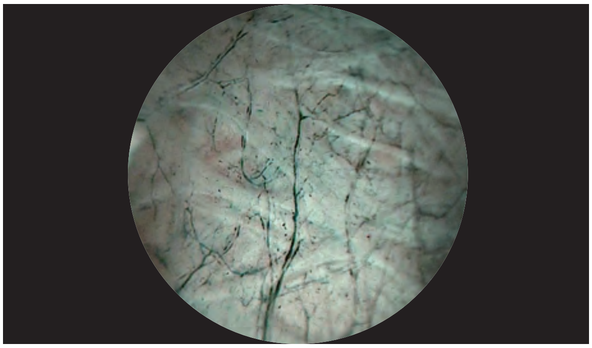
FULL HD image



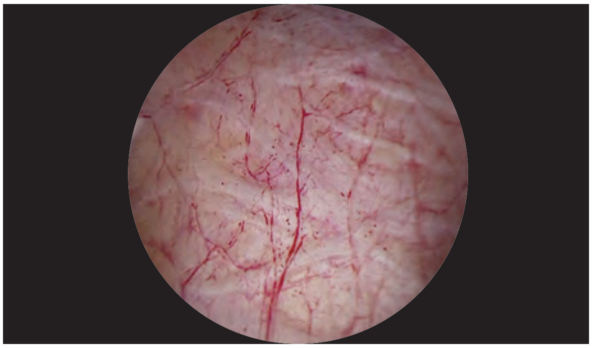
CHROMA



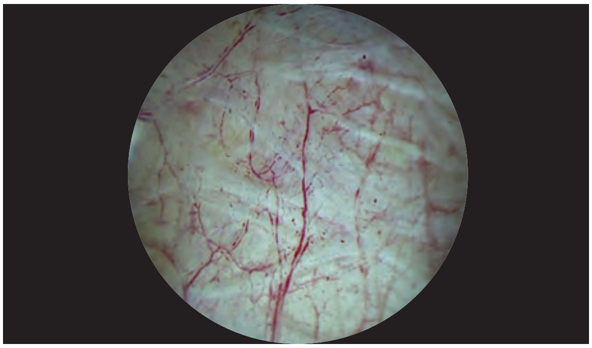
FULL HD image



*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

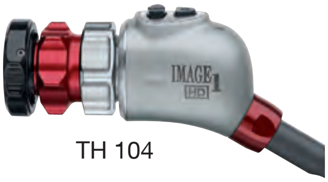
For use with IMAGE1 S Camera System
IMAGE1 S CONNECT Module TC 200EN, IMAGE1 S H3-LINK Module TC 300
and with all IMAGE1 HUB™ HD Camera Control Units

TH 100

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 1/3" CCD chip
Dimensions w x h x d	39 x 49 x 114 mm
Weight	270 g
Optical interface	integrated Parfocal Zoom Lens, f = 15–31 mm (2x)
Min. sensitivity	F 1.4/1.17 Lux
Grip mechanism	standard eyepiece adaptor
Cable	non-detachable
Cable length	300 cm



TH 104

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

Specifications:

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

Monitors

9619 NB

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

9826 NB

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

Monitors

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

Optional accessories:

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

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

Specifications:

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

Fiber Optic Light Cables
for Cold Light Fountains

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

495 NL **Same,** size 3.5 mm, length 180 cm

Cold Light Fountain XENON 300 SCB

20133101-1 **Cold Light Fountain XENON 300 SCB**
with built-in antifog air-pump, and integrated
KARL STORZ Communication Bus System SCB
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
Mains Cord
SCB Connecting Cord, length 100 cm

20133027 **Spare Lamp Module XENON**
with heat sink, 300 watt, 15 volt

20133028 **XENON Spare Lamp,** only,
300 watt, 15 volt

Cold Light Fountain XENON NOVA® 300

20134001 **Cold Light Fountain XENON NOVA® 300,**
power supply:
100–125 VCA/220–240 VAC, 50/60 Hz
including:
Mains Cord

20133028 **XENON Spare Lamp,** only,
300 watt, 15 volt

20200032 **KARL STORZ Special Beamsplitter,**
for use with Endovision TRICAM® and
TELECAM®, for simultaneous viewing
by endoscope and monitor screen

The camera head connector is 120° deflected
and can instantly be swiveled to the desired
position.

Data Management and Documentation

KARL STORZ AIDA® – Exceptional documentation

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

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

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

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

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

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

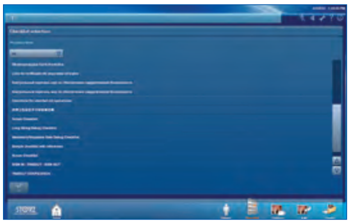
including:
USB Silicone Keyboard, with touchpad
ACC Connecting Cable
DVI Connecting Cable, length 200 cm
HDMI-DVI Cable, length 200 cm
Mains Cord, length 300 cm

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

Workflow-oriented use

Patient

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

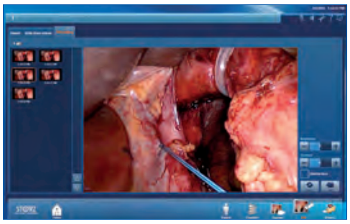


Checklist

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

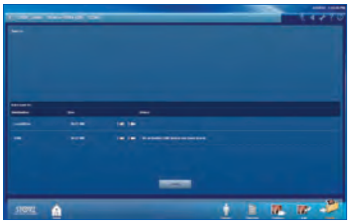
Record

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



Edit

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



Complete

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

Reference

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

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:

with the compliments of

KARL STORZ — ENDOSKOPE