ENDOSCOPIC DISSECTION
OF THE NOSE
AND PARANASAL SINUSES

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Endoscopic Dissection of the Nose and Paranasal Sinuses

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# Table of Content

1.0 Introduction ........................................ 4

2.0 Anatomy of the paranasal sinuses ................. 5
   2.1 The lateral nasal wall ........................... 5
   2.2 The ostiomeatal complex ....................... 6
   2.3 The middle turbinate ........................... 7
   2.4 The anterior ethmoidal sinuses ................. 8
   2.5 The posterior ethmoidal air cells .......... 9

3.0 Patient Assessment and Diagnostic Endoscopy .... 10
   3.1 History ........................................ 10
   3.2 Out-patient endoscopy ......................... 11

4.0 Patient selection for Endoscopic Sinus Surgery ... 14
   4.1 Aims of Patient Selection ....................... 14
   4.2 Assessment Process ............................. 15
   4.3 History ........................................ 15
   4.4 Examination .................................... 15
   4.5 Pre-operative Work-up .......................... 16
   4.6 The Ideal Case and the Nightmare Case .......... 17
   4.7 The Ideal Case .................................. 17
   4.8 The Nightmare Case ............................ 17

5.0 Anaesthesia for Endoscopic Sinus Surgery ....... 18
   5.1 The Phases of the L.A. Technique ............... 18

6.0 Principles Endoscopic Surgical Technique ....... 20
   6.1 Check List for Assessing CT Scans of the Sinuses ......................... 20

7.0 TUTORIAL I: Endoscopy Care and Instrument Handling - Preparation of the Specimen .............. 22
   7.1 Positioning and Instrument Handling .......... 22

8.0 TUTORIAL II: Nasendoscopy and Sinoscopy ........ 23
   8.1 Nasendoscopy .................................. 23
   8.2 The Nasal Floor and Inferior Meatus .......... 23
   8.3 The Middle Meatus, Infundibulum, Olfactory Cleft, Sphenethmoidal Recess and Nasopharynx .......... 23
   8.4 Maxillary Sinus Endoscopy ..................... 23
   8.5 Canine fossa Antroscopy ....................... 23
   8.6 Inferior meatus Antroscopy ................... 24

9.0 TUTORIAL III: Infundibulotomy and Anterior Ethmoidectomy ........................................ 24
   9.1 Infundibulotomy ................................ 24
   9.2 Bulla Excision ................................ 24

10.0 TUTORIAL IV: Middle meatal Antrostomy .......... 24

11.0 TUTORIAL V: The Ground Lamella and posterior ethmoid ...................... 26
   11.1 The Posterior Ethmoid .......................... 26

12.0 TUTORIAL VI: The Frontal Recess .................. 27
   12.1 Frontal Recess Surgery Type II ............... 28
   12.2 Frontal Sinus Endoscopy and Trephination .. 28
   12.3 Frontal Recess Surgery Type III ............... 29
   12.4 Median Frontal Sinusotomy-frontal Recess Surgery Type IV .............. 29

13.0 TUTORIAL VII: The Sphenoidal Sinus/Optic Nerve/Internal Carotid Artery/Pituitary .......... 29
   13.1 Trans-ethmoidal Approach to the Sphenoid Sinus .................. 29
   13.2 Trans-nasal Approach .......................... 30

14.0 TUTORIAL VIII: Optional Advanced Procedures .......... 30
   14.1 Endoscopic Approach to the Sphenopalatine Artery .......... 30
   14.2 Endoscopic DCR ................................ 31
   14.3 Endoscopic Orbital decompression (For Malignant Exophthalmos) .......... 31

15.0 Acknowledgments .................................. 31

Endoscopes and Instruments for Endoscopic Dissection of the Nose and Paranasal Sinuses .......... 32
1.0 Introduction

Training in endoscopic sinus surgery (ESS) poses a number of challenges. Supervised live operating is invaluable but presumes a basic skills competence on the part of the trainee, and a trainer with sufficient expertise to both monitor, and teach. Our philosophy has always been that ESS skills training or the lack of it, should not be a significant risk factor in patient outcome. For this reason this manual promotes the practice of regular cadaver dissection based skills training, and the need for in depth understanding of peri-operative assessment before live operating begins.

The text that follows is a distillation of our combined experience over the past decade in teaching minimal access sinus surgery to trainees in the U.K. It should act as a useful guide for surgical technique and the case selection process. The techniques described follow closely the teachings of the modern masters of endoscopic sinus surgery, including Stammberger, Kennedy and Kuhn, and to a lesser extent those of Wigand and Draf.
2.0 Anatomy of the Paranasal Sinuses

The nose and paranasal sinuses can be considered a series of corridors and rooms. The first corridor to enter is the nasal cavity.

2.1 The Lateral Nasal Wall

The main entrance corridor to the paranasal sinuses is between the middle turbinate and the lateral nasal wall. The lateral nasal wall facing the middle turbinate is composed of a number of structures. Anteriorly there is the dense bone of the frontal process of the maxilla, which always creates hard work for the surgeon who wishes to pass through this bone en route to the lacrimal sac. Posterior to the frontal process of the maxilla is the thin lacrimal bone in the superior part of the wall of the meatus. The lacrimal bone overlies the lacrimal sac. Inferior to the lacrimal bone is the lacrimal process of the inferior turbinate through which the nasolacrimal duct runs to exit approximately 1 cm behind and below the anterior end of the inferior turbinate.

The agger nasi is a smooth aerated bony swelling in the frontal process of the maxilla that overlies the lacrimal bone. The pneumatization of the agger nasi is variable and while its bony wall is usually thick in places it may be thin like an eggshell. The agger nasi can be an irritating source of recurrent nasal polyps if this area is not carefully inspected at the time of surgery. Agger nasi cells can make access to the lacrimal sac to create a dacrocystorhinostomy difficult. Agger nasi cells, usually, have to be cleared prior to a formal exploration of the frontal recess. The agger nasi, frontal recess, and nasolacrimal duct all lie in a similar coronal plane. An axial configuration of the lateral nasal wall is shown in Fig. 1.

The area posterior to the lacrimal bone and the lacrimal process of the inferior turbinate is composed of mucoperiosteum and is often deficient of bone. This area is called the anterior fontanelle and sometimes it contains an accessory ostium, which opens into the maxillary sinus. Posterior to the fontanelle is the uncinate process. One can ballot the uncinate process with a Freer elevator and identify the junction of attachment of the uncinate process Fig. 2.

Fig. 1
This line drawing shows an axial diagram of the lateral nasal wall.

Fig. 2
The uncinate process can be seen in this illustration within the middle meatus.
If the middle meatus allows easy access then one can identify a space between the posterior margin of the uncinate and the anterior wall of the ethmoid bulla. This space is called the hiatus semilunaris. Posterior to the hiatus semilunaris a part of the medial wall of the maxillary sinus is composed of mucoperiosteum and is called the posterior fontanelle. This area may contain an accessory ostium and it is through such an ostium that an antrochoanal olyp may protrude (see Fig. 13, page 12).

2.2 The ostiomeatal complex

The ostiomeatal complex is a collective term encompassing the maxillary sinus ostia, the ethmoidal infundibulum, the hiatus semilunaris, the middle meatus, the frontal recess, the uncinate process and the ethmoidal bulla. The ostiomeatal complex is the common muco-ciliary clearance pathway of the maxillary, frontal and anterior ethmoid sinuses.

The uncinate process forms the door into the maxillary sinus. This thin bony leaf has a superior origin, which may arise from the lamina papyracea, the lacrimal bone, the skull base or even on rare occasions from the lateral surface of the middle turbinate. This is shown in Fig. 3.

From its superior attachment the uncinate process sweeps down in a postero-inferior direction curving more posteriorly in its lower portion. Inferiorly the uncinate articulates with the ethmoid process of the inferior turbinate and the perpendicular plate of the palatine bone. The uncinate process forms the medial wall of the infundibulum and its posterior margin forms the anterior boundary of the hiatus semilunaris.

The ethmoidal infundibulum is a short corridor leading toward the maxillary sinus into which the anterior ethmoidal, frontal and maxillary sinuses drain. The uncinate process forms the medial wall of this three-dimensional space while the lamina papyracea sometimes with contributions from the frontal process of the maxilla and the lacrimal bone forms the lateral wall. Depending on the antero-superior insertion of the uncinate process the frontal recess may open into the middle meatus or into the infundibulum. In Fig. 4 the uncinate process has been removed to open the infundibulum and in this dissection the frontal recess drains into the infundibulum.

Posterior to the infundibulum lies the ethmoid bulla, which again is reasonably well illustrated in Fig. 4. The infundibulum can be very compressed in patients with sinus disease by mucosal swelling or by

Fig. 3
This line drawing shows the variable superior insertions of the uncinate process.

Fig. 4
The uncinate process has been removed and this illustration shows the frontal recess and the front wall of the ethmoidal bulla.
anatomical abnormalities of the middle turbinate such as a paradoxically bent middle turbinate or concha bullosa. In this situation the uncinate can be almost adherent to the lamina papyracea and for these reasons the orbit can be at risk even during “simple uncinectomy” for sinus disease.

The maxillary sinus ostium is in the postero-inferior portion of the infundibulum. It is important to realise that cannulation of the natural ostium is not a lateral movement but an infero-lateral movement hooking over the superior margin of the inferior turbinate. One should make every effort to see the maxillary ostium before cannulation. Blind cannulation in a lateral direction is a good way to push your instrument into the orbit! The uncinate process curves away postero-inferiorly and a common problem is that at uncinectomy a postero-inferior triangular remnant of uncinate remains which can obscure the natural maxillary ostium. If you cannot find the natural ostium look carefully at the superior margin of the inferior turbinate and also look for the obstructing tail of uncinate.

The frontal recess may open into the ethmoid infundibulum or into the middle meatus depending on the superior insertion of the uncinate process. This fact can often be identified on the coronal CT scan. The more common situation is for the frontal recess to be placed lateral to the uncinate process. The frontal recess can be narrowed by a prominent ethmoid bulla or prominent agger nasi cells.

2.3 The middle turbinate

The middle turbinate forms the medial wall of the middle meatus and is an integral part of the ethmoid bone. Often when the nasal septum is deviated to the opposite side of the nose the middle turbinate will “expand” to fill the space of the open nasal cavity. An air filled anterior middle turbinate is known as a concha bullosa. A concha bullosa can (but not inevitably) produce obstruction to the frontal recess and the ethmoidal infundibulum. The anterior end of the middle turbinate can be large and bulky without being filled with air. A cleft middle turbinate is not uncommon. The middle turbinate on the side of a nasal cavity that has been narrowed by a septal deviation is often very thin. A paradoxically bent middle turbinate has a concavity directed medially, with the convexity of the middle turbinate curving into the lateral nasal wall and thus narrowing the middle meatus.

The anterior part of the middle turbinate lies in a paramedian sagittal plane. The vertical lamella of the middle turbinate inserts into the skull base at the lateral border of the cribiform plate and is covered medially by olfactory epithelium. Clumsy dissection of this medial lamella due to the insertion into the skull base can create a cerebrospinal fistula.

Posteriorly the lamella of the middle turbinate curves laterally from the sagittal to the coronal plane rotating to insert into the lamina papyracea. This structure is known as the basal or ground lamella. The overall shape of the middle turbinate is like a cupped hand with the wrist as the anterior end of the middle turbinate, the thumb inserts into the cribiform plate, the fingers form the basal lamella and the tips of the finger insert into the lamina papyracea, Fig. 5.

The basal lamella separates the anterior from the posterior ethmoidal air cells. Air cells located anterior to the basal lamella have their ostia located in the anterior ethmoid whereas all of the posterior ethmoidal air cells have their ostia located in the superior meatus.
2.4 The Anterior Ethmoidal Sinuses

The ethmoidal bulla is the largest room of the ethmoidal sinuses and it can be seen through the corridor between the middle turbinate and the lateral nasal wall. An opening into the ethmoidal bulla is made at its most medial and inferior point and then the anterior wall of the bulla can be safely removed. Pneumatisation of the bulla is variable but division of the septa will usually create a large space. The lateral wall of the bulla is usually the lamina papyracea. Occasionally there is an airspace extending lateral to the ethmoidal bulla into the orbital floor. This air space is called a Haller cell and can be identified on the pre-operative CT scan of the sinuses. An unidentified Haller cell can be a persistent source of infection, can encroach and narrow the maxillary ostium and can be opened using “a middle meatal antrostomy” having been mistaken for the maxillary sinus.

A breach of the orbital wall will result in orbital fat prolapsing into the ethmoid. This problem can be demonstrated by gentle pressure on the eye while observing the movement of the fat endoscopically. This is preferable to removal of the fat to check whether it floats!

The medial roof of the ethmoid is a dangerous area. This part of the roof of the ethmoid is formed by the lateral lamella of the cribriform plate and is the thinnest part of the bone between the ethmoidal labyrinth and the brain. The bone in this area can be absent or as thin as 0.05 mm. Surgical instruments should not be rotated in a supero-medial direction within the ethmoid nor should tissue be removed from this area unless absolutely essential, as this may create a cerebrospinal fluid leak. The relative risk of the creation of a CSF leak is partly dependent on the configuration of the cribriform plate. The more the cribriform plate dips into the ethmoid the greater the risk. The configuration of the cribriform plate can be seen on the preliminary CT scan with line examples shown in Fig. 6.

On the roof of the anterior ethmoid crossing from lateral to medial is the anterior ethmoidal artery in approximately 80% of cases (Fig. 7). The anterior ethmoidal artery can run directly in a bony channel or can be suspended from a mesentery. Rarely this artery can be divided at surgery and retract into the orbit producing an expanding orbital haematoma.
The endoscopic surgeon should have a plan to deal with this emergency. Such a plan may involve a lateral canthotomy or an urgent external ethmoidectomy approach and removal of the lamina papyracea to decompress the expanding haematoma.

2.5 The Posterior Ethmoidal Air Cells

The ground lamella separates the anterior from the posterior ethmoidal air cells. The lateral sinus or retro-bullar recess is an air cell that can separate the ethmoid bulla from the ground lamella and may cause the surgeon to think that the basal lamella has been penetrated when it has not. As the name would suggest the lateral sinus when present overlies the junction of the basal lamella and the lamina papyracea and can run forwards along the orbital wall. This is shown in Fig. 1, see page 5.

Penetration of the ground lamella should always be at the most medial and inferior point. The bony lamella is then resected laterally opening into the posterior ethmoidal air cells. This is dangerous territory. There is frequently a prominence on the supero-lateral wall of the posterior ethmoidal air cell that is formed by the optic nerve. Occasionally the optic nerve does not just form the prominence on the lateral wall of the posterior ethmoid cell but runs through the posterior ethmoid cell. This configuration must be identified on the axial CT scan. Fig. 8 shows an exposed optic nerve.

Fig. 8
An exposed optic nerve is visible through an opening in the wall of the posterior ethmoid air cells (Not a normal operative step!).

The Sphenoid Sinus

The sphenoid sinus ostium is located in the sphenoethmoidal recess.

Inside the sphenoid sinus it is important to remember that an intersinus septum may be attached to the optic canal or carotid artery with potential serious injury if the septa are not removed with sharp and accurate punch forceps. Surrounding the lateral, posterior and superior walls of the sphenoid sinus are the important structures of the cavernous sinus and contents, the internal carotid artery, the pituitary fossa and the brain.
3.0 Patient Assessment and Diagnostic Endoscopy

3.1 History

The most important aspect of patient assessment is the taking of a careful history. The most useful diagnostic information gained is often from the patient’s symptoms. This is especially so when assessing recurrent acute conditions such as recurrent sinusitis or other conditions presenting with facial pain. The vast majority of patients attending a rhinology clinic present with a benign inflammatory condition giving rise to quality of life impairment. Patient symptoms, therefore, also constitute a vital outcome measure for the sinus surgeon. Standardised symptom score assessments (Table 1) provide an extremely useful outcome measure which along with CT staging systems and endoscopic appearance scores, form the mainstay of assessment of the degree of impairment and the value of intervention.

Table 1:
ICSD symptom scores used to assess nasal impairment.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Symptom score – visual analogue scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. facial pain or pressure</td>
<td>0 = none …… 10 = extreme</td>
</tr>
<tr>
<td>2. headache</td>
<td>0 = none …… 10 = extreme</td>
</tr>
<tr>
<td>3. nasal blockage or congestion</td>
<td>0 = none …… 10 = extreme</td>
</tr>
<tr>
<td>4. nasal discharge</td>
<td>0 = none …… 10 = extreme</td>
</tr>
<tr>
<td>5. disturbance of smell</td>
<td>0 = none …… 10 = extreme</td>
</tr>
<tr>
<td>6. overall discomfort</td>
<td>0 = none …… 10 = extreme</td>
</tr>
<tr>
<td>Total points</td>
<td>Score out of 60</td>
</tr>
</tbody>
</table>

Fig. 9
Mucus being suctioned from the left hiatus semi-lunaris, with ethmoidal bulla behind and uncinate process laterally.
3.2 Out-patient Endoscopy (Figs. 9 – 17)

A standard ENT examination followed by nasendoscopy form the basis of the initial diagnostic assessment. Nasendoscopy is more comfortable for the patient either lying supine on an examination couch or reclined in a dental chair (Fig. 10 + 11). The nasal mucosa is first carefully prepared using topical local anaesthetic in combination with vasoconstrictor solution. Our preference is to use Co-phenylcaine Forte® spray 5 puffs carefully directed into each nasal cavity. Narrow gauge telescopes (3mm Ø, KARL STORZ 7209 BA or 2.7 mm Ø, 7208 AA) are better tolerated by the patient and offer a better chance of visualising the narrow recesses of the nasal cavity than the larger 4mm diameter telescopes used in the operating theatre.

The main “work-horse” telescopes in our clinics have a 30° angulation. These offer the best compromise of straight ahead and angled viewing, but ideally a selection of telescopes with different angulations including 70° and 0° will facilitate the most thorough examination.

The initial steps include:
- Camera orientation
  - focus
  - light balance
    (Video-nasendoscopy only)
- Lens defog
- Retract ala prior to telescope insertion
  (To prevent the telescope fogging)
- Assess the nasal valve

Proceed with nasendoscopy (The areas to be examined are outlined in table 2).

### Areas of the nasal cavity visualised at nasendoscopy

- Nasal valve
- All areas of the nasal septum
- Middle meatus and middle turbinate
- Inferior meatus and inferior turbinate
- Nasopharynx
- Olfactory cleft
- Sphenoidophthalmic recess
- Uncinate process and ethmoidal bulla

Table 2
Fig. 12
Initial view at nasendoscopy:
Narrow nasal cavity due to a right septal deviation. Nasendoscopy would first be performed on the opposite side.

Fig. 13
First pass through the right middle meatus reveals an antro-choanal polyp.

Fig. 14
The right spheno-ethmoidal recess:
There is a superior turbinate and the sphenoid ostium can be seen medial to it.

Fig. 15
The right superior turbinate, superior meatus and olfactory cleft.
Usually these areas can be visualised with three endoscope passes through each nasal cavity:

1. **First pass**
   - middle meatus → nasopharynx → sphenopalatine recess.

2. **Second pass**
   - inferior meatus, nasal floor and inferior septum

3. **Third pass**
   - olfactory cleft then → middle meatus with retraction → infundibulum

To gain patient confidence it is important to make the first pass of the telescope through the easiest side, e.g. the side opposite to a septal deviation. It is also important to leave the most uncomfortable part of the examination until last i.e. assessment of the infundibular area which often will require some light retraction on the middle turbinate. Bear in mind that in some patients with severe septal deviation or marked middle turbinate lateralisation a complete examination of all areas, in the clinic situation, will not be possible without causing considerable discomfort and is, therefore best avoided.

---

**Fig. 16**
Septal spur encountered during a pass through the inferior meatus.

**Fig. 17**
Endoscopy under the left middle turbinate reveals the ethmoidal bulla, uncinate process and hiatus semi-lunaris.
4.0 Patient Selection for Endoscopic Sinus Surgery

The techniques of modern endoscopic sinonasal surgery have enabled rhinological surgeons to obtain excellent results in the management of a group of conditions loosely referred to as rhinosinusitis. As with every surgical procedure, the best results can be obtained by operating only on those patients who stand a high chance of benefiting from the surgery. Many of the poor results observed with previous surgical approaches to nasal and paranasal disease were not necessarily the fault of the operation but a direct effect of incorrect application of the operation due to inadequate diagnostic work-up. It is important, therefore, to ensure that we select patients who are likely to benefit most from endoscopic sinus surgery and that the operation is not applied as a panacea for all rhinological ailments. This process of patient selection encompasses pre-operative assessment, diagnostic strategy, setting of aims and the process of orientation in which we explain the nature of the surgery and adjust expectations to those which are feasible and likely to be achieved.

4.1 Aims of Patient Selection

Whilst it is obvious that all surgical procedures must be preceded by a selection process, it is perhaps useful to discuss the reasons for such a process.

First and foremost, we are aiming to obtain maximum patient reported success following surgery. Thus maximum patient reported success should be the main outcome measure following any operation and can be thought of as the patient indicating resolution of the symptoms which led them to seek help. This may seem a rather new concept for some surgeons who have traditionally been taught to aim for technical success, but nothing is achieved if the surgeon is satisfied with a beautiful middle meatal antrostomy and the patient continues to complain of the nasal obstruction which led them to seek help in the first place.

An important part of outcome assessment or audit is the recording of patient reported benefit and there are a number of different ways this can be achieved, for example symptom scores (pre- and post-op) or general health or benefit inventories of which a number have been described.

Another important aim is maximum disease resolution, e.g. total abolition of polyp disease, absence of purulent discharge, a stable mucosa etc. The resolution of disease usually but not always corresponds with a high patient reported success but there can be significant mismatches between variables which have to be taken into account.

From the surgeon’s point of view, the principal aim is to avoid complications and adequate pre-operative assessment and selection of patients will go some way to ensuring this. It may come as a surprise but not all surgical complications are the surgeon’s fault! At one extreme, complications would seem to be more likely when operating on a haemophiliac patient with an asymmetric skull base and pansinusitis who had undergone several previous operations for recurrent polyposis. Complications would be correspondingly less likely during a unilateral anterior ethmoidectomy in a patient with a well-pneumatised ethmoid and limited ostiomeatal complex disease. Therefore, we should ensure that we set realistic aims, which take into account the disease process, its extent
and various other factors such as nasal anatomy and the patient’s general condition. The net effect of an adequate and thorough pre-operative assessment process is reflected in high patient satisfaction, disease resolution, low complication rate and a low surgical revision rate, all of which are highly desirable.

4.2 Assessment Process
The assessment process can be thought of in terms of the history, examination, endoscopy, the therapeutic trial, imaging and the pre-operative work-up.

4.3 History
The history is of paramount importance and will give 99% of the diagnostic information required for the patient’s management. The history should take detailed note of the patient’s symptoms and a symptom rank should be established with the patient’s number one symptom placed at the top, e.g. a patient with bilateral nasal polyps may complain predominantly of bilateral nasal obstruction followed by rhinorrhea and hyposmia. The aims of the operation, therefore, should be first of all to relieve the nasal obstruction, if possible, reduce the rhinorrhea and, hopefully, improve the hyposmia in that order. The recording of a symptom ranking prior to surgery is particularly useful in the audit process to prevent surgical delusion when the patient reports benefit in one area but not in the others, e.g. it would be unfair to consider it a good result if the above patient reported following surgery that their rhinorrhea had settled but they could still not breathe or smell anything. On the other hand, ability to breathe through the nose with persistent rhinorrhea and hyposmia could be thought of as a good result as the patient’s cardinal symptom had been addressed.

4.4 Examination
The examination follows standard techniques but must include endoscopy of the nose and, if possible, drainage pathways of the paranasal sinuses. The information obtained during nasal endoscopy should be recorded in the patient’s case sheet and again some form of logical assessment of the importance of each of the abnormalities should be noted. Only when the history and examination have been taken, and a diagnostic label attached (e.g. polyposis, acute sinusitis, recurrent sinusitis, frontal recess-stenosis etc.) can we then formulate a treatment strategy. An area of concern is the level of importance which we can attach to each of the symptoms that the patient reports. This is summed up in the question; how predictive are the patient’s symptoms of underlying pathology? Very often we encounter patients with a large number of symptoms and complaints who have absolutely no evidence of a disease process, either on endoscopy or imaging of the paranasal sinuses. More often, however, some symptoms and some disease co-exist but a causal relationship is not as obvious as it may seem. In the author’s practice, a list of so called hard symptoms (predictive of underlying pathology) and soft symptoms (often unrelated to underlying pathology) have proved a useful clinical tool. The hard and soft symptoms are shown in Table 3. These hard symptoms are often associated with underlying pathology, e.g. a patient presenting with unilateral nasal obstruction and facial pain will often be found to have disease on the ipsilateral nose and sinus complex. In the author’s experience, bilateral or generalised headache or catarrh as an isolated symptom seldom correlates with any evidence of underlying pathology, on examination or imaging. There are obviously exceptions to this but as a general rule, the hard symptoms should be seen as the symptoms, which make you, sit up and take notice during the consultation.

<table>
<thead>
<tr>
<th>Hard findings</th>
<th>Soft findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral</td>
<td>Bilateral/generalised</td>
</tr>
<tr>
<td>Pain</td>
<td>Headache</td>
</tr>
<tr>
<td>Pus</td>
<td>Catarrh</td>
</tr>
<tr>
<td>Hyposmia</td>
<td></td>
</tr>
<tr>
<td>Obstruction</td>
<td></td>
</tr>
</tbody>
</table>

Table 3
History
A similar approach can be applied to the endoscopic or examination findings. Once again, hard and soft findings can be defined and these are shown in Table 4. In general, if findings are unilateral and indeed ipsilateral to the patient’s symptoms then we can apply greater diagnostic importance to them. The presence of polyp is also a very robust finding suggestive of underlying disease. Much has been written in the past on mucosal contact pressure zones, the concha bullosa and abnormalities of the uncinate process. In general, however, these variants should be regarded as soft findings as there is little or no scientific evidence to support their importance in the aetiology of paranasal sinus disease.

### Table 4

<table>
<thead>
<tr>
<th>Hard findings</th>
<th>Soft findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral/Ipsilateral</td>
<td>MCPZ</td>
</tr>
<tr>
<td>Polyp</td>
<td>Concha Bullosa</td>
</tr>
<tr>
<td>Gross DNS</td>
<td>Uncinate Abnormality</td>
</tr>
<tr>
<td>Pus</td>
<td></td>
</tr>
</tbody>
</table>

**4.5 Pre-operative Work-up**

Once a diagnosis has been reached, a therapeutic trial of medical treatment is usually embarked upon and then only in non-responders is surgery considered. Before embarking on a surgical course of treatment, it is important to define the aims (what symptoms are being treated, what disease process is being addressed).

This should be agreed with the patient as a means of ensuring that there is no mismatch in the surgeon/patient expectation equation. Accurate documentation is important and, therefore, the findings of the history, examination, diagnosis, outcome of medical treatment and aims of operative surgery should be recorded in the patient’s record. This latter aspect is particularly important for subsequent audit exercises.

The patient should provide informed consent, this necessitates a detailed explanation of the aims of the operation, the operative techniques involved, the post-op. course and, in the current medico-legal climate, a discussion of the potential complications. This discussion of potential complications of endoscopic sinus surgery is something which many surgeons find difficult. Complications in sinus surgery are, or at least should be, extremely rare. However, there have been some high profile major complications and, in particular, orbital penetration and CSF leak are worthy of mention. It is the author’s practice to discuss these in detail with the patients and give the patients an estimate of the frequency of occurrence in similar cases. It is this issue of frequency of complications that underlines the importance of personal audit. There is no use quoting to the patient the risk of orbital penetration that you have learned from reading the literature when, in fact, you know that your personal series is somewhat poorer than the expert who wrote the paper! In the author’s department, a leaflet which details all of the above is given to the patient as part of the pre-operative assessment process. To date, no one has declined surgery following a discussion such as described above.
4.6 The Ideal Case and the Nightmare Case

Using the approach described above leads us to two rather extreme scenarios. One is the ideal case and the other the nightmare case. Obviously these are hypothetical cases, which do not really exist, but they are perhaps worth describing as a guide and as a distillation of what has been said before.

4.7 The Ideal Case

The ideal case would have hard symptoms, hard signs and a firm symptom rank and a high potentially attainable benefit using minimal and safe surgical techniques. An example would be the patient whose history consists of unilateral facial pain and unilateral rhinorrhea with endoscopic findings of ipsilateral middle meatus purulent discharge, middle meatus polyp and a deviated septum compressing the middle turbinate against the lateral nasal wall. This leads to the diagnosis of unilateral recurrent acute sinusitis, which improves a little on medical therapy but still gives trouble from time to time. CT scanning (once a decision to operate has been made) reveals ipsilateral ostiomeatal complex obstruction with opacification of the antrum, the anterior ethmoids and the infundibulum. An operation of unilateral uncinectomy, middle meatal antrostomy, resection of the bulla ethmoidalis with correction of the septal deformity is likely to produce good results in this ideal hypothetical case.

4.8 The Nightmare Case

In contrast to the ideal case, this patient has a constellation of soft signs and symptoms, has had a hit or miss approach to medical therapy and cannot be pinned down on a symptom rank preferring to answer in the affirmative to all of the questions in the history. Therefore, the history is likely to consist of generalised catarrh as the most prevalent symptom, bilateral, constant, generalised headaches which cannot be localised, endoscopy shows nothing abnormal (beware of being trapped into attributing importance to mucosal contact pressure zones etc) and, therefore, the diagnosis is as general as “sinusitis and headache”. The medical therapy can be summed up as tried everything, nothing worked and CT scanning shows some minor mucosal thickening with evidence of previous surgery as the patient has seen many different surgeons. In such a nightmare case, if the surgeon decides to proceed to operation, this would characteristically be described as a bilateral F.E.S.S. with no definite strategy of steps clearly defined in the surgeon’s mind. More often than not, the outcome in such a case is less than satisfactory. A dissatisfied patient will then either continue to complain of a host of symptoms or will seek the opinion of another surgeon and the cycle begins again.

Obviously the ideal and nightmare cases are extreme examples but they serve to illustrate the importance of defining your aims based on history and examination findings and trying to avoid being trapped into attributing diagnostic significance to normal variations in the presence of an overwhelmingly negative history from the patient. Sticking firmly to a structured approach to patient assessment will lead to a logical soundly based practice and will enable the surgeon to identify those patients who will benefit most from surgery.
5.0 Anaesthesia for Endoscopic Sinus Surgery

Anaesthesia for endoscopic sinus surgery can be divided into two main categories, General Anaesthetic or Local Anaesthetic. We will consider the case for local anaesthetic, as general anaesthetic is largely anaesthetist controlled and local anaesthetic allows the surgeon a degree of flexibility in the approach. At the present time, local anaesthetic for endoscopic sinus surgery is not routine in the United Kingdom. However, it is the author’s belief that local anaesthetic for endoscopic sinus surgery is a very useful and reliable technique which is currently under-used and, at the very least, offers a safe alternative to general anaesthetic. There is a large amount of medico-legal support for the local anaesthetic technique, which is due to a potentially lower complication rate. In fact, whilst this claim may not be supported by an analysis of the literature, it would seem that major complications such as blindness, especially bilateral blindness, are extremely unlikely to occur in a local anaesthetic case! The local anaesthetic technique allows a shorter recovery time and lends itself well to day-case work. A particular benefit of the local anaesthetic technique for endoscopic sinus surgery is the level of delicacy and finesse that is required of the operator’s technique and, as such, it can be seen as a good technique builder for inexperienced F.E.S.S. surgeons. Learning to avoid hurting the patient by avoiding coarse, grab and tear manoeuvres during F.E.S.S. is very worthwhile and will eventually lead to a precise operating technique, which reduces blood loss, and tissue damage whatever anaesthetic technique is used.

5.1 The Phases of the L.A. Technique

Local anaesthesia should be seen as a stepwise technique, which begins well before surgery during pre-operative work-up. Once the decision to operate has been made, the patient should have the nasal mucous membrane in as good a condition as is possibly achievable prior to surgery. This can often be achieved using topical or low dose systemic steroid and judicious use of antibiotic, as required. The next phase is the pre-operative decongestion of the mucous membrane and then the application of anaesthesia to both the surface of the mucous membrane and by local injection. Immediately prior to arrival in the operating theatre, the patient should have a solution of either Co-phenylcaine Forte® or Oxymetazoline sprayed into the nasal cavity. This ensures adequate decongestion before the process of topical anaesthesia and local infiltration can occur. Once in theatre, microsurgical puffs soaked in Oxymetazoline or Co-phenylcaine® are placed by the surgeon under endoscopic vision. The author has stopped using cocaine as he found no additional advantage over Co-phenylcaine® Forte or Oxymetazoline. Once surface anaesthesia has been obtained using a decongestant and topical anaesthetic, injections of Lignocaine 2% with 1/80,000 adrenaline solution are made using either a dental needle and syringe or a special endoscopic sinus surgery needle. The areas that are injected include anterior to the uncinate process, into the bulla ethmoidalis and in the region of the sphenopalatine foramen. The sphenopalatine foramen can be approached either behind the posterior end of the middle turbinate or by passing the needle through the ground lamella.
The aim of the injection and topical anaesthetic process is to anaesthetise the anterior and posterior ethmoidal nerves which supply the antero-superior and postero-superior parts of the lateral nasal wall and septum and also branches of the sphenopalatine nerve which run with the major vessels from the sphenopalatine foramen to supply the lateral nasal wall. It is important that the injection process is unhurried and that surgery does not commence until the anaesthetic injections have had the chance to work. The combined effect of the topical anaesthetic, injected local anaesthetic and surface decongestant provide a reliable blood free field in most circumstances.

If the surgeon ‘pulls’ on an unanaesthetised area, e.g. dura, orbital fat, the patient is likely to report some discomfort and, hopefully, this would be sufficient to stop major complications but this should not be relied upon. An accurate, delicate cutting technique throughout the operation helps maintain a reliable field and prevents any discomfort. Indeed very often patients’ only adverse comment will be to complain of a rather unpleasant sound as the ethmoid bone is being removed.

In addition to local anaesthesia, a form of light sedation can be used and this can be obtained using a Benzodiazepine or, in some cases, intravenous sedation in the form of Propofol but this requires full anaesthetic support and monitoring. A summary of the required equipment for the L.A. technique is given in Table 5.

<table>
<thead>
<tr>
<th>Equipment required for the application of local anaesthetic.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Co-Phenylcaine spray or similar</td>
</tr>
<tr>
<td>• Lignocaine 1% with</td>
</tr>
<tr>
<td>• Freer’s elevator</td>
</tr>
<tr>
<td>• Straight suction cannula</td>
</tr>
<tr>
<td>• Patience!</td>
</tr>
</tbody>
</table>

Table 5: Equipment required for the application of local anaesthetic.
6.0 Principles Endoscopic Surgical Technique

Given that the vast majority of patients undergoing endoscopic sinus surgery are doing so for quality of life improvement, the first rule of surgery is first do no harm. The surgical procedure envisaged must address the balance of risk to the patient, against expected patient benefit. It is essential that the surgeon be aware of his/her own limitations in terms of skill level and anatomical knowledge. He/she should be quite prepared to terminate a procedure if ever “lost” because of difficult anatomy or excessive intra-operative haemorrhage. Surgical risk will be minimised by the surgeon ensuring the following points have been addressed:

- Attained sufficient endoscopy and instrument skills for the procedure planned
- High level of knowledge of sinonasal anatomy
- Risk assessment of patient’s individual anatomy (By assessment of CT scan – Fig. 18 and Table 6)
- Ensures the surgical field not obscured by bleeding

6.1 Check List for Assessing CT Scans of the Sinuses

1. Has the patient blown their nose before the examination? Check to see if there is any mucus on the floor of the nose. Check degree of true coronal orientation from the scout view.
2. Assess the distance from the uncinate process to the medial orbital wall, and consequent level of risk to medial orbital wall at uncinectomy.
3. Check for any anatomic anomalies which may increase the risk of orbital trauma; e.g. lateral rotation of the middle turbinate and uncinate, or the presence of Haller cells.
4. Check the integrity of the floor of the orbit. Is there any evidence of dehiscence? Is the infra orbital nerve at risk?
5. Determine the extent of disease. Is the ostiomeatal complex involved? Which sinus groups are involved?
6. Check the integrity and level of the skull base? What is the relationship between the thin lateral lamella of the cribiform plate and the orbital plate of the frontal bone? What is the height differential between the frontal bone and the cribiform plate.
7. Identify the relationship of the optic nerve to the posterior ethmoidal cells and to the sphenoid sinus. Is an Onodi cell present? – Consider the need for axial slices.
8. Identify the position of the internal carotid artery and the thickness of overlying bone and relation to the inter-sinus septum.
9. Assess the muco-ciliary clearance pathways of the frontal sinuses through the anterior ethmoid, and their relationship to the uncinate process. Are there frontal recess cells present which are causing stenosis in this area?
10. Assess the presence of any atypical pneumatization; e.g. supra-orbital recess of the frontal sinus, absent frontal sinus etc.

Fig. 18
Coronal CT scan depicting a hazardous variant of the “low lying cribiform plate”.

Table 6
The procedure of endoscopic ethmoidectomy is essentially a series of osteotomies through the bony partitions of the ethmoid labyrinth, usually performed in an anterior to a posterior direction. The extent of the operation is based on individual patient requirement, and will extend only as far as is required to deal with the patient’s disease. Thus for a patient with, for example, disease limited to the ostiomeatal complex, there would be little justification in violating the ground lamella and entering the posterior ethmoidal cells. Yet for a patient with a chronic pansinusitis a complete endoscopic sphenoethmoidectomy may prove necessary.

The tutorials, which follow, offer a step by step description of endoscopic ethmoidectomy and ancillary procedures. They are not intended for practise on patients but rather as a guide to cadaver dissection, for anatomical and surgical skills training. A general plan for an extensive endoscopic operation highlighting the important landmarks is set out in Table 7.

### A Plan for Operating Endoscopic Sphenoethmoidectomy (major land marks in bold)

1. Note position and integrity of **middle turbinate** (medial limit of ethmoid cavity dissection)
2. Define uncinate process \(\rightarrow\) uncinectomy (1st osteotomy)
   - *be aware of medial orbital wall*
3. Define ethmoidal bulla and remove (2nd osteotomy)
4. Define **medial orbital wall** (lateral limit of dissection)
5. Locate maxillary ostium \(\rightarrow\) perform middle meatal antrostomy*
   - *be aware of medial orbital wall and nasolacrimal duct -*
6. Osteotomise ground lamella* (3rd osteotomy)
   - *be aware of skull base -*
7. Define posterior ethmoid cells* **posterior wall** of posterior ethmoid and **skull base**
8. Perform sphenoidotomy* (trans-ethmoidal or via spheno-ethmoidal recess) (4th osteotomy)
   - *be aware of orbital apex, optic nerve and internal carotid artery -*
9. With skull base and anterior ethmoidal artery defined move forward along skull base in a retrograde manner \(\rightarrow\) frontal recess surgery*
   - *be aware of skull base -*

*This surgery only if indicated*
7.0 TUTORIAL I:  
Endoscope Care and Instrument Handling – Preparation of the Specimen

This course of dissection aims to provide you with a chance to become familiar with nasal endoscope and instrument handling. You should also improve your understanding of the detailed anatomy of the lateral wall of the nose and the paranasal sinuses. The complexity of the anatomy, and the close relations to vital structures, such as the optic nerve and internal carotid artery, make practised cadaver dissection an essential prerequisite for endonasal surgery.

The nasal and sinus endoscopes are rod lens telescopes, they are very delicate and all too easily damaged. **Do not drop, bend them, or use them as a lever!** The surgical instruments are also delicate, take particular care not to cause blunting of the sickle knife tip, and do not use the Blakesley forceps on thick bone. The Anatomy Department specimens have been formalin preserved, and the risk of infection transmission is extremely low. If you are ever dissecting on specimens in the morgue assume these specimens are HIV positive and take the appropriate precautions. The fresh cadavers offer a much more realistic dissection, and bleeding is not a problem!

7.1 Positioning and Instrument Handling

If you are right handed the telescope is held by your left hand at its shaft. You may wish to use an endoscope holder, to improve your grip. The elbows are placed on the dissection table for support, and the left hand rests lightly against the face of the cadaver. Remember to position yourself as if you were performing an operation. Sit on the right side of the specimen, (if you are right handed), and have the cadaver head inclined to its right. On the operating table the patient would be inclined 15 degrees head up, with the head slightly flexed. Using the wooden blocks in the lab try your best to achieve positioning as close to this as you can. The angled endoscopes give a distorted view of instrumentation, so when dissecting and operating the only endoscope you should use is the 0°. The 30° and the 70° are reserved for endoscopic examination rather than for guiding instrumentation. On entering the nostril retract the alar gently laterally with a Freer elevator, this prevents smudging of the lens as it enters the nose. As with other forms of endoscopy, “follow the lumen”, in this case the nasal cavity, guiding the endoscope in under direct vision. Most surgeons will use their dominant eye. It is preferable to keep the non-dominant eye open when guiding instruments into the nose, this allows the dominant eye to maintain a view of the surgical field. The endoscope is held superiorly in the nose, to allow sufficient space for the instruments to be introduced below the endoscope. You will find that the soft tissue of the formalin specimens is not very compliant, and if necessary perform an alar-otomy or mobilise the septum to improve access. If you have a dissection partner use him/her as a scrub nurse to wipe the lens, and to hand you instruments during the dissection. That way you should not have to take your dominant eye off the endoscope.

The formalin-preserved cadavers often require careful cleaning of debris within the nasal cavity before dissection can begin. This can be quite time consuming, but is worth persevering with to obtain a good dissection field. The loose debris is best removed under endoscopic control using Blakesley forceps. If suction is available, irrigation with water and suctioning may be helpful. In some specimens where there is either a profound septal deviation, or the mucosa is so congested that introduction of the endoscope is not possible, a partial septal resection maybe required.
8.0 TUTORIAL II: Nasendoscopy and Sinoscopy

8.1 Nasendoscopy
Select a 4 mm 30° endoscope to carry out the following examination:

8.2 The Nasal Floor and Inferior Meatus
Pass the endoscope along the floor of the nose, in live patients you would be interested in the state of the mucosa and in the presence of any abnormal secretion. Depending upon available space, it may be possible to examine the nasopharynx at this stage, otherwise do so at the next pass. To examine the inferior meatus in the cadaver it is usually necessary to in fracture the inferior turbinate. Do this under endoscopic control using a Freer elevator. Try to visualise the nasolacrimal duct opening at the apex of the inferior meatus on the lateral wall. If an inferior meatus antrostomy has been performed previously, the antrum can be visualised through this, a better view being achieved with a 70° endoscope. (Do not fashion an inferior meatus antrostomy at this stage as it will interfere with trochar introduction for sinoscopy.)

8.3 The Middle Meatus, Infundibulum, Olfactory Cleft Sphenoethmoidal Recess and Nasopharynx
The second pass of the endoscope is made between the inferior and middle turbinates. As you pass in a posterior direction identify the following structures in sequence, (see Fig. 17, page 13). The lateral surface of the middle turbinate. The ethmoidal bulla and the uncinate process has been performed previously, the antrum can be visualised through this, a better view being achieved with a 70° endoscope. (Do not fashion an inferior meatus antrostomy at this stage as it will interfere with trochar introduction for sinoscopy.)

The uncinate process is a boomerang shaped structure that’s free edge forms the antero-inferior limit of the hiatus semilunaris, its anterior edge approximately parallels the anterior free edge of the middle turbinate. The frontal recess in most specimens lies medial to the uncinate process. The maxillary sinus ostium is invariably positioned out of sight, lateral and inferior to the inferior free edge of the uncinate process. Openings seen on the lateral wall posterior to this are usually accessory ostia, i.e. defects in the membranous lateral wall. More rarely there may be a defect in the anterior fontanelle, giving the appearance of a ‘perforation’ between the uncinate and the inferior turbinate. Now withdraw the endoscope and reinsert it into the olfactory cleft, medial to the middle turbinate. Anteriorly the cribiform plate may be visualised, further posteriorly the superior turbinate (Fig. 15, page 12) if present can be seen, and beyond this the spheno-ethmoidal recess. (Fig. 16, page 12).

If the middle turbinate is medially placed or the septum deviated it may not be possible to enter the olfactory cleft with a 4 mm endoscope. In this case place the endoscope back into the middle meatus as far as the posterior end of the middle turbinate, now rotate the endoscope under the free edge of the turbinate and into the sphenoid recess, it should now be possible to visualise the sphenoid ostium. Follow the endoscope down the face of the sphenoid and into the nasopharynx. Using the 30° endoscope it is usually possible to examine both sides of the nasopharynx and both Eustachian tube orifices. The posterior wall, fossae of Rosenmuller and tori should also be examined.

8.4 Maxillary Sinus Endoscopy
This may be achieved by the inferior meatus or the canine fossa route. The former is associated with less morbidity in live patients but gives an inferior view. You should try both routes.

8.5 Canine Fossa Antroscopy
Begin by identifying the upper lateral aspect of the canine fossa, to palpate this area you may have to apply a considerable stretch on the upper lip in the formalin specimen. Now place the trochar on this point and orientate it at right angles to the anterior wall. Introduce the trochar slowly using a gentle rocking motion, guarding the trochar with your forefinger at all times, to prevent it penetrating the posterior wall as it slips into the sinus. After withdrawing the trochar from the cannula introduce the 30° and 70° endoscopes in succession. During the examination rotate the endoscope 360°s to visualise all areas. The maxillary sinus ostium can be seen high on the medial wall, using the 70° endoscope it should be possible to visualise the hiatus semilunaris and uncinate process at the medial end of the maxillary infundibulum. The infra orbital nerve can usually be seen coursing across the sinus roof.
8.6 Inferior Meatus Antroscopy

If the inferior turbinate has not already been in fractured, do so. Introduce the trochar into the inferior meatus under endoscopic guidance using the 0° endoscope. Using a similar technique as for sinus lavage gently rock the trochar into the sinus guarding the trochar with your forefinger to prevent a slip on to the posterior wall. The sinus is now best examined using the 70° endoscope which is rotated 360°. Good visualisation of the area of the natural ostium is readily achieved, along with the floor and lateral wall. The infra-orbital nerve can frequently be seen in its course across the sinus roof.

9.0 TUTORIAL III: Infundibulotomy and Anterior Ethmoidectomy

For safety the only endoscope to be used for operating is the 0°. The angled endoscopes give a deflected image, which are disorientating to the operator. These should only be used for examining recesses out of site of the axial view.

9.1 Infundibulotomy

Infundibulotomy is initiated by incising the attachment of the uncinate process with a sickle knife. If you gently press laterally on the free edge of the uncinate process it should flex at its attachment, thereby guiding you to its point of attachment. A common mistake is to make the incision too inferior, on to the bone of the agger nasi. Start the incision at the anterior attachment of the uncinate, cut in a strictly sagittal plane to avoid the risk of orbital penetration. Remember the lamina papyracea often lies immediately lateral to the uncinate process. Continue the incision in a posterior direction approximately level with the free edge of the middle turbinate, to the end of the process. Check the incision is complete by inserting a Freer elevator into the wound, and use this to gently mobilise the uncinate. Then remove the uncinate whole from its remaining anterior and posterior attachments with straight Blakesley forceps taking care not to tear the mucosa. In the live patient the surgery from this point on would depend on the individual extent of disease, based on pre-operative endoscopy and CT scanning. For training purposes we will continue with a complete fronto-sphenoido-ethmoidectomy.

9.2 Bulla Excision

The face of the bulla is revealed completely after the uncinate process is removed. It should be approached on its medial aspect, by carefully perforating it with closed Blakesley forceps. Once the presence of a bulla air cell is confirmed, the face of the bulla should be removed completely with Blakesley and Strumpel-Voss forceps. Completion of this osteotomy creates maximum light and space for further stages of the dissection. Take care to gently skeletonise the medial orbital wall at this time and throughout the dissection. Once the whole extent of the bulla has been removed, the ground lamella of the middle turbinate should be revealed. (See below under ‘Ground Lamella’).

10.0 TUTORIAL IV: Middle Meatal Antrostomy

Try to visualise the natural ostium with an angled endoscope such as the 30 or 70°. The natural ostium can be found inferior and lateral to the anterior aspect of the uncinate process. Uncinectomy already performed should facilitate ostium localisation. Ostia found lying more posterior to this in the membranous part of the lateral wall of the nose are invariably accessory ostia. If the ostium is difficult to find, palpate the area where it should be found with an angled curette, taking care not to palpate too high and risk penetrating the lamina papyracea. If one removes ones eye from the endoscope, it is possible to check the level of the curette against the level of the infra-orbital rim externally, confirming the curette is below the level of the antral roof. Now use the curette to make a small opening and confirm antrum is beyond the opening by “sounding” the opening with an angled sinus suction tube (Fig. 19).
Once satisfied the opening is at the right level enlarge it using a Stammberger ostrum punch forceps, rotating the blade of the opened forceps into the ostium from a superior to a lateral direction. One bite of the forceps is usually sufficient to enlarge the antrostomy forward (Fig. 20). Take care not to come too far anteriorly, as this places the nasolacrimal duct at risk. Further enlargement of the antrostomy can be achieved by resecting the posterior edge of the ostium into the membranous septum, using Blakesley forceps. An alternative method is to cut along the junction of the roof of the antrum with its membranous lateral wall using scissors, also enlarging the antrostomy in a posterior direction (Fig. 21). Care must be taken not to traumatise branches of the sphenopalatine artery as one nears the posterior wall of the antrum.
11.0 TUTORIAL V: The Ground Lamella and Posterior Ethmoid

The structure of the ground lamella is highly variable (Fig. 22). Sometimes it may be invaginated laterally forming a sinus lateralis or (retro-bullar recess), this is an anterior ethmoidal cell, which pneumatises posteriorly but remains separated from the posterior ethmoid by the ground lamella. Thickness of the ground lamella varies as well, and care should be taken not to mistake it for the skull base! Occasionally the ground lamella may be dehiscent, this dehiscence can at times be so large that the lamella appears at first glance to be absent. Assuming that in your specimen it is intact, then enter the posterior ethmoid by perforating the ground lamella as medially and as low as possible (Fig. 23), using closed Blakesley forceps. The safest way to enter the posterior ethmoid is to stay low and medial. Check that posterior ethmoidal cells can be visualised through the small opening created, before proceeding to remove the rest of the ground lamella. The skull base should now be identified as the thin ethmoidal cell partitions are removed.

11.1 The Posterior Ethmoid

The colour of the orbital plate of the frontal bone, which forms the bulk of the skull base here, has a different quality to the ethmoidal bone, being usually whiter and thicker. Note though, that the bone of the medial ethmoidal roof formed by the lateral lamella of the cribriform plate, is extremely thin and often dehiscent. Avoid instrument manipulation in this area. Perforation in this location is a common cause of iatrogenic csf leak.

In performing a full endoscopic ethmoidectomy the bulk of the ground lamella and inferior inter-sinus partitions should be removed. In practice, while doing this, one should attempt to preserve as much sinus mucosa as possible. Provided each ethmoidal cell is opened widely, the inter-sinus septae inserting into the skull base are best left intact. Obsessive removal of these, to create a perfect cavity, can result in fracture at their insertion into the lateral lamina of the cribriform plate, and csf leak.

Fig. 22
The left ground lamella (cadaveric) of the middle turbinate, note the invagination by retro-bullar pneumatisation.

Fig. 23
Perforation of the ground lamella at surgery.
The borders of the ethmoidal cavity you have created should now be clear (Fig. 24). The lamina papyracea laterally, the vertical lamella of the middle turbinate medially, the skull base forming its roof above, and the posterior wall of the most posterior ethmoidal cell behind. This cell typically pneumatizes towards the anterior clinoid, presenting a triangular shape, with the base towards the telescope and the apex away from you supero-laterally (Fig. 25). If extensive ethmoid pneumatisation is present, a cell may be seen lateral to the optic nerve (Onodi cell).

12.0 TUTORIAL VI: The Frontal Recess
Type I (Stammberger-Kuhn)

Having completed the posterior ethmoidal dissection the skull base can now be followed forward into the frontal recess. Skeletonise the skull base in a retrograde direction remembering its tendency to slope medially and avoiding the medial ethmoidal roof. Remove the intercellular partitions taking care to preserve the anterior ethmoidal artery which crosses the skull base from lateral to medial, and often hangs from a short bony mesentery. The dome of the ethmoid forward of the anterior ethmoidal artery can now be seen sloping upward toward the frontal sinus. Some surgeons use a 30° telescope for this part of the dissection. Although this was thought to be unsafe because of risk of instrument disorientation, Kuhn recommends using a 30°, while Stammberger now recommends using a 45° telescope. Fred Kuhn has designed a fine instrument set comprising sets of curettes, hooks and giraffe forceps which are ideal for removing the egg-shell like bony caps of the supra-bulla recess which often obscure visualization of the frontal isthmus.
12.1 Frontal Recess Surgery Type II
(Draf I)
Better access to the frontal recess can be achieved by using upward biting Hajek-Kofler (KARL STORZ No. 649001) forceps to remove the bone forming the junction between the anterior end of the middle turbinate and the agger (Fig. 27), so called ‘removing the beak’. This manoeuvre effectively extends the middle meatus forward and allows the frontal recess to be visualised with a 0° endoscope. Any remaining inter-sinus septa of the antero-superior ethmoidal cell group should be removed until the internal os of the frontal sinus is seen. Provided the ground lamella does not insert into the skull base too far forward, it is frequently possible to open the frontal recess without breaching the ground lamella. If, however, the anatomy of the antero-superior ethmoidal cells is complex, then it is safer to carefully osteotomise the ground lamella as we have already done, before initiating the frontal recess clearance. As before the posterior ethmoid is entered low and examined carefully where the ethmoid labyrinth is widest, determining the true level of the skull base, before following it forward into the narrower frontal recess.

12.2 Frontal Sinus Endoscopy and Trephination
While this procedure is not performed commonly, it is useful as an adjunct to difficult frontal recess surgery, especially when the frontal sinus ostium cannot be visualised from below. A small stab incision is made in the skin of the supero-medial orbital rim, if available a drill should be used to drill a hole through the frontal sinus floor using a cutting burr (e.g. KARL STORZ No. 649640). Once the opening is established the sinuscopy cannula is introduced to facilitate insertion of the telescope. As with maxillary endoscopy the 70° will demonstrate most of the anatomy. Be sure to locate the frontal ostium lying inferiorly and medially. Light from this telescope can later be used as a guide to the ostium through the frontal recess from below.

Fig. 26
Left ethmoid cavity in a cadaver:
A sphenoidotomy has been performed revealing the crests of the optic nerve and the internal carotid artery on the lateral wall of the sphenoid sinus.

Fig. 27
Removing the “break” to improve access to the frontal recess.
12.3 Frontal Recess Surgery Type III  
(Draf II)
Access to the internal os can be improved further by totally removing the beak (anterior bony ridge) using an endonasal drill. In addition to removal of the anterior beak, the anterior overhang is drilled out medially as far as the insertion of the nasal septum. In doing so take care to preserve the posterior mucosa and do not drill in a circumferential manner. This procedure is made easier by performing a combined approach procedure as described by Wigand. Here you visualise the surgery from above by performing frontal sinus endoscopy (as described previously). Using a 70° telescope with television camera attached the operation can be observed on the television monitor from the frontal sinus above, and by direct vision with a separate 0° endoscope placed in the nose from below.

12.4 Median Frontal Sinusotomy-frontal  
Recess Surgery Type IV (Draf III)
Resect an area of nasal mucosa the size of a 10 pence piece adjacent to the antero-superior attachment of the perpendicular plate of the ethmoid with the skull base. Now resect a similar sized area of the underlying cartilaginous septum, perpendicular plate, and the contralateral septal mucosa creating a superiorly placed septal perforation continuous with the anterior skull base. On the anterior midline skull base, where the perpendicular plate inserted define the area known as the “keel” rather like the keel of a yacht. This is the landmark for the central floor of the frontal sinuses. Have your assistant place a finger on the overlying nasal bone, use this to feel the drill and be sure not to penetrate through the bone into the subcutaneous tissue. Now under direct vision with a 0° telescope carefully drill out the keel in the midline, once you enter the frontal sinus try to preserve the inter-sinus septum. Now drill out the “bridge” separating your newly created sinostomy with the natural ostium on the affected size. A huge drainage ostium should now be evident.

13.0 TUTORIAL VII:
The Sphenoidal Sinus /  
Optic Nerve/Internal Carotid Artery/Pituitary
In live patients the sphenoidal sinus is a potentially hazardous area with both the optic nerve and the internal carotid artery, being close relations of its lateral wall. There are three commonly used intranasal routes to the sphenoid. Trans-septal, trans-ethmoidal and trans-nasal via the spheno-ethmoidal recess. The first route is the safest but involves performing an SMR first. The nasal route is relatively straightforward but has the disadvantage of approaching the sinus from a medial to lateral direction, and thus it could be argued places the vital structures of the lateral wall at greater risk, through instrumentation into the sinus lumen.

13.1 Trans-ethmoidal Approach to the Sphenoid Sinus
Enter the posterior ethmoidal cavity created above using a 0° endoscope. Divide the posterior wall of the most posterior ethmoidal cell into four quadrants. The sphenoid is entered through the infero-medial quadrant. The bony partition here is usually thinner than the surrounding bone and may form a bulge. Before perforating this it is advisable to check the operating level by coming out of the cavity back into the nose, and identifying the sphenoid sinus ostium medial to the middle turbinate, this is a reliable guide to the level of the sphenoid sinus. The anterior wall can now be removed using both upward and downward Hajek punch forceps. Once this has been widely taken down it should be possible to identify the crests of the internal carotid artery, and the optic nerve. Remove the bone of the lateral wall to expose these structures fully. Finally remove the thick bone of the posterior wall revealing the pituitary fossa and gland, this can be removed, as an endoscopic hypophysectomy. The remaining anterior wall of the sphenoid sinus can be removed by enlarging the sphenoid ostium and taking down any remaining bridge of bone between this and the opening created into the ethmoid. A large sphenoid cavity can be further created by performing an SMR and entering the sinus in the midline. Now the inter-sinus septum is removed and the contra-lateral sphenoid sinus included in the cavity.
13.2 Trans-nasal Approach
Some surgeons prefer the nasal route to the sphenoid. It is interesting to note that Kennedy has reverted to this method after having used the trans-ethmoidal route without complication for many years. The sphenoid is approached through the spheno-ethmoidal recess (Fig. 14, see page 12), very often the distal edge of the superior turbinate needs to be resected to gain adequate access to the ostium. Once identified the ostium is simply enlarged, usually downward with Hajek or Weiss forceps, creating a sizeable sphenoidotomy. The principle disadvantage of this technique is that the superior turbinate surgery so often required, gives rise to a significant resection of functioning olfactory mucosa.

14.0 TUTORIAL VIII: Optional Advanced Procedures
- The Internal Maxillary Artery
- Endoscopic Dacrocystorhinostomy
- Endoscopic Orbital Decompression

14.1 Endoscopic Approach to the Sphenopalatine Artery
Enlarge the antrostomy fashioned above so that it extends from the natural ostium posteriorly to the posterior wall of the maxillary sinus, and from the roof of the antrum down to the root of the inferior turbinate. This will require complete removal of the membranous fontanelle as far posterior as the posterior wall of the antrum. Make an incision along the posterior wound edge of the antrostomy (Fig. 28). Elevate the mucosa off the posterior edge of the antrostomy on the nasal side. Elevate this mucosa using a Freer elevator, creating a tunnel along the postero-lateral wall of the nose in the direction of the sphenopalatine foramen. The tunnel will soon develop into a natural upper and lower branch, separated by the pedicle of the sphenopalatine artery (Fig. 29). Gentle mobilisation at this point will create
Endoscopic Dissection of the Nose and Paranasal Sinuses

enough space for the insertion of the jaws of a Ligge clip applicator for ligation of the main artery pedicle, at its exit point from the sphenopalatine foramen.

14.2 Endoscopic DCR

Make an attempt to probe the superior or the inferior conjunctival punctum with a small sinus probe. Note that in some cadavers the cannaliculi stenose with formalin preservation. If you do manage a successful probing the tip of the probe should lie in the lacrimal sac. Once the punctum and canalculus has been dilated with the probe, replace the probe with an ophthalmic light pipe (if available). Once connected to a light source, the blush from the light pipe is used as a guide to the position of the lacrimal sac on the lateral wall of the nasal cavity.

Next visualise the agger area with a 0° endoscope. Make a vertical incision in the mucosa where the light blush is evident, this should correspond to a point on the agger nasi approximately 6mm anterior to the junction of the middle turbinate with the lateral wall. Elevate the mucoperiosteum off the bone and resect a window of bone using bone nibbling forceps, or a drill. Always remove bone in the direction of the brightening light blush. Try to create a window in the bone at least 5mm in diameter. It should now be possible to place the mucoperiosteal wall of the sac on the stretch, by passing the light pipe (or probe) in the sac further medially into the window.

Now cut down onto the probe with a sickle knife, opening the lacrimal sac through the window into the nose. At this point in life one would insert lacrimal stent tubing through the canalliculi into the nose, where the tubes are tied and left in place for several weeks.

14.3 Endoscopic Orbital Decompression
(For Malignant Exophthalmos)

Orbital decompression has been traditionally been performed using an external approach either decompressing the orbital contents into the antrum or ethmoidal sinuses. An excellent decompression can also be achieved endoscopically, and this same approach has been used for decompressing the optic nerve following trauma involving the orbital apex.

You should have already performed the first steps of this procedure which comprises a complete endoscopic sphenoidectomy with exposure of the whole medial orbital wall, from orbital floor to skull base, and from agger to the sphenoid sinus. If you haven’t achieved this do so now. Next define the optic nerve crest on the lateral wall of the sphenoid sinus. Skeletonise the bone overlying this using a Stammberger drill with a diamond burr, much as you would skeletonise the bone of the fallopian canal in the mastoid during facial nerve decompression.

Once this bone of the posterior medial orbital wall is ‘egg-shell’ thin, continue forward skeletonising all of the medial orbital wall. This bone should now fracture easily by pressing against it with the back of an angled curette. The thin bony segments created should be dissected free of the orbital periosteum using a Freer elevator and the angled curette. These bony pieces can now be removed with Blakesley forceps. This osteotomy of the medial wall should start posteriorly over the optic nerve and move anteriorly and include all of the bone from the level of the roof of the antrum to skull base. In cases of exophthalmos the orbital periosteum would now bulge into the ethmoid cavity. Taking great care to avoid trauma to the optic nerve, once again starting posteriorly, make multiple horizontal incisions in the orbital periosteum to allow the orbital fat to bulge through these into the ethmoidal cavity. Once these incisions are complete, the fat can be further indrawn by teasing through each incision with a Strumpel-Voss forceps. Your decompression is complete.

15.0 Acknowledgments

We wish to thank our invited faculty, especially Mr. Timothy Guerrier FRCS, Mr. Nicholas Jones FRCS and Mr. Thomas Alun-Jones FRCS, who have contributed tirelessly to our courses over the years, and whose wise words have influenced us in ways which we hope are evident in this manual. We also wish to thank KARL STORZ GmbH & Co.KG, Germany for their generous provision of endoscopes and instruments used for surgical skills training.
HOPKINS® Operating Telescopes
for Endoscopic Dissection of the Nose and Paranasal Sinuses

7230 AA–7230 CWA

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

HOPKINS® Wide Angle Straight Forward Telescope 0°,
enlarged view, diameter 4 mm, length 18 cm, autoclavable,
fiber optic light transmission incorporated.
color code: green

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

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

HOPKINS® Telescopes
for Nasal and Paranasal Diagnosis and Treatment

7209 BA
HOPKINS® Forward-Oblique Telescope 30°,
diameter 3 mm, length 11 cm, autoclavable,
fiber optic light transmission incorporated,
color code: red

7207 AA
HOPKINS® Straight Forward Telescope 0°,
diameter 2.7 mm, length 11 cm, autoclavable,
fiber optic light transmission incorporated,
color code: green

7207 BA
HOPKINS® Forward-Oblique Telescope 30°,
diameter 2.7 mm, length 11 cm, autoclavable,
fiber optic light transmission incorporated,
color code: red

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

628001  Sickle Knife, pointed, length 19 cm
628002  Same, round tip, double-cutting
628601  Antrum Curette, oval, size 1, length 19 cm
628602  Same, size 2
628603  Same, size 3
628701  Antrum Curette, round, length 19 cm
628702  Same, oblong, small
628703  Same, oblong, large
628712  KUHN-BOLGER Frontal Sinus Curette, 55° curved, oval, forward cutting, length 19 cm
628714  Same, 90° curved
629703  Antrum Curette, forward cutting, small, length 19 cm
629704  Same, backward cutting
Additional Instruments for Frontal Recess

629830  KUHN Frontal Sinus Seeker, double-ended, No. 6, both sides curved 77°, one tip straight, other tip reverse angle, length 22 cm

651210  KUHN-BOLGER Double Spoon Giraffe Forceps, 55° upturned, vertical opening, spoon diameter 3 mm, with cleaning connector, working length 13 cm

651220  Same, horizontal opening

651211  KUHN-BOLGER Double Spoon Giraffe Forceps, 55° upturned, vertical opening, spoon diameter 2 mm, with cleaning connector, working length 13 cm

651221  Same, horizontal opening

651231  KUHN-BOLGER Double Spoon Giraffe Forceps, 90° upturned, horizontal opening, spoon diameter 2 mm, with cleaning connector, working length 13 cm

651241  Same, vertical opening
Antrum Cannulas, Suction Tubes and Trocar

- 586030 v. EICKEN Antrum Cannula, Luer-Lock, long curved, outer diameter 3 mm, length 12.5 cm
- 586230 Same, short curved, outer diameter 3 mm
- 586240 Same, short curved, outer diameter 4 mm
- 586125 v. EICKEN Antrum Cannula, Luer-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm
- 586130 Same, Luer-Lock, outer diameter 3.0 mm
- 722830 Suction Tube, angular, with grip plate and cut-off hole, Luer-Lock, outer diameter 3 mm, working length 14 cm
- 722925 Suction Tube, conical, malleable, with finger grip plate, Luer-Lock, outer diameter 2.5 mm, working length 13 cm
- 810506 Septum Needle, angular, Luer-Lock

- 723005 A Trocar for Sinoscopy, with beak, outer diameter 5 mm, length of the cannula 8.5 cm, for use with HOPKINS® telescopes with diameter 4 mm
### Sphenoidal Punches

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>651055</td>
<td><strong>STAMMBERGER Punch</strong>, circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 3.5 mm, with cleaning connector, working length 18 cm</td>
</tr>
<tr>
<td>651050</td>
<td><strong>Same</strong>, diameter 4.5 mm</td>
</tr>
<tr>
<td>651060</td>
<td><strong>STAMMBERGER Punch</strong>, circular cutting, 65° upturned, for frontal sinus recess, diameter 3.5 mm, with cleaning connector, working length 17 cm</td>
</tr>
<tr>
<td>651065</td>
<td><strong>Same</strong>, diameter 4.5 mm</td>
</tr>
<tr>
<td>651050 R</td>
<td><strong>Cleaning Tool</strong>, for circular cutting punches type 651050 / 651055 / 60 / 65, double-ended, length 14 cm</td>
</tr>
<tr>
<td>649001</td>
<td><strong>HAJEK-KOFLER Bone Punch</strong>, rigid, 90° upbiting, not through-cutting, size 3.5 x 3.7 mm, working length 14 cm</td>
</tr>
<tr>
<td>649002</td>
<td><strong>Same</strong>, 90° downbiting</td>
</tr>
<tr>
<td>649003</td>
<td><strong>Same</strong>, upbiting backward</td>
</tr>
<tr>
<td>649004</td>
<td><strong>Same</strong>, downbiting backward</td>
</tr>
<tr>
<td>649005</td>
<td><strong>Same</strong>, upbiting forward</td>
</tr>
<tr>
<td>649011</td>
<td><strong>Same</strong>, 90° upbiting, size 4.2 x 5.5 mm</td>
</tr>
</tbody>
</table>
RHINOFORCE® II Nasal Forceps

456001 B – 456003 B
456001 B
456003 B

456001 B  BLAKESLEY RHINOFORCE® II Nasal Forceps, straight, size 1, with cleaning connector, working length 13 cm
456003 B  Same, size 3

456502 B
456502 B

456502 B  BLAKESLEY-WILDE RHINOFORCE® II Nasal Forceps, 45° upturned, size 2, with cleaning connector, working length 13 cm

456801 B
456801 B

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

456601 B
456601 B

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

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

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

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

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

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

451001 B  Same, size 1, width 3.5 mm

451002 B  Same, size 2, width 4.0 mm

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

451501 B  Same, size 1, width 3.5 mm

451502 B  Same, size 2, width 4.0 mm
RHINOFORCE® II Miniature Nasal Forceps

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

Same,
jaws 45° upturned

Same,
sheath curved 30°, with straight jaws

Same,
sheath curved 30°, jaws 45° upturned
Antrum Punches and Forceps

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

459011 Same, right side backward cutting

459012 Same, left side backward cutting

459051 STAMMBERGER Antrum Punch, right side downward and forward cutting, with cleaning connector, working length 10 cm

459052 Same, left side downward and forward cutting
Antrum Punches and Forceps

653000  **HEUWIESER Antrum Grasping Forceps**, jaws curved downwards, fixed jaw curved 90°, movable jaw opening up to 120° backward opening, with cleaning connector, working length 10 cm

653001  **Same**, jaws curved upwards

653002  **Same**, jaws curved right

653003  **Same**, jaws curved left

459016  **STAMMBERGER Antrum Punch**, backward cutting, sheath 360° rotatable, with fixing screw, dismantling, working length 10 cm, for use with Cleaning Adaptor 459015 LL

459015 LL  **Cleaning Adaptor**
Pediatric Instruments – Forceps for Postoperative Wound Debridement

634824 STRÜMPEL Forceps, with oval, fenestrated, cupped jaws, straight, width 2.5 mm, working length 12.5 cm

634825 A Same, 45° upturned

634825 B Same, 90° upturned

634826 BELUCCI Scissors, straight, working length 12.5 cm

722925 Suction Tube, conical, malleable, with finger grip plate, Luer-Lock, outer diameter 2.5 mm, working length 13 cm

586125 v. EICKEN Antrum Cannula, Luer-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm
UNIDRIVE® S III ENT SCB/UNIDRIVE® S III ECO
The multifunctional unit for ENT

**Special Features:**

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

### Specifications

#### System specifications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Order No.</th>
<th>rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shaver mode</strong></td>
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<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oscillating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with Handpiece:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DrillCut-X® II Shaver Handpiece</td>
<td>40712050</td>
<td>10,000*</td>
</tr>
<tr>
<td>DrillCut-X® II N Shaver Handpiece</td>
<td>40712055</td>
<td>10,000*</td>
</tr>
<tr>
<td><strong>Sinus burr mode</strong></td>
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<td></td>
</tr>
<tr>
<td>Operation mode:</td>
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<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with Handpiece:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DrillCut-X® II Shaver Handpiece</td>
<td>40712050</td>
<td>12,000</td>
</tr>
<tr>
<td>DrillCut-X® II N Shaver Handpiece</td>
<td>40712055</td>
<td>12,000</td>
</tr>
<tr>
<td><strong>High-speed drilling mode</strong></td>
<td></td>
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<tr>
<td>Operation mode:</td>
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<td></td>
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<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counterclockwise or clockwise</td>
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<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-Speed Micro Motor</td>
<td>20712033</td>
<td>60,000/100,000</td>
</tr>
<tr>
<td><strong>Drilling mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
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<tr>
<td>Max. rev. (rpm):</td>
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<tr>
<td>Counterclockwise or clockwise</td>
<td></td>
<td></td>
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<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro motor</td>
<td>20711033</td>
<td>40,000/80,000</td>
</tr>
<tr>
<td>and connecting cable</td>
<td>20711173</td>
<td></td>
</tr>
<tr>
<td><strong>Micro saw mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro motor</td>
<td>20711033</td>
<td>15,000/20,000</td>
</tr>
<tr>
<td>and connecting cable</td>
<td>20711173</td>
<td></td>
</tr>
<tr>
<td><strong>Intranasal drill mode</strong></td>
<td></td>
<td></td>
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<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
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<tr>
<td>micro motor</td>
<td>20711033</td>
<td>60,000</td>
</tr>
<tr>
<td>and connecting cable</td>
<td>20711173</td>
<td></td>
</tr>
<tr>
<td><strong>Dermatome mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro motor</td>
<td>20711033</td>
<td>8,000</td>
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<tr>
<td>and connecting cable</td>
<td>20711173</td>
<td></td>
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<tr>
<td><strong>Power supply:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 – 240 VAC, 50/60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(w x h x d)</td>
<td>300 x 165 x 265 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Two outputs for parallel connection of two motors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrated irrigation pump:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustable in 9 steps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Approx. 4,000 rpm is recommended as this is the most efficient suction/performance ratio.

### Technical Specifications

<table>
<thead>
<tr>
<th>UNIDRIVE® S III ENT SCB</th>
<th>UNIDRIVE® S III ECO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Touch Screen:</strong></td>
<td>6.4&quot; / 300 cd/m²</td>
</tr>
<tr>
<td><strong>Weight:</strong></td>
<td>5.2 kg</td>
</tr>
<tr>
<td><strong>Certified to:</strong></td>
<td>IEC 601-1 CE acc. to MDD</td>
</tr>
<tr>
<td><strong>Available languages:</strong></td>
<td>English, French, German, Spanish, Italian, Portuguese, Greek, Turkish, Polish, Russian</td>
</tr>
<tr>
<td></td>
<td>numerical codes</td>
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</tbody>
</table>
Motor Systems
Special features of high-performance EC micro motor II
and of the high-speed micro motor

Special features of high-performance EC micro motor II:
- Self-cooling, brushless high-performance EC micro motor
- Smallest possible dimensions
- Autoclavable
- Reprocessable in a cleaning machine
- Detachable connecting cable
- INTRA coupling for a wide variety of applications
- Maximum torque 4 Ncm
- Number of revolutions continuously adjustable up to 40,000 rpm
- Provided a suitable handle is used, the number of revolutions is continuously adjustable up to 80,000 rpm

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

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

Special Features of the high-speed micro motor:
- Brushless high-speed micro motor
- Smallest possible dimensions
- Autoclavable
- Reprocessable in a cleaning machine
- Maximum torque 6 Ncm
- Maximum torque 6 Ncm
- Number of revolutions continuously adjustable up to 60,000 rpm
- Provided a suitable handle is used, the number of revolutions is continuously adjustable up to 100,000 rpm

High-Speed Micro-Motor, max. speed 60,000 rpm, including connecting cable, for use with UNIDRIVE® S III ENT/NEURO
UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO

Recommended System Configuration

**UNIDRIVE® S III ENT SCB**

![UNIDRIVE® S III ENT SCB](image1)

- **UNIDRIVE® S III ENT SCB**, motor control unit with color display, touch screen, two motor outputs, integrated irrigation pump and SCB module, power supply 100 – 240 VAC, 50/60 Hz
  - Including:
    - Mains Cord
    - Irrigator Rod
    - Two-Pedal Footswitch, two-stage, with proportional function
    - Silicone Tubing Set, for irrigation, sterilizable
    - Clip Set, for use with silicone tubing set
    - SCB Connecting Cable, length 100 cm
    - Single Use Tubing Set*, sterile, package of 3

**UNIDRIVE® S III ECO**

![UNIDRIVE® S III ECO](image2)

- **UNIDRIVE® S III ECO**, motor control unit with two motor outputs and integrated irrigation pump, power supply 100 – 240 VAC, 50/60 Hz
  - Including:
    - Mains Cord
    - Two-Pedal Footswitch, two-stage, with proportional function
    - Silicone Tubing Set, for irrigation, sterilizable
    - Clip Set, for use with silicone tubing set

---

**Specifications:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch Screen</td>
<td>UNIDRIVE® S III ENT SCB: 6.4*/300 cd/m²</td>
</tr>
<tr>
<td>Flow</td>
<td>9 steps</td>
</tr>
<tr>
<td>Power supply</td>
<td>100-240 VAC, 50/60 Hz</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>300 x 165 x 265 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>5.2 kg</td>
</tr>
<tr>
<td>Certified to</td>
<td>EC 601-1, CE acc. to MDD</td>
</tr>
</tbody>
</table>

* mtp medical technical promotion gmbh, Take-Off GewerbePark 46, D-78579 Neuhausen ob Eck, Germany
UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO
System Components

Two-Pedal Footswitch

Silicone Tubing Set

UNIT SIDE

PATIENT SIDE

High-Speed Micro-Motor

20712033

High-Performance EC Micro Motor II

20711033 20711173

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

40712050

DrillCut-X™ II N Shaver Handpiece, optional adaptability to Shaver Tracker, for use with UNIDRIVE® S III ECO/ENT/NEURO

40712055

High-Speed Handpiece

252690 – 252692

INTRA Drill Handpiece

252575 – 252590

Shaver Blade

41201 KN

Shaver Blade, curved

41302 KN

Intranasal Drill

Sinus Burr

660000

41305 DN
Optional Accessories
for UNIDRIVE® S III ENT SCB and UNIDRIVE® S III ECO

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

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

Special Features

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

40 7120 50  **DrillCut-X® II Shaver Handpiece**, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40 7120 55  **DrillCut-X® II N Shaver Handpiece**, optional adaptability to Shaver Tracker 40 8001 22, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS
DrillCut-X® II Shaver Handpiece

Special Features:
- Powerful motor
- Absolutely silent running
- Enhanced ergonomics
- Lightweight design
- Oscillation mode for shaver blades, max. 10,000 rpm
- Rotation mode for sinus shavers, max. 12,000 rpm
- Straight suction channel and integrated irrigation
- The versatile DrillCut-X® II Shaver Handpiece can be adapted to individual needs of the user
- Easy hygienic processing, suitable for use in washer and autoclavable at 134° C
- Quick coupling mechanism facilitates more rapid exchange of work inserts
- Proven DrillCut-X® blade portfolios can be used

40 7120 50 DrillCut-X® II Shaver Handpiece, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

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

Optional Accessory:

41250 RA Cleaning Adaptor, Luer-Lock, for cleaning DrillCut-X® shaver handpieces
DrillCut-X® II Shaver N Handpiece

Special Features:
- Powerful motor
- Absolutely silent running
- Enhanced ergonomics
- Lightweight design
- Oscillation mode for shaver blades, max. 10,000 rpm
- Rotation mode for sinus shavers, max. 12,000 rpm
- Straight suction channel and integrated irrigation
- The versatile DrillCut-X® II Shaver N Shaver Handpiece can be adapted to the individual needs of the user
- Easy hygienic processing, suitable for use in washer and autoclavable at 134° C
- Quick coupling mechanism facilitates more rapid exchange of working inserts
- Proven DrillCut-X® blade portfolios can be used
- Optional adaptability to Shaver Tracker 40 8001 22
- Allows shaver navigation when used with NPU 40 8000 01

40 7120 55

40 7120 55 DrillCut-X® II N Shaver Handpiece, optional adaptability to Shaver Tracker 40 8001 22, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40 7120 90

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

Optional Accessory:

41250 RA

41250 RA Cleaning Adaptor, LUER-Lock, for cleaning DrillCut-X® shaver handpieces
Handle NEW for DrillCut-X® II Shaver Handpiece
for use with DrillCut-X® II 40 7120 50 and DrillCut-X® II N 40 7120 55

Special Features:
- Ergonomic design
- Ultralight construction
- Easy handle control allows individual adjustment
- The adjustable handle can be mounted to DrillCut®-X II or -X II N Shaver Handpiece
- Easy fixation via rotary lock
- Sterilizable

40 7120 90 Handle, adjustable, for use with DrillCut-X® II 40 7120 50 and DrillCut-X® II N 40 7120 55
Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

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

![Image of Shaver Blade](image)

Shaver Blades, straight, sterilizable

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>40712050</strong> <a href="#">DrillCut-X® II Handpiece</a></td>
<td>length 12 cm</td>
</tr>
<tr>
<td></td>
<td><strong>40712055</strong> <a href="#">DrillCut-X® II N Handpiece</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detail</th>
<th>Cutting Edge</th>
<th>Diameter</th>
<th>Color Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>41201 KN</td>
<td>Serrated</td>
<td>4 mm</td>
<td>Blue-red</td>
</tr>
<tr>
<td>41201 KK</td>
<td>Double Serrated</td>
<td>4 mm</td>
<td>Blue-yellow</td>
</tr>
<tr>
<td>41201 LN</td>
<td>Concave</td>
<td>4 mm</td>
<td>Blue-black</td>
</tr>
<tr>
<td>41201 GN</td>
<td>Concave</td>
<td>4 mm</td>
<td>Blue-green</td>
</tr>
<tr>
<td>41201 SN</td>
<td>Straight</td>
<td>4 mm</td>
<td>Blue-blue</td>
</tr>
<tr>
<td>41201 KSA</td>
<td>Serrated</td>
<td>3 mm</td>
<td>Blue-red</td>
</tr>
<tr>
<td>41201 KKSA</td>
<td>Double Serrated</td>
<td>3 mm</td>
<td>Blue-yellow</td>
</tr>
<tr>
<td>41201 KKSB</td>
<td>Double Serrated</td>
<td>2 mm</td>
<td>Blue-yellow</td>
</tr>
<tr>
<td>41201 LSA</td>
<td>Concave</td>
<td>3 mm</td>
<td>Blue-black</td>
</tr>
</tbody>
</table>

Optional Accessory:

41200 RA **Cleaning Adaptor**, LUER-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx
Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

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

Shaver Blades, curved 35°/40°, sterilizable

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>41202 KN</td>
<td>40 7120 50 DrillCut-X® II Handpiece 40 7120 55 DrillCut-X® II N Handpiece</td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td><img src="image1.png" alt="" /></td>
<td><img src="image2.png" alt="" /></td>
<td><img src="image3.png" alt="" /></td>
</tr>
<tr>
<td>41204 KKF</td>
<td></td>
<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41204 KKB</td>
<td></td>
<td>curved 40°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41204 KKFA</td>
<td></td>
<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41204 KKBA</td>
<td></td>
<td>curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
</tbody>
</table>

Optional Accessory:

<table>
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<tr>
<th>Detail</th>
<th>for use with</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>41200 RA</td>
<td>40 7120 50 DrillCut-X® II Handpiece 40 7120 55 DrillCut-X® II N Handpiece</td>
<td>Cleaning Adaptor, Luer-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx</td>
</tr>
</tbody>
</table>
Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

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

Shaver Blades, curved 65°, sterilizable

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 7120 50 DrillCut-X® II Handpiece</td>
<td>curved 65°, cutting edge serrated forwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td></td>
<td>40 7120 55 DrillCut-X® II N Handpiece</td>
<td></td>
</tr>
<tr>
<td>41203 KNF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41203 KNB</td>
<td></td>
<td>curved 65°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41203 KKF</td>
<td></td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 KKB</td>
<td></td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 KKFA</td>
<td></td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 KKBA</td>
<td></td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 GNF</td>
<td></td>
<td>curved 65°, concave cutting edge, oval cutting window, forward opening, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41203 GNB</td>
<td></td>
<td>curved 65°, concave cutting edge, oval cutting window, backward opening, diameter 4 mm, color code: blue-green</td>
</tr>
</tbody>
</table>

Optional Accessory:

41200 RA Cleaning Adaptor, Luer-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx
Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

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

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

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 7120 50</td>
<td>DrillCut-X® II Handpiece</td>
</tr>
<tr>
<td>41301 KN</td>
<td></td>
<td>serrated cutting edge, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41301 KK</td>
<td></td>
<td>double serrated cutting edge, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41301 GN</td>
<td></td>
<td>concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41301 LN</td>
<td></td>
<td>concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-black</td>
</tr>
<tr>
<td>41301 SN</td>
<td></td>
<td>straight cutting edge, diameter 4 mm, color code: blue-blue</td>
</tr>
<tr>
<td>41301 KSA</td>
<td></td>
<td>serrated cutting edge, diameter 3 mm, color code: blue-red</td>
</tr>
<tr>
<td>41301 KKSA</td>
<td></td>
<td>double serrated cutting edge, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41301 KKS</td>
<td></td>
<td>double serrated cutting edge, diameter 2 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41301 LSA</td>
<td></td>
<td>concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black</td>
</tr>
</tbody>
</table>
### Shaver Blades, curved for Nasal Sinuses and Skull Base Surgery

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

![Shaver Blades Image]

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 7120 50</td>
<td>DrillCut-X® II Handpiece</td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td></td>
<td>40 7120 55</td>
<td>DrillCut-X® II N Handpiece</td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41302 KN</td>
<td></td>
<td></td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41304 KKF</td>
<td></td>
<td></td>
<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41304 KKB</td>
<td></td>
<td></td>
<td>curved 40°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41304 KKFA</td>
<td></td>
<td></td>
<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41304 KKBA</td>
<td></td>
<td></td>
<td>curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
</tbody>
</table>
Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

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

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>length 12 cm</td>
</tr>
<tr>
<td>41303 KNF</td>
<td>40 7120 50 DrillCut-X® II Handpiece</td>
<td>curved 65°, cutting edge serrated forwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41303 KNB</td>
<td>40 7120 50 DrillCut-X® II Handpiece</td>
<td>curved 65°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41303 KKF</td>
<td>40 7120 55 DrillCut-X® II N Handpiece</td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41303 KKB</td>
<td>40 7120 55 DrillCut-X® II N Handpiece</td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41303 KKFA</td>
<td>40 7120 55 DrillCut-X® II N Handpiece</td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41303 KKBA</td>
<td>40 7120 55 DrillCut-X® II N Handpiece</td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41303 GNF</td>
<td>40 7120 50 DrillCut-X® II Handpiece</td>
<td>curved 65°, cutting edge concave forwards, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41303 GNB</td>
<td>40 7120 50 DrillCut-X® II Handpiece</td>
<td>curved 65°, cutting edge concave backwards, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
</tbody>
</table>
Sinus Burrs, curved
for Nasal Sinuses and Skull Base Surgery

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

![Image of a sinus burr with a label indicating use with DrillCut-X® II and II N](image)

<table>
<thead>
<tr>
<th>Sinus Burrs, curved 70°/55°/40°/15°, for single use, sterile, package of 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detail</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>
Accessories for Shaver

39550 A  **Wire Tray**, provides safe storage of accessories for KARL STORZ paranasal sinus shaver systems during cleaning and sterilization

**for storage of:**
- Up to 7 shaver attachments
- Connecting cable

**Please note:** The instruments displayed are not included in the sterilizing and storage tray.
INTRA Drill Handpiece
for Surgery in Ethmoid and Skull Base Area

**Special Features:**
- Tool-free closing and opening of the drill
- Right/left rotation
- Max. rotating speed up to 40,000 rpm / 80,000 U/min
- Detachable irrigation channels
- Light construction
- Operates with little vibrations
- Low maintenance
- Reproccessable in a cleaning machine
- Safe grip

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**INTRA Drill Handpiece**, angled, length 15 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

**INTRA Drill Handpiece**, straight, length 13 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

---

### Size and Details

<table>
<thead>
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<th>Size</th>
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---

**Standard Straight Shaft Burr**, stainless, size 014 – 070, length 9.5 cm, set of 11

**Diamond Straight Shaft Burr**, stainless, size 014 – 070, length 9.5 cm, set of 11

**Rapid Diamond Straight Shaft Burr**, stainless, with coarse diamond coating for precise drilling and abrasion without hand pressure and generating minimal heat, size 023 – 070, length 9.5 cm, set of 9, color code: gold

**Rack**, for 36 straight shaft burrs with a length of 9.5 cm, foldable, sterilizable, size 22 x 14 x 2 cm
**INTRA Drill Handpiece**

for Surgery in Ethmoid and Skull Base Area

**Special Features:**
- Tool-free closing and opening of the drill
- Right/left rotation
- Max. rotating speed up to 40,000 rpm/80,000 U/min
- Detachable irrigation channels
- Light construction
- Operates with little vibrations
- Low maintenance
- Reprocessable in a cleaning machine
- Safe grip

**INTRA Drill Handpiece**, angled, length 18 cm, transmission 1:2 (80,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

**INTRA Drill Handpiece**, straight, length 17 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

<table>
<thead>
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649600 L **Standard Straight Shaft Burr**, stainless, size 014 – 070, length 12.5 cm, set of 11

649700 L **Diamond Straight Shaft Burr**, stainless, size 014 – 070, length 12.5 cm, set of 11

649700 GL **Rapid Diamond Straight Shaft Burr**, stainless, with coarse diamond coating for precise drilling and abrasion without hand pressure and generating minimal heat, sizes 023 – 070, length 12.5 cm, set of 9, color code: gold

280034 **Rack**, for 36 straight shaft burrs with a length of 12.5 cm, foldable, sterilizable, size 22 x 17 x 2 cm
Accessories for Burrs

280033   Rack, for 36 straight shaft burrs with a length of 9.5 cm, foldable, sterilizable, size 22 x 14 x 2 cm

280034   Rack, for 36 straight shaft burrs with a length of 12.5 cm, foldable, sterilizable, size 22 x 17 x 2 cm

NEW 280043   Rack, flat model, to hold 21 straight shaft burrs with a length of 7 cm (6 pcs) and 9.5 cm (15 pcs), folding model, sterilizable, size 17.5 x 11.5 x 1.2 cm

Please note: The burrs displayed are not included in the racks.
Accessories for Burrs

39552 A: **Wire Tray**, provides safe storage of accessories for KARL STORZ drilling/grinding systems during cleaning and sterilization, includes tray for small parts, for use with Rack 280030, rack **not** included

**for storage of:**
- Up to 6 drill handpieces
- Connecting cable
- EC micro motor
- Small parts

39552 B: **Wire Tray**, provides safe storage of accessories for KARL STORZ drilling/grinding systems during cleaning and sterilization, includes tray for small parts, for use with Rack 280030, rack **included**

**for storage of:**
- Up to 6 drill handpieces
- Connecting cable
- EC micro motor
- Up to 36 drill bits and burrs
- Small parts

**Please note:** The instruments displayed are not included in the sterilizing and storage tray.
UNIDRIVE® S III ENT SCB NEW
High-Speed Handpieces, angled, 100,000 rpm

For use with High-Speed Drills, shaft diameter 3.17 mm and with High-Speed Micro Motor 20712033

20712033

100,000 rpm

diameter 7.5 mm

7.5 mm
53 mm

7.5 mm
252681

7.5 mm
93 mm

252682

252681  High-Speed Handpiece, medium, angled, 100,000 rpm, for use with High-Speed Micro-Motor 20712033

252682  High-Speed Handpiece, long, angled, 100,000 rpm, for use with High-Speed Micro-Motor 20712033
UNIDRIVE® S III ENT SCB NEW
High-Speed Handpieces, angled, 60,000 rpm

For use with High-Speed Drills, shaft diameter 2.35 mm and with High-Speed Micro Motor 20 712033

252661 High-Speed Handpiece, short, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 712033

252662 High-Speed Handpiece, medium, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 712033

252663 High-Speed Handpiece, long, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 712033
UNIDRIVE® S III ENT SCB <NEW>
High-Speed Handpieces, straight, 60,000 rpm

For use with High-Speed Drills, shaft diameter 2.35 mm
and with High-Speed Micro Motor 20712033

20712033

51 mm
5.5 mm
252691

71 mm
5.5 mm
252692

252691  High-Speed Handpiece, short, straight, 60,000 rpm,
for use with High-Speed Micro-Motor 20712033

252692  High-Speed Handpiece, medium, straight, 60,000 rpm,
for use with High-Speed Micro-Motor 20712033
UNIDRIVE® S III ENT SCB
High-Speed Handpieces, malleable, slim, angled, 60,000 rpm

For use with High-Speed Drills, shaft diameter 1 mm
and with High-Speed Micro-Motor 20 7120 33

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

252671 High-Speed Handpiece, extra long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 7120 33

252672 High-Speed Handpiece, super long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 7120 33
**UNIDRIVE® S III ENT SCB**

High-Speed Standard Burrs, High-Speed Diamond Burrs

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

![Image of burrs]

<table>
<thead>
<tr>
<th>Diameter in mm</th>
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<th>long</th>
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High-Speed Diamond Burrs, 100,000 rpm, for single use, sterile, package of 5

<table>
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<td>3</td>
<td>350230 M</td>
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<td>7</td>
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<td>350270 L</td>
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</table>
**UNIDRIVE® S III ENT SCB**

New High-Speed Diamond Burrs, High-Speed Acorn, High-Speed Barrel Burrs, High-Speed Neuro Fluted Burrs

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

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
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<tbody>
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**High-Speed Acorn, 100,000 rpm, for single use, sterile, package of 5**

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

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**High-Speed Neuro Fluted Burrs, 100,000 rpm, for single use, sterile, package of 5**

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### UNIDRIVE® S III ENT SCB

**New**

High-Speed Standard Burrs, High-Speed Diamond Burrs

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

![Image of burrs]

**60,000 rpm**

**Diameter 5.5 mm**

---

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

<table>
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<tbody>
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<td>330150 M</td>
<td>330150 L</td>
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<tr>
<td>6</td>
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#### High-Speed Diamond Burrs, 60,000 rpm, sterile, package of 5

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## UNIDRIVE® S III ENT SCB

**High-Speed Diamond Burrs, High-Speed Cylinder Burrs, LINDEMANN High-Speed Fluted Burrs**

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

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

<table>
<thead>
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<th>Diameter in mm</th>
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<th>long</th>
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<tr>
<td>7</td>
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### High-Speed Cylinder Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
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<tr>
<td>6</td>
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### LINDEMANN High-Speed Fluted Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
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UNIDRIVE® S III ENT SCB  
High-Speed Diamond Burrs

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

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

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>extra long</th>
<th>super long</th>
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<td>320320 SL</td>
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</tr>
<tr>
<td>4</td>
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<td>320340 SL</td>
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</table>
Navigation Panel Unit (NPU)
Straightforward and efficient support for ENT surgery and skull base

Similar to car navigation technology, surgery also requires a tool that provides safe and secure orientation towards a destination by means of a patient roadmap, uncomplicated surgical routes and a clear indication of danger zones. The system should always enable the surgeon to determine the exact location of an instrument in a patient’s body. The KARL STORZ Navigation Panel Unit provides the surgeon with this ability.

Special Features:
- Mobile, space-saving system with intuitive handling
- Easy assembly and flexible use in the OR
- Durable, sturdy and autoclavable navigation instruments
- Reduced costs through autoclavable accessories and reduced duration of surgery
Navigation Panel Unit (NPU)
Straightforward and efficient support for ENT surgery and skull base

40800001 Navigation Panel Unit NPU,
KARL STORZ SURGICAL COCKPIT® navigation system NPU,
including:
1x Navigation Panel
1x Optical Mouse
1x Navigation Camera
1x Electronic Box
1x Docking Adaptor
1x NPU Mobile Stand
1x Data Cable
1x Video Cable
1x Navigation Camera cable 250
1x Headband for Navigation, for single use
1x Patient Tracker II
1x Case Navigation
1x Navigation Probe
1x Mains Cord
Navigation Base Unit (NBU)
Space-saving integration in any operating room

The Navigation Base Unit NBU enables you to benefit from a seamlessly integrated high-performance navigation solution. The basic unit can easily be attached to a ceiling supply unit or integrated into an equipment cart. Mounted on a ceiling or an extension arm, the navigation camera allows an easy setup and optimal visualization of the surgical site combined with high flexibility. This results in a “zero footprint” navigation solution. Therefore the NBU is offered as a solution for the functional combination of all units in one place.
Navigation Base Unit (NBU)
Space-saving integration in any operating room

**Navigation Base Unit NBU**, KARL STORZ
SURGICAL COCKPIT™ Navigation System NBU,
including:
- 1x Navigation Base Unit
- 1x Optical Mouse
- 1x Navigation Camera
- 1x NBU Mobile Stand
- 1x Navigation Camera Cable 750
- 1x Headband for Navigation, for single use
- 1x Patient Tracker II
- 1x Transport Case Navigation
- 1x Navigation Probe
- 1x Mains Cord

**Remark:** Equipment cart and units are not delivered as a part of the NBU system
Probe, Patient Tracker and Headband
for Navigation Panel Unit (NPU)

40 8001 10 Navigation Probe, with glass marker spheres incorporated, autoclavable, dimensions: 295 x 15 x 30 mm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems.

40 8000 87 Patient Tracker II, with verification adaptor, 3 incorporated glass marker spheres and fixation screw, autoclavable, dimensions: 80 x 60 x 12 mm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems.

40 8000 83 Headband for Navigation, for single use, with plastic holder, for use with KARL STORZ SURGICAL COCKPIT® navigation systems.

The autoclavable Probe 40 800110 with glass spheres for position tracking is a versatile, basic instrument for navigation.

The autoclavable Patient Tracker 40 8000 87 ensures position tracking and orientation of the patient.
Navigated Suction Tubes

angular, curved downwards, curved upwards

40800140 FRAZIER Navigated Suction Tube, angular, for right-handed use, with cut-off hole, 9 Fr., working length 9 cm, for use with KARL STORZ SURGICAL COCKPIT® Navigation Systems

40800150 v. EICKEN Navigated Suction Tube, curved upwards, for right-handed use, outer diameter 3 mm, length 16.5 cm, for use with KARL STORZ SURGICAL COCKPIT® Navigation Systems

40800160 v. EICKEN Navigated Suction Tube, curved downwards, for right-handed use, outer diameter 3 mm, length 16.5 cm, for use with KARL STORZ SURGICAL COCKPIT® Navigation Systems

40800140 L FRAZIER Navigated Suction Tube, angular, for left-handed use, 9 Fr., working length 9 cm, total length 16 cm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems
Navigated Suction Tubes

angular, curved downwards, curved upwards

40800140 R  FRAZIER Navigated Suction Tube, angular, for right-handed use, 9 Fr., working length 9 cm, total length 16 cm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems

40800151  v. EICKEN Navigated Suction Tube, curved upwards, for left and right-handed use, outer diameter 3 mm, length 16.5 cm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems

40800160 LM  v. EICKEN Navigated Suction Tube, curved to left, for left and right-handed use, outer diameter 3 mm, length 16.5 cm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems

40800160 RM  FRAZIER Navigated Suction Tube, angular, for left-handed use, 9 Fr., working length 9 cm, total length 16 cm, for use with KARL STORZ SURGICAL COCKPIT® navigation systems
Instrument Tracker
for Navigation Panel Unit (NPU)

The autoclavable instrument tracker is designed for the navigation of various instruments. The small size of the instrument tracker reduces the risk of collision and ensures very good instrument maneuverability.

Special Features:
- User-friendly handling thanks to optimized, miniaturized design
- Can be used for various navigation instruments

![Instrument Tracker Image]

**40 8001 20**  
**Tool Tracker,** for navigated instruments, autoclavable, with 3 fix-mounted glass spheres, autoclavable, dimensions: 70 x 50 x 14 mm, for use with navigated instruments 40 80014x, 40 80015x, 40 80016x and 40 80017x
Wire Tray for Navigation Probe and Patient Tracker

The wire tray ensures hygienic and secure sterilization, cleaning and storage of standard navigation instrument sets.

39502 NAV1 Wire Tray with Lid, stackable, with silicone knob mat and fixation system, for the cleaning, sterilization and storage of one navigation probe and one patient tracker, external dimensions (w x d x h): 240 x 250 x 70 mm

Please note: The instruments displayed are not included in the rack.
Wire Tray for Suction Tubes and Instrument Tracker

The wire tray ensures hygienic and secure sterilization, cleaning and storage of the suction tube sets.

39502 NAV2 **Wire Tray with Lid**, stackable, with silicone knob mat and fixation system, for the cleaning, sterilization and storage of three suction tubes and three instrument trackers, external dimensions (w x d x h): 240 x 250 x 70 mm

**Please note:** The instruments displayed are not included in the rack.
**IMAGE1 S Camera System**

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

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

**Dashboard**

**Live menu**

**Intelligent icons**

**Side-by-side view: Parallel display of standard image and Visualization mode**
Brilliant Imaging
- Clear and razor-sharp endoscopic images in FULL HD
- Natural color rendition

- Reflection is minimized
- Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting

* SPECTRA A: Not for sale in the U.S.
** SPECTRA B: Not for sale in the U.S.
**IMAGE1 S Camera System**

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:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>TC 200EN*</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD video outputs</td>
<td>- 2x DVI-D</td>
</tr>
<tr>
<td>Format signal outputs</td>
<td>- 1x 3G-SDI</td>
</tr>
<tr>
<td>LINK video inputs</td>
<td>1920 x 1080p, 50/60 Hz</td>
</tr>
<tr>
<td>USB interface</td>
<td>3x</td>
</tr>
<tr>
<td>SCB interface</td>
<td>4x USB, (2x front, 2x rear)</td>
</tr>
<tr>
<td></td>
<td>2x 6-pin mini-DIN</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–120 VAC/200–240 VAC</td>
</tr>
<tr>
<td>Power frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Protection class</td>
<td>I, CF-Defib</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>305 x 54 x 320 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>2.1 kg</td>
</tr>
</tbody>
</table>

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:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera System</td>
<td>TH 100, TH 101, TH 102, TH 103, TH 104, TH 106</td>
</tr>
<tr>
<td>Supported camera heads/video endoscopes</td>
<td>(fully compatible with IMAGE1 S)</td>
</tr>
<tr>
<td>LINK video outputs</td>
<td>1x</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–120 VAC/200–240 VAC</td>
</tr>
<tr>
<td>Power frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Protection class</td>
<td>I, CF-Defib</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>305 x 54 x 320 mm</td>
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<tr>
<td>Weight</td>
<td>1.86 kg</td>
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</tbody>
</table>

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

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

**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 $f = 15 – 31\text{ mm (2x)}$, 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

### Specifications:

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

**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 $f = 15 – 31\text{ mm (2x)}$, 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

### Specifications:

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

9619 NB

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

9826 NB

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

KARL STORZ HD and FULL HD Monitors

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

Optional accessories:

<table>
<thead>
<tr>
<th>Product no.</th>
<th>Pedestal, for monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>9826 SF</td>
<td>9826 NB</td>
</tr>
<tr>
<td>9626 SF</td>
<td>9619 NB</td>
</tr>
</tbody>
</table>

Specifications:
Fiber Optic Light Cables
for Cold Light Fountains

495 NL  Fiber Optic Light Cable,
with straight connector, diameter 3.5 mm,
length 180 cm

495 NA  Same, length 230 cm

Cold Light Fountain XENON 300 SCB

20133101-1  Cold Light Fountain XENON 300 SCB
with built-in antifog air-pump, and integrated
KARL STORZ Communication Bus System SCB
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
Mains Cord
Silicone Tubing Set, autoclavable, length 250 cm
SCB Connecting Cable, length 100 cm

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

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

Cold Light Fountain XENON NOVA® 175

20131501  Cold Light Fountain XENON NOVA® 175,
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
Mains Cord

20132026  XENON Spare Lamp,
175 watt, 15 volt
KARL STORZ AIDA® compact NEO advanced

Brilliance in documentation

Data Acquisition

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

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

Flexible Review, Data Storage and Efficient Data Export

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

Special Features:

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

20040913-EN* KARL STORZ AIDA® compact NEO advanced

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

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

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

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

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

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

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

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