# Endoscopic Guided Rhinoplasty

Hans Behrbohm, MD[1] Johanna May, MD[1]

[1] Department of Otorhinolaryngology and Facial Plastic Surgery, Park-Klinik Weißensee, Berlin, Germany

**Address for correspondence** Hans Behrbohm, MD, Department of Otorhinolaryngology and Facial Plastic Surgery, Park-Klinik Weißensee, Schönstr. 80, 13086 Berlin, Germany (e-mail: behrbohm@park-klinik.com).

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## Abstract

Rhinoplasty operations were first performed in Europe in the 19th century, and since that time there has been much controversy on the best approach. Currently, the majority of rhinoplasty operations are performed using the "open access" approach. This approach has helped many surgeons get started in functional aesthetic surgery. However, the disadvantages of the open technique, such as destabilization of structures, longer operating times, and prolonged wound healing, allowed a comeback of the closed technique. In order not to lose the advantage of a better overview in the open technique, some steps of the operation may also be performed under endoscopic control. For this purpose, new instruments and an optical Aufricht were developed. Visual inspection of individual steps of the operation, as well as specialized miniaturized instruments, allow operations to be performed using minimally invasive technology, leading to good results and fulfilling the desire of many patients.

**Keywords**
- endoscopic approach
- closed technique
- microsurgery

The question of the best approach for septorhinoplasty is a long-standing controversy in rhinosurgery and even today is often a topic at international congresses and workshops. The first aesthetic rhinoplasty was performed by John Orlando Roe in 1887 via an endonasal approach.[1] In 1898 Jacques Joseph described the first nose reduction via external access. In 1904 he first reported simultaneous intranasal correction of the anterior septum and a nasal hump.[2] He continued to use this approach, developing it systematically (with some bitter resistance from leading contemporary surgeons such as Erich Lexer).[3,4] Joseph passed his experiences on to many later pioneers of rhinoplasty such as Safian, Aufricht, and Maliniak, thereby laying the foundations for the global spread of the closed technique. Protagonists of the open technique such as Rethi and Padovan long remained outsiders.[5,6] In the beginning, the closed technique was primarily used for resections of the alar cartilages or weakening of cartilage tension. Later, dynamic interactions of distinct endonasal procedures were of major interest, and suture techniques of the nasal tip came to the forefront in the last few decades.[7,8]

Although protagonists of the closed technique had been proving for decades that everything can be done in this way, the desire for easy access with maximum effect grew in the 1980s, resulting in a booming and prosperous market for facial plastic surgery.[9] The open technique appeared to many surgeons with little experience to enable rapid entry into rhinoplasty.[10] Since then, a good visual overview has become more important than minimal invasiveness. The open technique has developed rapidly in the last 30 years and has led to the new techniques and trends. Thus, a variety of suture techniques or the use of cartilage grafts and fixation was possible in unexpected diversity. Currently 88% of rhinoplasties performed in the United States are done via open access.[11]

Meanwhile, the principle disadvantage of the open technique is that it brings with it a tendency toward initial destabilization of a variety of structures that later need rebuilding with sutures and grafts. Sometimes many structures are involved, prepared, reconstructed, and fixed, treatment not requested by the patient. Operating times are longer, and the large wound runs the risk of prolonged healing and complications. Also, there is a risk of postoperative rigidity of the nose. The access process alone can cause asymmetry due to edema, hypersensitivity of the tip, and problems at the seams of the columella. Therefore, a new "old" closed technique is now experiencing a renaissance. The benefits gained from the development of open access techniques can also be applied endonasally with refined surgical techniques. This theme has prevailed: "Preserve functionality of the natural structure of the nose. You can rebuild form with

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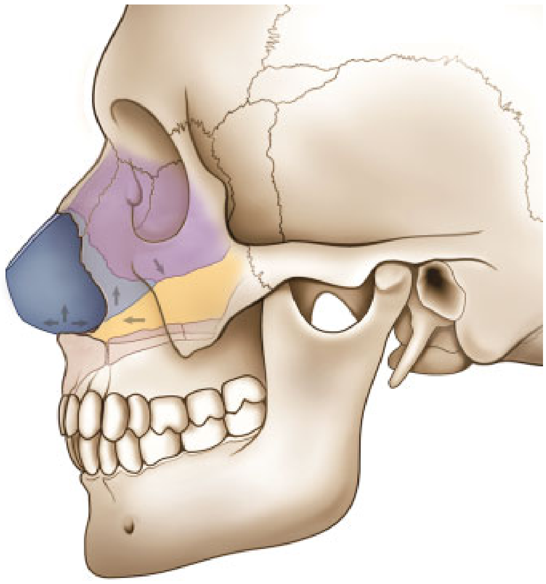

**Fig. 1** Anatomical structure of the medial nasal wall. Blue/light blue: cartilago quadrangularis; yellow: vomer; purple: lamina perpendicularis. The arrows show the vectors of the most common "tectonic shifts."

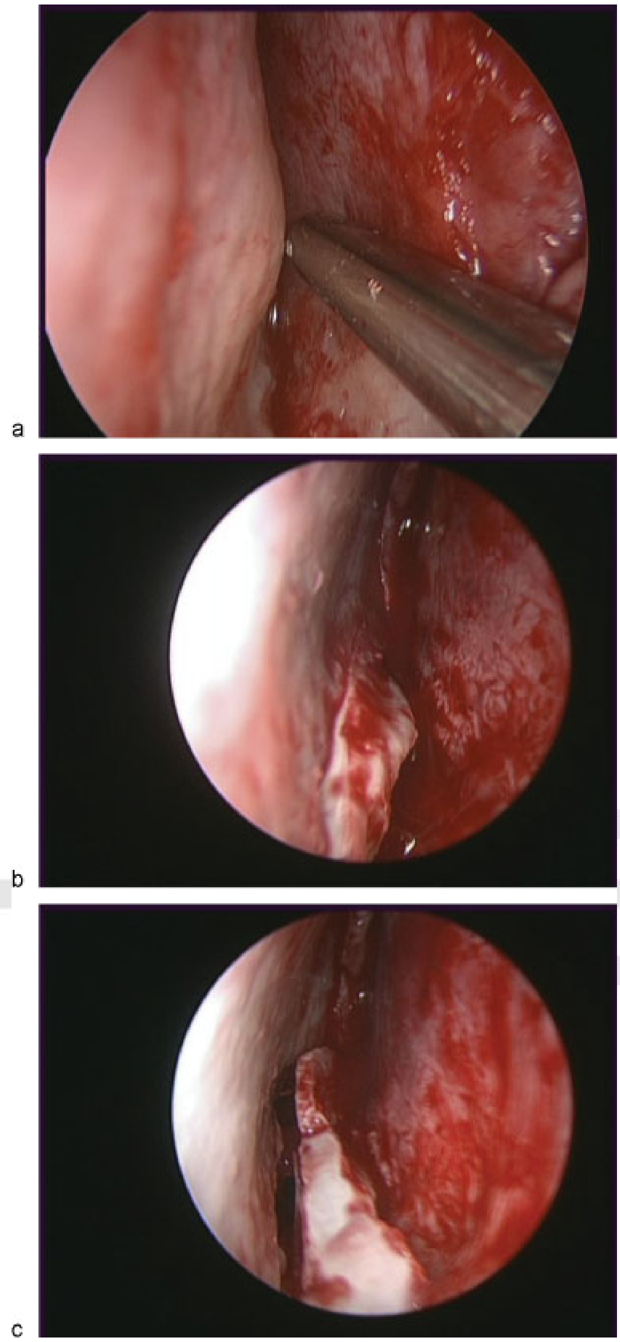

**Fig. 2** (**a**) An upper endoscopic dissection tunnel. (**b** and **c**) Removal of a vomer crest.

a lot of grafts, but not the natural functional elasticity of the nose."[12]

## Endoscopic Approaches

To avoid the drawback of a limited overview of the depths of the surgical field in the closed technique, the desire arose to adopt endoscopic surgical procedures in septorhinoplasty and rhinoplasty for both functional and aesthetic indications. Initial success was achieved using endonasal endoscopic access to the nose to endoscopically correct circumscribed disorders of the nasal septum.[13] It was increasingly followed by the implementation of endoscopes in submucosal septal surgery, even with the traditional approaches (e.g., via a hemitransfixion cut).[14] The nasal septum as part of the medial wall of the nose has many bony and cartilaginous structures: the lamina perpendicularis of the ethmoid, the vomer bone, the spina nasalis posterior, the sutura palatina transversa, the maxilla with the spina nasalis anterior, the bone incisivum, the caudal edge of the apertura piriformis anterior, and the cartilago quadrangularis (or the septal cartilage; ►**Fig. 1**).[15] Between these elements relative movements and displacements occur during growth of the skull. Several of the building blocks are always involved in bending the medial wall of the nose. The septal cartilage is virtually only the crumple zone of tension. Deviations occur either in special phases of "tectonic unrest" of skull growth (e.g., in puberty) or from traumatic causes, such as fractures of the nose, septum, or midface (►**Fig. 1**.)[16]

Submucosal endoscopy of the medial wall of the nose can help to identify the "cracking or stress point" of the individual morphologic septum problem. Through targeted microsurgery under endoscopic visualization, surgical trauma can be reduced and the functional result will possibly be improved. In addition to being bent, the septum may also be too long or too high for the nasal cavity, in different directions. The consequence is a subluxation or a tension of the septum. The nasal septum is connected at the keystone region with the bony nasal pyramid. Moreover, there are strong links with the triangle and alar cartilages. Anatomically the septum and upper lateral cartilages form a unit. The cartilaginous septum forms the leading edge of the upper lateral cartilages, the so-called internal nasal valve, the narrowest point of the nose. After septorhinoplasty, many patients complain of persistent or postoperative nasal breathing difficulties.[17,18] A postoperative septal deviation may have occurred after the primary operation either because an existing deviation has not been adequately treated or as the result of insufficient fixation, scar, or partial relaxation of the cartilage. Certainly, a lack of visual inspection can contribute to this situation.

## Endoscopic Surgery of the Medial Nasal Wall

Endoscopic septoplasty initially was regarded as being solely an accompanying measure of endoscopic procedures of the sinuses but nowadays has proven to be a valuable technique itself.

At the hemitransfixion cut, the mucoperichondrium is pushed away by special dissectors or an elevator by Freer on both sides of the cartilage (►**Fig. 2a**) and/or the lamina perpendicularis and the vomer under endoscopic control. Tunneling under the mucous membrane is much easier in the posterior septal area than in the front. The risk of posterior perforation is large and can only be avoided using meticulous endoscopic surgical techniques. The deviated cartilaginous and bony portions are cut basal and dorsal with septal scissors and removed (►**Fig. 2b, c**). The removed tissue is trimmed and the cartilage straightened with crimping pliers and reimplanted. The mucous membrane must be adapted exactly and perforations sutured carefully. Finally, endoscopic septal dissection using a hemitransfixion cut offers several advantages such as exact analysis of pathogenesis and morphology of the deviation, optically aided preparation at each

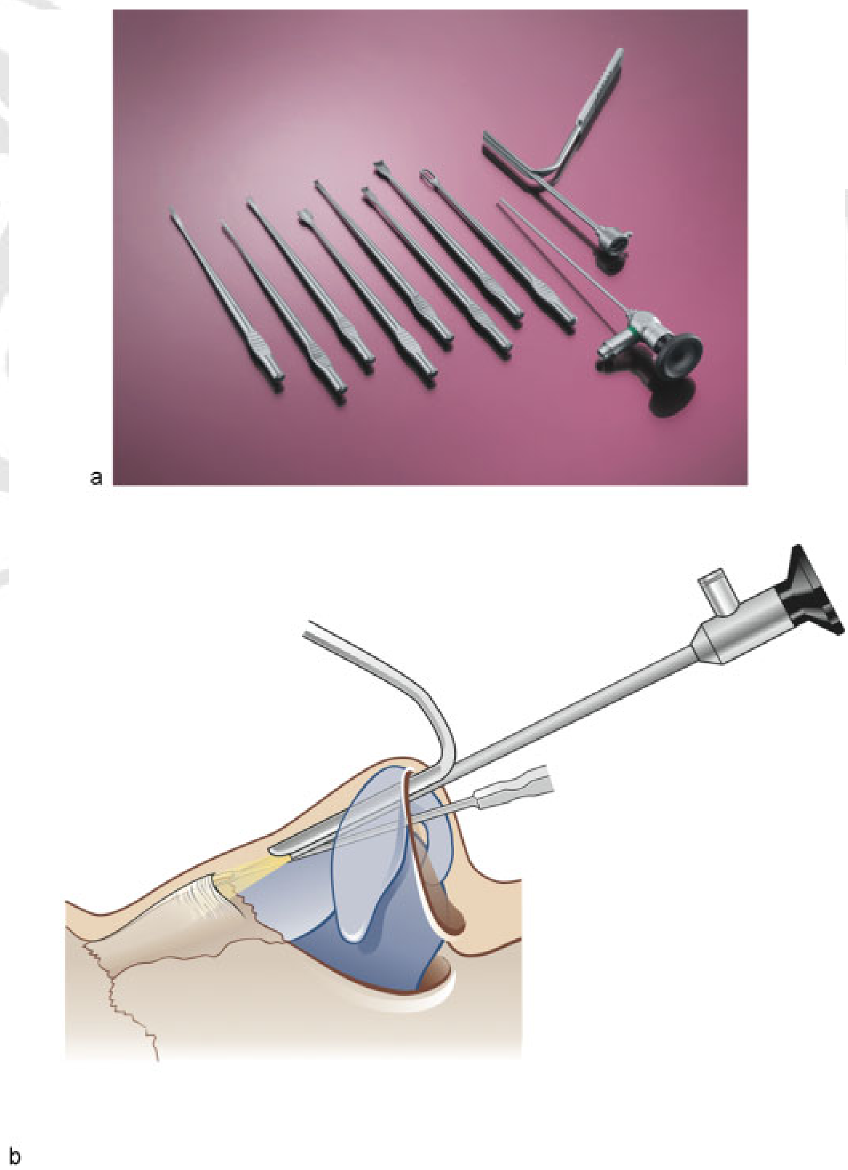


**Fig. 3** (**a**) A selection of instruments for endoscopic revision of the nasal dorsum. (**b**) Employment of the optical Aufricht.

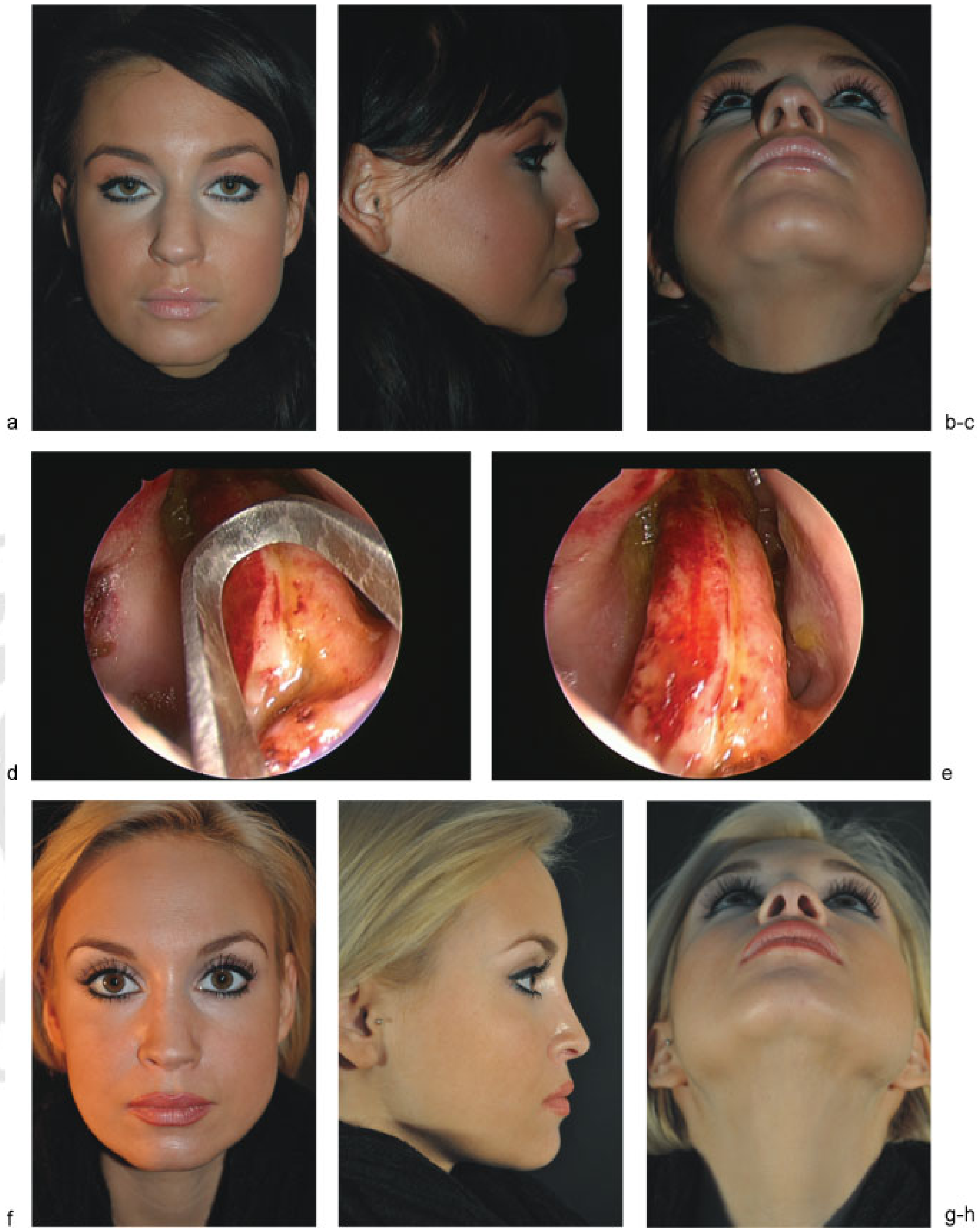


**Fig. 4** (**a**, **b**, **c**) Young woman 1 year after septorhinoplasty with open roof deformity, residual hump, and polly beak deformity. (**d**, **e**) Smoothing the supratip area with a mini-curette under endoscopic control. (**f**, **g**, **h**) The patient 2 years after secondary rhinoplasty with endoscopic controlled revision of the nasal dorsum, supratip area, and lateral osteotomies.


**Fig. 5** (**a–i**) Endonasal revision rhinoplasty for correction of middle vault asymmetry. (**a**, **b**, **c**) A 19-year-old woman 8 months after a functional aesthetic septorhinoplasty with hump removal. (**d**) Endoscopic preparation of an extramucosal pocket for a spreader graft on the left side. (**e**) Advancing the spreader graft into the pocket. (**f**) Endoscopic control of the final position of the transplant. (**g**, **h**, **i**) The patient 2 years postoperatively.

**Fig. 6** (**a**, **b**) The 36-year-old patient was dissatisfied with irregularity of the nasal dorsum 8 years after rhinoplasty. (**c**) Endoscopic revision of the nasal dorsum. (**d**) The patient 2 years after the revision surgery.

stage of the operation, and better overview of the back mucosal tunnel. Furthermore, surgical trauma may be minimized via an optical control at constant magnification and depth of field effect.

## Endoscopic Surgery of the Nasal Vault

The combination of endoscopic and miniaturized instruments offers the possibility of circumscribed, minimally invasive revisions of the nasal vault with minimal downtime and reduced surgical trauma. Besides the optical Aufricht, a range of new instruments has been developed for this purpose, such as the "mini-Joseph" in different sizes, small sharp curettes, mini–diamond rasps and mini-rasps, pulling swords (backward cutting), as well as chisels (forward-tapping; ►**Fig. 3a, b**).

Controlling individual surgical steps visually creates a major benefit even for revision rhinoplasty, in contrast to previous blind or noise-supported procedures. In conjunction with certain instruments, this facilitates, for example, the neat elevation of the periosteum.

Removal of a soft tissue polly beak is a special indication in the supratip area (►**Fig. 4a–h**). Endoscopic visualization allows smooth resection edges as the most important prerequisite for a stable result using mini-curettes and pulling swords.

Endoscopic guidance of mini-instruments provides correction of asymmetries even in the middle vault area. Triangular cartilages and the septum may be prepared with dissectors, irregularities removed, and pockets for the insertion of spreader grafts created, all via a closed access (►**Fig. 5a–i**).

In the upper vault, the most important advantage of endoscopic surgery lies in the optically controlled elevation of the periosteum and lifting or repositioning of displaced bony fragments. Moreover, small irregularities can precisely be detected and smoothened (►**Fig. 6a–d**). Even osteotomies, particularly reosteotomies, may be checked visually.

## Conclusion

The return to a more advanced closed technique corresponds to the desire and the motivation of many patients to undergo minimally invasive surgery with less downtime and to avoid external scars. The optical control during the individual surgical steps enriches the endonasal surgical technique and influences the choice of approach. The many advantages offered by intraoperative findings, analysis, and preparation have turned it into a surgical technique of the future. By using a video chain, a completely new world of diagnosis-oriented microsurgery is opened up.

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