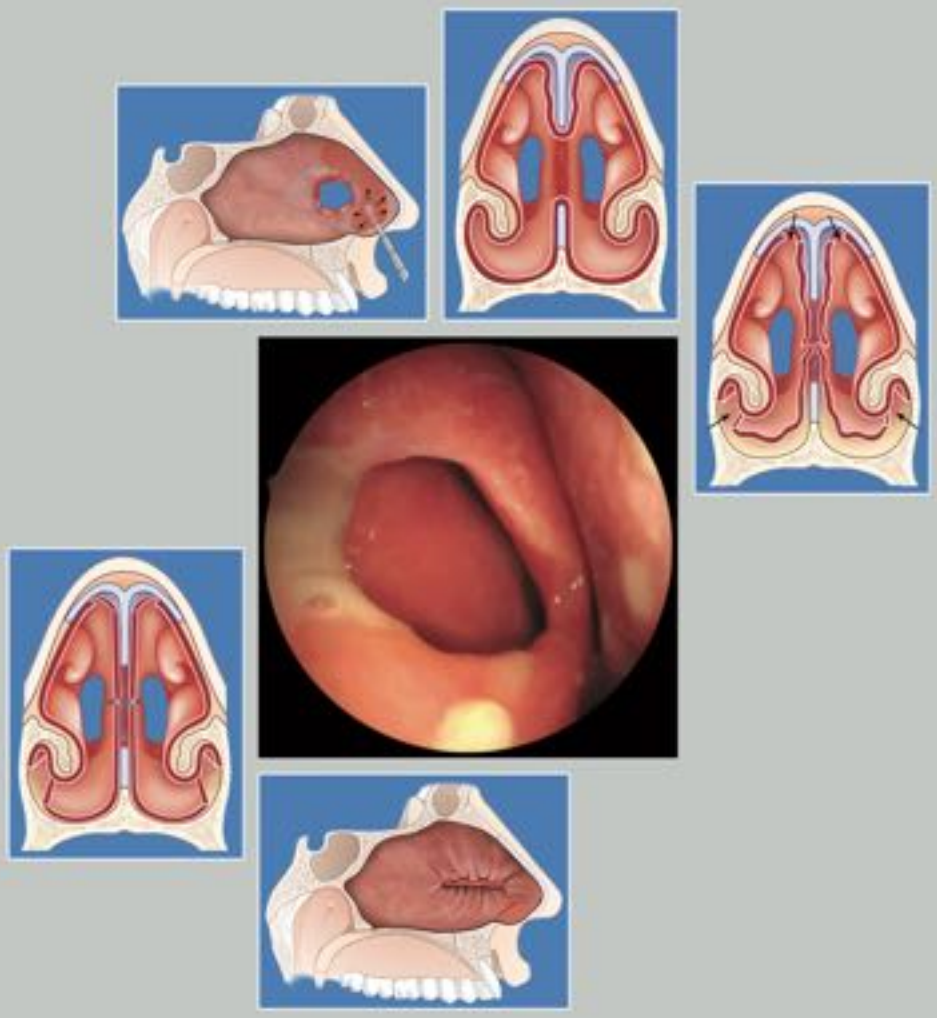
CLOSURE OF NASOSEPTAL DEFECTS:
THE ENDONASAL EXTENDED BRIDGE-FLAP CONCEPT



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Introduction

Since it was first described 20 years ago *(Schultz-Coulon 1989),* the bridge-flap technique has become the most successful method by far for the closure of nasoseptal defects *(Schultz-Coulon 1994, 2005).* Nevertheless, it is still widely believed that the surgical repair of nasoseptal defects should not be attempted because of its relatively low success rate. This view is supported by the fact that many different methods have been (and still are!) described for the repair of nasoseptal defects. Most of these publications have involved small numbers of patients, and their overall success rates have been low.

We feel that it is necessary, then, to revisit the bridge-flap technique and its modifications, drawing upon the experience gained in our annual courses at the German Academy for Otorhinolaryngology - Head and Neck Surgery.

1.0 Etiology and Clinical Manifestations

Most of the nasoseptal defects that we treated surgically from 1988 to 2007 (n = 622) had an iatrogenic cause. Fifty-six percent (n = 345) of the patients with nasoseptal defects had undergone at least one previous nasal operation (septoplasty or septorhinoplasty). Four percent (n = 27) had undergone surgical control of epistaxis, 6% (n = 37) complained of previous nasal trauma, and 34% (n = 213) of the patients had a spontaneous nasoseptal defect (**Diagram 1**).

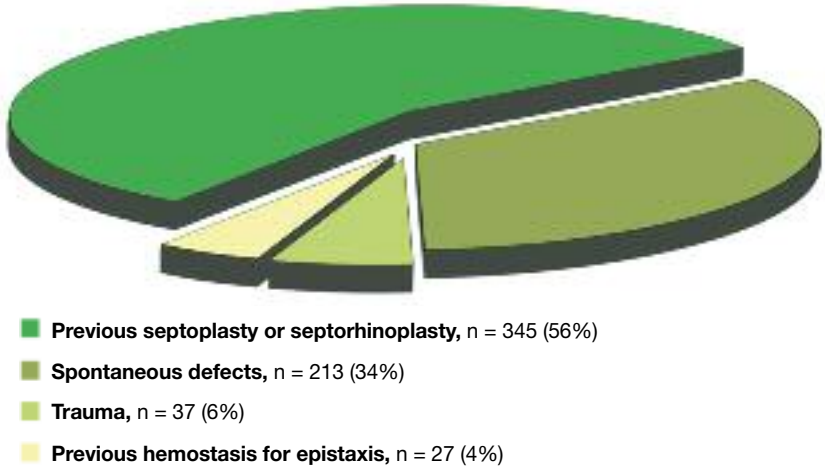
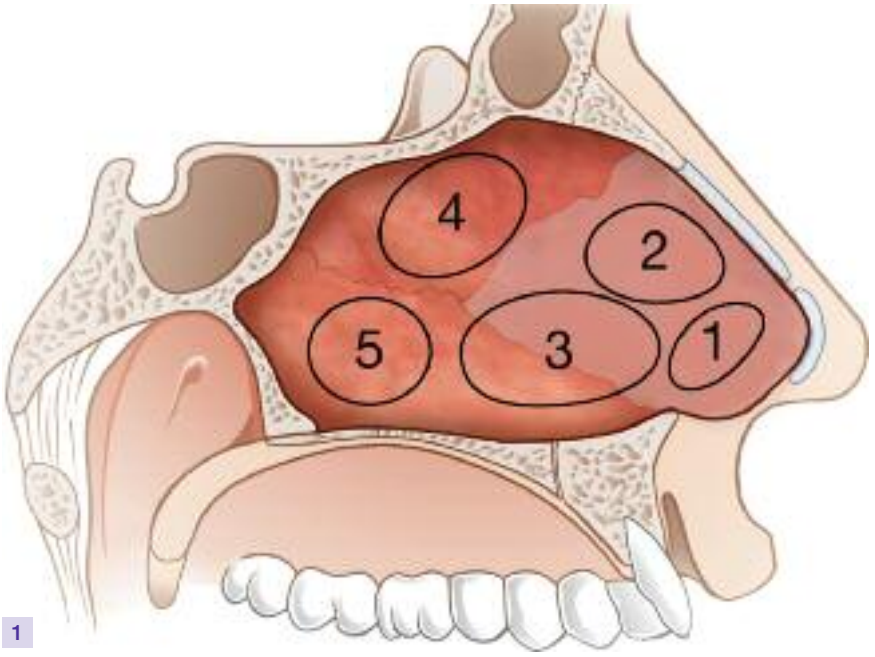


Diagram 1
Etiology of nasoseptal defects.



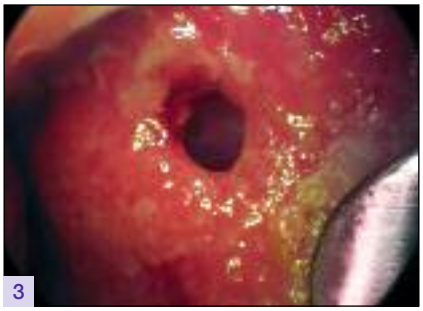
1

Surgical anatomy of the nasal septum: ① = caudal margin, ② = nasal valve region, ③ = premaxilla and crest of vomer, ④ = perpendicular plate, ⑤ = vomer.

Most defects are located in the central part of the nasal septum, designated as region 3 in our surgical anatomic classification (**Fig. 1**). Patients with large or medium-sized defects in this region (**Fig. 2**) very often complain of nasal obstructions, nasal dryness and crusting, and recurrent epistaxis. The most likely cause is a turbulent breakdown of nasal airflow at the posterior margin of the septal defect *(Grützenmacher et al. 2002).* Small defects in the anterior part of the septum often cause inspiratory whistling sounds that may cause considerable subjective discomfort (**Fig. 3**). Defects located in the superior or inferior portion of the septum, corresponding to regions 4 and 5, often produce no symptoms at all (**Fig. 4**).

2

Moderately large nasoseptal defect in region 3.



3

Small defect in the anterior nasal septum (region 3).

4

Craniodorsal defect in the nasal septum (region 4–5).

5

Inflamed mucosa surrounding a septal defect.

2.0 Methods for the Surgical Closure of Nasoseptal Defects

We prefer to speak of a "defect" in the nasal septum rather than the widely used term "perforation," because a nasoseptal defect involves the destruction of all three tissue layers – both of the mucosal layers plus the intervening cartilage. The surgical closure of this kind of defect is far more challenging than, say, the suture repair of an intraoperative perforation of the septal mucosa, because the deficient septal layers can be restored only by suitable tissue replacement.

Given the variety of methods described in the literature for the surgical closure of nasoseptal defects, together with the small case numbers and low success rates, it is reasonable to conclude that the closure of septal defects is among the most challenging rhinosurgical procedures. This relates to the technical difficulties of the operation as well as the diminished blood flow in the scarred area surrounding the septal defect. Moreover, the rest of the nasal mucosa is often very atrophic, delicate, and chronically inflamed, thus compounding the difficulty of surgery in this region (**Figs. 2, 5**). Because of these challenges, we feel that the surgical closure of nasoseptal defects is indicated only if the patient is experiencing significant complaints (recurrent bleeding, crusting, nasal obstruction, objectionable whistling sounds) and if there is a reasonable prospect of closing the defect without iatrogenic side effects such as endonasal stenosis or external scars.

Since the publication of *Seiffert's* textbook in 1936, more than 40 different methods have been described for the surgical closure of nasoseptal defects. They are based on the following methodologic strategies (detailed review in *Schultz-Coulon 2005*):

- Septal transposition and rotation flaps *(Seiffert 1936)*
- Free tissue grafts *(Heermann 1974, Fairbanks 1980)*
- Inferior turbinate flaps *(Seiffert 1936)*
- Oral vestibular flaps
  (Akyildis 1969, Dirlewanger and *Meyer 1969, Jeschek 1969)*
- Extensive elevation and advancement of the endonasal mucosa
  (Seeley 1949)
- Extensive procedures for very large septal defects:
  Frontotemporal flap *(Hertig* and *Meyer 1969),*
  Supraorbital flap *(Kastenbauer* and *Masing 1985),*
  Pericranial flap *(Paloma et al. 2000),*
  Radial forearm flap *(Mobley et al. 2001),*
  Galea-periosteum flap *(Matthias 2007)*

Most of these methods are complicated, however, and they often include a two-stage operation. A third problem is that none of these methods can ensure the definitive closure of nasoseptal defects because in most cases the septal mucosa is completely restored on only one side. The opposite side is either left to undergo protracted, spontaneous epithelialization or is covered precariously with a free graft. Postoperative suture dehiscence in these cases will inevitably lead to recurrent defects.

By contrast, our bridge-flap technique is designed to achieve the bilateral, tension-free closure of nasoseptal defects while replacing the missing septal cartilage with an autologous cartilage graft. This concept basically combines *Seiffert's* idea of the bridge-flap with *Seeley's (1949)* principle of extensive, bilateral endonasal elevation and advancement of the mucosa, resulting in an extended bridge-flap technique.

3.0 Technique of the Endonasal Extended Bridge-Flap Concept

3.1 Instrumentation

Successful reconstruction of the nasal septum requires an optimum dissection technique. In our experience, this can be achieved only by using optical magnification combined with excellent illumination of the operative site. We feel that it is essential to use a binocular operating microscope, which is generally available in every ENT operating suite.

The following instruments, which basically correspond to the standard instrument set used for septoplasty and septorhinoplasty, have proven very helpful in the closure of septal defects:

- Slender nasal specula (**Fig. 6,** top to bottom: *Killian* 90 mm, *Killian* 65 mm, *Cottle*)
- Curved *Cottle* double-ended elevator (**Fig. 7,** top)
- *Masing* double-ended elevator (**Fig. 7,** bottom)
- Mini-scalpel and Beaver knife with straight or angled blade (**Fig. 8**)
- *Masing* scoring knife (**Fig. 9**)
- Extra-long, slender needle holder (165 or 170 mm, **Fig. 10**)
- Angled needle holder (**Fig. 11**)
- *Blakesley* nasal forceps (**Fig. 12,** left)
- *Craig* septum forceps (**Fig. 12,** right)
- Straight, curved, and angled pointed scissors (**Fig. 13**)

6 Slender nasal specula: *Killian* 90 mm (top), *Killian* 65 mm (center), and *Cottle* (bottom).

7 Curved *Cottle* double-ended elevator (top), *Masing* double-ended elevator (bottom).

8 Mini-scalpel and Beaver knife with straight or angled blade.

9 *Masing* scoring knife.

10 Extra-long, slender needle holder (165 or 170 mm).

11 Angled needle holder.

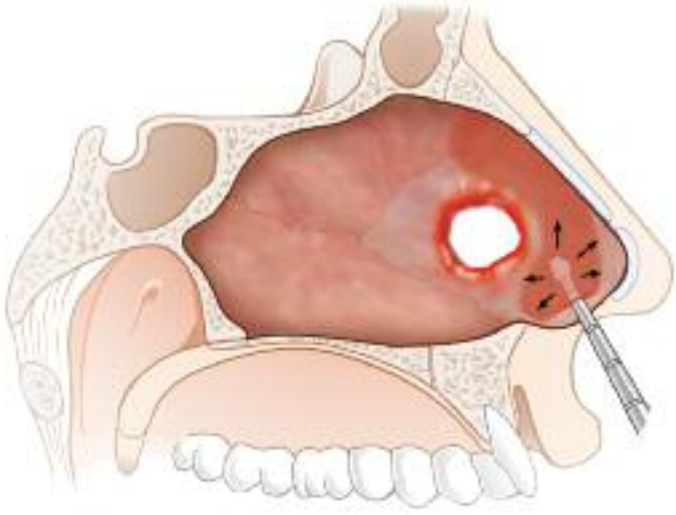
12 *Blakesley* nasal forceps (left), *Craig* septum forceps (right).

13 Straight, curved (left) and angled (right) pointed scissors.

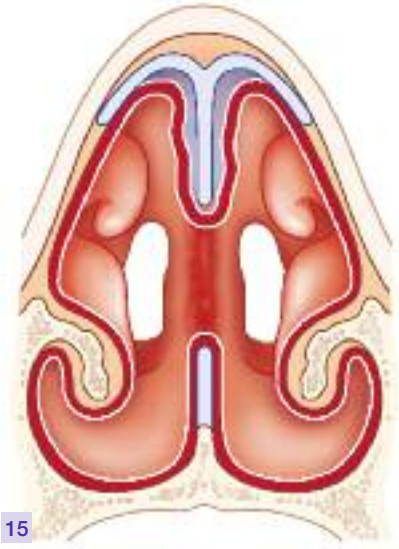
3.2 Procedure

The extended bridge-flap technique for the closure of nasoseptal defects is a purely endonasal procedure that eliminates the need for an external skin incision, which may leave a visible scar. A columellar incision may be necessary only if there are additional indications for an external approach, such as a severe nasal tip deformity due to asymmetry of the alar cartilages.

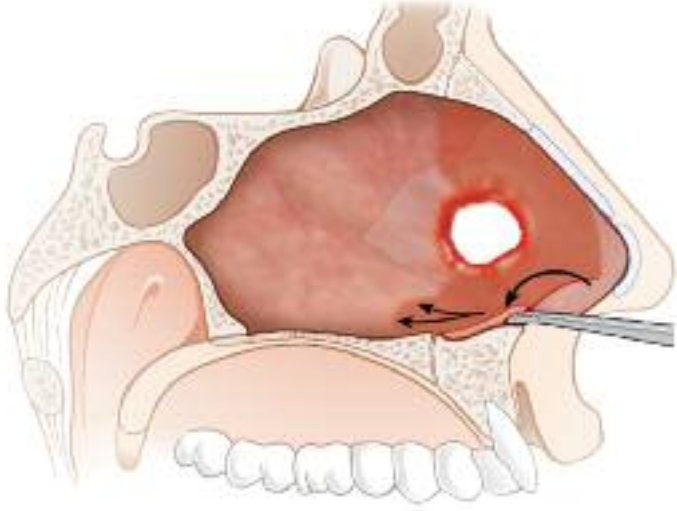
The ventral septal margin and anterior nasal spine are exposed through a hemitransfixion incision, as in a classic septoplasty. The hemitransfixion incision should be extended slightly laterally to facilitate further dissection, especially on the nasal floor. The remaining cartilaginous septum is undermined in the subperichondrial plane to the anterior margin of the septal defect on both sides, as in the *Cottle* technique (**Fig. 14**). The tunnels are then extended upward above the septal defect to the nasal roof, past the attachment of the lateral cartilages (**Fig. 15**). Next, starting at the piriform aperture, the mucoperiosteum on both sides is elevated from the nasal floor to the lateral wall of the inferior meatus (**Fig. 16**).



14 Subperichondrial undermining of the anterior residual septum and the area above the defect.

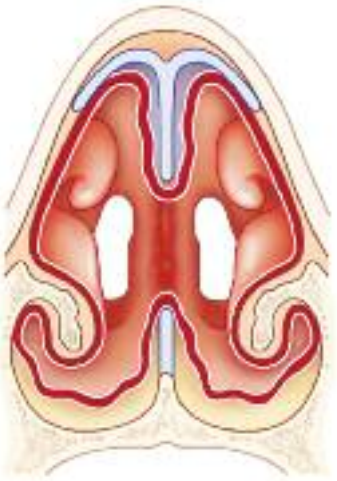


15 The tunnels are extended past the attachment of the lateral cartilages.

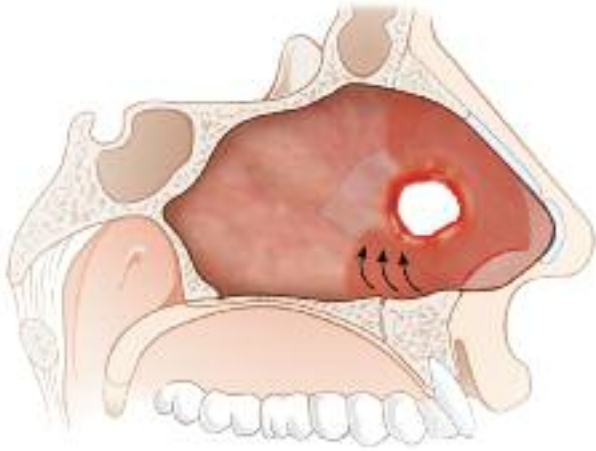


16 The mucoperiosteum is elevated from the nasal floor.

Aided by the operating microscope, the surgeon now separates the very thin and usually heavily scarred mucosa from the alae of the premaxilla without perforating the mucosa, so that the mucoperiosteum below the septal defect can also be dissected from the septum (**Figs. 17a, b**). Once the anterior, superior and inferior margins of the defect have been completely dissected free, the entire mucosal defect is divided in the midline with a round mini-scalpel, starting at the anterior margin (**Fig. 18a**). After the posterior edge of the septal defect has also been divided (**Fig. 18b**), the septal mucosa is completely undermined back to the posterior septal margin (**Fig. 19**).

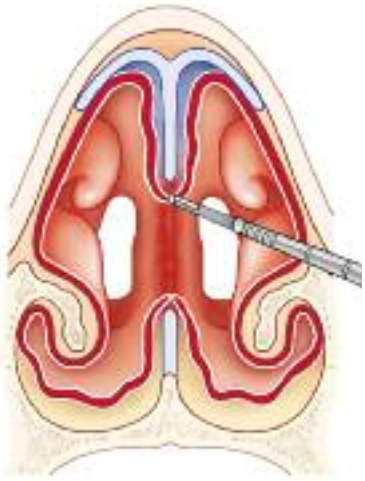


17a

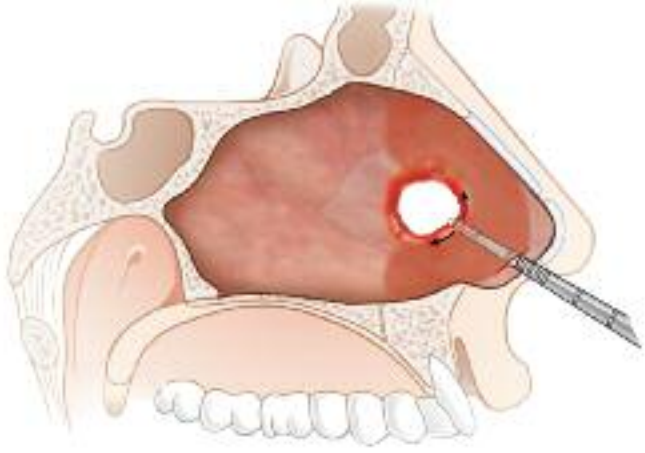


17b

The mucosa is separated from the alae of the premaxilla, and tunnels are developed below the septal defect. Coronal section (**a**), sagittal section (**b**).

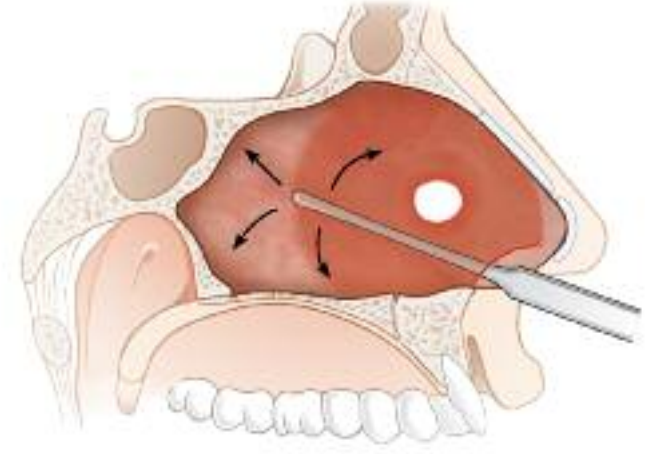


18a



18b

The mucosal defect is divided in the midline. Coronal section (**a**), sagittal section (**b**).



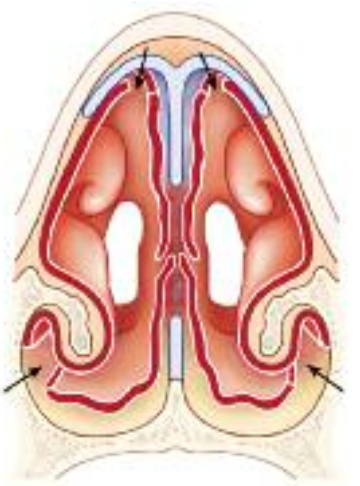
19

▶
The posterior nasal septum is undermined.

After completion of this extensive endonasal elevation of the mucosa, the remaining chondro-osseous septum is straightened. This is followed by a tangential conchotomy and lateralization of the inferior turbinates. The purpose of this step is twofold: (**1**) to prevent postoperative nasal airway obstruction due to slight widening of the reconstructed nasal septum and (**2**) to create additional space for microsurgical suturing of the margins of the mucosal defect.

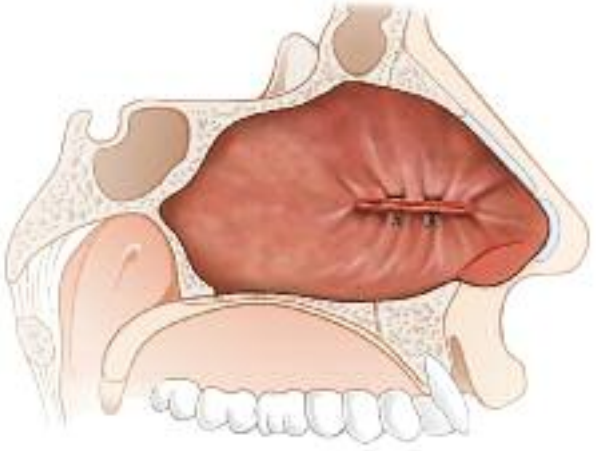
Bilateral longitudinal relaxing incisions are made along the lateral wall of the inferior meatus and along the nasal roof so that bilateral bridge-flaps can be dissected and mobilized above and below the septal defect (**Fig. 20**). The exposed areas of cartilage and bone will be subject to spontaneous epithelialization during subsequent weeks (**Fig. 30**).

The bridge-flaps can now be advanced over the mucosal defects, and the defect margins are approximated on both sides with rapidly dissolving suture material. Mattress sutures are placed because they create less tension than simple interrupted sutures (**Figs. 21a, b**).

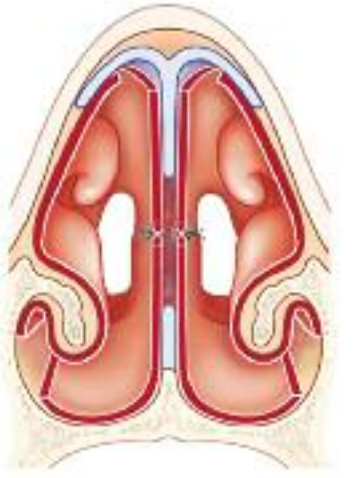


20

Relaxing incisions are made to facilitate dissection of the upper and lower bridge-flaps.



21a



21b

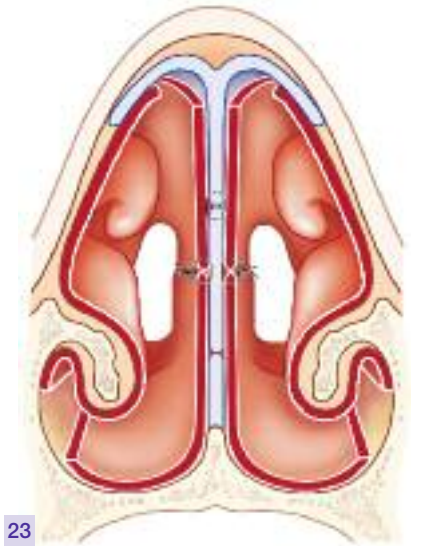
The margins of the mucosal defect are approximated with mattress sutures. Sagittal section (**a**), coronal section (**b**).

22 An autologous conchal cartilage graft is implanted to reconstruct the cartilaginous septum.

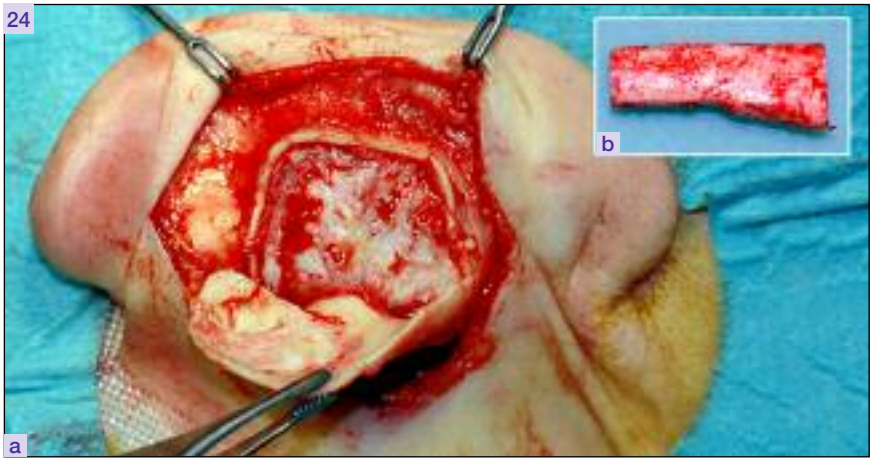
The cartilaginous septum is reconstructed by fitting a tailored autologous cartilage graft into the cartilage defect (**Fig. 22**). The graft is fixed with sutures to prevent postoperative displacement (**Fig. 23**).

In patients with spontaneous septal defects, the cartilaginous defect can be reconstructed with septal cartilage harvested posterior to the defect. In patients who have had prior septal surgery, on the other hand, we are consistently unable to find a suitable piece of septal cartilage, and so we usually reconstruct the septum with auricular cartilage harvested from the cavum conchae (**Fig. 24a**). In cases where it is also necessary to reconstruct a structurally competent anterior septum, as in patients with a large septal defect combined with saddle nose deformity, it is almost always necessary to use strips of autologous costal cartilage (**Fig. 24b**).

The layers of septal mucosa are fixed to the reconstructed cartilaginous septum with fibrin glue, and sutures are then placed to close the hemitransfixion incision. We prefer rapidly dissolving transseptal mattress sutures to stabilize the anterior septum and prevent graft displacement. At the end of the operation, silastic splints are placed into each side of the nasal cavity to support the reconstructed septum (**Fig. 25**) and are secured with transseptal sutures. Finally the nose is loosely packed with ointment-impregnated gauze strips (**Fig. 26**).



23 The autologous cartilage graft is fitted into place and secured with sutures.



24 Donor site for the conchal cartilage graft (**a**). Costal cartilage graft before shaping (**b**).

25 Insertion of silastic splints.

26 The nose is packed with ointment-impregnated gauze strips.

3.3 Postoperative Care

The nasal packing is removed on the fourth postoperative day, followed by nasal irrigations with physiologic saline solution and the local application of a mild nasal ointment. Broad-spectrum prophylactic antibiotics are continued for a total of six days. Of course, the patient is cautioned strongly against any manipulations on the nose. The septal splints are removed after six days, while irrigations and ointment treatments are continued on an ambulatory basis until the nose has completely healed. No further manipulations are necessary other than careful suctioning of the nose under microscopic or endoscopic control. All sutures, especially those above the septal mucosal defects, should be left alone.

It takes approximately six weeks for the septal mucosa to heal completely in most patients (**Figs. 27, 28**). Often the mucosal suture site can still be identified when the reconstructed septum is examined during the initial postoperative weeks (**Fig. 29**). The bony and cartilaginous areas along the attachment of the inferior turbinate and on the nasal roof that were initially exposed by the relaxing incisions should become epithelialized during this time (**Fig. 30**).

27 Preoperative appearance of the septal defect.

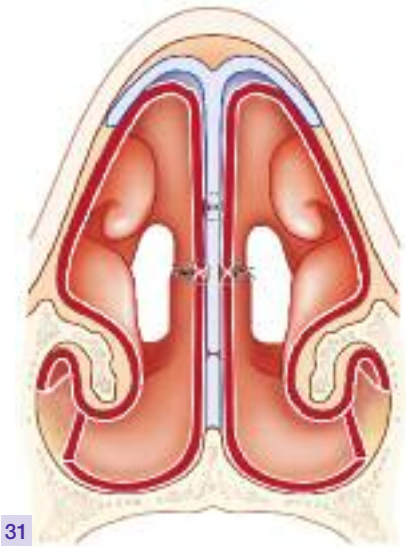
28 Appearance of the nasal septum 12 weeks after bilateral bridge-flap reconstruction of the septal defect.

29 Reconstructed nasal septum. Appearance of the suture site 6 weeks postoperatively.

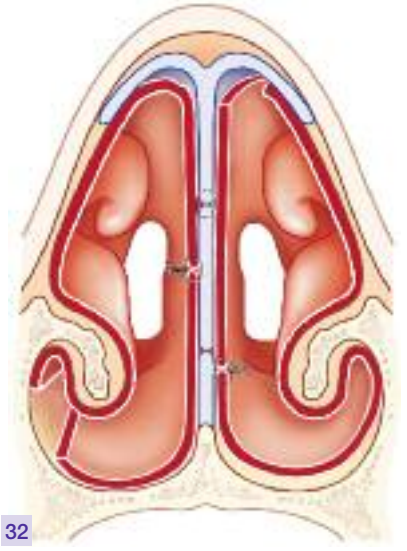
30 Complete epithelialization of the nasal floor and inferior meatus 6 weeks after the advancement of inferior bridge-flaps.

3.4 Modifications

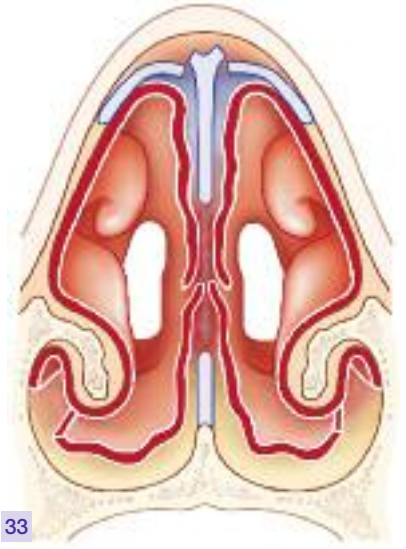
In patients with small septal defects, it may be sufficient to elevate the mucosa and then dissect only inferior bridge-flaps on both sides, or to develop an inferior bridge-flap on one side and a superior bridge-flap on the other side (**Figs. 31, 32**). The lateral cartilages on both sides can also be mobilized downward in patients with very large nasoseptal defects. This is done by undermining and elevating the cartilaginous nasal dorsum and separating the lateral cartilages from the superior septal margin (**Fig. 33**). Following tension-free suture closure of the septal mucosal defects, the lateral cartilages are returned to their original position (**Fig. 34**). In our experience, this maneuver is very rarely followed by saddling of the external nose.



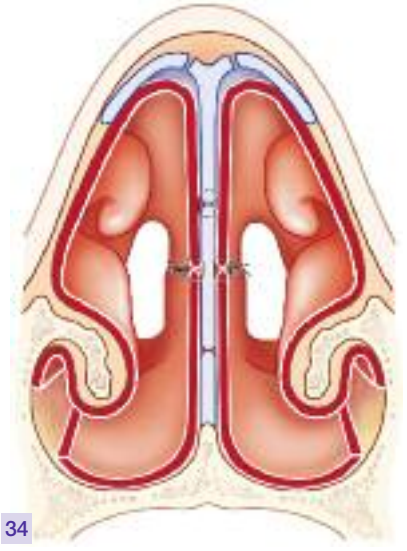
31 Modification: inferior bridge-flaps only.



32 Modification: inferior bridge-flap on the right side and superior bridge-flap on the left side.



33 Modification: The lateral cartilages are mobilized downward.



34 The lateral cartilages are returned to their initial position.

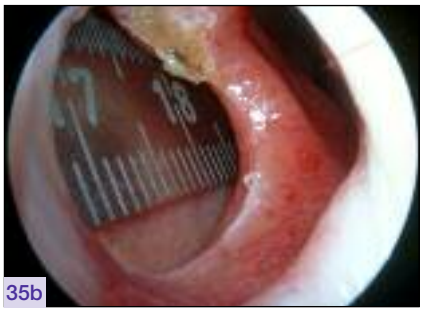
3.5 Combination with Other Rhinosurgical Procedures

3.5.1 Extended Bridge-Flap Technique Plus Rhinoplasty

The extended bridge-flap technique can be combined with rhinoplasty, keeping in mind that any and all manipulations on the nasal skeleton (osteotomies) should be completed before the mucosal defects are sutured in order to avoid excessive tension on the suture sites (**Figs. 35, 36**).

In patients with large defects of the cartilaginous nasal skeleton and associated saddle nose deformity, closure of the septal defect should be combined with the reconstruction of a structurally competent anterior septum. After suture of the mucosal defects, the anterior septum is reconstructed by implanting an autologous rib graft between the nasal dorsum and anterior nasal spine. Avoid making any mucosal incisions along the nasal dome in this case, as they could compromise the postoperative nutrition of the cartilage graft. Also avoid making the cartilage graft too large, as this might place undue tension on the sutured septal mucosa (**Figs. 37, 38**).


35a


35b

Preoperative appearance: humped nose (**a**) with a septal defect (**b**).


36a


36b

Postoperative appearance after rhinoplasty (**a**) and closure of the septal defect (**b**).


37a


37b

Preoperative appearance: saddle nose (**a**) with a septal defect (**b**).


38a


38b

Postoperative appearance (**a**) after closure of the septal defect with autologous rib cartilage (**b**).

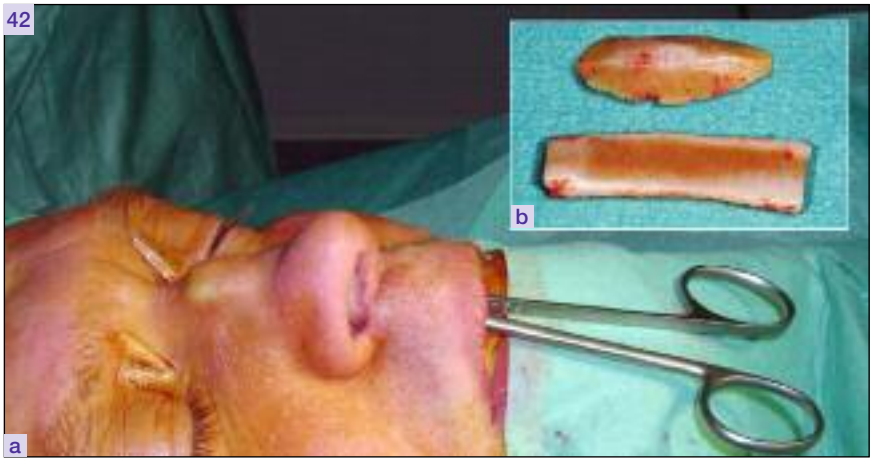
Preoperative appearance of a large septal defect (with saddle nose, see **Fig. 41**).

Postoperative appearance after closure of the septal defect with bilateral double bridge-flaps.

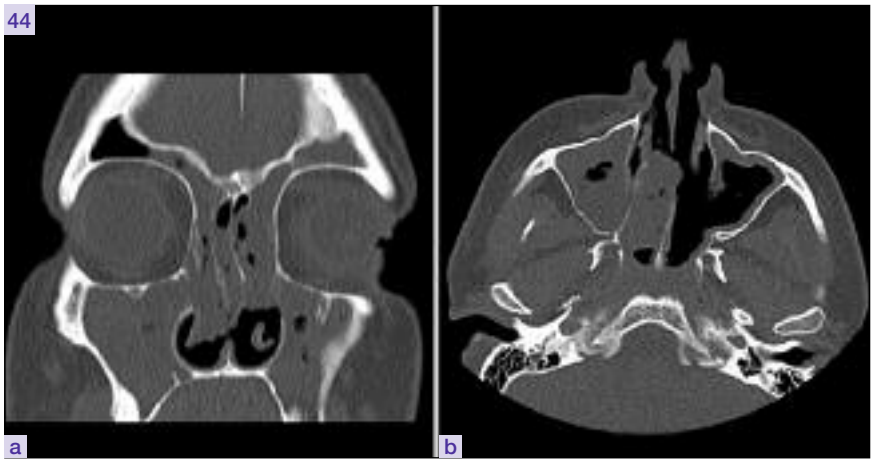
Preoperative saddle nose after closure of the septal defect.

A two-stage procedure is generally necessary for the repair of large or medium-sized nasoseptal defects accompanied by saddle nose deformity. In these cases the mucosal defects can be adequately closed only by using bilateral superior bridge-flaps with corresponding relaxing incisions placed along the nasal roof. First the nasoseptal defect is closed using the bilateral double bridge-flap technique (**Figs. 39, 40**). No earlier than six months post-surgery the saddle nose is corrected by straightening the nasal dorsum and nasal tip with costal cartilage grafts. We have had very good results with a sublabial approach through a tunnel in the columella, as this avoids incising and dissecting the mucosa on the reconstructed nasal septum (**Figs. 41–43**).

Postoperative appearance after straightening of the nasal dorsum and tip.



Sublabial approach through a tunnel in the columella (**a**). Autologous cartilage grafts have been harvested from the ribs and shaped for implantation (**b**).



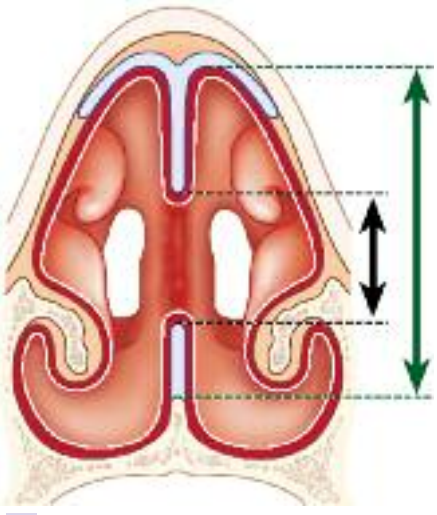
Coronal (**a**) and axial (**b**) CT scans of chronic polypoid sinusitis with a nasoseptal defect.

3.5.2 Extended Bridge-Flap Technique Plus Sinus Surgery

Paranasal sinus operations can also be combined with the bridge-flap closure of nasoseptal defects. Once again, the sinus surgery should be completed before the septum is reconstructed so to allow tension-free suturing of the septal mucosa (**Figs. 44a, b**).

3.6 Limits of Indications

Because defects in the septal mucosa are closed by endonasal mobilization and advancement of the mucosa, the extended bridge-flap technique is naturally subject to certain technical limitations. The vertical dimension of the nasoseptal defect is a key concern. The height of the septal defect should not exceed approximately one-half the total septum height at the site of the defect. Otherwise, insufficient mucosa would be available for mobilization, advancement, and a tension-free closure. Thus, the essential criterion is not the absolute size of the septal defect but its relationship to the total height of the septum at that location (**Fig. 45**).



Size range of nasoseptal defects that can be closed with the bridge-flap technique (**black:** height of the septal defect; **green:** total septum height at the site of the defect).

4.0 Results

The extended bridge-flap concept for the closure of nasoseptal defects was performed 622 times at our institution between 1988 and 2007. The age and sex distributions of the patients are shown graphically in **Diagram 2**. The absolute dimensions of the septal defects are shown in **Diagrams 3** and **4,** although, as noted above, these dimensions themselves are not the essential criteria for patient selection.

Closure of the septal defect was successfully accomplished in the initial operation in 92.8% of the patients. Six patients developed a recurrent defect, which could be definitively closed by revision surgery using the same technique. The percentage of patients reporting an improvement in their subjective complaints was 97.7%. This is because the few postoperative recurrent defects were almost always smaller than 5 mm, which very rarely caused significant subjective distress (**Table 1**).

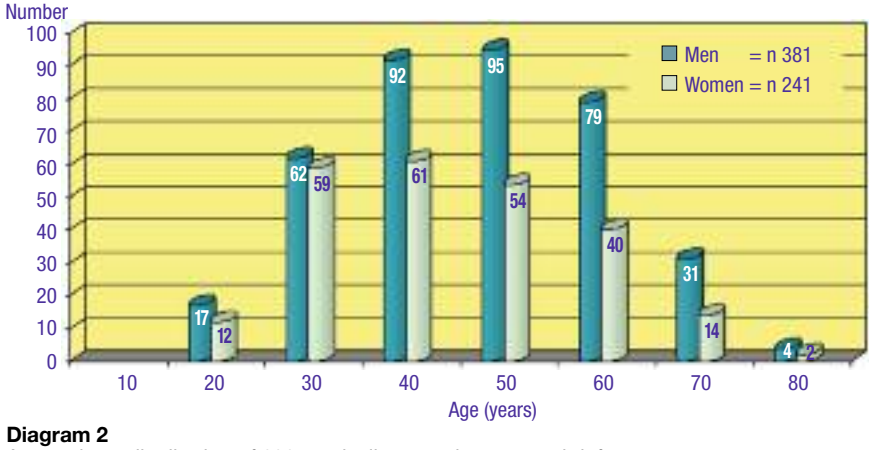


Diagram 2
Age and sex distribution of 622 surgically treated nasoseptal defects.

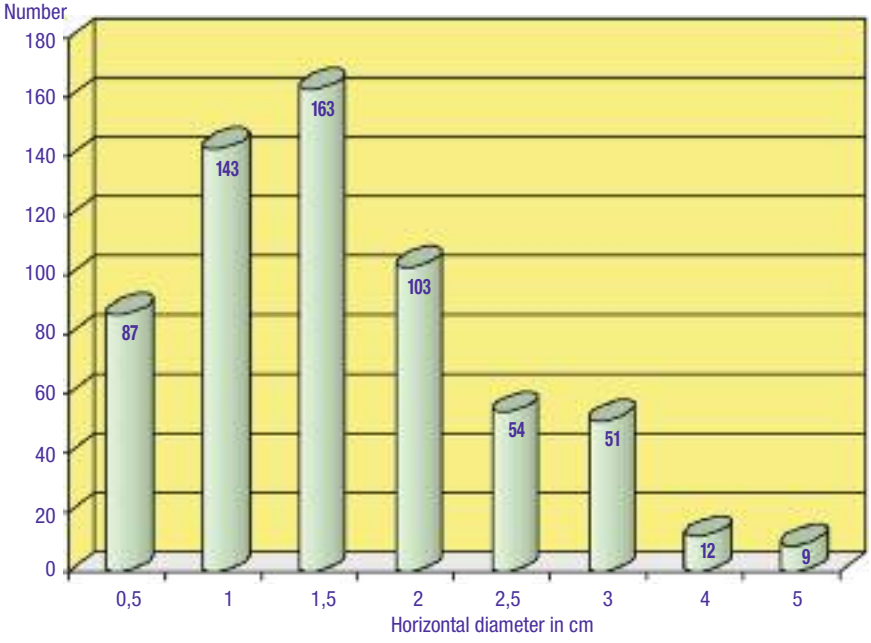


Diagram 3
Horizontal diameter of 622 nasoseptal defects.

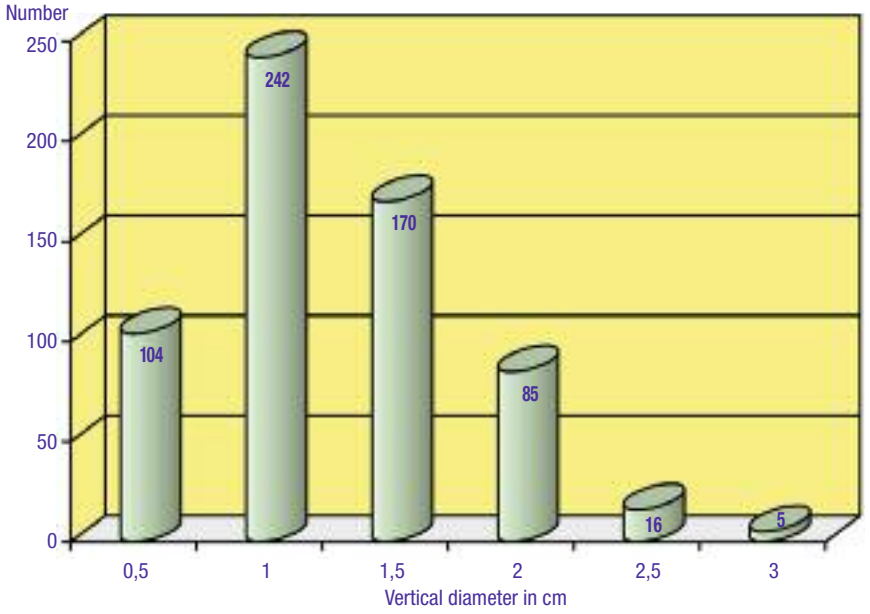


Diagram 4
Vertical diameter of 622 nasoseptal defects.

Table 1: Results of septal defect closure with the endonasal bridge-flap technique	
Primary closures:	577 = 92,8 %
Closures after revision surgery:	6 = 0,9 %
Total closures:	583 = 93,7 %
Postoperative residual defects: < 5 mm:	43 = 6,9 %
> 5 mm:	2 = 0,3 %
No or virtually no postoperative complaints:	608 = 97,7 %

Table 1
Results of septal defect closure with the endonasal bridge-flap technique. A total of 622 patients were operated at the Lukaskrankenhaus in Neuss from 1988 to 2007.

5.0 Summary

The extended bridge-flap concept offers several advantages compared to other reported methods for the repair of nasoseptal defects: It requires only one operation, which can always be performed endonasally and therefore does not leave visible scars. The procedure has a very high success rate and an extremely low complication rate. Recurrent defects are very rare; they are always much smaller than the preoperative defects and, if objectionable, can be closed using the same technique.

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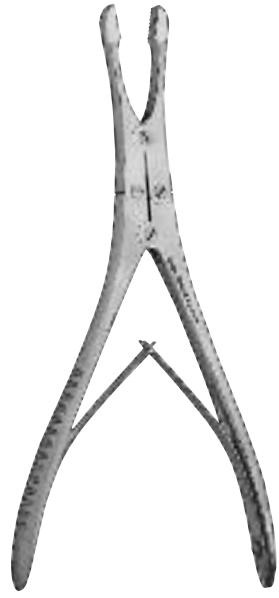
Recommended Instruments for the Closure of Nasoseptal Defects

Instruments for Plastic Surgery

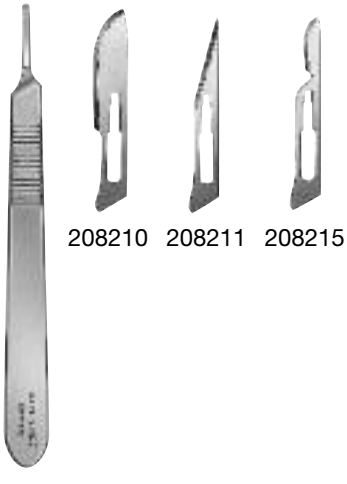
403240 – 403275

403565 – 403590

403655



488038



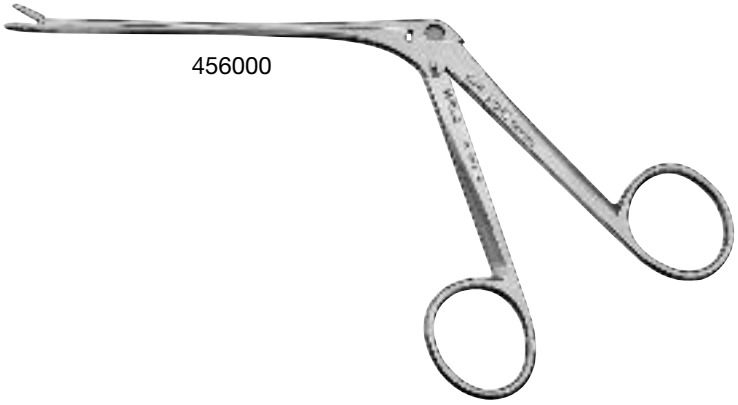
208210 208211 208215

208000

208100

403240	KILLIAN-STRUYCKEN **Nasal Speculum,** with set rack, blade length 40 mm, length 15 cm
403265	**Same,** blade length 65 mm
403275	**Same,** blade length 75 mm
403565	KILLIAN-STRUYCKEN **Nasal Speculum,** standard model, blade length 65 mm, length 13.5 cm
403590	**Same,** blade length 90 mm
403655	COTTLE **Nasal Speculum,** blade length 55 mm, length 13 cm
488038	RUBIN **Septum Morcelizer,** double action, straight, special matt finish, length 20 cm
208000	**Surgical Handle,** Fig. 3, length 12.5 cm, for Blades 208010 – 19, 208210 – 19
208210	**Blade,** Fig. 10, sterile, package of 100
208211	**Same,** Fig. 11
208215	**Same,** Fig. 15
208100	**Surgical Handle,** Fig. 4, length 13.5 cm, for Blades 208120 – 21, 208320 – 21

Instruments for Plastic Surgery



456000 BLAKESLEY **Nasal Forceps,** straight, size 0, working length 11 cm

456001 **Same,** size 1

456001 L **Same,** size 1, working length 15 cm

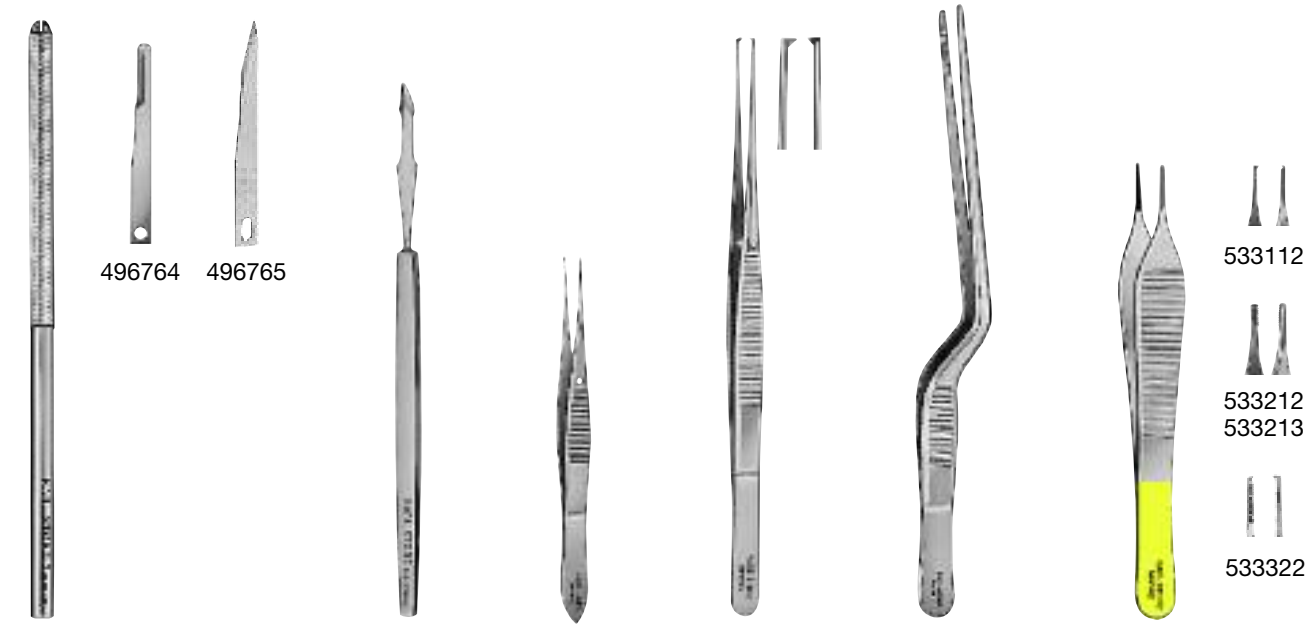
456002 **Same,** size 2

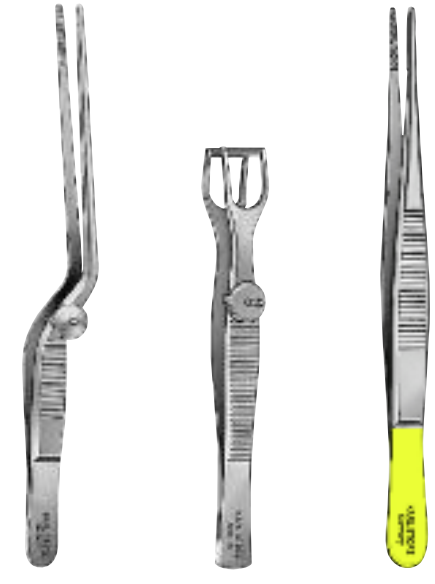
456003 **Same,** size 3

456004 **Same,** size 4

466000 CRAIG **Septum Forceps,** straight, working length 9 cm

Instruments for Plastic Surgery





496500	**Surgical Handle,** for miniature blades, round, length 15.5 cm, for Blades 496764 – 70
496764	**Miniature Blade,** Fig. 64, round, sterile, package of 24
496765	**Same,** Fig. 65, pointed
496900	MASING **Nasal Knife,** curved, roundly tipped blade, length 14 cm
530910	**Tissue Forceps,** delicate, straight, 1x 2 teeth, length 10 cm
214200	WULLSTEIN **Forceps,** 1x 2 teeth, length 15 cm
426516	JANSEN **Nasal Dressing Forceps,** bayonet-shaped, length 16.5 cm
533022	ADSON **Dressing Forceps,** serrated, tungsten carbide inserts, length 12 cm
533112	ADSON **Tissue Forceps,** 1x 2 teeth, length 12 cm
533212	ADSON-BROWN **Tissue Forceps,** atraumatic, fine side grasping teeth, length 12 cm
533213	**Same,** micro-model
533322	ADSON **Tissue Forceps,** serrated,1x 2 teeth, tungsten carbide inserts, length 12 cm
534015	COTTLE **Lower Lateral Forceps,** bayonet-shaped, with set screw, serrated tips and teeth on the inside, length 15 cm
534500	COTTLE **Columella Clamp,** length 11 cm
792314	**Dressing Forceps,** jaws with tungsten carbide inserts, width 1.8 mm, length 14.5 cm

Instruments for Plastic Surgery

629830

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

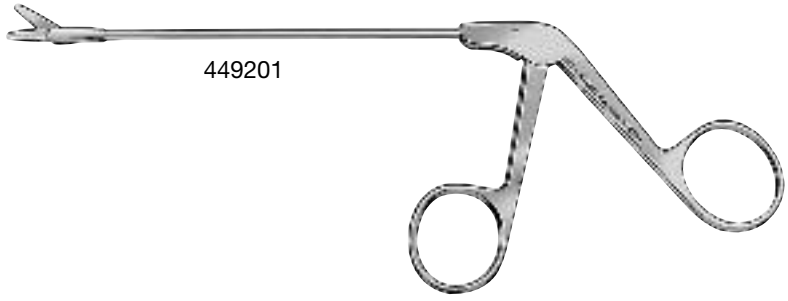
213314

213314 WULLSTEIN **Scissors,** curved,
sharp/sharp, length 14 cm

Instruments for Plastic Surgery

449002 HEYMANN **Nasal Scissors,** medium, (standard model), working length 9.5 cm

449003 HEYMANN **Nasal Scissors,** large, working length 11 cm



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

449202 **Same,** curved to right

449203 **Same,** curved to left

Instruments for Plastic Surgery

468500

489091

791815

512614
512618

513512

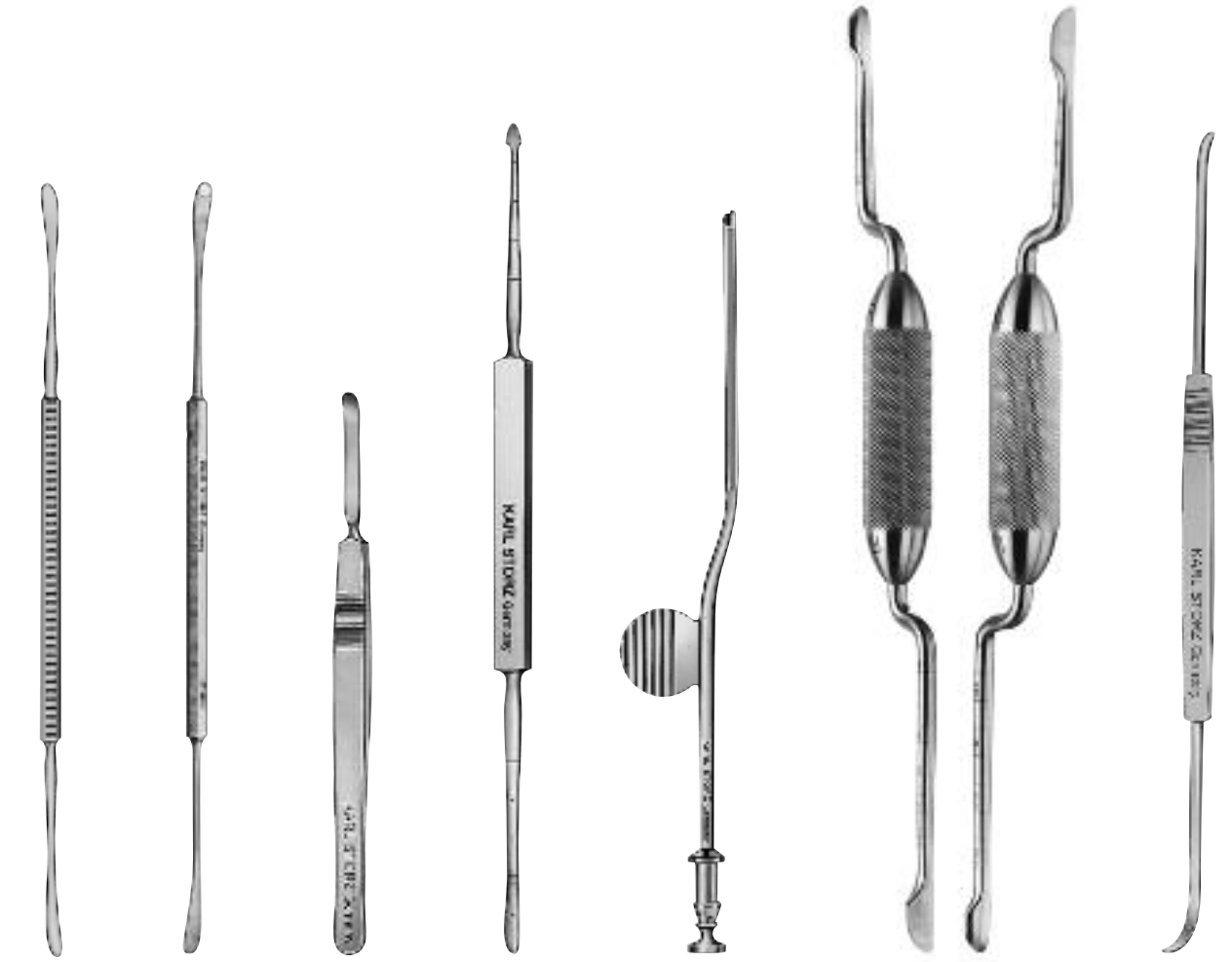
511210

511010

513200

468500	BECKER-CAPLAN **Septum Scissors,** double action jaws, serrated, working length 9.5 cm
489091	COTTLE **Dorsal Scissors,** angular, with tungsten caribide inserts, heavy, working length 7.5 cm
791815	REYNOLDS **Dissecting Scissors,** curved, delicate tips, length 15 cm
512614	METZENBAUM **Scissors,** with tungsten carbide inserts, curved, length 14 cm
512618	**Same,** length 18 cm
513512	**Scissors,** straight, length 12 cm
511010	**Scissors,** extra delicate, straight, length 10 cm
511210	**Same,** curved
513200	WALTER **Scissors,** angled, length 10 cm

Instruments for Plastic Surgery



474000 488074 478304 – 478305 479000 479800 525870 479200

474000 FREER **Elevator,** double-ended, semisharp and blunt, length 20 cm

488074 FREER **Elevator,** double-ended, sharp and blunt, special matt finish, length 20 cm

478304 McKENTY **Elevator,** width 4 mm, length 14.5 cm

478305 **Same,** width 5 mm

479000 MASING **Elevator,** double-ended, graduated, sharp and blunt, length 22.5 cm

479800 **Suction Elevator,** with stylet, length 19.5 cm

525870 BEHRBOHM-KASCHKE **Straightening Elevator** for fractures of the nasal bone and zygomatic Arc. Set of 2 right and left, double-ended, length 27 cm

479200 COTTLE **Elevator,** double-ended, for tunneling, length 22.5 cm

Instruments for Plastic Surgery

488060 499101 499205 498400 505000 505700 506400

488060 **Ala Double Hook,** with octagonal handle, with 2 sharp points, strongly curved, special matt finish, width 2 mm, length 16.5 cm

499101 **Hook,** one prong, sharp curve, length 16.5 cm

499205 JOSEPH **Double Hook,** sharp, width 5 mm, length 15 cm

498400 COTTLE **Retractor,** narrow (standard model), length 14 cm

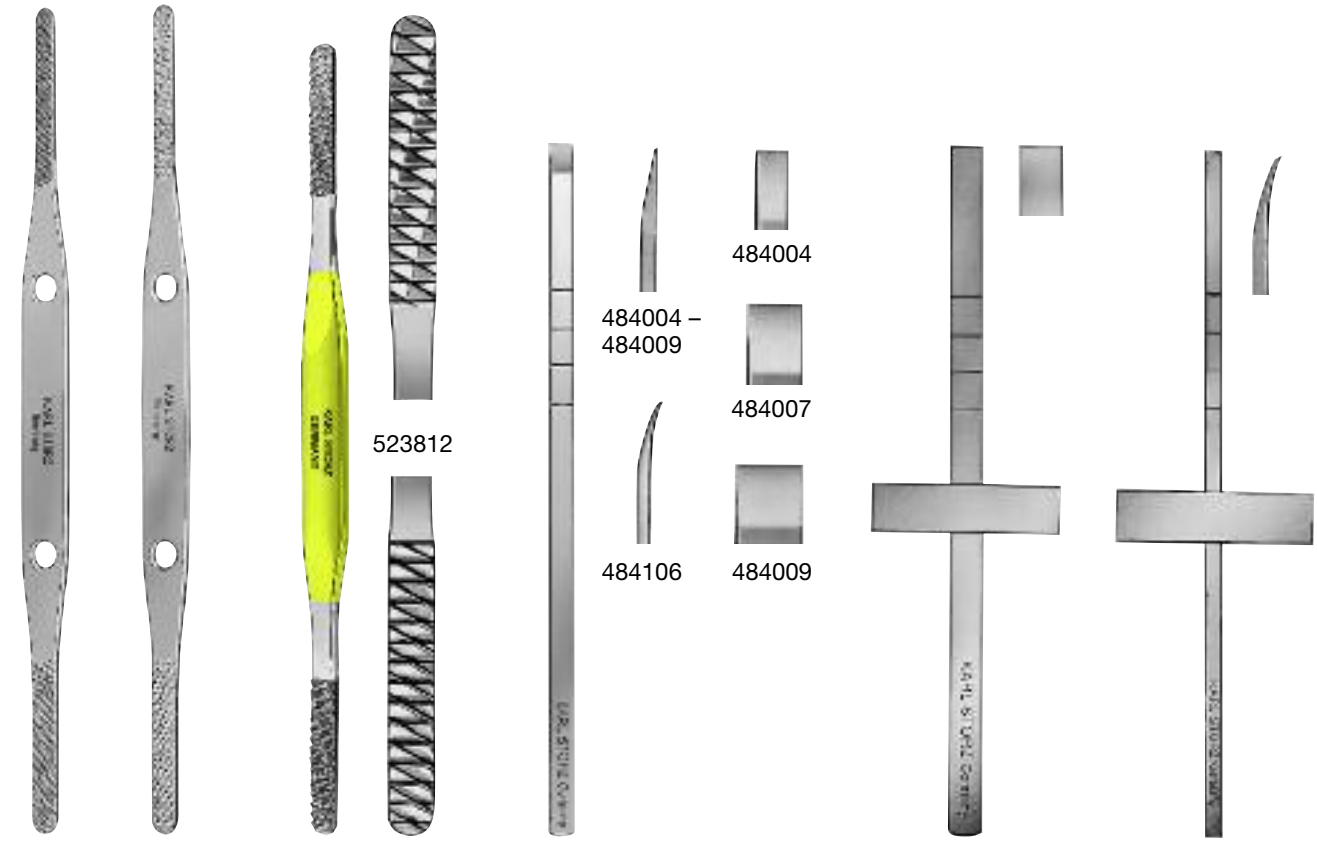
505000 COTTLE **Retractor,** two prongs, sharp prong on left, blunt prong on right, width 10 mm, length 14.5 cm

505100 **Same,** sharp prong on right, blunt prong on left

505700 COTTLE **Knife Guide and Retractor,** one side with two pronged nostril retractor, other side with flat retractor, length 19 cm

506400 AUFRICHT **Nasal Retractor,** width of retractor blade 8 mm, length of retractor blade 40 mm, length 16.5 cm

Instruments for Plastic Surgery



523600 523700 523812 484004 – 484009 484206 484406

523600 **Nasal Rasp,** double-ended, fine, length 21.5 cm

523700 **Same,** coarse (rasp)

523812 **Nasal Rasp,** tungsten carbide, double-ended, rasp blades Fig. 1 and 2, coarse, length 20.5 cm

484004 COTTLE **Chisel,** flat, graduated, straight, width 4 mm, length 18.5 cm

484007 **Same,** width 7 mm

484009 **Same,** width 9 mm

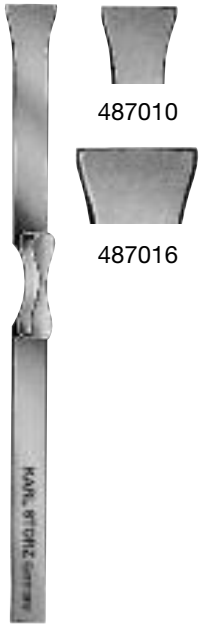
484106 COTTLE **Chisel,** flat, graduated, curved, width 6 mm, length 18.5 cm

484206 COTTLE **Crossbar Osteotome,** graduated, double-edged grinding, straight, width 6 mm, length 18.5 cm

484406 COTTLE **Crossbar Chisel,** graduated, single-edged grinding, curved, width 6 mm, length 18.5 cm

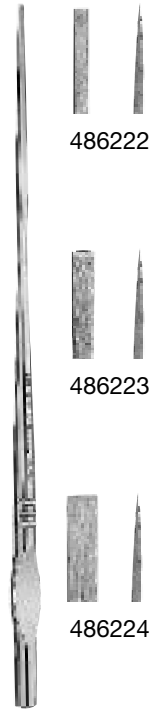
Instruments for Plastic Surgery

486102 – 486107



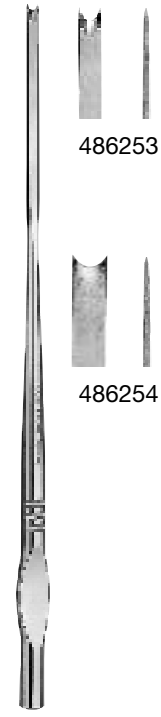
487010 – 487016

174200



486222 – 486224

486243

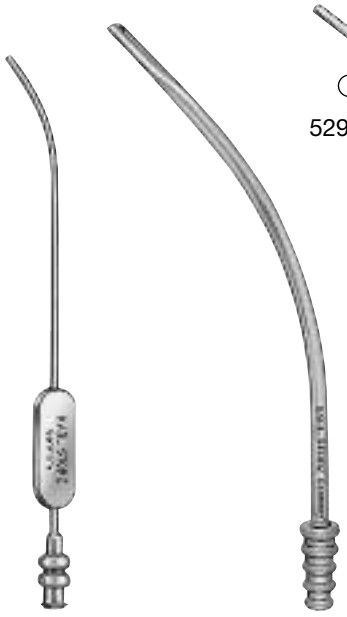


486253– 486254

486102	WALTER **Osteotome,** flat, double-edged grinding, width 2 mm, length 19 cm
486103	**Same,** width 3 mm
486104	**Same,** width 4 mm
486107	**Same,** width 7 mm
487010	RUBIN **Osteotome,** flat, straight, double-edged grinding, rounded corners, with finger grip stabilizer, width 10 mm, length 16.5 cm
487016	**Same,** width 16 mm
174200	COTTLE **Metal Mallet,** length 18 cm
486222	BEHRBOHM-WALTER **Micro Osteotome,** extra delicate, long flat blade, double-edged grinding, with round ergonomic handle and finger grip plate, width 2 mm, length 19 cm
486223	**Same,** width 3 mm
486224	**Same,** width 4 mm
486243	BEHRBOHM-WALTER **Micro Osteotome,** curved, extra delicate, with special double cut, with round ergonomic handle and finger grip plate, width 3 mm, length 19 cm
486253	BEHRBOHM-WALTER **Double Concave Hollow Osteotome,** extra delicate, double-guarded, with special double-edged grinding, with round ergonomic handle and finger grip plate, width 3 mm, length 19 cm
486254	**Same,** width 4.5 mm

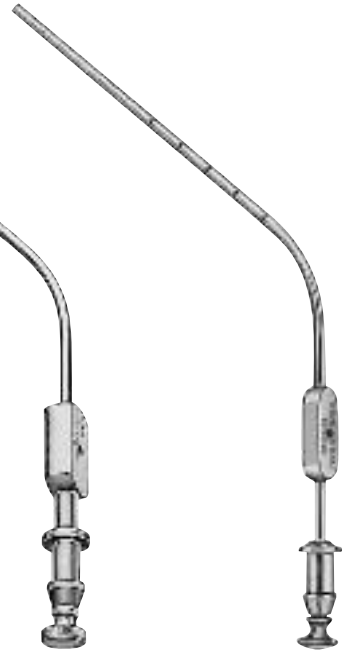
Instruments for Plastic Surgery

535212



204700

529105



529209

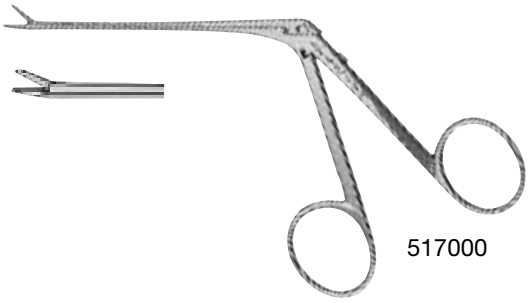
529305 – 529309

515117

516015

535212	HALSTEAD **“Mosquito” Artery Forceps,** curved, length 12.5 cm
204700	ZÖLLNER **Suction Tube,** LUER-Lock, outer diameter 2.5 mm, length 15 cm
529105	**Suction Tube,** curved, outer diameter 5 mm, length 16.5 cm
529209	FRAZIER **Suction Tube,** with cut-off hole and stylet, angled, outer diameter 9 Fr./3 mm, working length 10 cm, total length 17.5 cm
529305	FRAZIER **Suction Tube,** with mandrel and cut-off hole, with distance marking at 5 – 9 cm, 5 Fr., working length 10 cm
529307	**Same,** 7 Fr.
529309	**Same,** 9 Fr.
515117	**Needle Holder,** tungsten carbide inserts, length 17 cm
516015	**Needle Holder,** tungsten carbide inserts, length 15 cm

Instruments for Plastic Surgery



517000

517200

517000 MASING **Needle Holder,** ear forceps shape, intranasal, smooth jaws, working length 8 cm

517200 **Needle Holder,** intranasal, angled 30°, tungsten carbide inserts, working length 12.5 cm

214550 CASTROVIEJO **Needle Holder,** straight, tungsten carbide inserts, with ratchet, length 12 cm

515017 **Needle Holder,** extra delicate, slight spring action, length 17 cm

515515 CRILE-WOOD **Needle Holder,** length 15 cm

516513 NEIVERT-MASING **Needle Holder,** thumb ring upturned, one jaw with groove, length 13 cm

810806 **Cup Medicine,** 60 ccm, diameter 70 mm, height 33 mm

810806

214550

515017

515515

516513

Instruments for Plastic Surgery

842319

842319 **Bipolar Coagulating Forceps,** insulated, angled tip, blunt, very delicate, tip 1 mm, length 19 cm, for use with Bipolar High Frequency Cords 847000 or 847000 A/E/M/V

842016

842016 **Bipolar Coagulating Forceps,** insulated, angled tip, very delicate, tip 0.5 mm, length 16 cm, for use with Bipolar High Frequency Cords 847000 or 847000 A/E/M/V

847000 E **Bipolar High Frequency Cord,** to **KARL STORZ** Coagulator 26021 B/C/D, 860021 B/C/D, 27810 B/C/D, 28810 B/C/D, AUTOCON® system (50, 200, 350), AUTOCON® II 400 system SCB (111, 113, 115) and Erbe-Coagulator, T- and ICC-row, length 300 cm

Instruments for Plastic Surgery

748221

748220

525510

754350

525500

748220 DUPLAY **Dressing and Sponge Holding Forceps,** curved, with ratchet, length 21 cm

748221 **Same,** straight

525510 CASTROVIEJO **Skin Measurement Caliper,** measurement range 0 – 15 mm, length 8 cm

754350 **Wire Cutting Scissors,** serrated, length 12.5 cm

525500 **Rule,** stainless steel, flexible, length 20 cm

Notes: