ENDOSCOPIC ORBITAL AND TRANSORBITAL APPROACHES

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The advent of orbital surgery dates back to the end of the 19th century, with the description of the historically known Krönlein operation in 1889. For many years, this was the method of first choice in the treatment of retrobulbar tumors and Dollinger, in 1911, reported on the application of the technique in the treatment of Graves’ orbitopathy. Notwithstanding the significance of the method, a few decades later, the procedure was abandoned for some intrinsic limitations. In the 1930s and 1940s of the last century, other authors proposed different solutions for addressing orbital tumors. Worthy of mention is Berke’s proposal in the early 1950s. In 1976, Maroon and Kennerdel, proposed the use of lateral microsurgical orbitotomy for approaching selected intraorbital tumors.

From the mid-1990s until now, advances in the field of endoscopic sinus and skull base surgery have promoted the development of new approaches to the management of complex lesions of the median and paramedian skull base, and even of the sino-orbito-cranial interface and orbital regions.

The use of endoscopes in orbital surgery was first described by Norris and Cleasby in 1981. The initial report described the use of the endoscope for biopsy excision of orbital tumors and for removal of foreign bodies from the orbit. Unfortunately, the lack of sufficiently distensible space along with little anatomical knowledge and absence of neuronavigation technology have significantly contributed to the fact that endoscopic techniques were not widely accepted until recent years.

Very recently, during the last 5–10 years, use of the transnasal route to approach intraorbital spaces and pathologies enjoys increasingly widespread clinical use. These advancements are mainly based upon improved scientific knowledge and understanding of surgical anatomy as well as increased surgical experience and are, to a lesser extent, attributable to the availability of dedicated instrumentation. Further, upon closer investigation, endoscopic transnasal approaches to the orbit take exquisite advantage of the key anatomic relationship between the paranasal sinuses and the orbital content (concept of sino-orbito-cranial interface). In this respect, endoscopic visualization from inside and below gives surgeons the option of reaching the medial and inferior orbital structures and orbital apex without prior skin incision, bone work and brain retraction.

In a nutshell, at present, transnasal orbital decompression for Graves’ disease, optic nerve decompression, management of orbital wall fractures, sub-periosteal and intraorbital abscess drainage and, in highly selective cases, even the removal of intraorbital tumors, have developed into well-established procedures.

At the time of writing, endoscopic-assisted surgical approaches to the orbit are mainly performed via transnasal routes while non-transnasal endoscopic approaches inside and around the orbit are still rarely adopted in practice, aside from very few exceptions. Notwithstanding this, such pioneering experiences have broadened our horizons and revealed new surgical corridors that can be adopted not only in the management of orbital lesions but also involving deeper areas. In other words, nowadays the orbit should not only be considered the site of a pathologic finding, but also seen as a virtual corridor for access to deeper areas. Clinical experiences seem to demonstrate the feasibility and effectiveness of orbital and transorbital procedures. Needless to say that, once more, this new and exciting field is witnessing the necessity for multidisciplinary collaboration, a sine qua non for increasing success rates and reducing associated risks.

**Summary of Learning Objectives**

- Develop a good understanding of the anatomy of the orbital content and surrounding structures, as seen endoscopically from different perspectives.
- Understand the actual range of options given by orbital and transorbital endoscopic surgery.
- Understand the possible application of the so-called multiportal surgery.
Rationale of Orbital and Transorbital Surgical Approaches

Orbital and transorbital surgery requires great precision and care to safeguard structural integrity of the vital intraorbital content and associated functions as well as to preserve the aesthetics of the face. The decision-making as to which surgical approach to be chosen must be based on the site, relationships and suspected nature of the lesion (regional approach to the orbit). Each area can be accessed by using various approaches, each of them offering a specific angle of attack. It makes a great deal of difference whether a lesion is located at an anterior orbital, mid-orbital or orbital apex position!

Accordingly, from a practical viewpoint, any surgical approach should be defined on a case-to-case basis providing the most direct access to the lesion while minimizing any trauma to adjacent tissues.

Meticulous hemostasis is mandatory to reduce to a minimum the risk of an increase in intraorbital pressure. The use of well-adapted instrumentation and fine-tuned manual control are of key importance in all orbital and transorbital procedures.

Traditionally, surgical approaches to the orbit are subdivided into two main groups, one giving access to the anterior half of the orbit, and the other one, enabling access to the posterior orbit and orbital apex. Surgical access to the orbital skeleton and periorbital structures through eyelids and anterior orbit can be established using a wide range of cutaneous and transconjunctival incisions. The orbital skeleton and bony rim are anatomical structures that inherently limit the range of surgical maneuvers to a narrow space. Therefore, occasionally, bony work is required to create adequate room for the operative steps to be conducted subsequently. In this respect, orbital or cranio-orbital bony segments may temporarily be removed and repositioned to their original sites without incurring any morphological sequelae. Orbital marginotomies, available for surgical treatment of orbital diseases, are classified according to the bony wall involved: inferior, lateral, superior, and medial. Orbital bony disassembly can be performed as required.

Approaches, that enable access to the anterior half of the orbit usually do not call for bony work and can be divided into medial, inferior, lateral and superior approaches. A detailed description is outside the scope of this monograph and the reader is advised to refer to pertinent literature.

Conversely, approaches to gain access to the posterior orbit and orbital apex usually require some bony work. Coronal, transcranial, lateral orbitotomy and midfacial approaches are routes that are traditionally used to access and manage posteriorly located lesions. Historically, the medial intracanal space and orbital apex are addressed from an anterior direction, and a surgical management addressing these regions usually requires the removal of one or more orbital walls. The medial intracanal space may even be accessed by means of bone-sparing routes, such as the transconjunctival medial orbitotomy. This type of approach usually requires the detachment of the medial rectus muscle in order to gain enough space for the surgical steps intended. Conversely, laterally located lesions can be managed, among others, via swinging eyelid, lateral canthal, lateral orbitotomy, and superior lid crease approaches.

Based on the concept of surgical corridors, the orbit has recently been considered as a gate of access to deeper located structures. The anterior cranial fossa has been approached via the superior eyelid route. Very recently, reports in the literature suggested the feasibility of gaining access to the lateral cavernous sinus wall and to manage lesions located at the anterior aspect of the temporal lobe via a transorbital approach. Moe et al. have coined the term TONES (TransOrbital NeuroEndoscopic Surgery) to indicate a group of procedures done transorbitally and addressing the skull base. Based on preclinical and clinical experiences, the authors are convinced that endoscopic techniques can be integrated successfully in surgical procedures, offering improved outcomes and the added benefit of being used as a valuable teaching tool. The possibility to use different entry windows, each of which having its own advantages and limits, represents the basis for introducing a multiportal surgery concept.
Anatomical Background

3 Premise

Any academic report on anatomical details – as an end in itself – is meaningless, and cannot represent the basis for a modern surgical approach, which in turn should be geared to meeting specific functional and surgical objectives.

3.1 Endoscopic Approaches To / Through the Orbit in the Context of Adjacent Anatomy

3.1.1 Endonasal Intraorbital Approach

The ethmoidal sinus complex represents the medial boundary of the orbit, whereas the maxillary sinus is mainly located in its inferior aspect. Accordingly, from the transnasal perspective, once a standard spheno-ethmoidectomy and a medial maxillectomy have been accomplished, complete exposure of the lamina papyracea is achieved, also giving access to the medial and infero-medial walls of the orbit (Fig. 3.1).

In the upper part of the lamina papyracea, at the level of the frontoethmoidal suture, the ethmoidal foramina, usually two in number, are easily inspected. Occasionally, there are three, but also one or even four can be present. Most commonly, they are demarcated by the frontoethmoidal suture. On the orbital floor, the infraorbital bundle can be identified. Both infraorbital nerve and artery are very noticeable. Once the lamina papyracea has been removed, free access to the periorbita is obtained. Removal of the latter structure allows extraconal fat to come into view. Posteriorly, at the level of the medial aspect of the superior orbital fissure, an extraconal vein, draining into the anteromedial aspect of the cavernous sinus, can be seen. This vein lies on the medial surface of the common annular tendon. More anteriorly, a medial connecting vein is usually present, linking the superior to the inferior venous system.

Once the extraconal fat has been removed, the muscular wall – constituted mainly by the medial and inferior rectus muscles, and to a lesser extent by the superior oblique muscle – comes into view. Between the medial and inferior rectus muscles, it is possible to identify extraconal fat (infero-medial part) and to access the intraconal space. Within the orbit, a complex reticular system of fibrous septa divides the fat into distinct lobules. These septa are clearly noticeable in the anterior orbit and are found to interconnect the extraocular muscles, thus forming an intraconal and extraconal space. Posteriorly, this division is less pronounced. In the upper medial intraconal space, the nasociliary nerve (NCN) and distal segment of the ophthalmic artery (OA) are commonly visible. At this level, between the medial rectus and superior oblique muscles (SOM), the anterior ethmoidal artery (AEA), with anterior ethmoidal nerve are usually seen. Once the OA has branched off the AEA, it becomes the dorsal nasal artery. The anterior ethmoidal artery enters the nasal cavity, passing through the anterior ethmoidal foramen, which is located about 20 mm behind the orbital rim. At a distance of 10–15 mm behind the anterior ethmoidal foramen, the posterior ethmoidal foramen comes into view, accommodating the anterior ethmoidal artery (absent in 20% of subjects) and, if present, the posterior ethmoidal nerve. It should be noted that accessory ethmoidal foramina can be present.

Fig. 3.1 Step-by-step ethmoid exposure is performed, finally revealing the lamina papyracea (LP) as a whole (A–D). Superior turbinate (ST); bulla ethmoidalis (EC); ethmoidal complex (EC); frontal sinus (FS); inferior turbinate (IT); hard palate (HP); lamina papyracea (LP); maxillary sinus (MS); middle turbinate (MT); sphenoid sinus (SS); superior turbinate (ST); uncinate process ( ); natural maxillary sinus ostium ( ); naso-lacrimal duct ( ).
The superior ophthalmic vein (SOV) usually traverses in the vicinity of the OA. The SOV is the largest and most important vein of the orbit (Fig. 3.2). In the retrobulbar fat, the SOV is embedded in and supported by highly organized connective tissue. It usually emanates from a junction between the continuation of the supraorbital vein and the angular vein.\(^1\)

Anteriorly, the SOV stays on the medial aspect of the superior rectus muscle, and along its posterior course, the SOV runs below the superior rectus muscle (SRM), assuming a medial to lateral direction to posteriorly reach the lateral aspect of the SRM. As previously stated, the anterior ethmoidal bundle usually passes between the superior oblique muscle (SOM) and the medial rectus muscle (MRM) while the posterior bundle usually passes above the SOM.

Within the intraconal space, on the lateral aspect of the MRM, it is possible to identify the muscular arterial branches usually coming from the OA. As a general rule, the muscular branches are nearly all situated in the intraconal side of the muscles, principally at their posterior part. Slightly superior to the inferior rectus muscle, there is an inferior ophthalmic venous plexus that usually gives off small and short veins with abundant interconnections. From the posterior end of this plexus, the inferior ophthalmic vein (IOV) arises. The length of the IOV is highly unpredictable, because the size of the inferior ophthalmic venous plexus is subject to significant anatomical variability.

Posteriorly, the NCN, close to the optic nerve, gives rise to the long ciliary nerves. The origin of the anterior and posterior ethmoidal nerves, which are terminal branches of the NCN, is usually well identified transnasally. At the level of the trochlea, the NCN becomes the infratrochlear nerve.

The OA usually enters the orbit through the optic canal in its infero-lateral portion. Rarely, the OA enters through a duplicate optic canal or superior orbital fissure.\(^2\) During
its intraorbital course, the OA traverses anteriorly, passing medially above the optic nerve in about 85% of subjects. In the remaining cases, the artery crosses the optic nerve inferiorly. From this turning point, the OA runs anteriorly within the medial orbital segment, and in its posterior segment, it closely follows the optic nerve. At this level the OA is loosely attached to the dural sheath of the ON, while more anteriorly, the artery runs forward between the MRM and the SOM, in close relationship to the NCN and SOV.

The OA is ‘attached’ to the medial orbital wall by means of the AEA. Similar to the ethmoidal nerves, the ethmoidal arteries (EAs) are usually clearly visible transnasally. Other arterial branches, namely the supraorbital and supratrochlear, are hardly visible transnasally. Once the medial intraconal fat has been gently removed, the intraorbital portion of the optic nerve with its tortuous course, comes into view. Anteriorly, the optic nerve is closely interconnected with a vascular network, mainly given off by ciliary arteries (branches of the OA). Close to these vessels, the long ciliary nerves can usually be well defined. The posterior ciliary arteries (PCAs) arise independently from the proximal segment of the OA. The superior PCA is always located superior to the ON. The PCAs run forward and divide into numerous small, short ciliary arteries that are usually highly convoluted, especially near the globe. The medial PCA and the central retinal artery (CRA) are usually the first branches of the OA.

By means of an endoscopic transnasal approach, the CRA can commonly be identified. Usually, it enters the optic nerve from its inferior surface, but the CRA may also reach the nerve from its medial aspect. It should be noted that the CRA is one of the smallest branches of the OA.

![Fig. 3.4 Schematic coronal cross-sections demonstrating, in a posterior to anterior sequence, the geometrical relationships between anatomical structures. Note, the position of the ophthalmic artery (OA) that changes in relation to the optic nerve (ON), when coursing anteriorly. The optic nerve is supplied, in its canal, by pial branches of the OA.](image)

![Fig. 3.5 Orbital apex and superior orbital fissure region (right orbit). Schematic reconstruction in a dry skull (A). Three-dimensional reconstruction showing the endoscopic transnasal view (B). Optic canal (OC); greater wing of the sphenoid (GWS); cavernous portion of the internal carotid artery (ICAc); inferior rectus muscle (IRM); medial rectus muscle (MRM); posterior wall of the maxillary sinus (pwMS); second branch of the trigeminal nerve (V2); lateral opticocarotid recess (o); branches of the inferior division of the oculomotor nerve (●); maxillary strut (●●); optic nerve (●●●); ophthalmic artery (●●●●).](image)
3.1.2 Endonasal Approach to Medial Aspect of Superior Orbital Fissure Region

The medial aspect of the superior orbital fissure is bordered by the maxillary and optic strut. Once the bony covering is removed, fascial layers can be identified. The periorbital layer presents a ‘continuum’ with the dura of the lateral sellar compartment and the fascial system covering the inferior orbital fissure and the pterygopalatine fossa.

After removing the connective layer, deeper located structures come into view. Müller’s muscle extends over the entire length of the inferior orbital fissure, passes over the maxillary strut and enters the superior orbital fissure. It should be noted that this muscle maintains an intimate relationship with the cavernous sinus.

Entering the posterior aspect of the orbit by partially dividing the tendon of the medial and inferior rectus muscle permits visualization of the two main branches of the inferior bifurcation of the oculomotor nerve and, laterally to it, the first segment of the ophthalmic artery can usually be visualized. The relationship between Müller’s muscle, maxillary strut and anterior bend of the internal carotid artery (ICA) becomes evident once the dura of the medial wall of the cavernous sinus has been removed. The anterior bend of the ICA lies immediately posterior to the optic strut. As a matter of fact, the maxillary strut lends itself as a markedly constant bony landmark for identification of the superior orbital fissure and may also be used to define a sort of ‘front door’ to the cavernous sinus.

3.1.3 Superior Eyelid Approach

When viewed from anterior to posterior, the superior eyelid is composed of two lamellae, one anterior (skin and orbicularis oculi muscle) and one posterior (Müller’s palpebral muscle and levator aponeurosis). Interposed between these two lamellae lies the orbital septum (at least in the superior part of the eyelid).

The orbicularis oculi muscle is divided into pretarsal, preseptal and orbital portions. The orbital septum is a membranous sheet that is continuous with the periorbita and periosteum of the external cranial surface. The superior septum originates from the orbital rim at the arcus marginalis. Supero-medially, it is pierced by vessels and nerves. Medially, it is located behind the medial palpebral ligament, while laterally, it is anterior to the lateral palpebral ligament. The superior septum becomes thinner as it approaches the free margin of the eyelid. It attaches to Müller’s muscle and the superior tarsus inferiorly. It ends within the pre-tarsal skin.

The fat pads of the upper eyelid include a medial (whitish) and a central (yellowish) fat pad.

The superior tarsal plate (8–12 mm in height) provides support for the eyelid, with its lateral and medial canthal tendons they form the tarso-ligamentous sling. The upper eyelid retractor system is constituted mainly by the levator palpebrae and its aponeurosis, which passes downward from Whitnall’s ligament to insert onto the tarsal plate and

Fig. 3.6 Schematic drawings of the superior and inferior eyelids and anterior orbit (sagittal and frontal views). Capsulo-palpebral fascia (CPF); lacrimal gland (LG); inferior oblique muscle (IOM); inferior rectus muscle (IRM); levator palpebrae aponeurosis (LPA); orbital fat (OF); orbicularis oculi muscle (OOM); orbital septum (OS); superior rectus muscle (SRM); Whitnall’s ligament (WL); orbital septum ( ); superior tarsus ( ); inferior tarsus ( ); Müller’s muscle ( ); levator palpebrae aponeurosis ( ). The points of attachment of Whitnall’s ligament are located medially above the trochlea, and laterally on the superior portion of the lateral orbital wall, as the ligament has passed between both parts of the lacrimal gland.
Anatomical Background

The pretarsal eyelid skin. Whitnall’s ligament is a condensation of fascial covers around the levator palpebrae superioris muscle. The lateral horn of the levator aponeurosis attaches to Whitnall’s tubercle, while the medial horn is inserted into the posterior lacrimal crest. In the upper eyelid, Müller’s sympathetic muscle should be considered as an accessory tendon of the levator palpebrae. The marginal arterial arcade (mainly from the medial palpebral and lacrimal arteries) runs along the anterior surface of the upper tarsus. Therefore, the blood supply to the superior eyelid greatly depends on the ophthalmic artery (with lesser contributions from infraorbital, temporal, transverse facial and angular arteries).35

The retro-orbicularis oculi fat lies above the orbital septum and expands from the mid-supraorbital rim to the lateral orbital rim. Moving laterally, the orbital rim at the level of the fronto-zygomatic suture is reached. Just behind the orbital septum, in its supero-lateral aspect, the orbital (or upper) lobe of the lacrimal gland is visible, lying above the lateral extension of the levator palpebrae fascial system. The orbital portion of the lacrimal gland is lodged in the lacrimal fossa (frontal bone) while the palpebral portion extends through the lateral horn of the levator aponeurosis into the supero-lateral fornix. Accordingly, the palpebral portion can be seen shining through the conjunctival layer.

The lateral canthal tendon is given by the upper and lower lateral tarsal tendons and inserts into the periorbita overlying the lateral tubercle of Whitnall (that is usually 4 mm posterior to the orbital rim). The medial canthal tendon (MCT) presents two heads, superficial and deep. The first one is thicker and attaches anteriorly to the lacrimal fossa and to the frontal process of the maxillary bone. The deep head is thinner and attaches to the posterior lacrimal crest, behind the lacrimal sac. It should be underlined that the posterior limb of the MCT forms the medial component of the orbital septum.

Surgical Considerations for Transorbital Approaches

Once the orbital rim is skeletonized, a careful sub-periorbital dissection is performed until the superior and inferior orbital fissures are identified. Several bridging vessels are seen during this dissection. They should be coagulated and cut. Close to superior orbital fissure cranio-orbital foramen can be found in 50–60 % of subjects. It usually accommodates the recurrent meningeal artery or menin-golacrimal branch (this vessel can pass even through the SOF). Other minor foramina have been described close to the cranio-orbital foramen.

Once the periorbita is exposed, it can be cut or spared according to the primary goal of surgery.

In a ‘corridor approach’, the periorbita is left intact and usually spared. In a middle cranial fossa approach, the greater wing of the sphenoid should be removed as far as the dura mater. In this case, the supero-medial boundary of the approach is defined by the superior orbital fissure, while the

Fig. 3.7 Sequential endoscopic views of a transorbital approach to the anterior and middle cranial fossa. Anterior cranial fossa dura (ACFD); frontal lobe (FL); frontal nerve (FN); greater wing of the sphenoid (GWS); inferior orbital fissure (IOF); lacrimal nerve (LN); lateral rectus muscle (LRM); lesser wing of the sphenoid (LWS); middle cranial fossa dura (MCFD); floor of the middle cranial fossa (MCFI); optic canal (OC); orbital roof (OR); periorbita (PO); superior orbital fissure (SOF); temporal lobe (TL); temporalis muscle (TM); recurrent meningeal artery (); lateral wall of the cavernous sinus (); anastomotic vessel (); remnant of the greater wing of the sphenoid (); boundary of the lateral aspect of the superior orbital fissure ( ).
lateral boundary is delineated by the temporalis muscle. Superiorly, the approach can be partially extended to the lesser wing of the sphenoid towards the anterior clinoid process. If necessary, the frontal bone can be partially resected, and the sphenoorbital sinus can be coagulated. In case of an intracranial approach, the dura is opened and the anterior part of the temporal lobe of the brain is reached.

In an anterior cranial fossa approach, the craniotomy is made by removing the orbital part of the frontal bone, along with partial removal of the lesser sphenoid wing. The greater wing of the sphenoid is left intact. The dura is exposed and opened according to individual requirements.

In orbital approaches, the periorbita is incised, thus revealing the extraconal fat, which is more distinct in an anterior direction. At the anterior-most position, the posterior aspect of the lacrimal gland can be seen. The most important anatomical landmark is represented by the lateral rectus muscle (LRM), that appears more distinct in a posterior direction. Above the LRM, the most obvious structure encountered is the lacrimal neurovascular ‘bundle’ (nerve, artery and vein), overlying the superior surface of the LRM before it inserts onto the capsule of the lacrimal gland. The lacrimal artery arises from the OA in close proximity to the optic canal. It runs forward, supero-laterally, coming out from the muscular cone and moves toward the lacrimal gland. Commonly, the lacrimal artery gives rise to a recurrent branch that passes through the superior orbital fissure to anastomose with an orbital branch of the middle meningeal artery (MMA).

The orbital branch of the middle meningeal artery can enter the orbit through the superior orbital fissure and, usually, joins the lacrimal artery. Anteriorly, no other significant structure comes into view before reaching the postero-lateral ciliary artery and short ciliary nerves, that arise from the ciliary ganglion. The latter structure is located close to the optic nerve, on its lateral aspect. Posteriorly, close to the superior orbital fissure region, the superior branch of the IIIrd cranial nerve is visible (innervating the superior rectus muscle (SRM) and the levator palpebrae). The superior ophthalmic vein (SOV) can be identified when following in a posterior direction, superior to the optic nerve and below the SRM, to exit the muscular cone between the SRM and the LRM.

The zygomatic branch of the infraorbital nerve, arising from the inferior orbital fissure, can be found in the lower portion of the lateral extraconal space, where it divides into zygomatico-facial and zygomatico-temporal branches (both of them exit the orbit via small bony foramina). Communicating branches between the lacrimal and zygomatic nerves can be found laterally to the LRM. Posteriorly, toward the apex and superior orbital fissure, the inferior division of the IIIrd cranial nerve can be seen in the depth of the field. The inferior branch of the IIIrd cranial nerve gives off three branches, to the MRM, IRM and to the IOM. The branch to the IOM is the longest. The IOV, if present, leaves the muscular cone between the LRM and IRM. The annulus of Zinn is constituted by a thickening of the periorbita and the tendinous origins of the four rectus muscles. It encloses the orbital entrance of the optic canal and the medial portion of the superior orbital fissure (SOF), thus forming the oculomotor foramen. Accordingly, the annulus of Zinn divides the SOF into two spaces: intraconal and extraconal.

**Fig. 3.8** Lateral endoscopic view of the superior orbital fissure. Anterior cranial fossa dura (ACFD); frontal nerve (FN); greater wing of the sphenoid (GWS); lacrimal artery (LA); lacrimal nerve (LN); lateral rectus muscle (LRM); lesser wing of the sphenoid (LWS); middle cranial fossa dura (MCFD); periorbita (PO); orbital branch of the middle meningeal artery (or meningeal branch of the lacrimal artery) (→); boundary of the lateral aspect of the superior orbital fissure (→); remnant of the greater wing of the sphenoid (→).
### 3.1.4 Inferior Eyelid Approach

The inferior eyelid is composed of two lamellae: the anterior one consists of skin and orbicularis oculi muscle while the posterior lamella comprises the capsulo-palpebral fascia (CPF), inferior tarsal muscle and conjunctival layer. Between the anterior and posterior lamellae, in the inferior aspect of the eyelid, it is possible to identify the inferior orbital septum.

The orbicularis oculi fibers are attached to the rim along the medial half. The undersurface of the muscle is attached to the orbital rim by means of a ligamentous attachment, also termed circumferential intraorbital retaining ligament (CIRL) by Rohrich RJ et al.\(^{34}\) Below the OOM, the inferior septum lies. It is attached between the orbital rim inferiorly and the CPF superiorly. Behind the orbital septum, three pockets of fat are described (medial, central and lateral). The CPF originates from the terminal muscle fibers of the inferior rectus muscle and fuses anteriorly with the inferior oblique muscle fascia. It forms Lockwood’s ligament, anterior to the IOM. The CPF terminates anteriorly to the inferior border of the lower tarsus. The inferior tarsus

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**Fig. 3.9** Three-dimensional reconstruction of the superior orbital fissure (A). Lateral (B) and medial (C) endoscopic views. Anterior cranial fossa dura (ACFD); eyeball (EB); frontal nerve (FN); infraorbital nerve (ION); inferior rectus muscle (IRM); lacrimal nerve (LN); lateral rectus muscle (LRM); medial rectus muscle (MRM); maxillary strut (MS); optic nerve (ON); posterior wall of the maxillary sinus (pwMS); superior oblique muscle (SOM); superior rectus muscle (SRM); abducens nerve (abdu); superior division of the oculomotor nerve (smsO); branches of the inferior division of the oculomotor nerve (smsI); boundary of the lateral aspect of the superior orbital fissure (bdSOF); remnant of the greater wing of the sphenoid (rmsGS); orbital branch of the middle meningeal artery (or meningeal branch of the lacrimal artery) (omBMA).

**Fig. 3.10** Schematic drawing focusing on the inferior eyelid anatomy (anterior view). Capsulo-palpebral fascia (CPF); orbital fat (OF); orbicularis oculi muscle (OOM); orbital septum (OS); medial canthal ligament (mcl); inferior oblique muscle (iom).
Endoscopic Orbital and Transorbital Approaches

(height 4–7 mm) attaches medially and laterally by means of the canthal tendons. On the anterior surface of the lower tarsus, in a submuscular plane, the lower eyelid arterial supply is provided (mainly constituted by the inferior lateral and medial palpebral arteries and branches of the infraorbital and transverse facial arteries).

In the medial aspect of the orbital rim, a depression known as the lacrimal fossa houses the lacrimal sac. The sac is partially included in the orbital cavity given the fact that the orbital septum attaches anteriorly only to the lower part of the sac.

Once the orbital septum and periorbita are opened, the extraconal fat comes into view. The inferior extraconal space is bordered by the inferior rectus muscle and the inferior wall. This area is crossed by the inferior oblique muscle and it is filled with fat. Usually, a branch from the infraorbital artery reaches the inferior surface of the inferior oblique muscle (IOM). In the majority of individuals, the inferior muscular artery and inferior branch of the IIIrd cranial nerve terminate in the lateral third of the posterior edge of the IOM. In the lateral aspect, above the orbital floor, a wide area filled with fat is present. As stated, in the inferior extraconal space, the first anatomical structure is the inferior oblique muscle, that originates from the lateral aspect of the superior end of the nasolacrimal canal, just posterior to the orbital rim. Then it runs laterally, passing below the inferior rectus muscle, and follows the curvature of the eyeball to insert close to the point of insertion of the LRM. Intraconally, in the mid-orbit, above the inferior rectus muscle, there is the site of the inferior ophthalmic venous plexus. Usually these veins are short in length and small in diameter. The inferior ophthalmic vein (IOV) commonly arises from the posterior part of the inferior plexus. Normally, the IOV is connected to the SOV by means of lateral and medial collateral veins. Along its course, the IOV usually gives off communicating veins joining the pterygoid plexus. Posteriorly, the IOV can drain directly into the cavernous sinus or into the SOV.

The infraorbital artery arises from the pterygopalatine part of the maxillary artery and is located in the infraorbital groove, where it gives off branches. These branches supply the soft tissue of the orbital floor, lacrimal sac, nasolacrimal duct and, to a lesser extent, the inferior rectus muscle, inferior oblique muscle and Müller’s muscle.

Surgical Considerations for Transorbital Approaches

Once the orbital rim has been skeletonized, a careful subperiosteal dissection is performed until the inferior orbital fissure (IOF) is found. The content of the IOF can be cut, to facilitate exposure of the floor as far as the orbital apex. Usually some bridging veins are identified connecting the orbital content and the bony structures. The position of the infraorbital neurovascular bundle can be seen shining through the thin bone.
Selected Surgical Procedures

The decision-making as to which surgical approach is to be chosen must be based on the site, relationships and suspected nature of the lesion (regional approach to the orbit). Each area can be accessed by using various approaches, each of them offering a specific angle of attack. It makes a great deal of difference whether a lesion is located at an anterior orbital, mid-orbital or orbital apex position!

In the following paragraphs, the authors briefly describe their preferred approaches.

4.1 Transnasal Approach to Medial Orbital Spaces

A transnasal approach to medial orbital spaces commonly comprises the following intraoperative stages:

- Subtotal resection of middle turbinate (recommended).
- Complete sphenoethmoidectomy.
- Exposure and removal of lamina papyracea.
- Periorbital exposure and opening.
- Extraconal fat management (eventually removed as needed).

Surgery proceeds according to the predefined target site (extraconal versus intraconal target site). The medial collateral vein can be managed and cut. Medial and inferior rectus muscles are then identified. If more extensive intraconal work is anticipated, the medial rectus muscle can be medialized and attached to the nasal septum in order to increase the working space created between the medial and inferior rectus muscles. Particularly in extraconal approaches, dissection is facilitated by prior isolation and anterior transconjunc-

Fig. 4.1 Schematic drawing showing incisions for orbital approaches. Coronal incision (—); transconjunctival inferior fornix incision and lateral canthal incision (swinging eyelid approach) (——); subciliary incision (——); superior eyelid incision (——); lateral canthal incision (——); inferior eyelid incision (——); brow incision (——); lower rim incision (——); Lynch incision (——); Wright incision (——); vestibular incision (——).

Fig. 4.2 Endoscopic view of a transnasal orbital approach with complete exposure of the periorbita (right eye) (A). Schematic drawing showing a transnasal approach to the medial intraconal space (B).

Basisphenoid (BS); maxillary sinus (MS); nasal septum (NS); optic nerve (ON); periorbita (PO); skull base (SB); sphenoid sinus (SS).
4.2 Lynch Approach

A slightly curved vertical incision is made down to the periosteum, beginning along the inferior part of the medial brow, halfway between the medial canthus and the nasal dorsum (Fig. 4.1). Local vessels (angular artery and vein) are coagulated. Once the periosteum is reached, dissection proceeds in a sub-periosteal plane. If necessary, the medial canthal ligament can be elevated. In this case, the ligament should be reapproximated at the end of the procedure.

4.3 Superior Eyelid Approach

A skin incision is made on a lid crease in the superior eyelid. The orbicularis oculi muscle should be identified and a suborbicularis flap is raised. Dissection is carried in a supero-lateral direction until the orbital rim is reached. The decision as to whether the orbital septum should be spared or opened is subject to the target site of surgery. If an opening is created, orbital fat will protrude into the operative field and should be managed with retractors. If

\[\text{Fig. 4.3 Superior eyelid approach.}
\text{Placement of an eyelid crease incision (A). Raising of the skin-muscle flap (B,C). Note the orbicularis oculi muscle (---) in (B,C). The flap has been raised completely (D). Exposure of orbital rim (supero-lateral region) (E). Multiple stitches (----) are placed to enlarge the surgical field. Orbital rim (OR). The periorbita is dissected to expose the orbital walls (F). A malleable retractor is used to mobilize the orbital content infero-medially. Malleable retractor (MR).}\]

\[\text{Fig. 4.4 Superior eyelid approach. Deep superomedial dissection. Superior oblique muscle (SOM); levator palpebrae muscle (---); distal part of the superior ophthalmic vein (---).}\]
necessary, the levator palpebrae aponeurosis and Müller’s muscle can be cut, but they should be carefully reaproximated at the end of the procedure. In supero-medial dissection, the superior oblique muscle tendon should be identified and spared. In extraperiorbital approaches, a careful dissection of the periorbita from the orbital bones is conducted and carried as far as the superior and inferior orbital fissures. The greater wing of the sphenoid and orbital part of the frontal bone can be drilled out to expose the dura of the anterior and middle cranial fossa. Specific work is done according to individual requirements.

### 4.4 Inferior Eyelid Approach

The lower eyelid route can be adopted by using a subciliary or subtarsal incision. The authors prefer the use of a subtarsal incision (3–5 mm below the free margin of the lower eyelid). In this case, dissection is carried below the orbicularis and a skin-muscle flap is raised. Further dissection should be performed in the pre-septal plane until the orbital rim is reached.

Irrespective of the incision used, the orbital rim is identified by palpation and, at this level, the periosteum is incised. Then, a subperiosteal dissection is performed and carried as far as the inferior orbital fissure to create adequate space for the following surgical steps. The anterior maxilla and orbital floor can be exposed. If any intra-orbital surgical maneuvers are required, the orbital septum is opened allowing the target area to be accessed.

![Fig. 4.5 Inferior eyelid approaches. Subciliary incision ( ). Lid crease incision ( ).](image)

![Fig. 4.6 Inferior eyelid approach (lid crease). Marking of the incision (A). Placement of the incision (B). Raising of the skin-muscle flap (note, the scissors is below the muscle) (C). Elevation of the skin-muscle flap (D). Periosteal incision made in the inferior orbital rim (E). Elevation of the inferior orbital periosteum (F). Orbital rim (OR). Line of incision (lid crease) ( ). Orbicularis oculi muscle ( ). Periosteum ( ).](image)
4.5 Lateral Canthal Approach and Modifications

The skin incision starts from the lateral canthus and extends posteriorly toward the temporal fossa. Next, a lateral canthotomy and, occasionally, superior and inferior lateral cantholysis are performed. The incision can be extended laterally on the external surface of the zygomatic arch for 1–2 cm without placing the facial nerve branches at risk of iatrogenic injury. Once the orbital rim has been identified, the periosteum is incised and lifted from the lateral orbital wall. In this way, the supero-lateral extraconal space is accessed. In the final stages of the procedure, and provided they have been transected, the limbs of the lateral canthal tendon are reapproximated. It should be noted that not infrequently superior and inferior cantholysis can be avoided (which is preferred by the authors).
4.6 Swinging Eyelid Approach

Depending on the surgeon's individual preferences, a vasoconstrictive agent is injected under the conjunctiva of the inferior eyelid. The eyeball is protected. Next, the lateral canthotomy incision is made. Once the inferior crus of the lateral canthal ligament has been cut, the inferior eyelid is anteriorly retracted. Subconjunctival dissection is carried along the inferior margin of the lower tarsus (be careful medially to preserve integrity of the lacrimal system!). An inferiorly based conjunctival flap is raised and fixed to the superior eyelid edge. Dissection can be extended either in a pre-septal or a post-septal plane, if required. A pre-septal route is recommended in cases where access to the orbital floor must be accomplished (because the surgical field is not occupied by fat). The post-septal (or retro-septal) route is easier and more direct. In this case, the surgical field is occupied by fat, but this, commonly, is a minor concern. In a post-septal approach, no eyelid dissection is required. Alternatively, an inferior fornix conjunctival incision is performed. Regardless of the approach, the floor is accessed without difficulty (easier via the post-septal route). Once the orbital rim/floor has been reached, a periosteal incision and sub-periosteal orbital dissection are accomplished. Work proceeds as needed. The surgical procedure is completed by wound closure (an inferior canthopexy suture is applied, followed by conjunctival closure).

Fig. 4.9 Swinging eyelid approach. Step by step dissection. Lateral canthal incision (A). Eversion of the inferior eyelid (B). Subconjunctival dissection (C). Raising of the conjunctival flap (D). Superior transposition and fixation of the conjunctival flap (E–F).
Methodology of Endoscopic Orbital and Transorbital Skull Base Surgery

Patient positioning is the same as in a standard endoscopic surgical procedure. The operating room setup should allow for double-screen vision, which is the preferred option for any two-surgeon procedure. The head is usually not fixed in place if an extradural approach is planned. The head is fixed when intracranial dissection is anticipated.

Use of neuronavigation is strongly advised in all intraconal, orbital apex and intracranial procedures.

The endoscope is never fixed in a holder. As a rule, surgical procedures are performed using a three- or four-hand technique (Fig. 5.1). Based on the preferences of the surgical team, the first surgeon may hold the endoscope and an instrument, while the other surgeon takes care of a second instrument and suction/irrigation. As an alternative option, the first surgeon may work bimanually while the second one holds the scope. In transpalpebral procedures, it has proven helpful to assign a third surgeon with the task of creating an adequate working space by use of malleable instruments/retractors. The use of controlled systemic hypotension is recommended.
5.1 Indications for Selected Approaches

5.1.1 Transnasal Approach

- Orbital and optic canal decompression.
- Repair of medial and inferomedial wall fractures.
- Lesions of the medial intraconal spaces, mainly of infero-medial location.
- Lesions of the medial extraconal spaces, mainly of infero-medial location.
- In combination with a superior and inferior eyelid approach, giving rise to a multiportal procedure (to anterior and middle cranial fossa lesions).

5.1.2 Superior Eyelid Approach

- Superiorly and laterally located lesions (extra- and intraconal).
- Lesions located in the anterior and middle cranial fossa.
- In combination with a transnasal approach giving rise to a multiportal procedure.

5.1.3 Inferior Eyelid Approach

- Mainly for orbital floor decompression and repair of orbital floor fracture.
- Inferiorly located lesions (mainly extraconal).
- In combination with a transnasal approach giving rise to a multiportal procedure.
5.1.4 Lynch Approach
- Mainly for supero-medially located lesions.
- Especially for orbital and optic nerve decompression.

5.1.5 Swinging Eyelid Approach
- Infero-laterally located lesions (even in the orbital apex). For both extra- and intraconal lesions
- Laterally located lesions (extra- and intraconal).

5.1.6 Combined Multiportal Approach
- 360° approach to the optic canal.
- 360° approach to the cavernous sinus.
- Infratemporal fossa.
- Anterior and Middle cranial fossa.
6.1 Transnasal Approach

Transnasal approaches to the orbital content and the sino-orbito-cranial interface can be greatly improved if due consideration is given to a few surgical pearls and ‘tricks of the trade’, that will be addressed in this chapter.

Following creation of an anterior septal window, a two-nostril approach is used to employ a three or four-hand technique (Fig. 6.1) that provides a more favorable angle of attack.

Depending on the location of the lesion another ‘window of access’ can be created through the anterior maxillary sinus wall. Through this window curved instruments can be passed for lateral mobilization of orbital structures.

Employing a transnasal approach, the best corridor of access to intraconal spaces is that between the medial and inferior rectus muscle. Occasionally, this window can be too narrow to permit an adequate dissection. The ‘superior window’ (between the medial rectus and superior oblique muscles) is by far more technically demanding, and should be performed in highly selected cases.

Fig. 6.2 Sequence of intraoperative endoscopic views (0° telescope) captured in an anterior ‘septal window’ approach to the left eye. Surgical exposure (A, B). Note the improved triangulation between instruments and a wide working space offered by the two-nostril approach (C, D).

Fig. 6.1 Schematic representation of the anterior septal window. As shown above, the anterior septal window gives access to the surgical target area (........) and allows for a favourable angle of attack. Endoscope and instruments can be inserted according to the preferences of the surgical team.
Medial fixation of medial rectus muscle is an auxiliary measure that has proven useful in the creation of a wide corridor between the inferior and medial rectus muscles, thus improving the ability to dissect and work within the medial intraconal space (Fig. 6.4).\(^{38}\)

**Fig. 6.3** Close-up view of the frontal section in a cadaver specimen. Shown are the sino-orbito-cranial interface and the operative window for access to the medial orbital spaces. Ethmoidal complex (EC); inferior rectus muscle (IRM); inferior turbinate (IT); medial rectus muscle (MRM); maxillary sinus (MS); middle turbinate (MT); nasal septum (NS); optic nerve (ON); superior oblique muscle (SOM); superior rectus muscle (SRM); infraorbital nerve ( ). Shown is the orbital floor section ( ) that may be removed to increase the surgical window for improved mobilization of the orbital structures; operative window ( ); sino-orbito-cranial interface ( ).

Anterior stiffening of the medial and inferior rectus muscles by means of transconjunctival looping is an auxiliary measure that has proven helpful in intraorbital dissection (Fig. 6.5). The muscle pretreated in this way becomes rigid, thus facilitating the subsequent management of orbital structures.

**Fig. 6.4** Endonasal medial rectus muscle medialization demonstrated by images from a cadaver specimen (A, B), images taken under in vivo conditions (C, D) and schematic drawings (E, F).

Right eye. The muscle is fixed to the nasal septum. Eyeball (EB); inferior rectus muscle (IRM); medial rectus muscle (MRM); nasal septum (NS); orbital fat (OF); optic nerve (ON); superior rectus muscle (SRM).

An instrument has been passed through the anterior maxillary wall ( ), Nasociliary nerve ( ). Ophthalmic artery ( ).
6.2 Superior Eyelid Approach

The use of stitches and placement of small silastic tubes is a measure generally employed to create an adequately wide access and reduce the risk of iatrogenic damage to the eyelid skin.

The use of a custom-fashioned silastic sheet has proven very useful to keep the surgical field free from fat.\textsuperscript{34}

Low-flow venous bleeding can be reduced by continued hot water irrigation. Improved hemostasis inside the orbit and superior orbital fissure region is accomplished by cautious topical application of hemostatic matrix and compression.

In orbital decompression, creation of a periorbital opening should be initiated posteriorly, and then anteriorly. Most commonly, the inferolateral orbital fat can be removed without causing any clinically relevant changes in eye position.

![Fig. 6.6](image.png)

Fig. 6.6 Superior eyelid approach through a lid crease incision. The surgical window is kept open with the use of stitches and placement of silastic tubes.

![Fig. 6.7](image.png)

Fig. 6.7 The protective use of a silastic sheet is demonstrated in vivo. The sheet is placed on the periorbita to prevent both the latter structure and the orbit from iatrogenic injury.
**Fig. 6.8** The protective use of a silastic sheet is demonstrated in a cadaver. The sheet is placed on the periorbita to prevent both the latter structure and the orbit from iatrogenic injury.

**Fig. 6.9** **Bleeding management.** Sequential endoscopic views captured during major intraoperative bleeding occurring during sphenoid-orbital meningioma surgery (right eye). Bleeding was controlled using a bimanual technique (double-suction) and hemostatic agents.
During greater wing drilling, venous bleeding emanating from spongy bone or intraosseous channels can occur. In such cases, application of hemostatic agents has shown to be useful. Normally, bipolar coagulation is ineffective. Drilling with a diamond burr above the bleeding area without concurrent irrigation is another very effective method to control bleeding. By doing so, the bony dust fills the bleeding point and hemostasis is usually accomplished.

In huge spheno-orbital meningiomas, bleeding can be profuse making the use of hemostatic agents imperative. In such cases, the use of a typical neurosurgical two-hand technique is strongly advisable.

Occasionally, when faced with huge lesions, a temporary supero-lateral marginotomy, performed with various instruments, is used to increase the working space. Following tumor removal, the orbital rim is usually repositioned with microplates or application of stitches.

Fig. 6.10 External view of the surgical area during superior eyelid approach.

Fig. 6.11 Supero-lateral orbital rim marginotomy (left eye). The lesion was too large to be removed via a standard lid crease approach. Greater wing of the sphenoid (GWS); orbital rim (OR); tumor (T); lines of osteotomy (→).
7. Selection of Clinical Case Histories

7.1 Transnasal Approach

**Case 1** Orbital Decompression – Medial Wall and Medial Aspect of Inferior Wall

Patient with a severe thyroid-associated orbitopathy in which a balanced three wall orbital decompression was performed.

![Intraoperative sequential views (right eye). Sphenethmoidectomy and medial wall exposure (A–C). Surgical exposure and removal of the lamina papyracea (D, E). Periorbita exposure and incision (F, G). Orbital fat prolapse (H–I). Lamina papyracea (LP); nasal septum (NS); orbital fat (OF); posterior ethmoid (PE); periorbita (PO); sphenoid sinus (SS); superior turbinate (ST); lamina papyracea fragment (^); optic nerve (→).](image-url)
Case 2  Optic Nerve Decompression for Extensive Fibrous Dysplasia Compressing Both Optic Nerves

The patient was referred to us for progressive impairment of left visual acuity. CT scans showed a severe form of complex skull base fibrous dysplasia compressing both optic nerves, more pronounced on the left side. A transnasal endoscopic approach was used for decompression of the left orbit and optic nerve.

Fig. 7.2 Preoperative CT scans demonstrating the complexity of the fibrous dysplasia (A–F). Intraoperative views of the sequential steps performed to achieve adequate optic nerve decompression (left eye) (G–I). Optic nerve (ON); skull base (SB); sphenoid sinus (SS).
**Case 3  Optic Nerve Decompression for Traumatic Optic Nerve Neuropathy**

Left traumatic optic neuropathy treated endoscopically. Radiology showed only minimal alterations. The left optic nerve was decompressed and small bony fragments removed. The dura was incised.

**Fig. 7.3** Intraoperative sequential views (left eye) (A–D). Removal of a small bony fragment from the optic nerve, and following decompression (A, B). Incision made in the dura of the optic nerve (C). Final aspect of the procedure (D). Cavernous portion of the internal carotid artery (ICAc); optic nerve (ON); sphenoid sinus (SS); lateral optocarotid recess; optic nerve.
Case 4  Periorbital Recurrence of Intestinal-Type Sinonasal Adenocarcinoma

Recurrence of a left sinonasal intestinal-type adenocarcinoma in close proximity to the orbit. Following a thorough discussion with the patient regarding the proposed treatment, informed consent was obtained. The lesion was treated by means of an endoscopic transnasal procedure, employing a typical bimanual four-hand technique. Surgery was uneventful and the lesion was removed completely. Posteriorly, a small remnant of the lamina papyracea was still present.

Fig. 7.4 Sequential endoscopic views showing the various intraoperative stages of the procedure (A–G). The lesion is detached from the orbital content following a nice cleavage plane (B–D). Lamina papyracea and periorbita were dissected and resected (E, F). Operative field at the end of surgery with herniating orbital fat (G). Postoperative endoscopic view (H). Preoperative (I) and postoperative (J) MRI scans in coronal plane. Infratemporal fossa (ITF); lamina papyracea (LP); posterior wall of the maxillary sinus (pwMS); sphenoid sinus (SS); Eustachian tube (—); tumor (T); plane between the lesion and the orbital content (—).
### Case 5: Recurrence of Chondrosarcoma in the Pterygopalatine Fossa and Inferior Orbital Fissure Region

Recurrence of chondrosarcoma involving the right pterygopalatine fossa and inferior orbital fissure. The patient was treated by means of an endoscopic transnasal procedure employing a binostil, four-hand technique.

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**Fig. 7.5** Radiological evaluation. Preoperative MRI scans (A, C) showing a lesion involving the upper part of the pterygopalatine fossa and posterior aspect of the inferior orbital fissure. Postoperative MRI scans (B, D). Area of recurrence (arrow).

**Fig. 7.6** Intraoperative sequential views (A–G). Basisphenoid (BS); Eustachian tube (ET); cavernous portion of the internal carotid artery (ICAc); inferior orbital fissure (IOF); lateral pterygoid muscle (LPM); lateral pterygoid plate (LPP); medial pterygoid plate (MPP); nasopharynx (NP); pterygoid complex (PC); superior orbital fissure (SOF); sphenoid sinus (SS); tumor (T); tensor veli palatini muscle (TVPM); vidian nerve (VN); second branch of the trigeminal nerve (V2); plane between the lesion and the inferior orbital fissure/pterygoid complex ( ); area of recurrence ( ); boundary of the lesion ( ).
Case 6  Right Anterior Intraorbital Extra- and Intraconal Abscess

A young man was referred to us with symptoms of pain and mild impairment of ocular motility in the right eye following an episode of acute rhinosinusitis. Taking into account the medial location of the lesion, a transethmoidal approach to orbital spaces was chosen. No pus was observed subperiosteally. Following careful dissection within the extraconal fat, the abscess was found and drained.

Fig. 7.7  Preoperative MRI scans (A, B) showing an extra-intraconal abscess, located in close proximity to the anterior part of the medial rectus muscle. Intraoperative views (C–H) showing progressive intraorbital dissection and final abscess drainage. Orbital fat (OF); pus (P); periorbita (PO); medial rectus muscle ( ); orbital abscess ( ).
Case 7  Posterior Left Extraconal Cavernous Hemangioma

The male patient (61 yrs.) was referred to us for treatment of a small-to-moderate sized lesion located in the left orbital apex, outside the muscle cone. The patient presented only very mild symptoms and reported that something was not perfect with the left eye (he complained about discomfort associated with ocular motility).

The patient was operated using a transnasal endoscopic-assisted procedure. No major difficulties were encountered during surgery. Histologic evaluation confirmed the presence of a cavernous hemangioma.

Fig. 7.8  Preoperative and postoperative MRI scans showing a lesion located medially at the orbital apex (A, B). Intraoperative sequential views clearly demonstrating the lesion at the end of a complete sphenoidectomgy with removal of the lamina papyracea (C–F). The lesion was carefully dissected off the orbital fat and feeding vessels were coagulated, as required. The postoperative course was uneventful.

Middle turbinate (MT); nasal septum (NS); orbital fat (OF); tumor (T); periorbita ( ); superior oblique muscle ( ); medial rectus muscle ( ).
**Case 8  Right Infero-Medial Cavernous Hemangioma**

The young female patient was referred to us for treatment of a moderately sized lesion located in the right infero-medial extraconal orbital compartment. On account of the favorable position of the lesion, a transnasal approach was chosen. Upon surgery, the lesion was easily identified and removed. The postoperative course was uneventful.

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**Fig. 7.9** Radiological evaluation. Preoperative (A, C) and postoperative (B, D) MRI scans. Medial rectus muscle (→).

**Fig. 7.10** Intraoperative sequential views. Exposure of the lamina papyracea and creation of an opening in the periorbita (A–C). Dissection and removal of the lesion (D, E). Surgical specimen (F). Hemangioma (H); nasal septum (NS); orbital fat (OF); periorbita (PO); periorbital boundaries (→).
Case 9  Right Extra- and Intraconal Pseudotumor of the Orbit

A middle-aged male was referred to us for assessment of a painful mild proptosis in the right eye. MRI-based diagnostic evaluation showed the presence of a diffuse lesion, with ill-defined boundaries, located in the middle and posterior orbit.

Fig. 7.11  MRI-based evaluation. Coronal (A, B) and axial (C, D) MRI scans. Medial rectus muscle (MRM).

Fig. 7.12  Intraoperative sequential views (A–H). Ethmoidal dissection (A, B). Exposure of the medial orbital wall (C, D). Removal of lamina papyracea and periorbita incision (E, F). Tissue sampling for histopathological evaluation (G, H). Lamina papyracea (LP); medial orbital wall (MOW); medial rectus muscle (MRM); middle turbinate (MT); periorbita (PO); pathologic tissue (→).
Case 10 | Superomedial Intraconal Cavernous Hemangioma

A middle-aged woman was referred to us for assessment of a moderate-sized lesion of the left superomedial intraconal space. The patient complained of occasional visual impairment and sensation of pressure in the eye. Extraocular muscle motility was normal. Following a thorough discussion with the patient regarding the proposed treatment, informed consent was obtained. A transnasal intraorbital endoscopic approach was adopted to accomplish complete resection of the lesion. The postoperative course was uneventful. The patient had mild diplopia for a few months, but visual acuity remained stable. At long-term follow-up, mild enophthalmos was present.

Fig. 7.13 Stiffening of the medial rectus muscle (A) was achieved by transconjunctival looping of the muscle insertion. Surgical removal of the lesion (D). Preoperative MRI scans showed a well-defined intraconal lesion in a superomedial location (B, E). Postoperative MRI scans revealed no evidence of residual disease (C, F). Lesion (→).
7.2 Lynch Approach

**Case 11  Anterior and Posterior Ethmoidal Arteries Management for Refractory Epistaxis**

A 75 year-old patient was referred to us with symptoms of epistaxis refractory to sphenopalatine artery ligation. Coagulation of ethmoidal arteries was accomplished via a Lynch approach (left eye) and performed under endoscopic guidance.

**Fig. 7.14** Intraoperative sequential views (left eye) (A–D). Coagulation of anterior ethmoidal artery (A). Dissection and identification of posterior ethmoidal artery (B, C). Coagulation of posterior ethmoidal artery (D). Anterior ethmoidal artery (AEA); medial orbital wall (MOW). Anterior ethmoidal foramen with AEA coagulated and cut (→); posterior ethmoidal artery (→).
7.3 Lateral Canthal Approach

Case 12 Endoscopic-Assisted Lid-Sparing Right Orbital Exenteration

The patient presented with an adenoid cystic carcinoma invading the right orbit. Following a thorough discussion regarding the proposed treatment, the patient consented to undergo endoscopic-assisted right orbital exenteration performed via a lateral canthal approach in conjunction with a transnasal craniectomy. Intraoperative histology confirmed tumor-positive surgical margins and, at the end of surgery, complete oncological radicality could not be obtained. Post-operative heavy-particle radiotherapy was scheduled. Unfortunately, the patient died prior to the onset of post-operative radiotherapy.

Fig. 7.15 Intraoperative sequential transorbital views (A–F). Greater wing of sphenoid (GWS); inferior orbital fissure (IOF); lesser wing of sphenoid (LWS); optic nerve (ON); orbital roof (OR); sphenoid sinus (SS); superior orbital fissure (SOF); superior wall of maxillary sinus (swMS); optic strut (———).
7.4 Superior Eyelid Approach

Case 13 Orbital Decompression (Lateral and Superior Walls)

The young female patient presented with moderate symmetric proptosis arising from Graves’ orbitopathy and was treated according to the standard protocol used at the author’s institution. Endoscopic-assisted orbital decompression was performed on the lateral orbital wall and part of the superior orbital wall using a superior eyelid approach.

Fig. 7.16 Intraoperative views of the right eye (A, B) and of the left eye (C, D). Dura of the anterior cranial fossa (ACFd); dura of the middle cranial fossa (MCFd); superior orbital fissure (SOF); temporalis muscle (TM).

Fig. 7.17 Successful management of an intraoperative complication in another patient. This case is to demonstrate a skull base lesion that occurred in the right anterior cranial fossa, just anterior to the superior orbital fissure (→). Skull base plasty was performed using orbital fat and tabotamp. The postoperative course was uneventful. Anterior cranial fossa (ACF); fat (F); middle cranial fossa (MCF); periorbita (PO); skull base plasty (SBP); temporalis muscle (TM).
**Case 14 | Pleomorphic Adenoma of the Left Lacrimal Gland**

A middle-aged male was referred to us for diagnostic assessment of a moderate-sized lesion of the left superolateral orbital compartment. MRI evaluation showed a lesion of 3.5 cm in diameter, located in the left lacrimal fossa. The lesion was managed via a standard superior eyelid approach. Endoscopic-assisted dissection of the lesion was easily accomplished resulting in its complete removal. Final histopathological examination revealed a pleomorphic adenoma of the lacrimal gland.

**Fig. 7.18** Radiological evaluation. Preoperative MRI scans (A, C). Postoperative MRI scans (B, D) demonstrating complete removal of the lesion (→).

**Fig. 7.19** Intraoperative sequential views. Initial stages of dissection and identification of the lesion (A–C) and complete exposure of lateral orbital wall (D). Medial dissection of the lesion (E–H). View of the surgical field after removal of the lesion (I). Greater wing of the sphenoid (GWS); lateral rectus muscle (LRM); orbital rim (OR); tumor (T).
Case 15  Fibrous Dysplasia of the Right Anterior Cranial Base

A child with moderate dystopia of the right eye presented to us. MRI evaluation showed a moderate-sized lesion compressing the superior part of the orbit and extending into the anterior cranial fossa. No apparent orbital invasion was confirmed. CT imaging showed a suspected bony lesion. Intraoperative histological examination revealed a mesenchymal malignancy. On account of this false diagnosis, the osseous boundaries of the lesion were not removed and a gross total debulking performed. Final evaluation revealed the presence of fibrous dysplasia.

Fig. 7.20  Preoperative (A, B) and postoperative (C, D) MRI scans. External view of the surgical area (E). Intraoperative sequential views (F, G). Greater wing of sphenoid (GWS); superior orbital fissure (SOF); area of surgical removal (©).
Case 16  Intracanal Cavernous Hemangioma of the Right Orbital Apex and Superior Orbital Fissure

Small-to-moderate sized lesion in the right orbital apex. The lesion appeared well-defined and was suspected for cavernous hemangioma. The patient complained of visual disturbance. Surgery was performed by means of a neuronavigated endoscopic-assisted superior eyelid approach. The lesion was found not to adhere to surrounding structures and was removed without damaging its capsule. In the early postoperative period, the patient presented signs of oculomotor nerve palsy, that disappeared completely within a few months.

Fig. 7.21 Preoperative MRI scans (A, B). External view of the surgical area (C). Intraoperative sequential endoscopic views (D–J). Exposure of the surgical field and identification of the superior orbital fissure (D, E). Opening of the periorbita (F). Tumor dissection within orbital apex and superior orbital fissure (G–I). Operative site following resection of the lesion (J). Postoperative MRI scans (K, L). Anterior cranial fossa (ACF); greater wing of sphenoid (GWS); periorbita (PO); superior orbital fissure (SOF); superior rectus muscle (SRM); upper division of the oculomotor nerve; ophthalmic artery; lesion; anterior skull base bony defect.
Case 17  Huge Right Spheno-Orbital Meningioma

The patient was referred to us for the presence of a huge right spheno-orbital meningioma compressing the orbit and causing severe proptosis. The lesion was subtotally removed via a superior eyelid approach. On account of the bony behavior, the lesion was internally debulked using a high speed drill. Even though the eye was protected during surgery, the patient developed a corneal ulceration in the postoperative period, which completely resolved within a few weeks. In order to prevent the occurrence of a severe postoperative enophthalmos, a free fat graft was placed in the surgical defect, and helped to support the orbital content.

Fig. 7.22  Intraoperative sequential endoscopic views of various stages of the procedure (A–F). Preoperative (G, H) and postoperative (I, J) CT scans. The lesion was subtotally removed and the defect filled with fat. Dura of the anterior cranial fossa (ACFD); abdominal fat (AF); infratemporal fossa (ITF); meningioma (temporal fossa segment) (M); dura of the middle cranial fossa (MCFD); floor of the middle cranial fossa (MCFFl); superior orbital fissure (SOF); temporalis muscle (TM).
Case 18  Huge Left Spheno-Orbital En Plaque Meningioma

A young woman was referred to us with a large left sphe-no-orbital en plaque meningioma giving rise to moderate proptosis. The lesion was removed subtotally by means of a superior eyelid approach. Given the en plaque ‘bony’ type of meningioma, the lesion was reduced and debulked using a high-speed diamond drill. The dura was coagu-lated adequately.

Fig. 7.23  Preoperative CT scans in axial (A), coronal (B) and sagittal (C) planes. Postoperative CT scans in axial (D), coronal (E) and sagittal (F) planes show the gross total resection. Intraoperative sequential views (G–L). The dura mater of the anterior and middle cranial fossa is visualized (L). In (K), the tip of the suction tube points to the floor of the middle cranial fossa. Dura of the anterior cranial fossa (ACFD); greater wing of the sphenoid (GWS); dura of the middle cranial fossa (MCFD); floor of the middle cranial fossa (MCFII); superior orbital fissure (SOF).
7.5 Inferior Eyelid Approach

Case 19 Orbital Floor Decompression

This patient presented with severe bilateral proptosis as a result of thyroid orbitopathy. Following a thorough discussion regarding the proposed treatment, the patient consented to undergo balanced orbital decompression. Surgery included decompression, at least partially, of the four orbital walls. An inferior eyelid approach was adopted and the orbital floor was decompressed via this route. Some fat was also removed from the infero-lateral aspect of the orbit.

Fig. 7.24 Intraoperative sequential views (A–F). Identification of the inferior orbital rim and dissection of the orbital floor (right eyeball) (A, B). Removal of the orbital floor, medial (C–D) and lateral (E) to the infraorbital bundle. View of the surgical field upon completion of orbital floor decompression (F). Maxillary sinus mucosa (MSm); orbital fat (OF); orbital floor (OR); orbital rim (OR); infraorbital neurovascular bundle (→).
7.6 Swinging Eyelid Approach

**Case 20**  
Intraconal Neurinoma of the Left Orbital Apex

The patient complained of mild visual impairment in the left eye and reported on the feeling that something was not perfect. MRI evaluation showed the presence of a middle-sized lesion in the mid orbit, extending as far as the left orbital apex. The surgical treatment plan, consisting of an endoscopic-assisted swinging eyelid approach, was based on the site of the lesion in relation to the optic nerve. The lesion was firmly adherent to surrounding structures and was removed in a piecemeal fashion. Following removal of the lesion, the intraorbital optic nerve was revealed. The postoperative course was uneventful. On the last follow-up visit, the patient was fine and presented only a reduced/delayed pupil light reflex.

![Fig. 7.25](image)

**Fig. 7.25** Preoperative MRI scans showing a moderate sized lesion placed in the middle and posterior orbit (A, B). Postoperative MRI scans showing complete removal of the lesion with moderate disarrangement of the orbital content (C, D). Intraoperative aspect (left eyeball) during dissection of the lesion (E). Surgical field upon completion of the procedure (F). Eyeball (EB); inferior rectus muscle (IRM); optic nerve (ON); orbital rim (OR); lateral rectus muscle (LRM); lesion ( ).
7.7 Combined Multiportal Approach

7.7.1 Transnasal-Superior Eyelid Approach

**Case 21** Huge Right Recurrent Spheno-Orbital Meningioma Involving the Infratemporal and Middle Cranial Fossa

The patient presented with a complex and extensive recurrent meningioma invading the right infratemporal fossa, greater wing of the sphenoid, floor of the middle cranial fossa and part of the parapharyngeal region. A combined neuronavigated multiportal transorbital-transnasal procedure was performed and a sub-/gross-total resection achieved with minimal morbidity. The endoscopic transorbital stage of the procedure was performed via a right superior eyelid approach, as previously described.

![Fig. 7.26] Intraoperative sequential endoscopic views (right side) (A–D). Transorbital stage of approach (superior orbital fissure is visible) (A–B). Transnasal stage (infraorbital and infratemporal fossa dissection) (C–D). Preoperative (E) and postoperative (F) MRI scans. Infraorbital nerve (ION); infratemporal fossa (ITF); pterygoid plates (PP); sphenoorbital meningioma (SOM); superior orbital fissure (—).
**Case 22 | Complex Right Sphenoidal Meningioma Invading the Floor of the Middle Cranial Fossa, Greater Wing of the Sphenoid, Pterygoid Plates and Sphenoid Sinus**

A young woman was referred to us with symptoms of sensory disturbance in the right V2 area. Radiological evaluation showed a complex skull base lesion invading the greater wing of the sphenoid, the floor of the middle cranial fossa, the pterygoid plates and the sphenoid sinus. Following a thorough discussion regarding the proposed treatment, the patient consented to a combined (transnasal and transorbital) approach that finally resulted in a near-total resection of the lesion. The postoperative course was uneventful.

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**Fig. 7.27** Radiological evaluation. Preoperative (A–C) and postoperative (D–F) CT scans. The latter confirm a near-total resection of the skull base lesion.

**Fig. 7.28** Intraoperative sequential views (right eye) (A–H). Transorbital stage of approach (A–D). Superior eyelid approach (A). Resection of meningioma (B–C). Surgical field upon completion of surgery (D). Transnasal stage of approach (E–H). The wide anterior sphenoidotomy reveals the part of the lesion that has invaded the sphenoid sinus (E). Exposure of the posterior wall of the maxillary sinus and pterygoid system (F). Resection of meningioma in the circumference of V3 (G). View of the operative field upon completion of surgery (H).

Anterior cranial fossa (ACF); greater wing of sphenoid (GWS); infratemporal fossa (ITF); meningioma (M); dura of middle cranial fossa (MCFd); floor of middle cranial fossa (MCFfl); nasopharynx (NP); nasal septum (NS); periorbita (PO); posterior wall of the maxillary sinus (pwMS); sphenoid sinus (SS); temporalis muscle (TM); third branch of the trigeminal nerve (⇒); sphenoid sinus (⇒).
7.7.2 Transnasal-Inferior Eyelid Approach

**Case 23** Malignant V2 Schwannoma Extending from Malar Region to Foramen Rotundum

The patient was referred to us with a right malignant schwannoma of the second branch of the trigeminal nerve, extending from the anterior cheek region to the foramen rotundum, just below the antero-inferior wall of the cavernous sinus. A combined neuronavigated multiportal transorbital-transnasal approach was performed and a gross total resection completed with very limited morbidity. The transorbital stage of the procedure was conducted via an inferior eyelid approach.

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**Fig. 7.29** Preoperative MRI scans in coronal (A), axial (B) and sagittal (C) planes. Inferior eyelid approach (D). Transorbital stage: the tumor was dissected off from the orbital content and maxillary sinus walls (E, F). Combined transorbital-transnasal stage (G–I). Orbit (Or); sphenoid sinus (SS); tumor (T); second branch of the trigeminal nerve (V2); medial aspect of the superior orbital fissure (→).
References


12. Dallan I, Castelnuovo P, De Notaris M, Sellari-Cheung N, McNab AA. Venous anatomy of the orbit. Investiga-


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Elevators, Knives, Curettes and Spatulas

479100  COTTLE Elevator, double-ended, semisharp and blunt, graduated, length 20 cm

660500  Sickle Knife, slightly curved, pointed, length 18 cm

660506  Round Knife, vertical cutting, 3.5 x 2.5 mm, length 18 cm

660509  Round Knife, angled 45°, diameter 2 mm, length 18 cm

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

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

628714  Same, 90° curved

635012  Spatula, malleable, width 12 mm, length 20 cm

635017  Same, width 17 mm

635025  Same, width 25 mm

635050  Spatula, malleable, width 50 mm, length 30 cm
Scissors, Forceps, Needle Holders and Retractor

- **791500** Stitch Scissors, straight, sharp/sharp, length 12.5 cm
- **791600** Same, curved
- **533012** ADSON Dressing Forceps, serrated, length 12 cm
- **533013** Same, micro-model
- **533212** ADSON-BROWN Tissue Forceps, atraumatic, fine side grasping teeth, length 12 cm
- **533213** Same, micro-model
- **535010** Baby “Mosquito” Forceps, straight, extra slender, length 10 cm
- **535812** DE BAKKEY “Mosquito” Artery Forceps, atraumatic, curved, length 12 cm
- **516013** Needle Holder, tungsten carbide inserts, length 13 cm
- **798418** HEGAR Needle Holder, slender, length 18 cm
- **801201** MIDDELORPF Retractor, with grid handle, small, size 1, 15 x 15 mm, length 20 cm
CASTELNUOVO Spread Forceps

STAMMBERGER RHINOFORCE® II Forceps

CASTELNUOVO Spread Forceps, malleable distal end with blunt curved blades, self-retaining, with ratchet, with cleaning connector, working length 16 cm

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

Same, horizontal opening
STAMMBERGER Punch

651055  STAMMBERGER Punch, circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 3.5 mm, with cleaning connector, working length 18 cm, including Cleaning Tool 651050 R

651050  Same, diameter 4.5 mm

651060  STAMMBERGER Punch, circular cutting, 65° upturned, for frontal sinus recess, diameter 3.5 mm, with cleaning connector, working length 17 cm, including Cleaning Tool 651050 R

651065  Same, diameter 4.5 mm

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

651066  Same, diameter 4.5 mm

Cleaning Tool

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

with integrated irrigation channel

HOSEMANN **Sphenoid Punch**

### BLAKESLEY RHINOFORCE® II Nasal Forceps

- **456000 B** BLAKESLEY RHINOFORCE® II Nasal Forceps, straight, size 0, with cleaning connector, working length 13 cm

- **456500 B** BLAKESKEY-WILDE RHINOFORCE® II Nasal Forceps, 45° upturned, size 0, with cleaning connector, working length 13 cm
BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps
end of sheath 25° upturned

GRÜNWALD-HENKE RHINOFORCE® II Nasal Forceps
straight, through-cutting, tissue-sparing,
BLAKESLEY shape, size 0, width 3 mm,
with cleaning connector, working length 13 cm
BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps
end of sheath 25° upturned

456009 B  BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps,
end of sheath 25° upturned, with straight jaw,
width 2.5 mm, with cleaning connector,
working length 13 cm

456010 B  BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps,
end of sheath 25° upturned, with straight jaws,
width 3 mm, with cleaning connector,
working length 13 cm

456509 B  Same, jaws 45° upturned, width 2.5 mm

456510 B  Same, jaws 45° upturned, width 3 mm

451010 B  CASTELNUOVO RHINOFORCE® II Nasal Forceps,
end of sheath 25° upturned, through-cutting,
with straight jaws, BLAKESLEY shape, width 3 mm,
with cleaning connector, working length 13 cm

451510 B  Same, jaws 45° upturned
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<td>Same, size 1</td>
</tr>
<tr>
<td>459151</td>
<td>STAMMBERGER SILCUT® Antrum Punch, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, right side downward and forward cutting, with cleaning connector, working length 10 cm</td>
</tr>
<tr>
<td>459152</td>
<td>Same, left side downward and forward cutting</td>
</tr>
<tr>
<td>459161</td>
<td>SILCUT® Antrum Punch, right side upward and forward cutting, sheath distally curved right, with cleaning connector, working length 10 cm</td>
</tr>
<tr>
<td>459162</td>
<td>Same, left side upward and forward cutting, sheath distally curved left</td>
</tr>
<tr>
<td>452011</td>
<td>MACKAY-GRÜNWALD SILCUT® Nasal Cutting Forceps, straight, through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, size 1, 8 x 3 mm, with cleaning connector, working length 13 cm</td>
</tr>
<tr>
<td>452021</td>
<td>SILCUT® Nasal Cutting Forceps, straight, through-cutting, extremely powerful resection, patented uniform force transmission for gently controlled cutting, new ergonomic handle design, width of cut 1.5 mm, with cleaning connector, working length 13 cm</td>
</tr>
<tr>
<td>452031</td>
<td>Same, jaws upturned 15°</td>
</tr>
</tbody>
</table>
RHINOFORCE® II Nasal Scissors

449211
RHINOFORCE® II, Nasal Scissors, straight, small model, length of cut 10 mm, with cleaning connector, working length 13 cm

449212
Same, curved to right

449213
Same, curved to left

RHINOFORCE® II Miniature Nasal Forceps

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

452832
Same, jaws upturned 45°

452833
Same, sheath curved 30°, straight jaws

452834
Same, sheath curved 30°, jaws 45° upturned
CASTELNUOVO RHINOFORCE® II Miniature Nasal Forceps

CASTELNUOVO RHINOFORCE® II Miniature Nasal Forceps, with extra fine flat jaws, through-cutting, tissue-sparing, 65° upturned, backward opening, width of cut 1.5 mm, with cleaning connector, working length 13 cm

452841 L Same, left side opening

452841 R Same, right side opening

HEUWIESER Antrum Grasping Forceps

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

653000

HEUWIESER Antrum Grasping Forceps, with extra long curve for anterior alveolar recess, fixed jaw curved downwards 115°, movable jaw backward opening up to 140°, with cleaning connector, working length 10 cm

653005
CASTELNUOVO Sphenoid Punch

615015  CASTELNUOVO Sphenoid Punch, rigid, 65° upbiting forward cutting, size 3.5 x 3.7 mm, fixed jaw extra thin, working length 11 cm

615025  CASTELNUOVO Sphenoid Punch, rigid, 30° upturned, not through-cutting, upbiting forward cutting, fixed jaw extra flat, size 2 x 2 mm, working length 11 cm

PARSONS RHINOFORCE® II Punch

459040  PARSONS RHINOFORCE® II Punch, for partial resection of the uncinate process, upside backward cutting, movable jaw with round tip, diameter 2.5 mm, with cleaning connector, working length 10 cm

OSTRUM Rotating Antrum Punch

459097  Rotating Punch, for resection of the uncinate process, with set screw, backward cutting, sheath slightly curved downwards, small size, bite 2.3 x 4 mm, with cleaning connector, working length 9 cm
STAMMBERGER **Antrum Punch**

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

459052 Same, left side downward and forward cutting

CASTELNUOVO **TAKE-APART®** Bipolar Forceps

462020 CASTELNUOVO **TAKE-APART®** Bipolar Forceps with fine jaws, width 2 mm, distally angled 45°, outer diameter 3.4 mm, working length 14 cm, with irrigation connection for cleaning, including:
- Handle
- Outer Sheath
- Inner Sheath
- Bipolar Insert
CASTELNUOVO Frontal Sinus Probe and Positioning Instrument

629820  Probe, double-ended, maxillary sinus ostium seeker, ball-shaped ends diameter 1.2 and 2 mm, length 19 cm

629822  CASTELNUOVO Positioning Instrument, double-ended, curved/double curved, with 4 spikes, length 22 cm

629823  CASTELNUOVO Positioning Instrument, double-ended, straight/curved 60°, with 4 spikes, length 22 cm

629824  CASTELNUOVO Frontal Sinus Probe, curved, double-ended, length 22 cm
CASTELNUOVO **Elevators, double-ended**

CASTELNUOVO **Suction Elevators**

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

28164 EB  **Same**, angled end shovel-shaped, semisharp, blunt end slightly curved

28164 EC  **Same**, blunt end angled, semisharp end slightly curved, graduated

474015  CASTELNUOVO **Suction Elevator**, flat tip, 5 x 1.8 mm, lateral suction opening, bayonet-shaped, with grip plate, length 21 cm

474016  CASTELNUOVO **Suction Elevator**, flat tip, 3 x 1.8 mm, lateral suction opening, bayonet-shaped, with grip plate, length 21 cm

474017  CASTELNUOVO **Suction Elevator**, 5 x 1.8 mm, double curved, length 21 cm

474018  CASTELNUOVO **Suction Elevator**, 3 x 1.8 mm, double curved, length 21 cm
STRÜMPEL Nasal Forceps

634825 A STRÜMPEL Forceps, with oval, fenestrated, cupped jaws, 45° upturned, width 2.5 mm, working length 12.5 cm

Forceps

663239 Forceps, straight, not through-cutting, with oval, fenestrated cupped jaws, width 2.5 mm, working length 18 cm

663217 Forceps, 45° upturned, not through-cutting, extra sharp, with oval, fenestrated spoon, width 1.5 mm, working length 18 cm, color code: one blue handle
RHINOFORCE® II Nasal Forceps

28164 UA  **RHINOFORCE® II Nasal Forceps**, with extra fine flat jaws, through-cutting, tissue sparing, width of cut 1.5 mm, straight sheath, straight jaws, with cleaning connector, working length 18 cm

28164 UB  **Same**, jaws angled upwards 45°

28164 UE  **Same**, jaws angled downwards 45°

Scissors

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

663301  **Scissors**, straight, delicate, working length 18 cm

663302  **Scissors**, straight, extra delicate, working length 18 cm

663304  **Same**, curved to right

663305  **Same**, curved to left

663307  **Same**, 45° curved upwards

663327  **Scissors**, 45° upwards curve, delicate, shaft 360° rotatable, with cleaning connector, working length 18 cm
Curettes, Dissectors and Elevators

28164 KA  **Curette**, round spoon, tip slightly angled, size 1 mm, with round handle, length 23 cm

28164 KB  **CAPPABIANCA-de DIVITIIS Curette**, round spoon, tip slightly angled, size 2 mm, with round handle, length 23 cm

28164 KF  **Curette**, round spoon, tip highly angled, size 2 mm, with round handle, length 23 cm

28164 KG  **Same**, size 3 mm

28164 RN  **CAPPABIANCA-de DIVITIIS Ring Curette**, with round wire, inner diameter 3 mm, tip angled 45°, with round handle, length 25 cm

28164 RE  **Same**, malleable

28164 RO  **CAPPABIANCA-de DIVITIIS Ring Curette**, with round wire, inner diameter 5 mm, tip angled 45°, with round handle, length 25 cm

28164 RJ  **Same**, malleable

28164 RI  **CAPPABIANCA-de DIVITIIS Ring Curette**, with round wire, inner diameter 3 mm, tip angled 90°, with round handle, length 25 cm

28164 RG  **Same**, inner diameter 5 mm

28164 RB  **CAPPABIANCA-de DIVITIIS Ring Curette**, with round wire, inner diameter 3 mm, laterally curved sheath end, with round handle, length 25 cm

28164 RD  **CAPPABIANCA-de DIVITIIS Ring Curette**, with round wire, inner diameter 5 mm, laterally curved sheath end 90°, with round handle, length 25 cm

28164 RW  **Same**, inner diameter 7 mm

28164 RR  **CAPPABIANCA-de DIVITIIS Curette**, blunt, stirrup-shape, with round handle, length 25 cm

28164 DA  **Dissector**, sharp, tip angled 45°, round spatula, with round handle, size 2 mm, length 23 cm

28164 DB  **Same**, size 3 mm

28164 DF  **Dissector**, sharp, tip angled 15°, flat long spatula, with round handle, size 1.5 mm, length 23 cm

28164 DS  **Elevator**, sharp, tip angled 15°, slightly curved spatula, with round handle, size 2 mm, length 23 cm

28164 DM  **Elevator**, sharp, straight tip, slightly curved spatula, with round handle, size 3 mm, length 23 cm
de DIVITIIS-CAPPABIANCA **Scalpel**

Round Knife

28164 M  
de DIVITIIS-CAPPABIANCA **Scalpel**, with retractable blade, length 23 cm, including:
- **Handle**
- **Outer Sheath**
- **Micro Knife**, pointed

28164 KK  
de DIVITIIS-CAPPABIANCA **Scalpel**, with retractable blade, length 23 cm, including:
- **Handle**
- **Outer Sheath**
- **Micro Knife**, sickle-shaped

28164 MP  
Round Knife, vertical, oval, with round handle, 3.5 x 2.5 mm, length 25 cm

**de DIVITIIS-CAPPABIANCA Suction Curettes,**

with stylet, basket-shaped and hook-shaped

28164 RSB  
CAPPABIANCA-de DIVITIIS **Suction Curette**, blunt, inner diameter 5 mm, tip angled 45°, Luer, length 25 cm

28164 RSC  
Same, inner diameter 7 mm

28164 RT  
CAPPABIANCA-de DIVITIIS **Suction Curette**, with basket, round, size 5 mm, rotatable tube, Luer, length 25 cm

28164 RU  
Same, size 6.5 mm

28164 HKL  
**Hook Curette**, curved to left, hook width 2.5 mm, hook size 0.5 mm, length 25 cm

28164 HKR  
**Hook Curette**, curved to right, hook width 2.5 mm, hook size 0.5 mm, length 25 cm
CASTELNUOVO Hook and Suction Tube

28164 H

28164 H  CASTELNUOVO Hook, 90°, blunt, with round handle, length 25 cm

28164 X

28164 X  CASTELNUOVO Suction Tube, diameter 2 mm, malleable, lateral suction holes, working length 25 cm

Fluorescein Blue Filter System

20 1000 32

20 1000 32  Fluorescein Blue Filter System for fluorescence diagnosis, with 2 rotatable integrated blue filters of different spectral characteristic and additional passage for white light illumination, for use with KARL STORZ cold light fountains and fiber optic light cables. The use of fluorescein barrier filter 20 1000 33 is recommended

20 1000 33

20 1000 33  Fluorescein Barrier Filter, for use with fluorescein blue filter systems 20 1000 32 and HOPKINS® telescopes series 7230, for visual observation or for connection to KARL STORZ Endovision® video cameras
Antrum Cannulas

586125  v. EICKEN **Antrum Cannula**, Luer-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm
586130  **Same**, outer diameter 3 mm
586225  v. EICKEN **Antrum Cannula**, Luer-Lock, short curved, outer diameter 2.5 mm, length 12.5 cm
586230  **Same**, outer diameter 3 mm
586145  v. EICKEN-CASTELNUOVO **Antrum Cannula**, Luer-Lock, S-shaped slightly curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm
586146  **Same**, S-shaped strongly curved
### Suction Tube

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>722830</td>
<td>Suction Tube, angular, with grip plate and cut-off hole, Luer-Lock, outer diameter 3 mm, working length 14 cm</td>
</tr>
<tr>
<td>649180 N</td>
<td>FERGUSON-CASTELNUOVO Suction Tube, without cut-off hole, with stylet, Luer, diameter 2 mm, working length 15 cm</td>
</tr>
<tr>
<td>649182 BU</td>
<td>FERGUSON-CASTELNUOVO Suction Tube, with cut-off hole and mandrel, with calibration markings, lateral opening downwards, diameter 2.5 mm, working length 15 cm</td>
</tr>
<tr>
<td>649183</td>
<td>FERGUSON Suction Tube, with cut-off hole and stylet, Luer, 10 Fr., working length 15 cm</td>
</tr>
<tr>
<td>662882</td>
<td>FRANK-PASQUINI Suction Tube, angular, tip curved upwards, ball end, with grip plate and cut-off hole, Luer, diameter 2.4 mm, working length 13 cm</td>
</tr>
<tr>
<td>662883</td>
<td>Same, tip curved downwards</td>
</tr>
<tr>
<td>662885</td>
<td>FRANK-PASQUINI Suction Tube, angular, tip curved upwards, ball end, with grip plate and cut-off hole, Luer, diameter 3 mm, working length 13 cm</td>
</tr>
<tr>
<td>662886</td>
<td>Same, tip curved downwards</td>
</tr>
</tbody>
</table>
**Instrument Set for Endonasal Dacryocystorhinostomy**

*according to Prof. CASTELNUOVO*

- **660531**
  - CASTELNUOVO *Dissector*, 90°, right, double curved, length 19.5 cm

- **660532**
  - *Same*, left, double curved

- **660533**
  - CASTELNUOVO *Dissector*, 45°, right, double curved, length 19.5 cm

- **660534**
  - *Same*, left, double curved

- **660537**
  - CASTELNUOVO *Knife*, round, 45°, horizontal, diameter 2 mm, double curved, length 19.5 cm

- **660538**
  - *Same*, vertical, diameter 2 mm, double curved

- **660519**
  - CASTELNUOVO *Palpation Probe*, 90°, double curved, length 19.5 cm
Knives, Elevator, Hook and WILDER Dilator
BOWMAN Lachrymal Probe, Light Transmission Probe

- **Surgical Handle**, Fig. 7, length 16.5 cm, for Blades 208010–15, 208210–15
- **Blade**, Fig. 15, sterile, package of 100
- **Elevator**, sharp, curved to right, length 18 cm
- **Elevator**, sharp, curved to left, length 18 cm
- **Hook**, 90°, blunt, length 18 cm

- **WILDER Dilator**, for salivary duct, length 11 cm
- **BOWMAN Lachrymal Probe**, length 13 cm including:
  - **Probe**, size 0000–000
  - **Probe**, size 00–0
  - **Probe**, size 1–2

- **Light Transmission Probe**, for diaphanoscopic localization of the nasolacrimal ducts and fistulae, diameter of distal tip 0.5 mm, sterile, for single use, for use with Fiber Optic Light Cable 495 NL, package of 3
**UNIDRIVE® S III ENT SCB/UNIDRIVE® S III ECO**

The multifunctional unit for ENT

---

**Special Features:**

- **Touch Screen:** Straightforward function selection via touch screen
- **Set values of the last session are stored**
- **Optimized user control due to touch screen**
- **Choice of user languages**
- **Operating elements are single and clear to read due to color display**

One unit – multifunctional:
- Shaver system for surgery of the paranasal sinuses and anterior skull base
- INTRA Drill Handpieces (40,000 rpm and 80,000 rpm)
- Sinus Shaver
- Micro Saw
- Dermatome
- High-Speed Handpieces (60,000 rpm and 100,000 rpm)

Two motor outputs: Two motor outputs for simultaneous connection of two motors:
- For example, a shaver and micro motor
- **Soft start function**

Integrated irrigation and coolant pump:
- Absolutely homogeneous, micro-processor controlled irrigation rate throughout the entire irrigation range
- Quick and easy connection of the tubing set

**Easy program selection via automated motor recognition**

**Continuously adjustable revolution range**

Maximum number of revolutions and motor torque: Microprocessor-controlled motor rotation speed. Therefore the preselected parameters are maintained throughout the drilling procedure

Maxime number of revolutions can be preset

SCB model with connections to the KARL STORZ Communication Bus (KARL STORZ-SCB)

Irrigator rod included
## 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>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode:</td>
<td>40712050</td>
<td>10,000*</td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td>40712055</td>
<td>10,000*</td>
</tr>
<tr>
<td>Oscillating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with Handpiece:</td>
<td>DRILLCUT-X® II Shaver Handpiece</td>
<td></td>
</tr>
<tr>
<td>DRILLCUT-X® II N Shaver Handpiece</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sinus burr mode</strong></td>
<td>40712050</td>
<td>12,000</td>
</tr>
<tr>
<td>Operation mode:</td>
<td>40712055</td>
<td>12,000</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>DRILLCUT-X® II Shaver Handpiece</td>
<td></td>
</tr>
<tr>
<td>DRILLCUT-X® II N Shaver Handpiece</td>
<td></td>
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</tr>
<tr>
<td><strong>High-speed drilling mode</strong></td>
<td>20712033</td>
<td>60,000/100,000</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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<td></td>
</tr>
<tr>
<td>Counterclockwise or clockwise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-Speed Micro Motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drilling mode</strong></td>
<td>[20 7110 33]</td>
<td>40,000/80,000</td>
</tr>
<tr>
<td>Operation mode:</td>
<td>[20 7111 73]</td>
<td></td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counterclockwise or clockwise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro motor and connecting cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Micro saw mode</strong></td>
<td>[20 7110 33]</td>
<td>15,000/20,000</td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td>[20 7111 73]</td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro motor and connecting cable</td>
<td></td>
<td></td>
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<tr>
<td><strong>Dermatome mode</strong></td>
<td>[20 7110 33]</td>
<td>8,000</td>
</tr>
<tr>
<td>Max. rev. (rpm):</td>
<td>[20 7111 73]</td>
<td></td>
</tr>
<tr>
<td>in conjunction with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro motor and connecting cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Power supply

100–240 VAC, 50/60 Hz

### Dimensions

300 x 165 x 265 mm

### Two outputs for parallel connection of two motors

### Integrated irrigation pump:

Flow: adjustable in 9 steps

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

---

<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>
</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

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
- 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

---

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

20 7111 73  Connecting Cable, to connect High-Performance EC Micro Motor 20 7110 33 to UNIDRIVE® S III ENT/ECO/NEURO

20 7120 33  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 ECO**

![UNIDRIVE® S III ECO](image2)

**40 7016 01-1** 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
- Clip Set, for use with silicone tubing set
- SCB Connecting Cable, length 100 cm
- Single Use Tubing Set*, sterile, package of 3

**40 7014 01** 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
- Clip Set, for use with silicone tubing set
- Single Use Tubing Set*, sterile, package of 3

**Specifications:**

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

UNIT SIDE

PATIENT SIDE

High-Speed Micro-Motor
High-Performance EC Motor II
High-Speed Handpiece
INTRA Drill Handpiece

Sinus Burr

Shaver Blade
Shaver Blade, curved

System Components

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

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

Two Pedal Footswitch
Single Use Tubing Set

High-Speed Micro-Motor
High-Speed Handpiece

INTRA Drill Handpiece

Shaver Blade

Shaver Blade, curved

Sinus Burr

Unit Side

Patient Side
### 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>

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

**Special Features:**

<table>
<thead>
<tr>
<th>Feature</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>

**Images:**

- **40712050** DRILLCUT-X® II Shaver Handpiece, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS
- **40712055** DRILLCUT-X® II N Shaver Handpiece, optional adaptability to Shaver Tracker 40800122, 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

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

Handle, adjustable, for use with DRILLCUT-X® II 40712050 and DRILLCUT-X® II N 40712055

Optional Accessory:

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 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 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
Handle 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

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>40712050 DRILLCUT-X® II Handpiece</td>
<td>length 12 cm</td>
</tr>
<tr>
<td></td>
<td>40712055 DRILLCUT-X® II N Handpiece</td>
<td></td>
</tr>
<tr>
<td>41201 KN</td>
<td>serrated cutting edge, diameter 4 mm, color code: blue-red</td>
<td></td>
</tr>
<tr>
<td>41201 KK</td>
<td>double serrated cutting edge, diameter 4 mm, color code: blue-yellow</td>
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</tr>
<tr>
<td>41201 GN</td>
<td>concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-green</td>
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</tr>
<tr>
<td>41201 LN</td>
<td>concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-green</td>
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</tr>
<tr>
<td>41201 SN</td>
<td>straight cutting edge, diameter 4 mm, color code: blue-blue</td>
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</tr>
<tr>
<td>41201 KSA</td>
<td>serrated cutting edge, diameter 3 mm, color code: blue-red</td>
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</tr>
<tr>
<td>41201 KKSA</td>
<td>double serrated cutting edge, diameter 3 mm, color code: blue-red</td>
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</tr>
<tr>
<td>41201 KKS</td>
<td>double serrated cutting edge, diameter 2 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41201 LSA</td>
<td>concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black</td>
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#### Optional Accessory:

<table>
<thead>
<tr>
<th>Detail</th>
<th>Description</th>
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<tbody>
<tr>
<td>41200 RA</td>
<td><strong>Cleaning Adaptor</strong>, 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 DRILL-CUT-X II and DRILL-CUT-X II N**

![Image of Shaver Blade]

**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></td>
<td>40712050 DRILL-CUT-X II Handpiece</td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td></td>
<td>40712055 DRILL-CUT-X II N Handpiece</td>
<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41202 KN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41204 KKF</td>
<td></td>
<td>curved 40°, cutting edge serrated backwards, 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:**

![Image of Cleaning Adaptor]

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 65°, sterilizable

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40712050 DRILLCUT-X® II Handpiece</td>
<td>length 12 cm</td>
</tr>
<tr>
<td></td>
<td>40712055 DRILLCUT-X® II N Handpiece</td>
<td></td>
</tr>
<tr>
<td>41203 KNF</td>
<td>curved 65°, cutting edge serrated forwards, diameter 4 mm, color code: blue-red</td>
<td></td>
</tr>
<tr>
<td>41203 KNB</td>
<td>curved 65°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
<td></td>
</tr>
<tr>
<td>41203 KKF</td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41203 KKB</td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41203 KKFA</td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41203 KKBA</td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41203 GNF</td>
<td>curved 65°, concave cutting edge, oval cutting window, forward opening, diameter 4 mm, color code: blue-green</td>
<td></td>
</tr>
<tr>
<td>41203 GNB</td>
<td>curved 65°, concave cutting edge, oval cutting window, backward opening, diameter 4 mm, color code: blue-green</td>
<td></td>
</tr>
</tbody>
</table>

Optional Accessory:

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 DRILLCUT-X® II Handpiece 40 7120 50</th>
<th>Shaver Blade length 12 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>41301 KN</td>
<td>diameter 4 mm, color code: blue-red</td>
<td></td>
</tr>
<tr>
<td>41301 KK</td>
<td>double serrated cutting edge, diameter 4 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41301 GN</td>
<td>concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green</td>
<td></td>
</tr>
<tr>
<td>41301 LN</td>
<td>concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-black</td>
<td></td>
</tr>
<tr>
<td>41301 SN</td>
<td>straight cutting edge, diameter 4 mm, color code: blue-blue</td>
<td></td>
</tr>
<tr>
<td>41301 KSA</td>
<td>serrated cutting edge, diameter 3 mm, color code: blue-red</td>
<td></td>
</tr>
<tr>
<td>41301 KKSA</td>
<td>double serrated cutting edge, diameter 3 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41301 KKSB</td>
<td>double serrated cutting edge, diameter 2 mm, color code: blue-yellow</td>
<td></td>
</tr>
<tr>
<td>41301 LSA</td>
<td>concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black</td>
<td></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 35°/40°, 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>41302 KN</td>
<td><em>40 7120 50 DRILLCUT-X® II Handpiece</em> &lt;br&gt;&lt;br&gt;<em>40 7120 55 DRILLCUT-X® II N Handpiece</em></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>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>curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41304 KKFA</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>curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
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</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]

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

For use with DRILLCUT-X\textsuperscript{®} II and DRILLCUT-X\textsuperscript{®} II N

![Image of sinus burr](image-url)

<table>
<thead>
<tr>
<th>Detail</th>
<th>Sinus Burr</th>
<th>for use with</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 40°, cylindric, drill diameter 3 mm, shaft diameter 4 mm, color code: red-blue</td>
<td>41304 W</td>
</tr>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 55°, cylindric, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-blue</td>
<td>41303 WN</td>
</tr>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 15°, bud drill, drill diameter 4 mm, shaft diameter 4 mm, color code: red-black</td>
<td>41305 RN</td>
</tr>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 15°, diamond head, drill diameter 3 mm, shaft diameter 4 mm, color code: red-yellow</td>
<td>41305 DN</td>
</tr>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 15°, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-black</td>
<td>41305 D</td>
</tr>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 40°, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow</td>
<td>41305 DW</td>
</tr>
<tr>
<td><img src="image-url" alt="Image of sinus burr" /></td>
<td>curved 70°, diamond head, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-yellow</td>
<td>41303 DT</td>
</tr>
</tbody>
</table>

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

For use with DRILLCUT-X\textsuperscript{®} II and DRILLCUT-X\textsuperscript{®} II N Handpiece

<table>
<thead>
<tr>
<th>Sinus Burr</th>
<th>length 12 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>41304 W</td>
<td></td>
</tr>
<tr>
<td>41303 WN</td>
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<td>41305 RN</td>
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<td>41305 DN</td>
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<td>41305 D</td>
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<tr>
<td>41305 DW</td>
<td></td>
</tr>
<tr>
<td>41303 DT</td>
<td></td>
</tr>
</tbody>
</table>
Accessories for Shaver

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

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

<table>
<thead>
<tr>
<th>Detail</th>
<th>Size</th>
<th>Dia. mm</th>
<th>Standard</th>
<th>Diamond</th>
<th>Diamond coarse</th>
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<tbody>
<tr>
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<td></td>
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<td>7</td>
<td>649670</td>
<td>649770</td>
<td>649770 G</td>
</tr>
</tbody>
</table>

649600 Standard Straight Shaft Burr, stainless, size 014–070, length 9.5 cm, set of 11
649700 Diamond Straight Shaft Burr, stainless, size 014–070, length 9.5 cm, set of 11
649700 G 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
280033 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

- Lightweight 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

Same, transmission 1:2 (80,000 rpm)

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>
<tr>
<th>Detail</th>
<th>Size</th>
<th>Dia. mm</th>
<th>Standard sterilizable</th>
<th>Diamond sterilizable</th>
<th>Diamond coarse sterilizable</th>
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<tbody>
<tr>
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<td>649614 L</td>
<td>649714 L</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>018</td>
<td>1.8</td>
<td>649618 L</td>
<td>649718 L</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>023</td>
<td>2.3</td>
<td>649623 L</td>
<td>649723 L</td>
<td>649723 GL</td>
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<tr>
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<td>2.7</td>
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<td>649727 L</td>
<td>649727 GL</td>
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<td>031</td>
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<td>649731 GL</td>
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<td>035</td>
<td>3.5</td>
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<td>649735 L</td>
<td>649735 GL</td>
</tr>
<tr>
<td></td>
<td>040</td>
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<td>649640 L</td>
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<td>649740 GL</td>
</tr>
<tr>
<td></td>
<td>045</td>
<td>4.5</td>
<td>649645 L</td>
<td>649745 L</td>
<td>649745 GL</td>
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<td>070</td>
<td>7</td>
<td>649670 L</td>
<td>649770 L</td>
<td>649770 GL</td>
</tr>
</tbody>
</table>

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
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

100,000 rpm

diameter 7.5 mm

20712033

53 mm

7.5 mm

252681

93 mm

7.5 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
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 7120 33

<table>
<thead>
<tr>
<th>Handpiece Type</th>
<th>Description</th>
<th>Diameter</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Speed Handpiece, short</td>
<td>angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 7120 33</td>
<td>5.5 mm</td>
<td>51 mm</td>
</tr>
<tr>
<td>High-Speed Handpiece, medium</td>
<td>angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 7120 33</td>
<td>5.5 mm</td>
<td>71 mm</td>
</tr>
<tr>
<td>High-Speed Handpiece, long</td>
<td>angled, 60,000 rpm, for use with High-Speed Micro-Motor 20 7120 33</td>
<td>5.5 mm</td>
<td>91 mm</td>
</tr>
</tbody>
</table>
UNIDRIVE® S III ENT SCB
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

60,000 rpm
60,000 rpm
60,000 rpm

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

![High-Speed Standard Burrs, 100,000 rpm, for single use, sterile, package of 5](image1)

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>350110 M</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>350120 M</td>
<td>350120 L</td>
</tr>
<tr>
<td>3</td>
<td>350130 M</td>
<td>350130 L</td>
</tr>
<tr>
<td>4</td>
<td>350140 M</td>
<td>350140 L</td>
</tr>
<tr>
<td>5</td>
<td>350150 M</td>
<td>350150 L</td>
</tr>
<tr>
<td>6</td>
<td>350160 M</td>
<td>350160 L</td>
</tr>
<tr>
<td>7</td>
<td>350170 M</td>
<td>350170 L</td>
</tr>
</tbody>
</table>

![High-Speed Diamond Burrs, 100,000 rpm, for single use, sterile, package of 5](image2)

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>350210 M</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>350220 M</td>
<td>350220 L</td>
</tr>
<tr>
<td>3</td>
<td>350230 M</td>
<td>350230 L</td>
</tr>
<tr>
<td>4</td>
<td>350240 M</td>
<td>350240 L</td>
</tr>
<tr>
<td>5</td>
<td>350250 M</td>
<td>350250 L</td>
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<tr>
<td>6</td>
<td>350260 M</td>
<td>350260 L</td>
</tr>
<tr>
<td>7</td>
<td>350270 M</td>
<td>350270 L</td>
</tr>
</tbody>
</table>
UNIDRIVE® S III ENT SCB
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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>350330 M</td>
<td>350330 L</td>
</tr>
<tr>
<td>4</td>
<td>350340 M</td>
<td>350340 L</td>
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<tr>
<td>5</td>
<td>350350 M</td>
<td>350350 L</td>
</tr>
<tr>
<td>6</td>
<td>350360 M</td>
<td>350360 L</td>
</tr>
<tr>
<td>7</td>
<td>350370 M</td>
<td>350370 L</td>
</tr>
</tbody>
</table>

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>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>350675 M</td>
</tr>
<tr>
<td>9</td>
<td>350690 M</td>
</tr>
</tbody>
</table>

High-Speed Acorn, 100,000 rpm, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>350960 M</td>
</tr>
<tr>
<td>9.1</td>
<td>350991 M</td>
</tr>
</tbody>
</table>

High-Speed Barrel 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>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>350718 M</td>
<td>350718 L</td>
</tr>
<tr>
<td>3</td>
<td>350730 M</td>
<td>350730 L</td>
</tr>
</tbody>
</table>
## UNIDRIVE® S III ENT SCB
High-Speed Standard Burrs, High-Speed Diamond Burrs

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

60,000 rpm
diameter 5.5 mm

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>330110 S</td>
<td>330110 M</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>330120 S</td>
<td>330120 M</td>
<td>330120 L</td>
</tr>
<tr>
<td>3</td>
<td>330130 S</td>
<td>330130 M</td>
<td>330130 L</td>
</tr>
<tr>
<td>4</td>
<td>330140 S</td>
<td>330140 M</td>
<td>330140 L</td>
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<tr>
<td>5</td>
<td>330150 S</td>
<td>330150 M</td>
<td>330150 L</td>
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<tr>
<td>6</td>
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<td>330160 M</td>
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</tr>
<tr>
<td>7</td>
<td>330170 S</td>
<td>330170 M</td>
<td>330170 L</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>330206 S</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>330210 S</td>
<td>330210 M</td>
<td>–</td>
</tr>
<tr>
<td>1.5</td>
<td>330215 S</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>330220 S</td>
<td>330220 M</td>
<td>330220 L</td>
</tr>
<tr>
<td>3</td>
<td>330230 S</td>
<td>330230 M</td>
<td>330230 L</td>
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<tr>
<td>4</td>
<td>330240 S</td>
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<td>330240 L</td>
</tr>
<tr>
<td>5</td>
<td>330250 S</td>
<td>330250 M</td>
<td>330250 L</td>
</tr>
<tr>
<td>6</td>
<td>330260 S</td>
<td>330260 M</td>
<td>330260 L</td>
</tr>
<tr>
<td>7</td>
<td>330270 S</td>
<td>330270 M</td>
<td>330270 L</td>
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</table>
**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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>330330 S</td>
<td>330330 M</td>
<td>330330 L</td>
</tr>
<tr>
<td>4</td>
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<td>330340 M</td>
<td>330340 L</td>
</tr>
<tr>
<td>5</td>
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<td>330350 M</td>
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<tr>
<td>6</td>
<td>330360 S</td>
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<td>330360 L</td>
</tr>
<tr>
<td>7</td>
<td>330370 S</td>
<td>330370 M</td>
<td>330370 L</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
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<tbody>
<tr>
<td>4</td>
<td>330440 S</td>
</tr>
<tr>
<td>6</td>
<td>330460 S</td>
</tr>
</tbody>
</table>

LINDEMANN High-Speed Fluted Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Size in mm (diameter x length)</th>
<th>short</th>
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</thead>
<tbody>
<tr>
<td>Diameter 2.1/11</td>
<td>330511 S</td>
</tr>
<tr>
<td>Diameter 2.3/26</td>
<td>330526 S</td>
</tr>
</tbody>
</table>
**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>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>320220 EL</td>
<td>320220 SL</td>
</tr>
<tr>
<td>3</td>
<td>320230 EL</td>
<td>320230 SL</td>
</tr>
<tr>
<td>4</td>
<td>320240 EL</td>
<td>320240 SL</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>extra long</th>
<th>super long</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>320320 EL</td>
<td>320320 SL</td>
</tr>
<tr>
<td>3</td>
<td>320330 EL</td>
<td>320330 SL</td>
</tr>
<tr>
<td>4</td>
<td>320340 EL</td>
<td>320340 SL</td>
</tr>
</tbody>
</table>
**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

**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

**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**
Brillant Imaging
- Clear and razor-sharp endoscopic images in FULL HD
- Natural color rendition

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

FULL HD image

CLARA

FULL HD image

CHROMA

FULL HD image

SPECTRA A*

FULL HD image

SPECTRA B**

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

TC 200EN

<table>
<thead>
<tr>
<th>Specification</th>
<th>TC 200EN*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 S CONNECT</strong> 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:</td>
<td></td>
</tr>
<tr>
<td>Mains Cord, length 300 cm</td>
<td></td>
</tr>
<tr>
<td>DVI-D Connecting Cable, length 300 cm</td>
<td></td>
</tr>
<tr>
<td>SCB Connecting Cable, length 100 cm</td>
<td></td>
</tr>
<tr>
<td>USB Flash Drive, 32 GB, USB silicone keyboard, with touchpad, US</td>
<td></td>
</tr>
</tbody>
</table>

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

**Specifications:**

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

*For use with IMAGE1 S

**IMAGE1 S CONNECT Module TC 200EN**

TC 300

<table>
<thead>
<tr>
<th>Specification</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 S H3-LINK</strong> 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:</td>
<td></td>
</tr>
<tr>
<td>Mains Cord, length 300 cm</td>
<td></td>
</tr>
<tr>
<td>Link Cable, length 20 cm</td>
<td></td>
</tr>
</tbody>
</table>

**Specifications:**

<table>
<thead>
<tr>
<th>Camera System</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported camera heads/video endoscopes</td>
<td>TH 100, TH 101, TH 102, TH 103, TH 104, TH 106 (fully compatible with IMAGE1 S)</td>
</tr>
<tr>
<td></td>
<td>22220056-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220065-3</td>
</tr>
<tr>
<td></td>
<td>(compatible without IMAGE1 S technologies CLARA, CHROMA, SPECTRA*)</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>
</tr>
<tr>
<td>Weight</td>
<td>1.86 kg</td>
</tr>
</tbody>
</table>

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

For use with IMAGE1 S Camera System

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

---

**TH 100**

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

<table>
<thead>
<tr>
<th>Specifications:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 FULL HD Camera Heads</strong></td>
<td><strong>IMAGE1 S H3-Z</strong></td>
</tr>
<tr>
<td>Product no.</td>
<td>TH 100</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x $1/3$&quot; CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<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, $f = 15–31$ 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>

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**TH 104**

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

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

9619 NB

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

9826 NB

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

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
</tbody>
</table>

**Inputs:**
- DVI-D
- Fibre Optic
- 3G-SDI
- RGBS (VGA)
- S-Video
- Composite/FBAS

**Outputs:**
- DVI-D
- S-Video
- Composite/FBAS
- RGBS (VGA)
- 3G-SDI

**Signal Format Display:**
- 4:3
- 5:4
- 16:9
- Picture-in-Picture
- PAL/NTSC compatible

**Optional accessories:**
- 9826 SF Pedestal, for monitor 9826 NB
- 9619 NB Pedestal, for monitor 9619 NB

**Specifications:**

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop with pedestal</td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td>Product no.</td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
<tr>
<td>Brightness</td>
<td>200 cd/m² (typ)</td>
<td>500 cd/m² (typ)</td>
</tr>
<tr>
<td>Max. viewing angle</td>
<td>178° vertical</td>
<td>178° vertical</td>
</tr>
<tr>
<td>Pixel distance</td>
<td>0.29 mm</td>
<td>0.3 mm</td>
</tr>
<tr>
<td>Reaction time</td>
<td>5 ms</td>
<td>8 ms</td>
</tr>
<tr>
<td>Contrast ratio</td>
<td>700:1</td>
<td>1400:1</td>
</tr>
<tr>
<td>Mount</td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
</tr>
<tr>
<td>Weight</td>
<td>7.6 kg</td>
<td>7.7 kg</td>
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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>
</tr>
<tr>
<td>Rel. humidity</td>
<td>max. 85%</td>
<td>max. 85%</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>469.5 x 416 x 75.5 mm</td>
<td>643 x 396 x 87 mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
</tr>
<tr>
<td>Certified to</td>
<td>EN 60601-1, protection class IPX0</td>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
</tr>
</tbody>
</table>
Data Management and Documentation
KARL STORZ AIDA® – Exceptional documentation

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

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

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

WD 200-XX* AIDA Documentation System, for recording still images and videos, dual channel up to FULL HD, 2D/3D, power supply 100–240 VAC, 50/60 Hz including:
- USB Silicone Keyboard, with touchpad
- ACC Connecting Cable
- DVI Connecting Cable, length 200 cm
- HDMI-DVI Cable, length 200 cm
- Mains Cord, length 300 cm

WD 250-XX* AIDA Documentation System, for recording still images and videos, dual channel up to FULL HD, 2D/3D, including SMARTSCREEN® (touch screen), power supply 100–240 VAC, 50/60 Hz including:
- USB Silicone Keyboard, with touchpad
- ACC Connecting Cable
- DVI Connecting Cable, length 200 cm
- HDMI-DVI Cable, length 200 cm
- Mains Cord, length 300 cm

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

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

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

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

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

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

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

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

Same, length 230 cm

Cold Light Fountain XENON 300 SCB

Cold Light Fountain XENON 300 SCB
with built-in antifog air-pump, and integrated KARL STORZ Communication Bus System SCB
power supply: 100–125 VAC/220–240 VAC, 50/60 Hz
including:
Mains Cord
SCB Connecting Cord, length 100 cm
Spare Lamp Module XENON
with heat sink, 300 watt, 15 volt
XENON Spare Lamp, only, 300 watt, 15 volt

Cold Light Fountain XENON NOVA® 300

Cold Light Fountain XENON NOVA® 300, power supply: 100–125 VCA/220–240 VAC, 50/60 Hz
including:
Mains Cord
XENON Spare Lamp, only, 300 watt, 15 volt
Equipment Cart

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

**Dimensions:**
- Equipment cart: 830 x 1474 x 790 mm (w x h x d)
- shelf: 630 x 510 mm (w x d)
- caster diameter: 150 mm

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

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

**UG 310**

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

**UG 410**

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

**UG 510**

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