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This publication is based on surgical experience from more than 20,000 operations in the area of ENT and Facial Plastic Surgery.

During the intensive cooperation with the KARL STORZ Company, several new instruments have been developed or improved.

The purpose of this publication is to provide beginners with basic information on instruments from the surgeon’s point of view.

Important Publications:

• BEHRBOHM, H., KASCHKE, O., NAWKA, T.: Endoskopische Diagnostik und Therapie in der HNO, © Gustav Fischer Verlag, Stuttgart · Jena · Lübeck · Ulm, 1997


A Spanish edition was published recently. In 2004 the English edition was awarded the First Prize of the British Medical Association, London.


The following publications by the author of this booklet have been published to date by Endo-Press®:

• BEHRBOHM H, KASCHKE O: Nasal Endoscopy

• BEHRBOHM H: Endoscopic Surgery of the Paranasal Sinuses – Maxillary Sinus Endoscopy

• KASCHKE O, BEHRBOHM H: Endoscopic Surgery of the Paranasal Sinuses – Postoperative Treatment

• BEHRBOHM H, KASCHKE O: Oto-Endoscopy – Otoscopy with Endoscopes – Diagnosis, Assessment of Findings, Postoperative Treatment after Ear Surgery

• BEHRBOHM H, HILDEBRANDT T, KASCHKE O: Functional and Aesthetic Surgery of the Nose

• BEHRBOHM H, KASCHKE O, NAWKA T: Identification and Assessment of Organ-Related Visual Findings in Otorhinolaryngology

• BEHRBOHM H: Aesthetic and Reconstructive Facial Surgery – Selected Aspects and Novel Instruments

• BEHRBOHM H, NEUMANN A: CIM – Contralateral, Ipsilateral and Median Drainage – A Staged Program for External Revision Surgery of the Frontal Sinus with Reconstruction of the Frontal Sinus Floor and Lamina papyracea
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Foreword

A valuable resource regarding the history, development and essentials of surgical instrumentation has been painstakingly created in this monograph by Professor Hans Behrbohm and co-writers. Surgeon of extensive experience, the author brings together, in a richly-illustrated production, historical vignettes combined with practical advice about the proper use of surgical instruments.

Inventive surgeons over the centuries generally designed instruments to solve a technical surgical problem relating to access, manipulation or extirpation. Each generation of surgeons stamped their imprint on traditional basic instruments to assist surgery, refining and “fine-tuning” the inventions of their surgical predecessors. Often, as is the case increasingly today, instruments useful in one specific field have been adapted from those found helpful in an associated field. Refinements in raw materials, fiberoptics, endoscopic tools and computer-assisted technology characterize modern instrument development. An unending search for trauma-reducing limited-access operations creates the need for instruments, that can be safely manipulated in deep recesses with remote control guidance. Only one generation ago, large incisions and generous access constituted a basic tenant of surgery (my own personal professor of surgery often impressed his students with the proclamation: “I limit my incision by the length of the body, and if that ain’t enough, I turn them over and start back up the other side!”) To the profound benefit of surgical patients that expansive philosophy of gaining thorough access has been largely superceded.

In the final analysis, however, it remains the accurate evaluation, judgement and consummate skill of the surgeon, that marks the most favorable outcome of any surgical procedure, no matter how minor or major. The history and implementation of instrument development, utilization and care chronicled in this valuable monograph will have meaning to the student as well as the experienced senior surgeon. The aphorism “It is the poor workman who blames his tools” is as relevant today as in the past. Fortunately, brilliant tools exist, and continue to be developed, that guide the surgeon’s pathway to successful, safe and secure surgical outcomes.

M. Eugene Tardy, Jr. MD, FACS
1.0 History of Surgical Instruments

The shape of ancient surgical knives was described in the Corpus Hippocraticum as early as the fourth to fifth centuries B.C. Among the few surgical instruments of that time were convex and pointed surgical knives.

Scissors were rarely mentioned in ancient times. They were shaped rather like tweezers, without crossed blades.

The purpose of this monograph is to show which instruments were developed or are particularly well suited for specific operation steps. The decision as to when, for example, a straight and pointed or a curved and blunt-tipped dissecting scissors is appropriate, is by no means arbitrary, but follows objective criteria that will be discussed here.

The history of surgical instruments goes back thousands of years, and is characterized by the constant striving of human beings to invent better instruments. From the very beginning, the KARL STORZ company has been strongly committed to the philosophy of taking up the ideas of innovative surgeons in order to create practical user-oriented solutions for specific applications.
Fig. 3
Instruments of the surgeon, Gaspar Stromayr (around 1560). Gaspar Stromayr used shearing knives, lancets, cutting knives and scissors.11.

But what is the use of the great wealth of ideas realized in the form of instruments, if their special features and advantages are no longer known in detail? This question shall be explored here – beginning with an overview of scissors and scalpels as an example.

Milne (1907) systematized the ancient knife blades, distinguishing between straight and curved, single- and double-edged, and those with pointed or blunt tips. The cutting edges of ancient knives were made of iron, which is why they usually became more or less oxidized, whereas the handles, which were made of copper alloy or bronze, proved more durable. Knives were usually designed for special purposes, e.g. scarification, phlebotomy, polyp removal or lithotomy.

Collections of famous surgeons, such as those of Gaspar Stromayr (around 1560) or Professor Lorenz Heister (around 1719) provide insights into the state of instrumentology, and thus also of surgery of past epochs.
Atraumatic surgical techniques via increasingly smaller openings require finer and more precise instruments. In addition to the size and shape of the instruments, the physical properties of the material and its degree of hardness, e.g. of scissor blades, are important aspects.

Historical collections of original instruments used by great surgeons reflect the technical state of the art of instrument design and construction, but also shed light on the surgical techniques for which they were developed.

Instrument collections are contemporary documents of medical history, and therefore plainly significant for cultural history, because they show how surgery literally invaded the lives of people: what traumas, what risks or how long hospital sojourns were in conjunction with the operations of that epoch.
Historical photograph of the operating theater at the Charité Hospital at about the time when Jacques Joseph was in charge of the department of plastic facial surgery (1916–1922). A surgical team, wearing white hygienic cloaks, is crowded around the operating table. The age of asepsis and antisepsis had just begun. Diffuse daylight illuminates the operating field. A tiltable mirror with a rope pull illuminates the operating table. In the foreground are a well-equipped instrument table, the Schimmelbusch drums with sterile instruments, sponges and drapes, and auxiliary tables with disinfectant solutions.

It is particularly fascinating when such a collection comes about through the efforts of a prominent protagonist of a young specialty, who assembled it in a detective-like search for unique pieces scattered all over the world. Thus, behind the collection and each and every instrument there is often a very personal story.

All his life, the founder of modern nasal surgery and pioneer of facial plastic surgery, Professor Jacques Joseph (1865–1934), developed new instruments or modified and improved instruments for his innovative techniques of reconstructive and aesthetic facial operations. World famous is the so-called “Joseph”, a periosteal elevator named after him, that is still in demand in operating rooms the world over.

Joseph had every instrument developed by him engraved with a small inscription: “PROF. JOSEPH”.

During the Nazi era, many of Joseph’s students and close colleagues emigrated. The original instruments were scattered all over the world and cared for like religious relics by renowned plastic surgeons. In 1969, Professor Rudolf Stellmach (1924–2003) was given a few of Professor Joseph’s original instruments by the widow of Dr. Pabst, who had practiced plastic surgery in Berlin-Grunewald. It is a particular accomplishment of Professor Stellmach – himself a world-famous facial plastic surgeon,
specialized in repair of facial clefts – that he assembled numerous original instruments in a collection. Stellmach’s international reputation and scientific travel activities were the fortunate precondition for Joseph’s students, meanwhile famous in their own right, e.g., Gustave Aufricht, Joseph Safian, Samuel Fomon, or Jacques Maliniac, and leading plastic surgeons of the day, such as John Maurice Converse, to give him their “mementos.”

At many courses given in the United States, Samuel Fomon taught the rhinoplasty techniques he had seen performed by Professor Joseph in 1930; among his students were Maurice Cottle of Chicago und Irving Goldman of New York.

After 1922, Aufricht und Safian worked together in Joseph’s practice, having previously passed an internship there (Aufricht for nearly two years and Safian for a few months). There is an impressive report by Safian on Joseph’s teaching sessions, which took place in the operating theaters of the various hospitals in which he treated his patients.
While performing an operation, Joseph was deeply concentrated and hardly spoke at all. He regarded questions by the observers as disruptive, perhaps, among other reasons, because the locally anesthetized patients would have been able to follow whatever was said. There was practically nothing to see when an intranasal operation was being performed. Thus, many of the guest physicians were disappointed and dropped out. Among those who did not want to leave without achieving their goal were Aufricht and Safian. For their persistence, diligence, and open admiration for Joseph’s ability, they were rewarded with their master’s trust, even his affection, so that with them he broke his usual reserve and apparent coldness. For them he became a caring, patient teacher, even accepting and realizing some of their suggestions, such as holding a surgical course on a cadaver. Later, both of them emigrated to America, settling in New York. Joseph remained their friend until his death. Aufricht published a great deal and became one of the best-known rhino-surgeons in the USA.

After a period of study with Joseph, J. Maliniac, a military surgeon from Poland, also tried his luck in New York. In 1931, together with Gustave Aufricht, he founded the American Society of Plastic and Reconstructive Surgeons.

Thus, most of the original instruments were to be found in the United States, and returned to Berlin with this collection.

Like the instruments, Joseph’s personality and significance were largely forgotten in Germany, even after the end of the Nazi era and awareness of his legacy in the minds of his specialty colleagues had to be rekindled.

Stellmach’s collection of highly varied original instruments is also revealing of another aspect: the inseparable duality between surgical mastery and
constant striving for improvement of the required instruments. To illustrate this, a few innovative surgical steps and the instruments developed for their performance are described.

2.1 Intranasal Approaches
Nasal Hump Removal (Rhinokyphectomy)

In 1898, Joseph performed the first plastic operation for reduction of nasal size using an external approach. More than 100 years ago, in 1904, he presented the first report on simultaneous intranasal removal of a nasal hump and the anterior septum.

Joseph systematically worked up this approach for various indications in the years that followed.

At that time, intranasal surgical techniques were considered complex, unsurgical and highly susceptible to infection.

By the time World War I began, Professor Jacques Joseph had a well-earned reputation, both among specialist colleagues and medical lay people as the most prominent German facial surgeon.

For the removal of nasal humps, Joseph used saws. Detachment of the cutis was performed by making a precise stab incision with a double-convex scalpel as far as the piriform aperture.

Then the periosteum was elevated using a raspatory. This instrument served to guide the saw and position it securely, while protecting the surrounding tissue (superficial musculo-aponeurotic system, SMAS).

Bernhard von Langenbeck (1810 – 1887)

Bernhard von Langenbeck was born in Padingbütteln on the River Weser. From 1842 to 1848 he served as Director of the University Hospital in Kiel, then as successor to J.F. Dieffenbach from 1848 to 1882 as Director of the Royal Surgical University Hospital in the Ziegelstrasse in Berlin; in 1872 he became a founding member of the German Surgical Society. Langenbeck was one of the pioneers of modern surgery in Germany, although no sensational discoveries or first descriptions are attributed to him. Ernst von Bergmann used the following words to describe him: “He was the right man, in the right place, at the right time.” He inaugurated or improved several operative procedures, such as subperiosteal bone and joint resections, extension of stiffened joints under anesthesia, and surgery of pharyngeal carcinoma.

Numerous instruments were invented or modified by Langenbeck. Among them are palate knives, hooked forceps, mouth gags and, above all, the blunt wound retractors that bear his name.

Fig. 10
For intranasal operations such as removal of humps, narrowing of the bony nose, and correction of a deviated nose, Joseph used the following instruments, the originals of which are contained in the collection:

1. Joseph surgical knife, double-edged, in various sizes
2. Joseph rhinoplasty scissors, straight
3. Joseph rhinoplasty scissors, curved
4. Joseph shielded saw guide, bayonet-shaped, in two sizes
5. Joseph periosteal elevator
6. Joseph septum chisel
7. Joseph nasal saw, bayonet-shaped
8. Joseph nasal rasp, angular
Paul Viktor von Bruns started his medical studies in 1831 in Brunswick, then proceeded to Tübingen, Halle and Berlin. In 1837 he went into private practice in Brunswick, where he started teaching anatomy in 1839 and wrote his first "Textbook of General Human Anatomy," containing a captivating wealth of illustrations. Even today, Bruns is held in high esteem, not only by medical historians. He concentrated on surgery exclusively, and was called to Tübingen as a professor of surgery, where he worked until 1882, passing away the following year.

Bruns was active in all areas of surgery, including plastic surgery. He was highly successful in lip and cheek reconstruction and as a specialist in diseases of the larynx. Bruns is said to have had an excellent technique in the use of the laryngeal speculum, the application of which he perfected. Furthermore, the first intralaryngeal surgical treatment of laryngeal polyps is attributed to him. As an innovator in wound treatment, he succeeded in preparing absorbent cotton for dressings by degreasing and bleaching it.

Fig. 11a
Intranasal intercartilaginous incision with the double-convex Joseph scalpel.

Fig. 11b*
Intranasal subcutaneous insertion of the nasal rasp.

Fig. 11c*
Intranasal removal of a hump with a saw.

* after JOSEPH, J: Nasenplastik und sonstige Gesichtsbräun; Kabitzsch, Leipzig, 1931
**Technique:**

Removal of the hump proceeds in two stages: 1. intranasal separation of the skin and the periosteum, and 2. the actual sawing.

It is performed by me in the following manner using the intranasal approach...

Using a surgical knife that has been introduced through the nostril, the surgeon makes a mucosal incision just above the posterior edge of the triangular cartilage. ... Then he introduces the tip of the surgical knife between the triangular or lateral cartilage toward the front, in order to reach the lateral surface of the nasal bone; once there, he transsects the periosteum and elevates it gently. With the raspatory, which bends around the surface, the periosteum can be separated from the bony hump upwards to the nasal base and far enough laterally to provide sufficient space for the saw, which is applied from the side.*

... If the nasal dorsum has not become too wide due to removal of the hump, the operation is finished. If the dorsum is too wide, the morphologic deficiency must be repaired in the same session by narrowing the bony nose (Rhinosypasis).

To this end, the double-edged straight scalpel is used to make an incision in the lateral recess of the nasal vestibule, just inferior to the nasolabial fold and deep enough for the tip to reach the outer surface of the maxilla. It is much easier to introduce the lateral saw if one does as I do regularly, i.e. first insert a “guide”, a hook-shaped instrument with its end hollowed into a trough, through the incision in the vestibule, and introducing the saw alongside it.*

*) after JOSEPH, J: Nasenplastik und sonstige Gesichtsplastik; Kabitzsch, Leipzig, 1931

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Fig. 12
Prof. Jacques Joseph during tibial bone graft harvesting prior to rhinoplasty.

Richard von Volkmann
(1830 – 1889)

The native of Leipzig earned his doctor’s degree in 1854 at the University of Berlin Medical School. From 1867 to 1889 he was professor of surgery and director of the University Hospital Department of Surgery in Halle / Saale. In 1870/1872 he participated in the Franco-Prussian War as physician general, taking part in the battle of Sedan (Maas), among others. After the war he waged a successful campaign against the very widespread wound infections, erysipelas and pyemia, applying the ideas of Lister. In 1886 he succeeded Bernhard von Langenbeck as president of the German Society for Surgery. Richard von Volkmann’s name stands for various developments and instruments, e.g. the four-pronged sharp wound retractor, Volkmann’s triangle in bimalleolar ankle fractures, the Volkmann splint, and others.
Wilhelm Brünings (1867 – 1958)

Wilhelm Brünings was a student of Gustav Killian in Freiburg. He advanced direct laryngoscopy as inaugurated by Kirstein both technically and instrumentally, inventing a better handle and improving the lighting by use of a more powerful, smaller lamp and a focussing lens. The result was a universal endoscopy tube that could be lengthened as desired by addition of auxiliary tubes, and became the instrument of choice for decades for direct laryngoscopy, tracheo-bronchoscopy and esophagoscopy.

Brünings constructed and independently manufactured a special endoscopy chair for endoscopy of seated patients.

Fig. 13a
Lateral incision with the double-edged Joseph scalpel.

Fig. 13b
Insertion of the shielded saw guide.
The fact that Joseph used the sawing technique might be explained by his orthopedic training with Professor Julius Wolff (1836–1902) at a time when saws were much in use.

“...After preliminary exposure of the nasal bone and the triangular cartilage, one can proceed to the actual removal of the hump. This can be done in various ways: with a saw, with a chisel, with a drill, or with the bone forceps. There is still a world-wide controversy as to which instrument is most suitable. Again and again there are reports on the advantages of one instrument over the others.

In earlier times, according to Eitner, sharp spoons and punches were also used to remove the hump (Lexer and Balsinger).

Lexer employed an obsolete method of hump removal using a Luer forceps inserted from the outside via a median incision on the nasal dorsum.

French pioneers of plastic surgery preferred the chisel, whereas Joseph, Lindemann, Roy, Eitner, Frühwald and others introduced the use of a saw. ... In the last analysis, it is more important that the surgeon has a good command of one of the instruments. Safian in 1955 emphasized the advantages of the Joseph saw over the chisel. The saw is supposed to be faster and more precise, and the line of resection straighter.”*

At that time, various chisels for ear, nasal septum, and sinus surgery, such as those from Thies, West, Freer or Brünings, were already available in sufficient degrees of hardness.

*) after DENECKE HJ, MEYER R: Plastische Operationen an Kopf und Hals, Springer, Berlin, 1964

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Erich Lexer (1867–1937)

Born in Freiburg and a student of Ernst von Bergmann, Erich Lexer was one of the most important pioneers of modern plastic and reconstructive surgery.

After training in Königsberg and Jena, Lexer was Head of the Surgery Department at the University Hospital in Freiburg from 1919 to 1927, where he conducted the world’s first reduction mammoplasty in 1923. In the spring of 1928, he succeeded Ferdinand Sauerbruch as Head of the Surgical University Hospital in the Nussbaum Street in Munich. His monographs, “Free Transplantation” and “Reconstructive Surgery,” and their expanded, two-volume edition, “The Entire Field of Reconstructive Surgery”, are still of scientific and literary value. Under Erich Lexer the hospital became an international center for reconstructive surgery. One of his students was Eduard Rehn, whom Lexer in 1914 stimulated to write about deep skin grafts (interpositional dermal grafts).

Lexer was vehemently opposed to Joseph’s intranasal operation techniques, which he considered unsurgical and conducive to infection.
2.2 Realignment of a Crooked Nose
(Nasal Orthoplasty)

For measurement of the lateral deviation of the nasal dorsum from the midline, Joseph used a special instrument he designed himself, the so-called rhinoscoliometer.

**Technique:**
Joseph resected intranasally a wedge-shaped piece of bone from the maxilla, from the broader side of the crooked nose, while resecting the opposite side in a line. This wedge resection from the broader side of the bony crooked nose provides space for it to shift toward the midline of the face, facilitating repositioning.⁹

Repositioning of the nose was performed manually or by a few taps with the Joseph rhinoclast.
After the operation, the patient had to wear a retainer designed by Joseph to maintain the position of the nose.

*My retainer is constructed as follows: A headband bearing a strong metal plate in front is fitted to the forehead as closely as possible. From the middle of the metal plate a slender bar projects downward, parallel to the nose; the bar is equipped with a pressure pad attached to it by a hinge.*

Theodor Kocher (1841 – 1917)

Theodor Kocher was born in Bern, Switzerland, where he became director of the Surgery Department of the University Hospital.

Kocher’s most important achievement was research on the complications of total thyroidectomy. As the best thyroid surgeon of his time, he transformed the operation from a bloody radical procedure to an atraumatic, tissue-sparing one in which structures were preserved.

In 1880 he invented a toothed arterial clamp for so-called “forcipressur,” i.e., hemostasis by means of an arterial clamp. In 1909 he was awarded a Nobel Prize. He is reported to have carried out more than 20,000 operations. At the same time, he developed numerous operative techniques in nearly all areas of surgery, as well as inventing and improving instruments. Kocher’s “Chirurgische Operationslehre” (Textbook of Surgical Operations) is one of his most outstanding publications; it was used the world over.
2.3 Correction of the Nasal Tip

For narrowing a broad nasal tip, Joseph developed various methods.

The Joseph punch shown in Fig. 17a served to excise a strip from the alar cartilage via the intranasal approach.

**Technique:**

With this method, one must distinguish an immediate and a long-term effect. The immediate effect is that the nasal tip is drawn back a bit and is initially somewhat narrower, without the nasal wings being pulled together to any extent. The long-term effect of the method consists of the nasal wings shifting toward the midline. This effect is caused by transverse contraction of scar tissue, which sets in later.

**Fig. 17a**

Joseph punch for nasal tip cartilage.

**Fig. 17b**

Intranasal excision of a strip of alar cartilage by Joseph’s method.
2.4 Reconstruction of the Nasal Framework

For reconstruction of bony and cartilaginous structures, Joseph developed several techniques (such as tibio-labial and tibio-brachial septoplasty) using free transfer of various autologous grafts. Bone grafts harvested from the tibia and cartilage from the ribs played an important role. He also used ivory, which he obtained from the Berlin piano manufacturer, C. Bechstein.

Joseph prepared the grafts in an osteoplastic laboratory.

Fig. 18
Ivory holding forceps for preparation of grafts.
Vise-jaw forceps were used for firm fixation of various bone grafts. The forceps were secured in a vise.

On 2, June 1916 Joseph took over the direction of the Department of Facial Plastic Surgery at the Charité Ear Hospital from Adolf Passow (1859–1926). The main objective during the time of World War I was to provide surgical care for a large number of war-wounded patients, most of them presenting with severely disfiguring facial injuries.
In the immediate vicinity of Joseph’s facility was the Clinic for Neck and Nose Patients founded by Bernhard Fränkel (1836–1911) in the Charité Hospital. In 1911, Gustav Killian (1860–1921) was appointed to succeed Fränkel as head of the laryngology department.

Like Joseph, Killian was an untiring and enthusiastic inventor.

Not only did Killian develop numerous techniques for endoscopy in his field, such as suspension laryngoscopy and bronchoscopy, but also techniques for endonasal surgery of the sinuses and the nasal septum.

When Gustav Killian moved to Berlin from Freiburg, the F.L. Fischer company opened a branch office at Luisenstrasse 64, just across the street from the Charité.

This close collaboration enabled the development of many instruments, such as the Killian speculum and the Killian-Claus chisel. The catalog texts explained the outstanding feature of “English steel” and the stringent tests of quality on hard bone.

Howard P. House (1908–2003)

Howard House and his brother, William F. House, belong to the most important pioneers of modern otology and otosurgery.

In 1946, Howard P. House established the Los Angeles Foundation of Otology and Otologic Medical Group near the world-famous Universal Studios in Los Angeles. Later, the institution was renamed House Ear Institute, a center of research, innovation, and advanced training, that gave important impulses, e.g., for modern approaches to the cerebello-pontine angle, the internal acoustic meatus, and for cochlear implantation.

House performed stapedioplasty through an ear speculum and was an unforgettable teacher with a wonderful sense of humor at the courses in otosurgery that he continued to hold at an advanced age in the House Ear Institute. The House curette is a cutting instrument with sharp lateral edges. It serves to remove bony projections, e.g., in the posterior auditory canal or the lateral attic wall for exposure of the long crus of the incus and the footplate in middle ear operations.

Howard P. House (1860–1921) performing an esophagoscopy with the patient in Mikulicz (lateral recumbent) position.
As stated in the advertisement, the instruments of Jacques Joseph were manufactured by the Pfau company, Luisenstraße 48 in Berlin, only a few meters away from Fischer’s address, according to Joseph’s instructions and some were made “from best English steel.”

The Pfau company, then the leader in the field, was dissolved in mergers more than twenty years ago. The initially used trademark was later lost.

Many of the instruments developed by Professor Jacques Joseph have proved useful for decades. They are still included in the catalogs of KARL STORZ and are among the most demanded instruments for plastic facial nasal surgery.

We would like to thank Mrs. Maja Stellmach for generously permitting us to photograph the collection of original instruments.
3.0 Fundamentals of ENT Instruments

Surgical Knives

Convex-shaped surgical blades, curved to various degrees, are very suitable and nearly universally applicable for skin incisions and sharp dissection. The choice of blade size depends on the length of the incision and the thickness of the skin, subdermis, and fatty tissue.

The pointed blade (No. 11) is suitable for making small and angled fine incisions; the Joseph double-edged scalpels serve for sharp dissection and detachment of larger areas, guided by a finger.

Fig. 22
Various cambered, bellied scalpels and the curved double-edged Joseph scalpel.
Manual Guidance of the Scalpel

Secure guidance of the scalpel is possible, if it is held like a pen. At the same time, the hand or the third to fifth fingers are used for support.

The skin incision starts with a controlled but firm puncture of the skin (depending on its thickness), with the blade held nearly perpendicularly. Then the scalpel is lowered to an angle of 45° and the incision drawn to the end. There the blade is again raised, ensuring a uniform depth of the cut.

Caution:
A sharp blade cuts best. Sharp, smooth incisions are essential for uncomplicated wound healing with good scars.
If the scalpel is applied at an angle of less than 45°, the cutting edge loses force, e.g., if applied sensitively the blade can even glide across a vein without perforating it. This feature can be used to advantage, e.g., in the large skin incision for a neck dissection, to avoid injury to the external jugular vein.

The example makes it clear that the cutting performance of a convex blade is highly dependent on the angle of application during dissection. The surgeon can take advantage of this fact when performing a sharp dissection of a large flap, e.g., for skin flap elevation during neck dissection and laryngectomy. It allows switching from maximum cutting performance to semi-blunt dissection of the tissue layers. On the whole, sharp dissection with a scalpel requires more dexterity, feel, and expertise than that with scissors, but it is a very efficient technique.

If the scalpel is used for piecemeal excision of skin, the angle of incision ought to deviate slightly from the perpendicular (to about 95°), cutting the corium and fatty tissue obliquely to form a wound margin. This ensures a larger surface for approximation of the wound margins and improves healing.

The surgeon should always draw the scalpel toward himself. Thus, the incision begins at the most distant point. Cutting is performed by drawing the blade, rather than by pushing or sawing.

**Sickle Knives and Other Surgical Knives**

Sickle knives are curved to a variable extent. In ancient times, sickle knives were used for tonsillectomy. Today they serve for various mucous membrane incisions, such as for tonsillectomy and infundibulotomy. The best cutting effect is achieved with the midsection of the blade, which should be guided in such a way as to ensure optimum cutting performance.

Some other special surgical knives are the Plester round knife, the Freer septum knife, the Joseph plastic surgery knife, the Cottle septum knife, and the Vetter tonsil knife.

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**Fig. 24**

*Sickle knife for endoscopic surgery of the paranasal sinuses.*
Dissection Scissors

A dissection scissors is the extended hand of the surgeon. Using it, he touches the depths of the tissue. Beyond its function as a dissecting instrument, the scissors is also a kind of sensor for the condition of the tissue being operated on. Every surgeon must develop a sensitivity for this instrument, because it is a prerequisite for the surgeon’s particular feel for tissue.

A distinction is made between:
- straight and curved dissection scissors.

Further differences are distinguished regarding:
- the length of the blades and handles,
- the shape and length of the scissor blades.

Curved Dissection Scissors

The curved, blunt dissection scissors is one of the most important instruments for a surgeon. The scissors is used for dissection, i.e., the ideally atraumatic separation of tissues in layers bonded to each other by connective tissue.

Figs. 25a, b
Holding the scissors correctly with the thumb and the ring finger is essential. The middle finger supports the right blade (for right-handers), while the index finger guides the scissors.
The surgeon advances the scissors parallel to the skin or plane of the layers to be separated, opens the blades, and draws it opened toward himself. The tissue strata are separated by the opening movement of the blades, providing access to the desired layer. If convex structures, such as lymph nodes or glands, are to be exposed and detached from the surrounding tissue, the scissors is applied to conform to the curvature of the structure to be dissected, i.e., the concave side of the curved dissection scissors stays close to the lymph node or gland.

Although the most important indication for blunt dissection with the curved dissection scissors is undermining and elevating the skin, it is also used in dissection of deeper structures. For skin dissection, the scissors is applied at an angle of 45° toward the operator. This detaches the layer without distorting it, which can occur at larger angles.

The tip is always pointed toward the less vulnerable structures during dissection.

Instruments often bear the names of the surgeons who invented or designed and perfected them. The realization of such ideas requires close cooperation with an instrument technician. Every surgeon should know the instruments of daily use by the names of the authors who devised them. The marginal columns provide brief biographical information about a few of these inventors.

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**Fig. 26**
Comparative depiction of a dissection scissors and a traditional non-medical scissors.
Such dissection is enabled by the specific design of the dissection scissors. The shear blades have a precise twist angle and are hollow-ground in the vicinity of the screw head. By reducing friction, these features help avoid trapping of tissue. When a closed scissors is held against the light, it is possible to see between the blades. The point at which light no longer penetrates between the blades is where the cutting force builds up. This build-up is felt as a defined resistance that is different in each type of dissection scissors. A sensitivity for the critical build-up of cutting force / resistance is important for the feel for tissue that a surgeon needs to develop anew during every dissection, since the “starting friction” must be added to the tissue resistance. The latter is determined by the tissue texture, scars, inflammation, induration or tumor growth.

The starting friction is caused by the contact between parts of the scissors and by the three-point support, i.e., at the cut, at the inside closing surface and on the screw head.

A sensitivity for the build-up of cutting force / resistance is required for the feel for tissue that a surgeon must develop.

Fig. 27
The surgeon must develop a special sensitivity for the critical build-up of cutting force inherent to each individual dissection scissors.

Fig. 28a, b
The inner part of the joint area, twist angle, hollow ground surface, and the bicon (point of inflection) determine the properties of the scissors.
A dissection scissors serves, so to speak, only secondarily for cutting. Cutting is performed with the distal two-thirds of the blade. Of critical importance for the cutting performance of a dissection scissors is the twist angle at the bicon (point of inflection), which normally is about 6°. For soft tissue it ought to be larger than 6°, for firm tissue smaller.

The shape of the blades and the tips of a dissection scissors determine its usage. A distinction is made between straight and curved dissection scissors.

The tips of the blades can be pointed/pointed, pointed/blunt, or blunt/blunt.

**Straight Dissection Scissors**

- Straight, pointed dissection scissors are used for sharp dissection.
- Sharp dissection is performed, for example, on thin or adherent subcutaneous connective tissue, or on fibrous connective tissue septa that firmly adhere to the skin or other structures. Detachment of closely apposed surgical layers is also accomplished by sharp dissection.

In simplified terms, dissection with a straight dissection scissors combines the technique of cutting with the scalpel with that of blunt dissection using curved scissors. Of critical importance is appropriate and secure guidance of the scissors by the index finger.

**The Most Common Types of Scissors Blades**

- pointed/blunt
- pointed/pointed
- semi-blunt/semi-blunt
- semi-blunt (wide)
- blunt/blunt (slim)
- blunt/blunt (ball end)

*Fig. 29*
1. Pointed/blunt
The adjective “pointed/blunt” describes a scissors with one pointed and one blunt blade. This widely used standard type can be used to cut tissue, wound edges, or suture material.

2. Pointed/pointed
The combination of two pointed blades is used for sharp, i.e., cutting dissection, e.g., for separation of tissue layers that are firmly attached to each other by scarring, or for surgical access to a tissue layer, e.g. to reach between the SMAS (superficial musculo-aponeurotic system) and the nasal dorsum perichondrium.

3. Blunt/blunt

3a. Semi-blind/semi-blind
The distal ends of both blades are of pointed shape, but they are rounded at the ends. This type of blade is suitable for dissection in areas requiring a high degree of precision, such as for vessels and delicate structures.

3b. Blunt/blunt (wide)
This commonly used blade shape is used in standard and dissection scissors for surgical exposure and determination of various tissue layers and structures (e.g., vessels, nerves, tendons).

   The rounded-off tips enable atraumatic separation of structures.

3c. Blunt/blunt (slim)
This is the prototype of the surgical dissection scissors, e.g., Metzenbaum or Lexer scissors.

3d. Blunt / blunt (ball end)
Both slender blades have small spheres attached to their ends. The slender scissors with slightly curved blades enables precise microdissection. The “balls” prevent cutting as the blades are pushed forward, and thus inadvertent injury to vulnerable structures. The so-called parotid scissors fits these specifications. With this scissors, it is possible, for example, to expose individual branches of the facial nerve. Nerve dissection with this scissors is performed practically directly along the perineurium of the nerve (e.g., facial or accessory nerve).

Caution:
Large, blunt scissors are often more atraumatic than those of small size with pointed tips. Of course, tissue texture plays a key role in selection.

- Large, blunt scissors are often more atraumatic than those of small size with pointed tips. Of course, tissue texture plays a key role in selection.
Cutting Properties

Just as with scalpels, the cutting properties depend on sharpness of the blade, i.e., their shear, bevel of grinding, and the material they are made of. Hard metals such as chrome-tungsten alloys have particularly good cutting properties. The cutting edges are inserted into such scissors and precision-ground to ensure a gentle, sharp cut.

These instruments are hallmarked by gold-plated rings or blade ends. The durability of hard-metal scissors is substantially higher than that of scissors lacking tungsten carbide inserts. However, even hard-metal scissors must and can be sharpened.

Grinding

Grinding of scissors is a matter of trust, for it is a critical factor in maintaining the functionality and durability of instruments. The scissors must be taken apart for sharpening. Grinding of the individual blades causes a slight loss of material. In the process of reassembling it, the scissors (corresponding to its three-point support, see above) can be adjusted to generate an optimal cutting force.

Inexpensive services do not disassemble the scissors and make up for loss of substance by hitting the screw with a hammer. Such “riveting” makes it practically impossible to sharpen the scissors again, and sooner or later the precision movement of the blades is lost.

Specialized Scissors

In addition to the various kinds of dissection scissors there are also a few special scissors. For resection of particularly delicate structures (e.g., in surgery of peripheral nerves), spring-loaded scissors or microscissors are suitable.

Shaft scissors have a long shaft, at the end of which the blades open. They enable dissection in cavities (middle ear, ethmoid bone) via narrow, e.g. endo-meatal or endonasal approaches.

Examples of other specialized scissors, are the Fomon- or Cottle-type angled scissors.

![Fig. 30](Design of a microscissors: 1 Cutting edge, 2 Back of blade, 3 Blade, 4 Closing section, 5 Arms, 6 Leaf springs.)
4.0 Examples of Clinical Application

The following is intended to illustrate optimum application of different cutting instruments in typical steps of operations from various areas of plastic surgery of the neck and face.

4.1 Rhinoplasty – Open Approach

First, the columellar flap is opened with the pointed no. 11 blade (Fig. 1).

The best cutting performance is achieved by cautious puncture, aligning the blade in direction of the intended incision, and carefully tilting the blade forward.

Using the small pointed-pointed dissection scissors, the subcutaneous connective tissue fibers (cross-hatched in white) are first transsected, then separated by spreading the blades (Fig. 2).

By opening the pointed/pointed scissors even more, a completely subcutaneous pocket can be created (Fig. 3).
By raising the mobilized columella flap with the sharp two-pronged retractor, the delicate connective tissue between the alar cartilages and the cutis is stretched taut.

The curved pointed/pointed scissors serves well for atraumatic sharp dissection of tissue fibers in the supraperichondrial plane (Fig. 4a).

Once access to the appropriate plane of dissection has been gained as described above, dissection with the angled (blunt/blunt) Walter scissors can proceed along the anterior border of the alar cartilage (Fig. 4b).
4.2 Rhinoplasty – Delivery Approach

The sharp two-pronged retractor is inserted into the nasal vestibule to expose both the anterior border of the alar cartilage for the marginal incision and a sulcus between the cranial border of the alar cartilage and the triangular cartilage. With the no. 15 blade, the mucosa between these two cartilages is dissected, then the incision is carried around the anterior angle of the nasal septum.

Using the no. 15 blade, the anterior border of the alar cartilage is first palpated, then the marginal incision is made from lateral to medial.

With the aid of the small pointed-pointed scissors, the alar cartilage is now separated in the supraperichondrial layer from the SMAS-cutis sheath.
Delivery is accomplished with the curved blunt/blunt dissection scissors, and cranial volume reduction using a No. 11 blade and Adson forceps.
With the small pointed/pointed straight scissors, sharp dissection is performed to gain access to the plane of dissection, e.g., intercartilaginous approach to the nasal dorsum.

**Colors and Tissues**
- **Blue** – cartilage
- **Green** – perichondrium
- **Violet** – SMAS
- **Light Gray** – periosteum
- **Gray** – bone

The fibrous connective tissue in the midsagittal plane between bone and periosteum of the nasal pyramid can be dissected with a pointed/pointed, curved Joseph nasal scissors, enabling the periosteum to be raised with a periosteal elevator.
4.3 Fundamentals of Cartilage Shaping: Trimming the Septal or Conchal Cartilage
after M. Eugene Tardy Jr.

A Partial incisions on the concave aspect of the cartilage with a pointed no. 11 blade causes the cartilage to straighten toward the opposite side, taking the adherent perichondrium with it.

B Partial incisions are particularly suitable for relieving tension in twisted cartilaginous structures with multiple deviations. In contrast to cross-hatching or squeezing, which cause the changes in tension to be distributed diffusely across a larger area, the changes in tension can be controlled from one cut to the next, referred to technically as trimming.

C Fanning of a sheet of cartilage by complete incisions. Continuity is maintained only by the perichondrium.
Trimming of a deviated septum cartilage by application of the principles illustrated in Fig. 9.
4.4 The Neck: Soft-Tissue Dissection with the Convex Blade

The surgical knife with a convex blade in various sizes is a suitable instrument for sharp dissection of superficial soft-tissue structures. Prerequisites for sharp dissection with a blade are precise knowledge of anatomy, a sense of space regarding the position of the compartments to be exposed by the incisions, and a feeling for the cutting force of the particular scalpel.

Although sharp dissection is elegant, time-saving, and atraumatic, it is not without pitfalls for those with insufficient practice.

The illustration shows the exposure of the superficial layers of the neck through an incision along the anterior border of the sternocleidomastoideus muscle, such as that commonly performed in neck dissection, or removal of a lateral cervical cyst or a lymph node.

One after the other, the cutis/subcutis ① is separated as a single layer from the platysma ② and musculature ③. Then blunt dissection proceeds, using the blunt-blunt dissecting scissors to localize the structures of the cervical vascular sheath (common carotid artery, vagus nerve, and jugular vein).

By altering the angle of inclination (relative to the vertical and horizontal planes) of the convex blade, the surgeon can exert control over the preferred degree of cutting performance – varying from sharp through semisharp to blunt (see page 26).
4.5 Dissection of the Cervical Vascular Sheath

Blunt dissection of the cervical vascular sheath with the curved dissection scissors (blunt/blunt). The connective tissue covering the jugular vein is grasped by a delicate forceps and elevated. After opening the “tent” thus formed, the blades of the scissors are spread cautiously and advanced. Effective spreading action of the blades ensures better visibility and safer dissection. A small dissection forceps provides a better grip for grasping the connective tissue, whereas an anatomic forceps prevents injury to the thin venous wall.
Dissection of the carotid artery by detachment of the adventitious coat. Dissection is performed with a small pointed/blunt dissection scissors, then with a blunt/blunt one.

This surgical step, for example, as part of a neck dissection for cervical metastases, is particularly important both for removal of all lymph nodes from the cervical vascular sheath and for complete resection of suspicious tissue from the vessel.
4.6 Extirpation of a Lateral Cervical Cyst

The blunt/blunt dissection scissors can be guided securely by the index finger, which is placed firmly on the hinge area.

The objective of dissection is to release the cyst from a thicket of connective tissue septa. To this end, the blades of the scissors closely follow the convexity of the cyst with their concave sides.

It holds true that “… every time you think you have reached the last layer of connective tissue, another one appears.” Once the last layer of connective tissue next to the cyst has been released, the dissection becomes very easy.

Acutely inflamed, infected cervical cysts must be treated with antibiotics first, possibly punctured for decompression, and enucleated later after the inflammation has resolved.
4.7 Dissection of a Large Skin Flap

Dissection of a large skin flap (e.g., in lateral parotidectomy, facelift) with exposure of branches of the facial nerve, using a Metzenbaum blunt/blunt dissection scissors.

Alternately cutting and spreading the blades releases the skin flap, which is then raised with a retractor to permit viewing of the deepest parts of the dissection.

For such purposes, large dissection scissors are often less traumatic than small ones.
4.8 Extirpation of a Cervical Lymph Node

By exposure of all connective tissue septa and layers surrounding the lymph nodes, it is possible to mobilize them.

Here, too, the concavity of the scissors blades closely follows the convex surface of the lymph node, to prevent inadvertent trauma to the thin wall of the jugular vein traversing inferior to the lymph node. A blunt/blunt or blunt/pointed dissection scissors in not too small a size is recommended.

Dissection should always be done at the spot where the individual layers can be detached most easily.
4.9 Dissection and Mobilization of a Peripheral Nerve

The tissue covering the accessory nerve is mobilized and elevated with a sharp retractor. The nerve is traced with spreading movements of a slender, blunt/blunt dissecting scissors (with ball ends) parallel to the expected nerve route.

Once the nerve is identified, the tissue above it is grasped with one or two fine surgical forceps and pulled taut.

The fine dissecting scissors is inserted into this cavity above and directly along the nerve, cautiously advancing it with spreading movements.

Finally, the mobilized tissue over the nerve is transected above and in the same direction as the nerve, and the dissection is continued as described.
4.10 Undermining Large Areas of Skin

Large areas of skin are undermined with a blunt/blunt dissection scissors once the incision with a convex surgical knife has been made through skin, subcutis, and platysma (see above). The tips of the blades point toward the external surface and can be seen or palpated through the skin. In this way, inadvertent injury to vessels and nerves is practically impossible, provided that one remains within the plane of dissection, thus avoiding trauma to deeper layers, particular the muscles.
### 4.11 Cutting Off Protruding Suture Material

After suturing, protruding threads are cut off with a suitable suture scissors. The dimensions of the scissors depend on the size of the individual operation field. As a rule, more slender models are preferred, with straight or curved blades, depending on the situation. Blunt ends prevent trapping or iatrogenic trauma to the tissue during cutting.
5.0 Principal Stages of the Manufacturing Process of a METZENBAUM Scissors

Step 1
Flat steel (Material DIN 1.4117), chamfered

Step 2
Die forging of the blank

Step 3
Die-cutting the blank.

Step 4
Finished blank from the die.

Step 5
Machining:
Drilling, milling and grinding of the blade and the final bevel, regrinding the inner sides of the blades, regrinding the rings

Step 6
- Upper side: Boring the sink for the countersunk headscrew.
- Lower side: Cutting the thread for the screw.
- Bending
- Milling the blade to accommodate the tungsten carbide insert.
Step 7
- Tungsten-carbide hard facing
- Hardening
- Electropolishing

Step 8
- Preliminary grinding of tungsten-carbide hard facing
- Grinding the cutting edge
- Polishing the cutting edge
- Screwing together the parts
- Adjustment of form and action

Step 9
- Fire polishing and ground polishing
- Removal of the screw
- Vibratory finishing
- Electropolishing

Step 10
- Screwing together the parts
- Finish. Test for proper operation
- Grinding of the cutting edge

Step 11
- High-gloss polishing of rings
- Gold-plating of rings
- Matte finishing
- Precision grinding of the cutting edge
- Marking
- Cleaning
- Final control (cutting test and check of all surfaces)
Scalpels

208000  Surgical Handle, Fig. 3, length 12.5 cm, for Blades 208010 – 19, 208210 – 19
208010  Blades, Fig. 10, non-sterile, package of 100
208011  Same, Fig. 11
208013  Same, Fig. 13
208015  Same, Fig. 15
208210  Blades, Fig. 10, sterile, package of 100
208211  Same, Fig. 11
208212  Same, Fig. 12
208215  Same, Fig. 15
496400  MASING Surgical Handle, length 14 cm, for Blades 208010 – 19, 208210 – 19
748000  Surgical Handle, Fig. 7, length 16.5 cm, for Blades 208010 – 19, 208210 – 19
748100  Same, Fig. 3L, length 21 cm
208100  Surgical Handle, Fig. 4, length 13.5 cm, for Blades 208120 – 21, 208320 – 21
208120  Scalpel Blades, for handle 208100, Fig. 20, non-sterile, package of 100
208121  Same, Fig. 21
496550  Surgical Handle, for miniature blades, round, length 16.5 cm, for Blades 496764 - 70
496764  Miniature Blades, Fig. 64, round, sterile, package of 24
496765  Same, Fig. 65, pointed

It is recommended to check the suitability of the product for the intended procedure prior to use.
Rounded-Edge Nasal Knife and Nasal Knife

492900  FREER Rounded-Edge Nasal Knife, length 16.5 cm
493000  COTTLE Nasal Knife, round, length 14 cm
493800  JOSEPH Plastic Knife, length 15.5 cm
496400  MASING Surgical Handle, length 14 cm, for Blades 208010 – 19, 208210 – 19
496800  Nasal Knife, curved, roundly tipped blade, width 4.5 mm, length 13.5 cm
496801  Same, straight
496900  MASING Nasal Knife, curved, roundly tipped blade, length 14 cm
Scissors

“DIAMOND STANDARD” Scissors with ultimate cutting quality

Special Features:
- Very fine-toothed upper blade prevents cut material from slipping off
- Razor-sharp lower blade ensures easy and highly efficient cutting

790802 DS Dissecting Scissors, straight, sharp/blunt, length 14.5 cm, color code: one gold-plated handle ring
790902 DS Dissecting Scissors, with tungsten carbide inserts, straight, sharp/blunt, length 14.5 cm, color code: one black handle ring, one gold-plated handle ring
791002 DS Dissecting Scissors, curved, sharp/blunt, length 13 cm, color code: one gold-plated handle ring
791003 DS Same, blunt/blunt
791202 DS Dissecting Scissors, curved, sharp/blunt, length 14.5 cm, color code: one gold-plated handle ring
791302 DS Dissecting Scissors, with tungsten carbide inserts, curved, sharp/blunt, length 14.5 cm, color code: one black handle ring, one gold-plated handle ring
791815 DS REYNOLDS Dissecting Scissors, curved, small tips, length 15 cm, color code: one gold-plated handle ring
792013 DS MAYO Dissecting Scissors, with tungsten carbide inserts, curved, length 15 cm, color code: one black handle ring, one gold-plated handle ring
**Scissors**

*"DIAMOND STANDARD" Scissors with ultimate cutting quality*

**Special Features:**
- Very fine-toothed upper blade prevents cut material from slipping off
- Razor-sharp lower blade ensures easy and highly efficient cutting
- Color code: one gold-plated handle ring
- Color code of the models available with tungsten carbide inserts: one black, one gold-plated handle ring

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449002 DS | HEYMANN **Nasal Scissors**, medium size, (standard model), working length 9.5 cm, color code: one gold-plated handle ring

511010 DS | **Scissors**, extra delicate, straight, sharp/sharp, length 10 cm, color code: one gold-plated handle ring

511210 DS | **Same**, curved

511414 DS | JOSEPH **Scissors**, curved, length 14 cm, color code: one gold-plated handle ring

511514 DS | METZENBAUM **Scissors**, curved, length 14 cm, color code: one gold-plated handle ring

512310 DS | **Scissors**, with tungsten carbide inserts, straight, sharp/sharp, length 11 cm, color code: one black handle ring, one gold-plated handle ring

512311 DS | **Same**, curved

512614 DS | METZENBAUM **Scissors**, with tungsten carbide inserts, curved, length 14 cm, color code: one black handle ring, one gold-plated handle ring

512618 DS | **Same**, length 18 cm

513200 DS | WALTER **Angular Scissors**, length 10 cm, color code: one gold-plated handle ring

513410 DS | COTTLE **Scissors**, curved, length 10.5 cm, color code: one gold-plated handle ring

513512 DS | **Scissors**, sharp/sharp, length 12 cm, color code: one gold-plated handle ring

513700 DS | FOMON **Scissors**, curved surface, delicate, working length 6.5 cm, color code: one gold-plated handle ring
# Scissors

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Scissors

511010  Scissors, extra delicate, straight, length 10 cm
511210  Same, curved
511314  JOSEPH Scissors, straight, length 14 cm
511414  Same, curved
511514  METZENBAUM Scissors, curved, length 14 cm
752918  Same, length 18 cm
511612  METZENBAUM-LAHEY Scissors, curved, extra slender, length 12 cm
511615  Same, length 15 cm
511812  KILNER Scissors, curved, flat end, length 12 cm
511814  Same, length 14 cm

512012  FOMON Scissors, curved, length 12 cm
512110  Scissors, with tungsten carbide inserts, sharp/sharp, straight, length 11 cm
512118  Same, curved
512121  Same, blunt/blunt
512151  Same, blunt/blunt, curved
5121614  METZENBAUM Scissors, with tungsten carbide inserts, curved, length 14 cm
5121618  Same, length 18 cm
**Scissors**

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Scissors

790902 Dissecting Scissors, with tungsten carbide inserts, straight, sharp/blunt, length 14.5 cm
791302 Same, curved

791500 Scissors, for suture, straight, sharp/sharp, length 12.5 cm
791600 Same, curved
791709 SPENCER Stitch Scissors, length 9 cm
791711 WEERDA Stitch Scissors, laterally angled, length 11 cm

791903 MAYO Dissecting Scissors, straight, length 15 cm
791913 Same, with tungsten carbide inserts

792003 MAYO Dissecting Scissors, curved, length 15 cm
792013 Same, with tungsten carbide inserts
Retractors and Hooks

477098 Ala Dilatator, for preparation and cutting of nostril cartilage, graduated, width 5 x 8 mm, length 9.5 cm
498000 JOSEPH Retractor, length 15.5 cm
498400 COTTLE Retractor, length 14 cm
499001 KILNER-GILLIES Hook, 1 prong, small curve, length 17 cm
499101 Hook, one prong, sharp, curved, length 16.5 cm
499111 Hook, one prong, angled 90°, length 16.5 cm
499201 JOSEPH Hook, one prong, sharp, large curve, length 15 cm
499202 JOSEPH Double Hook, sharp, width 2 mm, length 15 cm
499205 Same, width 5 mm
499207 Same, width 7 mm
499210 Same, width 10 mm
499212 Same, width 12 mm

505000 COTTLE Retractor, two prongs, sharp prong on left, blunt prong on right, width 10 mm, length 14.5 cm
505100 Same, sharp prong on right, blunt prong on left
505200 COTTLE Retractor, two prongs, sharp, with thimble, width 10 mm, length 5.5 cm
505210 KILNER Ala Retractor, two prongs, sharp, width 10 mm, length 8.5 cm
505211 Same, blunt
505213 KILNER Ala Retractor, two prongs, sharp, width 13 mm, length 8.5 cm
488065 BERGHAUS Ala Guiding Set, consisting of 2 guiding instruments with distance markings 488065 A and 1 fixation block 488065 B
**Forceps**

- **532013** Tissue Forceps, straight, 5x6 teeth, length 13 cm
- **533012** ADSON Dressing Forceps, serrated, length 12 cm
- **533013** Same, micro model
- **533022** ADSON Dressing Forceps, serrated, tungsten carbide inserts, length 12 cm
- **533112** ADSON Tissue Forceps, 1x2 teeth, length 12 cm
- **533113** Same, micro model
- **533212** ADSON-BROWN Tissue Forceps, non-traumatic, fine side grasping teeth, length 12 cm
- **533213** Same, micro model
- **533214** ADSON-BROWN Tissue Forceps, non-traumatic, fine side grasping teeth, with tungsten carbide insert, width 1.5 mm, length 12 cm
- **533215** GLANZ Forceps, non-traumatic, fine side grasping teeth, with extra long tips for better view and work in the depth, length 15 cm
- **792301** Dressing Forceps, standard width, length 13 cm
- **792302** Same, medium width
- **792303** Same, narrow width
- **792314** Dressing Forceps, jaws with tungsten carbide inserts, width 1.8 mm, length 14.5 cm
- **792318** Same, length 18 cm
- **792401** Dressing Forceps, standard width, length 14.5 cm
- **792402** Same, medium width
- **792403** Same, narrow width
- **792601** Dressing Forceps, standard width, length 16 cm
- **792602** Same, medium width
- **792603** Same, narrow width
- **750000** Dressing Forceps, serrated, width 4 mm, length 20 cm
- **750001** Same, width 1.8 mm
Notes:
WITH COMPLIMENTS OF
KARL STORZ — ENDOSKOPE