

The external approach for septorhinoplasty

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THE EXTERNAL APPROACH FOR SEPTORHINOPLASTY

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan
de Rijksuniversiteit Limburg te Maastricht,
op gezag van de Rector Magnificus, Prof.mr. M.J. Cohen,
volgens het besluit van het College van Dekanen,
in het openbaar te verdedigen
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"Rhinoplasty is an easy operation.
It is only hard to get good results."

AUFRICHT

Aan mijn ouders

*Voor Patrice,
Derk,
Mees.*

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LIST OF ABBREVIATIONS

A.A.F.P.R.S.	American Academy of Facial Plastic and Reconstructive Surgery
C.S.	Cartilaginous Septum
K-Area	Keystone Area
L.L.C.	Lower Lateral Cartilage
N.V.	Nasal Valve
N.V.A.	Nasal Valve Area
N.V.I.	Nasal Valve Insufficiency
N.S.P.	Nasal Septal Perforation
O.S.R.	Open Structure Rhinoplasty
R.S.T.L.	Relaxed Skin Tension Lines
S-STE	Skin-Soft Tissue Envelope
U.L.C.	Upper Lateral Cartilage

PREFACE

"Rhinoplasty is the thinking surgeon's operation" (Anderson 1986)¹.

The development and recognition of the external approach in septorhinoplasty has come a long way over many decades after the first description of the technique was made by A. Rethi (1884-1976) from Budapest in the French literature during the first decades of this century². The history of revitalization of this old, but relatively unknown approach forms an intriguing story in facial plastic surgery.

Rhinoplasty is considered to be one of the most demanding surgical challenges in facial plastic surgery because of its diversity in pathology and solutions. It is said that only after experience in hundreds of rhinoplasty patients one is considered well trained enough. Rhinoplasty aims at the restoration of normal nasal function and aesthetic improvement with a related individual psychosocial well-being. The rhinoplasty surgeon must convert a mental image into a surgical reality through analysis of anatomy and aesthetics. Nasal aesthetics are influenced by changing nasal parameters such as length, width, projection, rotation and refinement. Assessing facial balance before attempting correction of nasal proportions is critical. Facial modifications, even of features with seemingly minor disproportion, can do much to enhance final results. As a rule the nose is considered to be an entity with indivisible functional and aesthetic aspects. Nasal function is improved through correction of the nasal valve, septal and turbinate pathology sometimes in combination with endoscopic sinus surgery.

Rhinoplasty changes the nose but also the face as a whole. As the face is a common metaphor for social interaction, it is important to realize that facial attractiveness has always played a key role in social interaction, which in turn can affect one's psychological experiences and development. The instant, frequently unconscious established assessment of a person's aesthetic features is a simple, direct method of categorizing and comparing. This qualitative assessment of beauty is applied to both the young and the old³⁻⁴. The ultimate attractive "ideal" face is harmonious, symmetrical, and well-proportioned. Beauty depends upon a certain degree of balance and harmony of facial features. Facial features are determined by individual parameters such as age, sex, body type, hair and race. It is possible to measure and compare facial components by angles, lines and planes during the pre-operative analysis process⁵. Cultural factors influence the concept of beauty. It is difficult, if not impossible to estimate the objective degree of facial attractiveness, because no general consensus exist as to what constitutes beauty. It is open to a great deal of personal interpretation.

As the anterior-most projection of the face, the nose forms a major aesthetic unit. Nasal deformities have an important impact on facial appearance and attractiveness. Therefore rhinoplasty has besides functional, aesthetical, and artistic also psychological aspects. In the early days of rhinoplasty at the onset of the 20th century, rhinoplasty was considered a surgical part of "psycho-therapy". Mental depression was considered an indication for surgery⁶!

After Killian's first description of the submucous septal resection and the premaxilla-maxilla approach of the nasal septum according to Cottle was popularized, the modern concept of septoplasty became generally accepted. The basics for corrective rhinoplasty were founded by visionary men like Dieffenbach, Roe, Weir and Joseph and others (Chapter I). Their initial descriptions of the (closed) approaches for exposure of the nose are still valid. During the 20th century septorhinoplasty has developed into a sophisticated operation. Although, initially external incisions were used soon rhinoplasty surgeons considered these incisions as unacceptable sequelae and started to use intranasal incisions for exposure of the nasal skeleton. The general acceptance of the closed approach in rhinoplasty is based on a worldwide experience over more than a century. However, over time also disadvantages came into focus. Some warned of a potential danger of overreduction and outlined a difficult reconstruction of the weakened skeleton. Others recognized the relative inaccessibility to certain anatomical areas. Loss of tip projection, aesthetic disharmony, supra-tip scar (de-)formation, and columellar retraction began to be recognized as inadvertent long term sequelae. In revision surgery special difficulties are encountered, demanding even more of the technique.

When shortly after the end of World War I the disadvantages of closed rhinoplasty were recognized, a modified concept of an external approach using columellar skin incisions was introduced. It was called "external decortication". The concept of complete exposure of the nasal skeleton, by elevation the skin-soft tissue envelope (S-STE), was thought to bring a possible solution for the problems encountered in closed rhinoplasty.

Despite several publications presenting satisfying results achieved in an external fashion, the closed approach remained the technique of first choice for many decades and the external approach became almost forgotten.

In North America the development of the external approach was stimulated since I. Padovan from Zagreb presented his results in 1970 with the external approach at the 1st International Symposium of the American Academy of Facial Plastic & Reconstructive Surgery (AAFPRS) in New York. After 1970 a growing number of facial plastic surgeons in North America embraced the technique for an increasing number of indications. Outstanding members of the AAFPRS have made major contributions to the development of the external approach by their clinical research. After having done thousands of closed septorhinoplasties, in 1986 the late Professor J. Anderson from New Orleans had no doubt about the potential values of the technique for the future of rhinoplasty, suggesting that within 10 years or even sooner most rhinoplasties in North America would be external procedures⁷. The approach was described by him:

"The external approach enables the surgeon to view the various components of the nose in situ, to appreciate any disproportions, asymmetries, or deficiencies that may exist, to operate with greater confidence and precision, and to see at once the effect of any surgical modifications that are made. Furthermore, the wide exposure makes surgical instrumentations easier and will demystify the procedure". Despite this inspiring statement, three years later Professor P.A. Adamson from Toronto stated "open or external rhinoplasty is a con-

troversial operation"⁸. Although especially (facial) plastic surgery is prone for medicolegal complications, the external approach encountered a rapidly growing interest and appreciation following its re-introduction. This fact was felt as an indication for the reliability and versatility of the technique. Today it is recognized a well accepted alternative for the closed approach in both functional and aesthetic septorhinoplasty in North America. Moreover it has become a basic part of the educational program in most training hospitals.

In Otolaryngology the great majority of rhinoplasties in European countries have almost exclusively been executed in the closed approach. In general the external approach was felt only indicated in selected "difficult" cases, like cleft lip rhinoplasty and therefore mostly executed by the General Plastic Surgeons. The changing concepts and recent innovations in septorhinoplasty, the apparent growing acceptance of the external approach in daily practice elsewhere and the notion of the relative lack of clinical experience and scientific knowledge about the external rhinoplasty in our own country, stimulated to explore the external approach at our Department. This decision was made, despite statements by some alarmists that the scar was unacceptable and unnecessary. Almost sixty years after the publication of Rethi and more than two decades after its re-introduction in North America the main question in our country remains whether the external approach is a safe and reliable technique for a non-selected group of rhinoplasty patients. Since 1989 the external approach is almost exclusively used in all aesthetic, functional and reconstructive surgery of the nose at the department of Otolaryngology & Head and Neck Surgery of the University Hospital Maastricht and the Department of Otolaryngology and Facial Plastic and Reconstructive Surgery of the Gooi-Noord Hospital in Blaricum. At the International Symposium on "The Open Approach for Septorhinoplasty", which was held in 1989 in Maastricht the technique was scientifically explored.

The aim of this study is to answer the question whether the external approach for septorhinoplasty is a safe and reliable method for exposure of the nasal skeleton and covering S-STE. Furthermore the question is raised what are the advantages and disadvantages of external rhinoplasty and which are the indications or contraindications. A theoretical comparison between the external approach and the closed approach for rhinoplasty is made and discussed.

This thesis is based on a historical review of the use of external incisions in rhinoplasty as described in chapter I, emphasizing the transverse interrupted columellar incision. The major contributions of the pioneers of external rhinoplasty are highlighted. In Chapter II the pre-operative photographic analysis is reviewed. In general, analysis and planning are considered prerequisites for successful surgery. In Chapter III the basic concept of the external approach, technique and results in 130 patients is presented. Recent developments have changed the concept for aesthetic and reconstructive rhinoplasty. Rhinoplasty changed from a merely reductive procedure, mainly characterized by tissue reduction and sacrifice into a graduated approach of nasal reconstruction, limited tissue reduction and reorientation. This has resulted in more emphasis being laid on the importance of augmentation with autologous (cartilage) donor material. In chapter IV a review of the literature on the concept of the use of autologous grafts to the nasal lobule and clinical results are presented. Chapter V presents a study of reconstructive surgery of the middle nasal

third. Special emphasis is placed on the use of autologous "spreader grafts" for surgical treatment of nasal valve insufficiency. In chapter VI a modified concept for nasal septal reconstruction with a five layer closure in septal perforation is suggested. The role of the external approach to the nasal dorsum for congenital or acquired deformities is presented in chapter VII. The thesis concludes with a general discussion and a summary.

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Chapter I

A HISTORICAL REVIEW EXTERNAL INCISIONS IN RHINOPLASTY

T.D. ZIJLKER
H.D. VUYK
P.A. ADAMSON

ABSTRACT

External incisions in rhinoplasty have a long tradition from the ancient cultures until present. The nature and localization of the nasal abnormalities have determined the way of exposure. Functional and reconstructive causes formed the main indication for surgery after trauma or infectious disease, like saddle nose deformity after lues. However, although rhinoplasty started by means of an external incision through skin and cartilage, during the 20th century it developed into a sophisticated technique mainly executed with an endonasal or "closed" approach, also for aesthetic reasons.

More recently the concept of an external approach of the nasal skeleton has appealed to facial plastic surgeons in search of improved exposure and has encountered renewed appreciation. Initially advocated in the 1930's by Rethi, and later improved by Sercer, Padovan, and Goodman *e.o.*, the external approach using a mid-columellar skin incision has evolved to its present status in which it enjoys a growing interest and approval for a variety of indications. A historical review of the external skin incisions used for rhinoplasty is presented.

INTRODUCTION

Exposure is a basic principle in surgery. In aesthetic and reconstructive nasal surgery, both endonasal and external incisions are used. The nature and localization of the nasal pathology determines which incision is the most preferable and the least traumatic. The history of rhinoplasty goes back to the earliest years of the ancient cultures in India, Egypt, Greece and Italy¹⁻². Until well into the 19th century nasal surgery was confined to the immediate care of acute injuries and to flap reconstruction of parts cut off or destroyed by disease. The earliest rhinoplasties were reduction procedures, executed with external skin incisions of many varieties later followed by various wedge resections of skin, cartilage and soft tissue. The external incisions for different nasal areas will be presented here and discussed. Then modern developments as well as the surgeons who have made significant contributions to the field of rhinoplasty are highlighted.

EXTERNAL APPROACH FOR RHINOPLASTY

History: 1845-1955

In the 19th century plastic surgery of the nose was primarily confined to those patients suffering from extraordinary disfigurements, with concurrent mental depression. The indication for surgery was especially accepted in those patients with a profession of high social exposure, such as actors, singers, politicians and teachers, women in particular! The first two referrals for a reduction rhinoplasty were made by Johann Friedrich Dieffenbach³ (1792-1847), a General Practitioner from Berlin, when he re-published his "Operative surgery" in 1845. He described the use of external incisions or wedge resections containing dorsal skin, cartilage, and soft

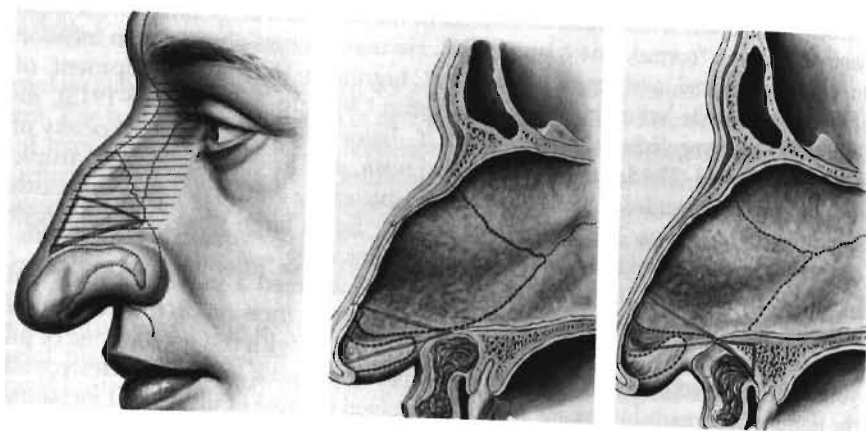


Figure 1

Schematic drawings of different techniques in a reduction rhinoplasty according to Joseph. A. Wedge resection of dorsal skin, upper lateral cartilage and nasal septum. B. Wedge resection of dorsal skin, upper lateral cartilage and lower lateral cartilage. C. Two triangular resections of cartilaginous nasal septum and anterior nasal spine.

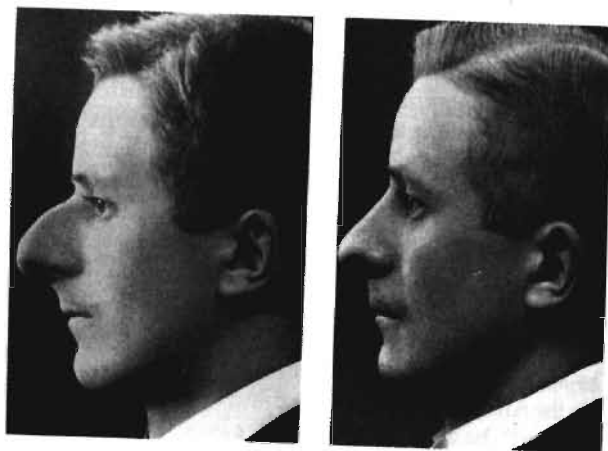
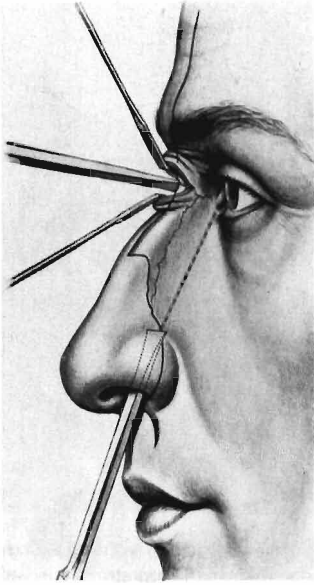


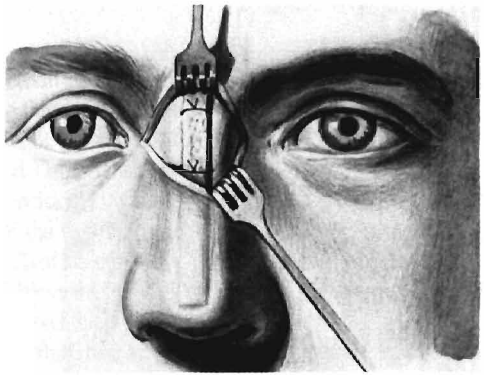
Figure 2

A-B. Pre- and postoperative lateral views of a closed reduction rhinoplasty executed by Joseph.

nose with a large bony-cartilaginous hump. This approach allowed the surgeon to operate under aseptic conditions with direct visual control, which is an advantage in augmentation procedures with grafts. Preferably the incision was placed parallel to the relaxed skin tension lines (R.S.T.L.). Despite meticulous suturing the scar remained visible (Figure 4 A-B). Lexer¹³ used a median vertical skin incision along with perichondrial and periosteal flap elevation for reduction of a nasal dorsal hump (Figure 5). As this incision lies perpendicular to the R.S.T.L., the scar will be objectionable. After the first World war, the lack of exposure of the closed approach in septorhinoplasty has led to the introduction of a variety of alternative external approaches. In 1928 Maliniak¹⁴ described a median vertical and horizontal incision at the nasofrontal region indicated for surgical repair of traumatic lesions of the nasal

**Figure 3**

Rhinoplasty according to Trendelenburg for correction of a crooked nose. The nasal bony sidewalls are mobilized with lateral osteotomies which start at the pyriform aperture and are directed to the orbital rim. An external incision is used for transverse osteotomies.

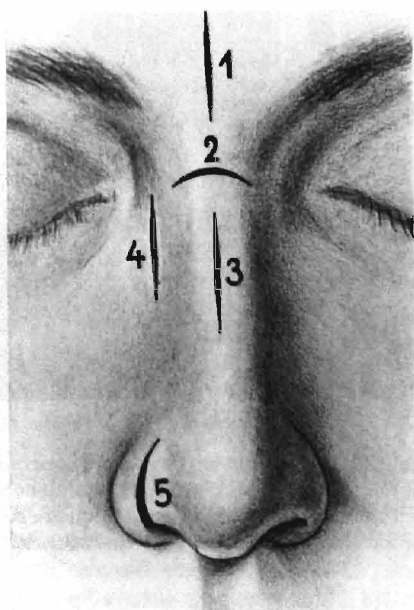
**Figure 4**

A. Reduction of the nasal dorsum by way of a horizontal incision through skin and periosteum. The dorsal hump is removed with a "Luer" forceps. **B.** Insertion of a bone graft in a saddle nose deformity via an external incision.

bones (Figure 6-1, 6-2). The same goal was served by a vertical incision according to Kazanjian¹⁴ placed laterally over the bony nasal vault between the midline and the medial canthus (Figure 6-4). Lexer propagated the median skin incision through the nasal dorsum, earlier also described by Dieffenbach (Figure 6-3). In certain cases of alar anomalies even a transcartilaginous allotomy through the alar sidewall was advocated (Figure 6-5). Figure 7 illustrates various external skin incisions for ex-

**Figure 5**

Reduction of the nasal dorsum according to Lexer. The nasal dorsal skin and the periosteum are incised. The hump is removed with a sharp chisel.

**Figure 6**

External incisions in rhinoplasty. 6-1. Median vertical horizontal incision according to Maliniak. 6-2. Horizontal incision according to Maliniak. 6-3. Median incision according to Dieffenbach. 6-4. Paramedian incision according to Kazanjian. 6-5. Transcartilaginous alotomy.

posure of the lower third of the nose. Direct approaches to the nasal tip and dorsum could be obtained by external infralobular incisions according to Portmann and Reinhard¹⁴ (Figure 7 A-1). This slightly curved incision at the infra-tip region was used in cases with a high bony-cartilaginous hump or saddle nose deformity. The

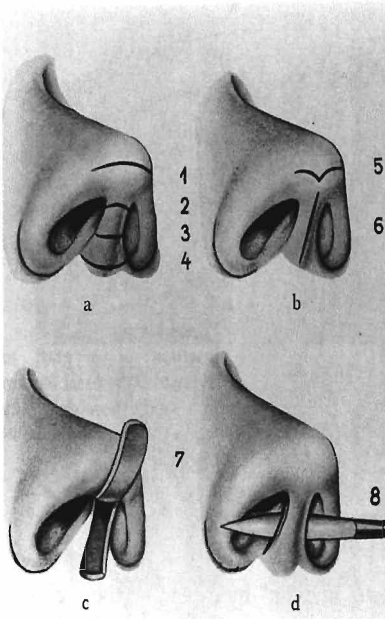


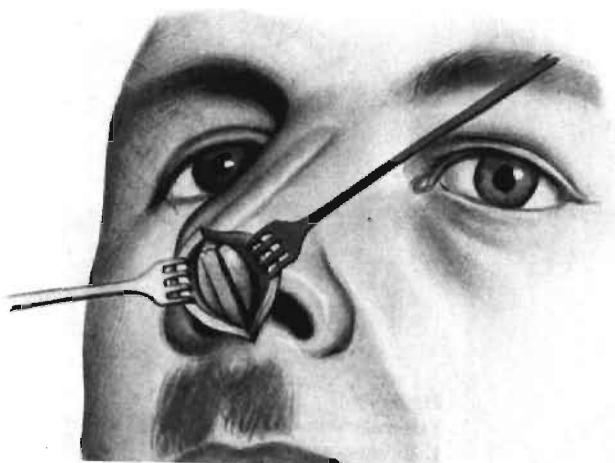
Figure 7

External columellar incisions in rhinoplasty. A-1. Incision according to Portmann and Reinhard. A-2. Incision according to Rethi. A-3. Incision according to Sercer. A-4. Incision according to Gillies. B-5. Incision according to Sercer. B-6. Incision according to Sheehan. C-7. Columellar flap elevation according to Gillies. D-8. Transseptal incision according to Gillies.

scar was considered almost invisible. Sheehan's¹⁵ first edition of "Plastic Surgery of the Nose" (1925) describes rhinoplasty done through a columellar-splitting incision using chisels instead of saws (Figure 7B-6, 7D-8, 8). In his second edition (1936) he turned to the closed approach. In 1920, Sir Harold Delft Gillies¹⁶ (1882-1960), a British Plastic Surgeon described an "Elephant trunk" incision, in which an U-shaped incision in the nasolabial angle at the upper border of the upper lip in combination with bilateral vertical incisions along the lateral side walls of the skin covering the medial crura is used to elevate of the columellar flap and to deglove the tip (Figure 7C-7). The danger of flap necrosis and scarring were recognized as potential problems.

In 1921 Aurel Rethi¹⁷⁻¹⁸ (1884-1976) from Budapest advocated an external approach for exposure of the alar cartilages and the nasal dorsum with a relatively high incision only through columellar skin in combination with bilateral endonasal skin incisions along the side walls of the medial crura perpendicular to the horizontal columellar segments of the columellar incision (Figure 7A-2). After elevation of the skin flap, both alar cartilages and upper laterals were sharply divided through vestibular skin and septal mucoperichondrium medial to the domes and paramedian to the nasal septum. After tip correction and nasal dorsal reduction with a saw, the separated cartilages were approximated and the incisions closed (Figure 9 A-F). He emphasized meticulous surgical technique and removal of the sutures after only 48 hours! "Rethi incision" became an aphorism for the transcolumellar approach. Independently of Rethi, in 1938 Dr. E.C. Padgett¹⁹, a British Plastic Surgeon described a similar approach for the nasal tip, which he described as an "external exposure of the nasal tip"

In 1951 May published the first paper on the Rethi incision in rhinoplasty in the American literature²⁰.

**Figure 8**

Insertion of a graft to reconstruct the nasal septum in a saddle nose deformity via a vertical columella-splitting incision.

History: 1956-present

In 1956 Haubenrisser²¹ modified the "Rethi incision" by extending the marginal incision further in lateral direction curving it in the crease at the alar facial junction over the external skin. The flap elevation was facilitated in such manner. In the same year Professor Ante Sercer¹⁴ (1896-1969) from Zagreb designed an external incision located at the nasal tip with the design of a "Gull-wing". This incision could be used in combination with a vertical mid-columellar incision according to Sheehan (Figure 7B-5, 7B-6, 10A-B). This offered better access in a single procedure to the anterior nasal spine and the nasal tip. Insertion of grafts in the dorsal region was said to be enhanced.

Sercer¹⁴ searched also for an alternative technique to improve his success rate in difficult noses and modified the Rethi concept. A horizontal mid-columellar incision was used. This site was preferred because of the skin support by the underlying paired medial crura which minimizes scar retraction (Figure 7A-3). The alar cartilages were not incised, which was considered unphysiological. Although it seemed a contradiction to combine "Decortication of the nose" with the advantages of the endonasal approach, a combination of better exposure with concurrent advantages of the endonasal approach in an one stage procedure proved to be worthwhile. Sercer considered decortication was indicated in almost all patients but especially suitable in secondary procedures and major deformities such as saddle noses. It was considered a "safe" procedure which produced "reliable" results and was "easy to learn". The only price to pay was "a small scar under the nose" (Figure 11).

Ivo Padovan²²⁻²⁴, Sercer's successor in Zagreb used the "Operation under an open sky" for the long nose with a large hump, the severe crooked nose with concurrent septal pathology, deformities of the nasal pyramid in conjunction with congenital pathology of the lip, upper jaw and palate, and posttraumatic deformities. New on the list was the inclusion of septal pathology. He presented the results of 400 cases in 1970 at the 1st International Symposium of the AAFPRS on facial plastic and reconstructive surgery in New York. He modified the incision to a V-shaped incision

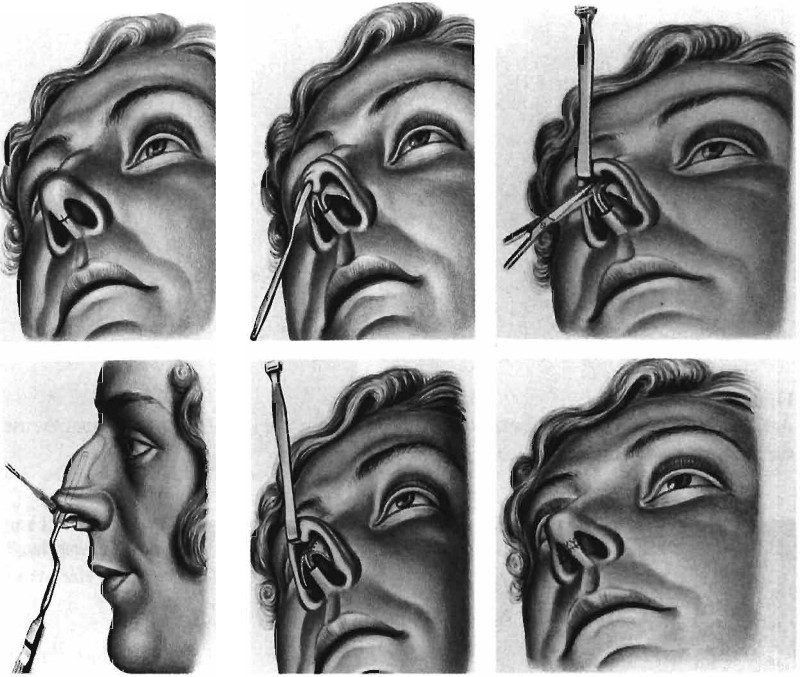


Figure 9

External rhinoplasty according to Rethi.

A. The transverse, horizontal columellar skin incision is connected with bilateral vertical incisions along the lateral aspect of the membranous septum and extended intranasally. The vertical incision over the columella marks the midline and facilitates closure. B. The skin and subcutaneous tissues are elevated from the alar cartilages and upper lateral cartilages over the nasal dorsum up to the nasal bones. C. A bony-cartilaginous hump is removed with a saw preferably underneath the perichondrium and periosteal layer. D. The alar cartilages are sharply divided just medial to the domes. The upper laterals and the nasal septum are sharply divided and if necessary resections of the alar cartilages are done. E. The alar cartilages are approximated with sutures. F. The skin is closed as well as the intranasal incision. The sutures are removed after two days.

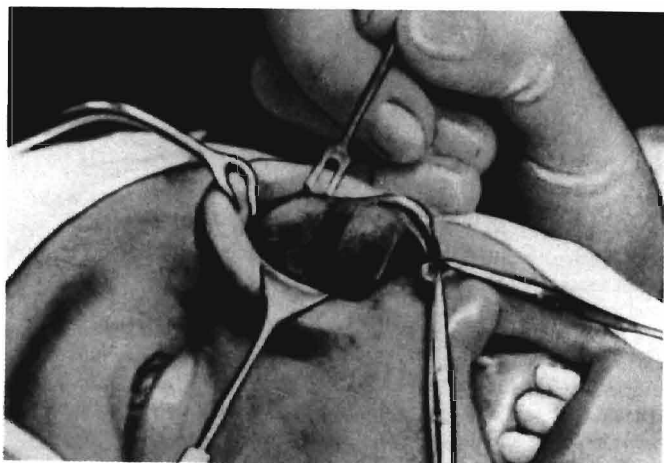
located at the natural crease caused by diversion of the foot plates of the medial crura. He developed a method of elevation and preservation of the perichondrial and periosteal layer over the nasal dorsum and was the first to use the technique in congenital anomalies in children.

Jugo²⁴⁻³⁰, a disciple of Padovan, also used "decortication", using the previously mentioned incision according to Padovan in contrast with the transversal interrupted design of the skin incision which became popular several years later.

Wilfred S. Goodman³¹⁻³⁶ from Toronto, after having attended the Padovan lecture at the 1st International Symposium of the AAFPRS started to use the "External" approach in rhinoplasty in a systematic manner for augmentation procedures, cartilaginous deformities, correction of a bifid tip, excision of subcutaneous tissue and surgical repair of nasal septal perforations. After extensive experience, Goodman formulated the potential values of the external approach as follows: (1)

**Figure 10**

A-B. Transverse incision at the nasal lobule provides access to the nasal dorsum facilitating the use of cartilage grafts.

**Figure 11**

"Decortication"
rhinoplasty according to
Sercer

Meticulous surgery of the nasal dorsum; (2) Precise correction of the upper lateral and lower lateral alar cartilages; (3) Excellent access to the nasal septum; (4) More accurate augmentation of the anterior nasal spine, the columella and the nasal dorsum. The scar healing and flap viability disturbances were considered very rare problems. He stated that the reluctance to use the external approach was based on "emotional rather than rational" arguments. He refined the incision, also known by him as the "Butterfly" incision (Figure 12 A-B). He suggested the use of electrocautery to minimize the blood loss and the use of a rotating burr to lower and narrow the bony dorsum by drilling the midline portion of the bones or to deepen the nasofrontal angle. Several publications from the "Goodman" school followed (Briant³⁷, Fenton³⁸, Conrad³⁹, Lawson⁴⁰).

In these early days of development of the external approach for septorhinoplasty in North America, other well known closed rhinoplasty surgeons, like Anderson⁴¹⁻⁴⁴,

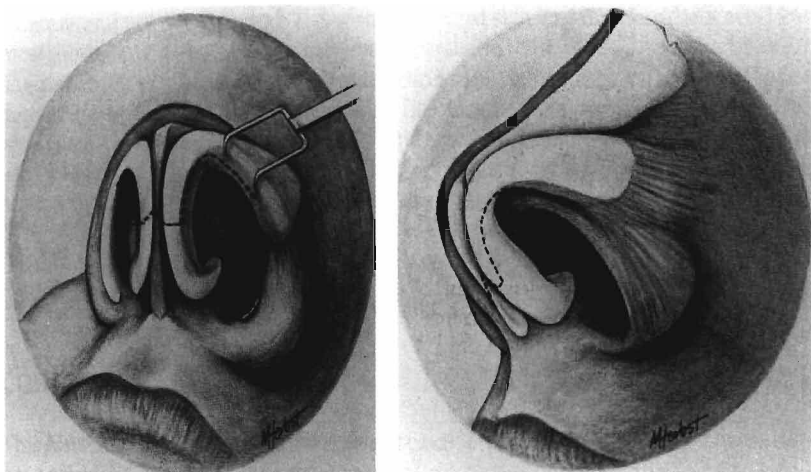


Figure 12

A. Basal view of the broken-line midcolumellar skin "Butterfly" incision according to Goodman.

B. Lateral side view

Farrior⁴⁵ and Wright⁴⁶, recognized the potential values of the external approach. Anderson was the first to popularize the term "Open rhinoplasty" as synonymous with "External rhinoplasty". Adamson⁴⁷⁻⁵¹, from Toronto, completed a fellowship of the AAFPRS with Anderson and started to use the mid-columellar incision in almost all rhinoplasties. He advocated the use of tip-, dorsal-, spreader-, columellar- and premaxillary grafts and in-situ sculpturing and fixation. Rather than defining the indications for the external approach in terms of specific deformities, he recognized that each surgeon has his own eclectic experience and technique in all cases unless the nasal pathology could be accurately diagnosed pre-operatively and the surgeon felt that he could correct the pathology just as well with a closed approach as an external approach.

The concept of "Open Structure Rhinoplasty" was introduced by Johnson, an associate of Anderson from New Orleans and Toriumi⁵²⁻⁵³. Johnson combined the external approach with autologous cartilage grafts to the nasal tip, based on the earlier work of Sheen⁵⁴, with the emphasis on the recreating of a strong structural support of the nose.

In Europe the external approach was described by Meyer and Denecke⁵⁵ for only limited indications like cleft lip rhinoplasty, saddle nose deformity and complicated nasal tip pathology. In the Netherlands rhinoplasty is predominantly performed by the closed approach. The external approach was mainly used for correction of nasal deformities associated with cleft lip. Hage⁵⁶⁻⁵⁹, a General Plastic Surgeon, used the external approach for congenital deformities of the nose s.a. dermoid cysts, nasal gliomas, fronto-nasal encephaloceles. He also used it for secondary operations of nasal deformities in the cleft lip patient and correction of an insufficient nasal valve with autologous ear cartilage. However, in 1979 Baarsma⁶⁰ was the first Dutch Otolaryngologist publishing about the external approach for septorhinoplasty, refer-

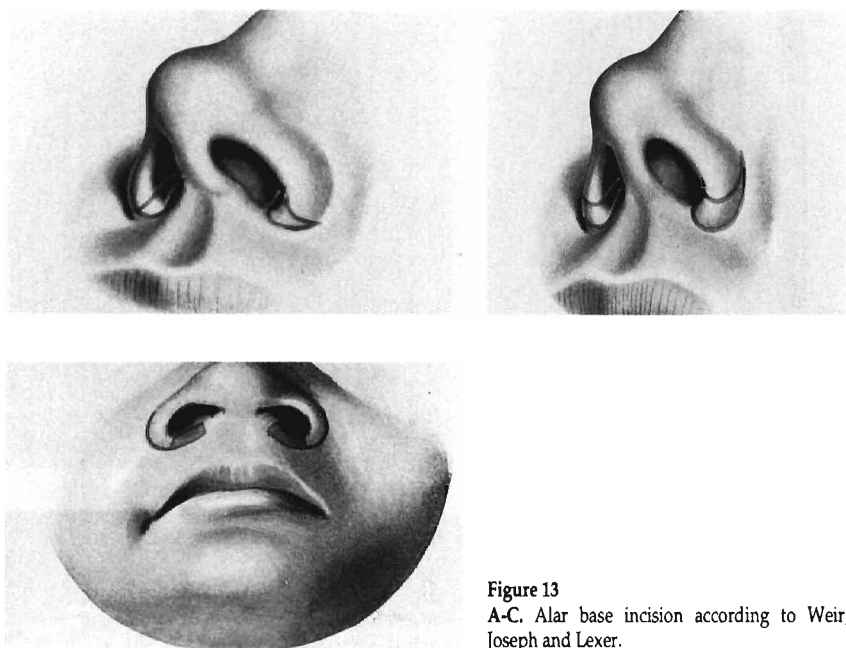


Figure 13
A-C. Alar base incision according to Weir, Joseph and Lexer.

ring to Goodman's technique. In 1989 the Department of Otolaryngology and Head & Neck Surgery of the University Hospital Maastricht, hosted an International Symposium "The Open Approach for Septorhinoplasty".

DISCUSSION

The closed approach for rhinoplasty has gained worldwide acceptance for over more than a century. Depending on the underlying pathology endonasal infra-cartilaginous or "marginal" incisions, transcartilaginous incisions and intercartilaginous incisions are used for exposure of the nasal skeleton in combination with a (hemi-)transfixion incision to provide access to the nasal septum. The lateral wall of the nasal pyramid is generally approached by a vestibular incision or an external "stab" incision. Endonasal incisions provide limited exposure and visual control over the surgical manoeuvres⁶¹.

After several external incisions for exposure of different nasal components were proposed, used and rejected because of the external scarring and concurrent tissue trauma, the columellar incisions with undermining of the S-STE came into focus. At first the mid-columellar incision did not encounter broad acceptance and almost vanished from the armamentarium of the rhinoplasty surgeon. The criticism focussed on the external scar, despite the fact that other external incisions in the vicinity of the nose were already accepted for a long time (Figure 13 A-C)⁶². The design of a straight horizontal incision and vertical division of the L.L.C. for enhanced exposure as advocated by Rethi was considered less ideal with respect to

cosmesis and not physiological. Today an interrupted skin incision is advocated by most rhinoplasty surgeons⁵¹. The incision lies parallel to the R.S.T.L., and the broken line redistributes the wound's contractile forces. This minimizes the risk of scar depression or notching of the columella. This incision is a modification of the transversal incision proposed by Rethi¹⁸⁻¹⁹ and Sercer¹⁴. The external incision can be used in combination with a posteriorly located "Killian" incision for separate exposure of the nasal septum or with vestibular incisions for access to the bony pyramid side walls or alar incisions in alar base narrowing procedures. A separate incision for exposure of the nasal septum preserves major tip support and minimizes the risk of loss of nasal tip projection.

CONCLUSION

This historical review describes the renewed discovery and recognition of the external approach for septorhinoplasty using a mid-columellar skin incision in combination with bilateral endonasal marginal incisions.

The external approach offers a different concept for septorhinoplasty which is primarily based on an almost complete visual control of the anatomy and almost all surgical manoeuvres. Arguments against the use of external incisions in corrective nasal surgery, as long as they are well planned and attention is paid to careful tissue handling and wound closure, seems no longer valid.

FIGURES

Figure 2. from *Handbuch der Speziellen Chirurgie des Ohres und der Oberen Luftwege*. Katz und Blumenfeld. Leipzig 1927, Verlag von Curt Kabitzsch.

Figure 6, 7, 11. from *Plastische Operationen an der Nase und an der Ohrmuschel*. Sercer und Mundnich. G. Thieme Verlag. Stuttgart.

Figure 12. from *Otolaryngol. Clin. North. Am.* 20, 4, November 1987

Figure 1, 3-5, 8-10, 13. from Kirschner M. (1935) *Allgemeine und Spezielle Chirurgische Operationslehre*. III/1, 32, 502. Springer J., Berlin.

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Chapter II

A REVIEW

RHINOPLASTY:

PRE-OPERATIVE PHOTOGRAPHY

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H.D. VUYK

P.A. ADAMSON

ABSTRACT

Pre-operative photographic analysis and planning is a crucial part of rhinoplasty. This paper reviews various steps in pre-operative rhinoplasty analysis, emphasizing the use of standard life-size photographic patient documentation.

INTRODUCTION

Rhinoplasty is considered one of the most demanding operations in facial plastic surgery. As the nose is the most prominent part of the face, the responsibility of the surgeon to the outcome of the surgery is obvious. There are many publications on rhinoplasty but only a few deal with pre-operative assessment and planning. In our opinion, such assessment is crucial for functional and aesthetic nasal surgery and may be considered the key to master rhinoplasty. It is self evident that a perfect execution of a flawed plan will lead to unsatisfactory results.

The basic foundation of pre-operative analysis is a sense of beauty, harmony and proportion combined with keen observational skills. The proportions of the aesthetic face have been excellently described by Powell and Humphreys¹. However, one should be aware that the concept of beauty varies among cultures, geographic areas, and times. To stress the importance of observation, Fomon² has stated that more mistakes in rhinoplasty result from not seeing than from not knowing. The surgeon therefore must train himself to look and to see.

The purpose of this publication is to describe our experience in the pre-operative assessment and planning of more than 300 rhinoplasties over a 3-year period.

The first analysis performed during the consultation should include an evaluation of what the patient perceives as the major defects, the surgeon's evaluation of the defects, and discussion regarding reasonable expectations for correction of the defects and possible complications.

An album depicting previous rhinoplasty results of the surgeon is shown to the patient, and an information booklet have proved to be very helpful. A rough instant photographic analysis can be performed with the patient during the first consultation by sketching on Polaroid pictures.

Standard quality photographs are a prerequisite for any rhinoplasty analysis. These photographs can be taken easily by the surgeon, thereby cutting costs while it takes no more than a few minutes. The essential camera equipment consists of a 35 mm SLR camera and a lens with a fixed focal length of 100 mm. For lighting, a strong flash mounted on the camera is sufficiently effective and inexpensive. The camera and flash attachment can be positioned so as to avoid shadows on the background for lateral views; that is, if the patient's profile is taken, the flash is positioned to the right of the camera, just like the photographer views the subject. Some slight shadows in the face and on the background of full face photographs are inevitable using a one-flash system. A second flash may be used as "fill" light on the opposite side of the camera to eliminate these shadows. Even more sophisticated is the use of a third flash, shining on the patient's head and background. This third flash does bring the patient "out" from the illuminated background thus creating a three-dimensional effect. Slave modules eliminate complicated wiring while securing

simultaneous lightning for multiple flash systems.

Correct exposure can be automatically obtained with cameras using through the lens flash metering. Standard magnification can be obtained by taking pictures with the patient at a pre-set distance (e.g. 1.0m) and prefixed focus (100 mm), while moving the camera closer to and further from the patient, watching the nose until it is in sharp focus. Autofocus cameras are of no extra use for this purpose. From the many films available, we believe Kodachrome 64 to be superior because of the stable colour emulsion, fine detail and overall quality. Because light(kings)blue is non-distracting, we use this as background for colour portrait photography. A set of pre-operative photos should consist of full frontal, right and left lateral and basal views. Right and left oblique views are optional. The reference for positional consistency is the "Frankfurt" horizontal plane (see Figure 1). For the frontal, lateral and oblique views, the patient is positioned so that the "Frankfurt" horizontal plane is parallel and that the mid-sagittal plane is perpendicular to the floor (see Figure 2A,B). For the basal view (see Figure 2c), the midsagittal plane should be perpendicular to the floor and the tip of the nose should lie on a horizontal line passing through the interbrow area. A satisfactory landmark for the three-quarter oblique view is the alignment of the lateral border of the face to the nasal tip. A lateral view taken with the patient smiling may provide additional information in some cases. A photograph taken from above with the head of the patient tilted backward ("sky-line" view) may give a good perspective to appreciate any asymmetry or deviation of the face and/or the nose from the midline as advocated by Jacobs³.

In general the lips should be gently touching and the upper and lower teeth in contact, to avoid alterations in facial dimensions due to a variation in jaw position. To visualize the subject's Frankfurt plane, the patient's ear and forehead may be exposed with hair clips if necessary. Furthermore an easily removable sticker or marker may be placed on the inferior border of the orbital rim, located by palpation to facilitate the recognition of the "Frankfurt" plane in the lateral view^{4,5}. Full scale photographs measuring 20x30 cm are obtained using a focus of 100 mm combined with a distance of 1.0 meter. Furnas⁶ has also stressed that large-size reproduction provides the surgeon with more reality to analyze and plan future surgery.

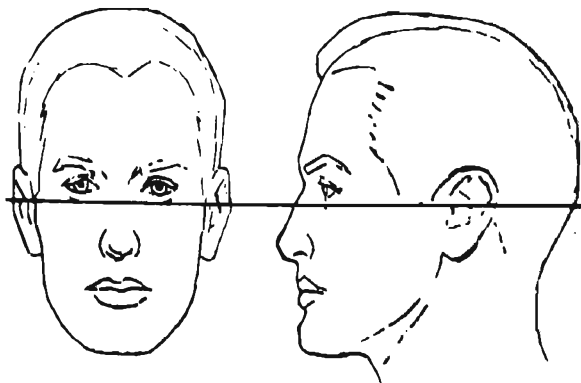


Figure 1
Frankfurt plane transver-
sely the top of the tragus (or auditory canal) as well as both infraorbital rims. The plane should be parallel to the floor for appropriate head positioning during photography.

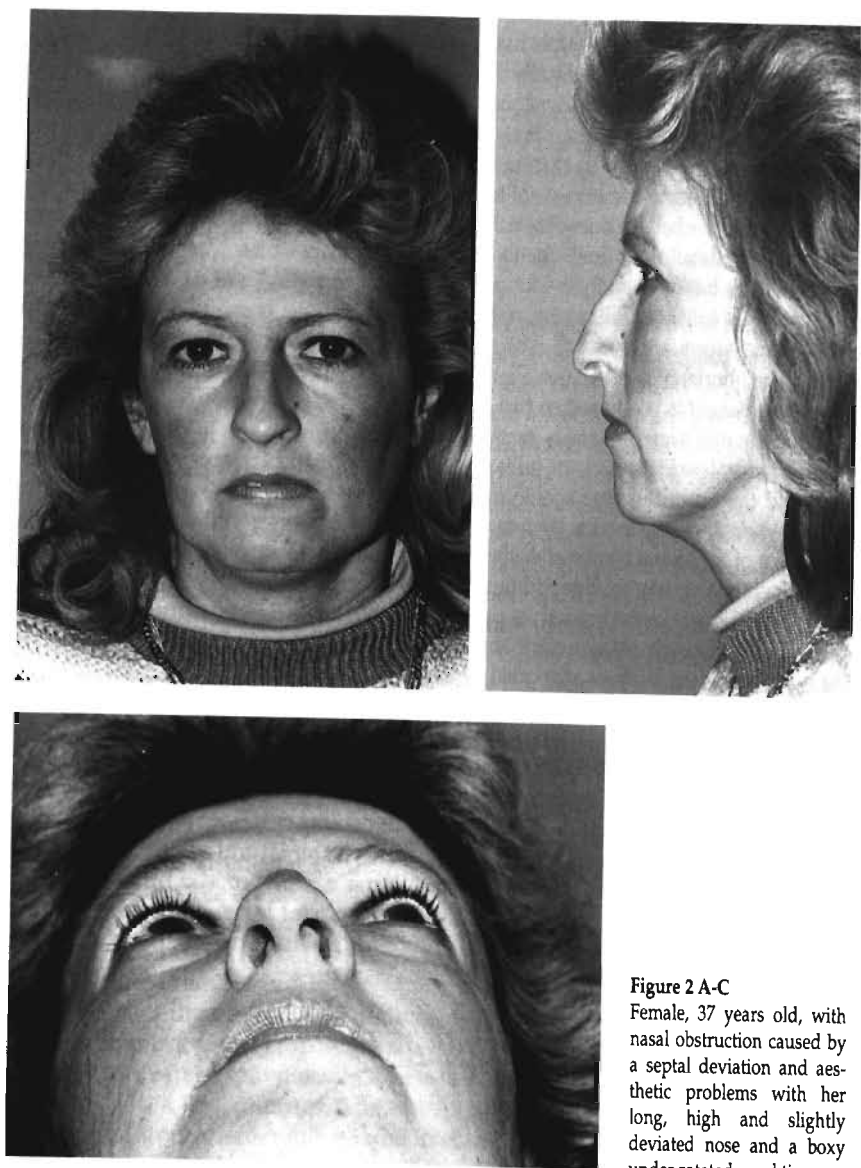


Figure 2 A-C

Female, 37 years old, with nasal obstruction caused by a septal deviation and aesthetic problems with her long, high and slightly deviated nose and a boxy under rotated nasal tip.

OPERATION PLAN

Only after a thorough pre-operative assessment and an evaluation of our goals with the patient can a surgical plan be formulated. One should have a clear idea of exactly what is to be done pre-operatively. Rhinoplasty is a complex operation, mainly because reduction and augmentation change not only the parts being reduced or augmented but also their real and apparent positions. Moreover, the changes that

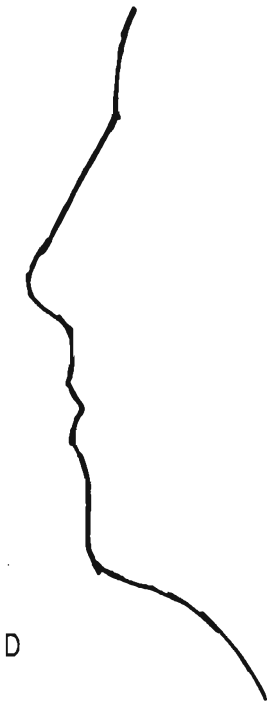
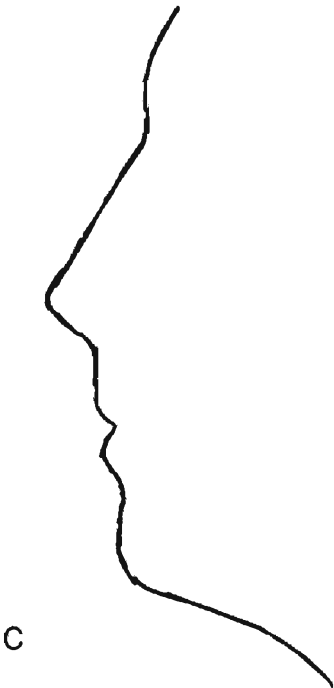
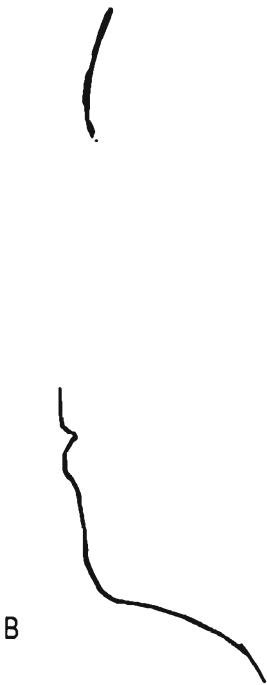




Figure 4

A. Frontal and mental contour depicted (light-box on). B. Profile line with nose blanked out (light-box off). C. The drawn profile is not aesthetically pleasing profile because of the over-rotated nasal tip and the extremely low nasal dorsum. D. Definitive goal for rhinoplasty: strong nasal bridge with tip moderately rotated which leads the profile (light-box off). E. Ideal profile is deemed a realistic rhinoplasty option (light-box on). F. Ideal nasal base depicted (light-box on).

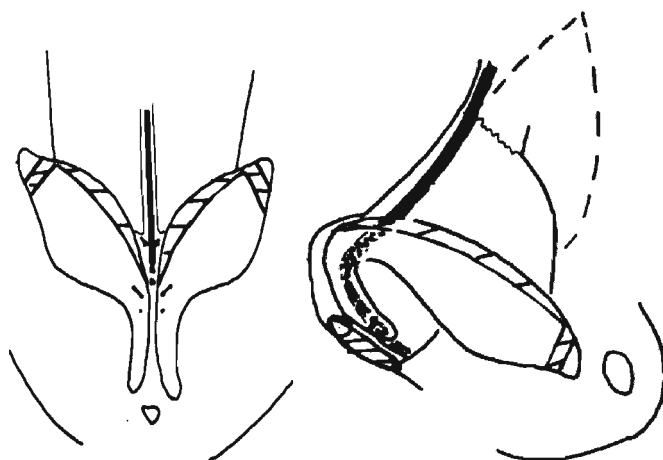


Figure 5

Surgical plan for the patient is depicted.

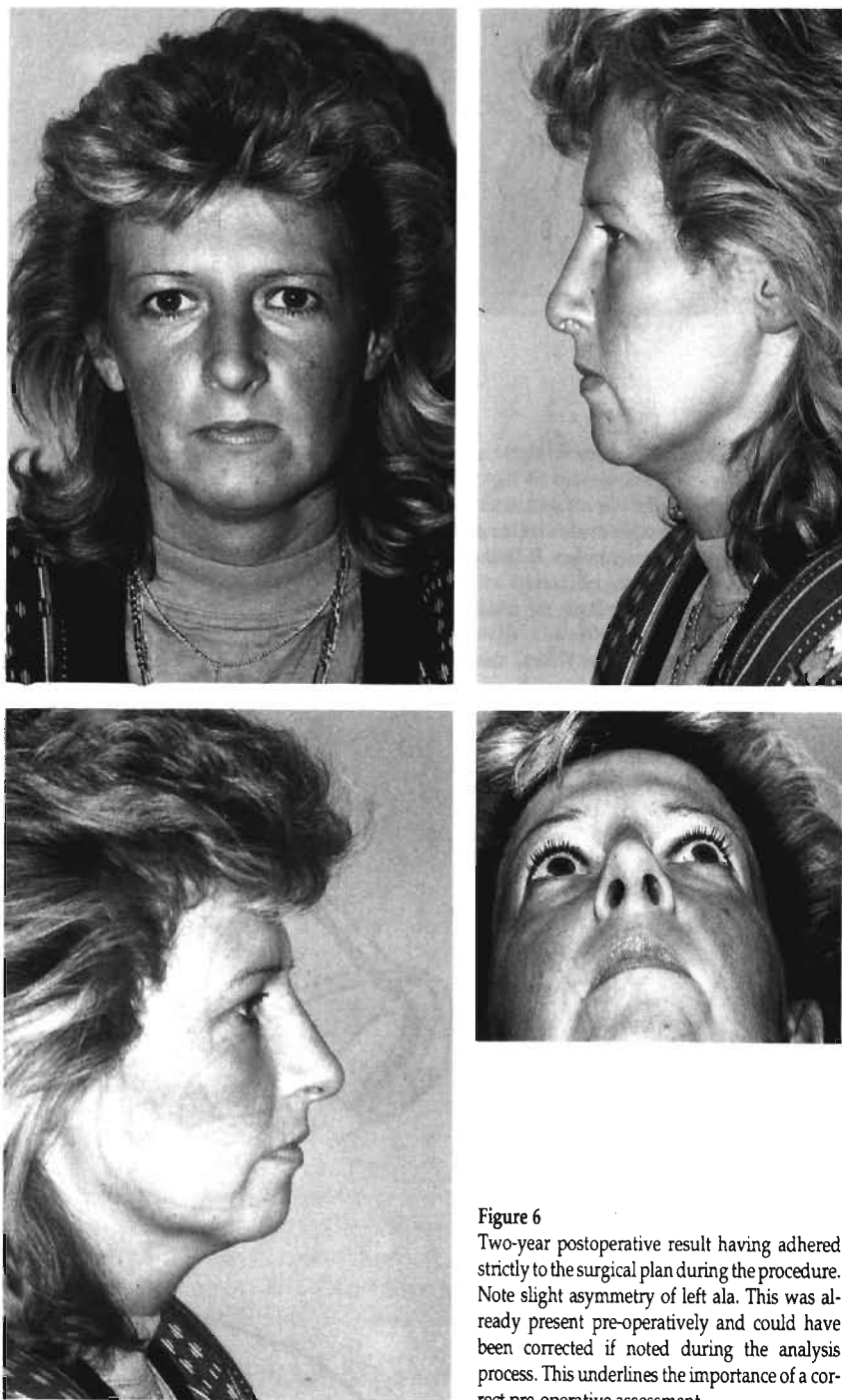


Figure 6

Two-year postoperative result having adhered strictly to the surgical plan during the procedure. Note slight asymmetry of left ala. This was already present pre-operatively and could have been corrected if noted during the analysis process. This underlines the importance of a correct pre-operative assessment.

analysis of the lower facial third. The photographs with drawings and operation plan are displayed in the operating room on a light box for reference during the procedure.

DISCUSSION

We want to stress that thorough pre-operative analysis and planning is crucial to meet the psychological and aesthetic goals of rhinoplasty. It is important that patients feel that their reasons for seeking surgery and their expectations of the procedure are understood by the surgeon⁸. Communication between the surgeon and the patient is also the keystone for setting a realistic aesthetic goal for the rhinoplasty procedure. Various methods have been proposed for improved assessment, planning and patient's communication for rhinoplasty. These include photographic reproductions, large-scale slide projected images with artistic renderings⁶, facial wax moulages⁹, soft tissue cephalometric calculations¹ and computer imaging^{10,11}. Because of their simplicity, photographs are the most widely used for documentation and subsequent pre-operative analysis and planning. In contrast, large scale slide projected images combined with tracings are more complex, and may preclude optimal patient-surgeon communication. Facial moulage are used mainly for pre-operative fashioning of alloplastic facial implants. In recent years, computers have enabled the surgeon to present the patient's image on a video screen and alter the image as the patient watches. This fast and direct method does seem to improve patient-surgeon communication and is well accepted by the patients¹². However, the high costs and time expense of these computer systems have prevented a general application.

In contrast, photographs can be made with relatively simple equipment. However, strict uniformity and standardisation is of utmost importance^{13,14}. The most inconsistent part of photography may well be head positioning and the definition of the horizontal facial plane on subsequent analysis. This problem may be overcome by placing an easily removable marker on the palpable infraorbital rim at the time of the photography. Robin¹⁵ has called attention to the value of large scale photography. However, his measurements on 3/4 scale photographs need to be converted to full size for precise analysis and planning. For many years, maxillo-facial specialists have analyzed and planned their surgery with the help of life-size reproductions using mainly xerocephalograms and life-size models¹⁶. This "in-depth" life size analysis and planning of maxillo-facial surgery is not routinely applied in rhinoplasty surgery. Analogous to maxillo-facial analysis and planning we have used life-size photographs for our surgery. These pictures provide the surgeon and the patient with a greater sense of reality and control which enhances analysis and planning. These large scale reproductions also increase the patient's awareness as to how they might look like postoperatively. The measurements taken from the life-size photographs can be used without conversion in the actual "life-size" surgery planning procedure. Guyuron^{4,5} has shown, in a study combining pre- and postoperative life-size photographs, xerocephalograms and intraoperative measurements, that soft tissue response rate to skeletal and soft tissue alterations following rhinoplasty is not one-to-one but depends on the part of the nose that is

operated and on skin thickness. In other words the measured differences in ideal and existing profile may be used without conversion in surgery¹⁷, but generally needs some adaptation for a predictable rhinoplasty result.

Initially photographic analysis and planning appears time consuming. As the surgeon becomes more experienced, the overall time required for does not take more than 10 to 15 minutes. It should be stressed to the patient that the drawings on the photographs like any prediction tracings, are presented as an ideal aim of the profile to be attained. Moreover, patients are told that in 5-10% of the time a secondary operation may be required. Ideally, these information is presented as an informed consent, in addition to a signed disclaimer. Such detailed patient discussion helps to prevent a dissatisfied patient and possible medico-legal problems.

CONCLUSION

In our opinion pre-operative analysis and planning is the key to successful rhinoplasty. Taking life-size photographs using standard views is a simple and effective method for accurate rhinoplasty assessment and planning and can be used to enhance communication with the patient. The described method is a synthesis of work done by previous authors in the fields of both facial plastic and maxillo-facial surgery. Exact pre-operative analysis and planning will remove rhinoplasty, which previously was considered mainly an artistic operation¹⁸. This will assist the aspiring facial plastic surgeon in the pre-operative analysis and planning of this difficult and demanding operation (Figure 5,6). Such a protocol will result in improved diagnostic acumen, and ultimately more accurate and successful surgery.

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Chapter III

OPEN STRUCTURE RHINOPLASTY

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ABSTRACT

Open structure rhinoplasty (O.S.R.) uses the open or external approach via a mid-columellar and bilateral marginal incisions. In combination with grafting procedures, with columellar struts, dorsal- and tip grafts, rhinoplasty has developed from a merely reductive procedure to a more graduated approach to the nose. Emphasis is now placed on repositioning, augmentation and restructuring the nasal anatomy to create an as natural and functional nose as possible. This retrospective study analyses our experience with 130 rhinoplasties over a 3-year-period. The study reveals O.S.R. to be a safe and reliable technique which produces predictable results.

INTRODUCTION

Rhinoplasty is considered to be one of the most demanding operations in facial plastic surgery. Until recently it has been mostly a reductive procedure executed via the closed or endonasal approach, with traditional emphasis on restoration of nasal function. The (re)-introduction of the open or external approach for septorhinoplasty, using a mid-columellar skin incision in combination with bilateral marginal incisions, in the early 1970s offers a new perspective. With the O.S.R. predictable results are achieved and modern grafting techniques have been introduced¹⁻¹⁰. This paper covers the concept of O.S.R., the indications and contraindications, surgical technique, results and complications, with special attention to skin incision and scar analysis.

CONCEPT

As an undesired late effect of rhinoplasty, some decrease in nasal tip projection is to be expected in almost all patients¹¹. This is probably due to damage of tip supporting components, scar retraction and a weakened nasal skeleton. This is more likely to occur from a theoretical point of view in the conventional endonasal approach, because of the inability to avoid incisions violating tip support, and a lack of reliable reconstructive techniques. Precise placement and fixation of autologous grafts is also more difficult.

The open approach provides excellent exposure of the bony and cartilaginous nasal vault, tip, septum, columella and anterior nasal spine. It allows an undistorted view of the anatomy of the nose. All surgical maneuvers except the lateral osteotomies are performed under direct vision¹²⁻¹⁸. All reconstructive maneuvers are carried out more easily, thus minimizing a loss of structural integrity of the nose.

INDICATIONS

The choice of whether to use the O.S.R. or not depends strongly on the surgeon's personal preference. We use the O.S.R. in almost all cases, unless we are able to analyze the pathology pre-operatively. In the past, widely accepted indications such as cleft lip rhinoplasty, severe septal, tip and dorsal abnormalities and revision rhinoplasty were cited¹⁹. The O.S.R. is also useful in the surgical treatment of nasal

septal perforations²⁰⁻²³, pituitary gland tumors^{24,25} and severe nasal septal abnormalities in the (very) young patient^{26,27}.

COLUMELLAR SCAR

The O.S.R. has been widely criticized because of the columellar scar. However, when the mid-columellar skin incision is used parallel to the relaxed skin tension lines, with underlying support of the medial crura of the alar cartilages, careful flap elevation and meticulous closure, fear of an unsatisfactory, ugly scar is not justified¹⁹. Wound dehiscence, flap necrosis and skin loss are reported in small numbers and are probably due to a too superficial dissection of the skin and/or excessive thinning of the subcutaneous layer^{29,30}.

PRE-OPERATIVE ANALYSIS AND PLANNING

We consider pre-operative analysis and planning the key to successful rhinoplasty^{31,32}. Routine head and neck examination, specific nasal and facial morphology at analysis, and occasional psychological examination are recommended^{33,34}. Life-size photographs using standard views or computer graphics are valuable for adequate pre-operative analysis^{35,36}. The use of an assessment sheet and a written operation plan is recommended¹⁸.

EXPOSURE

The sequential steps in O.S.R. are depicted in Figure 1-14. A posterior "Killian" incision provides access to correct minor septal problems and to harvest cartilage grafting material. When there is caudal septal abnormality or previous septal surgery, a V-notched broken midcolumellar skin incision is used, which runs parallel to the R.S.T.L., connected with bilateral marginal incisions. The inverted V-shaped break serves to facilitate closure as well as to camouflage the incision. The columellar flap is carefully elevated with sharp and blunt dissection using 3-point counter retraction, beginning just cephalad to the caudal margin of the medial crura. The skin is elevated in the avascular plane, leaving the skin flap as thick as possible to improve flap viability. The fibrous connection, also known as "Pitanguy ligament", between the skin and the domes lower lateral of the cartilages (L.L.C.) is dissected, as well as the interdomal ligament³⁷.

The dorsal skin flap is elevated as far as necessary up to the nasofrontal angle. Excessive soft tissue in the supratip region is resected from the undersurface of the skin (defatting), taking care not to violate the subdermal plexus. The perichondrium covering the upper lateral cartilage (U.L.C.) is incised and carefully elevated and preserved. Exposure of the nasal septum, the nasal spine, or the premaxillary space is facilitated.

LOWER NASAL THIRD

Columella

A columellar strut made of a firm piece of septal cartilage, is inserted between the medial crura of the alar cartilages. As an elongation of the feet of the medial crura, the strut prevents loss of tip projection. It also lengthens and strengthens the columellar-L.L.C. complex. The strut is placed in a pocket between the feet of the medial crura but not extending down to the nasal spine. The cephalic part of this pocket should be kept intact to prevent retrodisplacement of the graft.

A "batten" is different from the strut, inasmuch as it is placed along the caudal aspect of the medial crura as a volume filler to help correct a retracted columella. It does not offer any additional support to the tip.

Nasal tip

Nasal tip surgery usually follows adaptation of the nasal dorsum. The L.L.C.'s are analyzed in their mutual relation to the nasal septum, U.L.C.'s and the skin of the nasal vestibule. Asymmetries and deformities are corrected, according to the tripod concept². After readjustment of the cartilage in the desired position the cartilages are secured with nylon 6-0 buried sutures. This is especially important if vertical (dome)incisions have been made through the alar cartilages. Other refinement techniques include horizontal resection of the mediocephalic margin of the L.L.C., triangular wedge resections lateral to the domes, scoring and suture techniques.

The introduction of the versatile shield type graft made of septal or auricular cartilage has tremendous implications for rhinoplasty³⁸⁻⁴³. The tip graft allows the surgeon to reshape, camouflage or to refine the tip, to increase and maintain tip projection, and/or to lengthen the nose.

Middle nasal third and nasal septum

The cartilaginous dorsum extends from the anterior septal angle to the ossea-cartilaginous junction ("K-area"), overlapped in a side to side manner by the nasal bones. The U.L.C.'s fuses in the midline with the cartilaginous septum. After extramucosal sharp dissection of the U.L.C.'s and septum, correction of the dorsum is executed. As well as reduction of the nasal dorsum after elevation and preservation of the perichondrial/peri-osteal flap, augmentation with onlay and "spreader grafts" is possible⁴⁴⁻⁴⁷. This approach also provides superb access to the nasal septum, for treatment of the difficult septum or closure of septal perforations.

Upper nasal third

Conservative dorsal hump removal is performed in a subperiosteal plane using a rasp, chisel or burr. In a broad nasal pyramid paramedian resections may take place to narrow the nose. After (fading) paramedian and low lateral osteotomies the nose is narrowed, adjusted to the midline and the open roof closed⁴⁸. The O.S.R. allows the use of a drill more easily to deepen the nasal frontal angle⁴⁹. If dorsal augmenta-

tion is required, a small pocket is made and a carefully sculpted autologous or alloplastic graft is sutured or glued in place. If lateral osteotomies are required, they are carried out at the end of the operation, to minimize blood loss and swelling.

Closure

The columellar skin incision is closed with 6-0 simple nylon sutures, taking care to evert the skin edges. No subcutaneous sutures are needed. At the junction of the transverse and marginal skin incision the skin is slightly undermined before closure to prevent a "trap door" deformity. The marginal incisions are closed with 5-0 absorbable sutures. The columellar sutures are removed at 3 days and the corner sutures at day 7. To facilitate drainage of blood, small stab incisions are made in the intercartilaginous area and on one side of the nasal septum. Silastic splints are inserted. After compression of the nasal dorsum paper tape and a cast are applied. A non-adhesive absorbent packing is removed within 24 hours.

Postoperative care

The cast and the septal splints are removed at 7 days. The patient is seen monthly. In some cases, Kenalog® (Triamcinolone acetonide) is used for subdermal injection in the supratip area to decrease edema and prevent a soft tissue "pollybeak" by scar formation. After 6, 12 and 24 months standard photographs are taken.

MATERIAL and METHODS

The notes of 130 patients who had an O.S.R. performed by TDZ between 1989 and 1991 were reviewed. The assessment sheet was reviewed to determine pre-operative complaints and objective findings related to the nose and face. The worksheet was studied to determine the plastic and reconstructive techniques. The criteria used to evaluate the efficacy of the O.S.R. included patient satisfaction at the latest follow-up visit, postoperative appraisal by the surgeon and comparison of the pre-operative and postoperative standard photographs.

RESULTS

Thirty-three (25%) operations were secondary procedures, after previous endonasal rhinoplasty in 31 patients and in 2 patients after an O.S.R. The revision rate of the author (TDZ) was 5%. Combined functional and aesthetic abnormality turned out to be the most frequent indication (53%). Functional disorders were caused by nasal valve insufficiency in 32 (24%), septal deviation in 10 (8%) and N.S.P. in 6 (5%). (Table 1) Table 2 depicts the various types of grafts used. Beside septal cartilage, auricular cartilage was used in 17 (13%) patients, bovine cartilage (Chondroplast®) in 2 cases, Mersilene Synthetic® mesh in 5 cases and Goretex® in 2 cases. In 32 (25%) patients permanent suture material (Prolene® 6-0) was used inside the nose. Patient satisfaction was high. One hundred-seventeen patients (90%) achieved the expected cosmetic or functional improvement.

Table I

General data obtained in 130 O.S.R. patients

Mean follow up		22 months (range 6-42)
Average age	male	36 years (range 12-65)
	female	32 years (range 15-54)
Primary rhinoplasty		97 (75%)
Secondary rhinoplasty		27 (20%)
Revision rhinoplasty		6 (5%)
Indication	Aesthetic	13 (10%)
	Functional	48 (37%)
	Combined	69 (53%)

Table II

Grafts used in 130 consecutive O.S.R.

premaxilla	- onlay	7
columella	- strut	74
	- batten	2
tip		24
L.L.C.	- replacement	4
	- onlay	3
U.L.C.	- "spreader"	64
nasal dorsum	- onlay	21
nasal septum	- replacement	8

Complications related to the technique are listed in Table 3. All complications related to the open approach healed without problems, except for two patients with a "trapped door" deformity. In Figure 15-16 two patients are presented after an external approach for septorhinoplasty.

DISCUSSION

Many surgeons are reluctant to use the open approach for rhinoplasty. This is only a different approach to the nose, and does not in itself guarantee a better result. However, it offers improved exposure for both accurate diagnosis and management of nasal deformities. Table 4 summarizes other series with respect to wound healing. The risk of complications directly related to the open approach is minimal. None of our patients requested revision of the external scar. No loss of skin was seen, even when previously scarred columellar skin was incised. The risk of prolonged edema may be increased using the O.S.R. compared to the endonasal approach, but after 6 months no significant swelling is noted. The closure takes 5-10 minutes extra time. The exposure calls for more comprehensive and meticulous surgery, thus a prolonged operation time. An advantage is the additional control over surgical

Table III

Complications in 130 rhinoplasty patients

Intra-operative complications:	
cutting L.L.C.	4
columellar flap tears	1
buttonholing skin	1
Early postoperative complications:	
excessive edema	1
dehiscence marginal incision	1
septal hematoma	0
flap necrosis	0
localized infections	0
pain	0
Late complications:	
columellar scar	2
persistent anesthesia	0
suture protrusion	0
septal perforation	0
graft displacement	1

Table IV

Series on wound healing after a mid-columellar skin incision in O.S.R.

Author	Number of patients	Flap necrosis	Scar revision
Goodman (1978) ⁷	200	-	3*
Stone (1980) ⁵⁰	78	-	-
Wright (1981) ¹⁰	110	-	-
Anderson (1982) ¹⁴	200	-	-
Ezon (1985) ⁵¹	140	-	-
Gunter (1986) ⁵²	100	-	-
Adamson (1987) ¹⁸	158	-	-
Zijlker (1993)	130	-	-
Total number patients	1.116	-	3

* All three patients were cleft lip rhinoplasties.

manoeuvres, which can be carried out under direct vision. Tissue handling and instrumentation are facilitated, leading to a decrease in tissue trauma and blood loss, leading to a quick recovery. New developments such as the use of in situ sutured grafts are enhanced by the open approach. Treatment on an one-day care basis is possible in selected patients. This has become more important as budgets for health care decrease. The O.S.R. has special advantages in teaching and learning rhinoplasty in a training hospital.

CONCLUSION

The O.S.R. enables us to improve the diagnosis of nasal deformities and apply our surgical skills to achieve resolution of functional and aesthetic deformities. Predictable results become within reach more frequently, leading to greater patient and surgeon satisfaction. The columellar scar is well tolerated on woundhealing after a midcolumellar skin-incision. The O.S.R. should become a tool in the armamentarium of the contemporary rhinoplasty surgeon.



Figure 1
Head position after local infiltration anesthesia.



Figure 2
Mid-columellar skin incision.



Figure 3
Incision made with a number 11 scalpel blade. An inverted V-shaped incision is connected with bilateral marginal incisions placed just behind the rim of the columella.

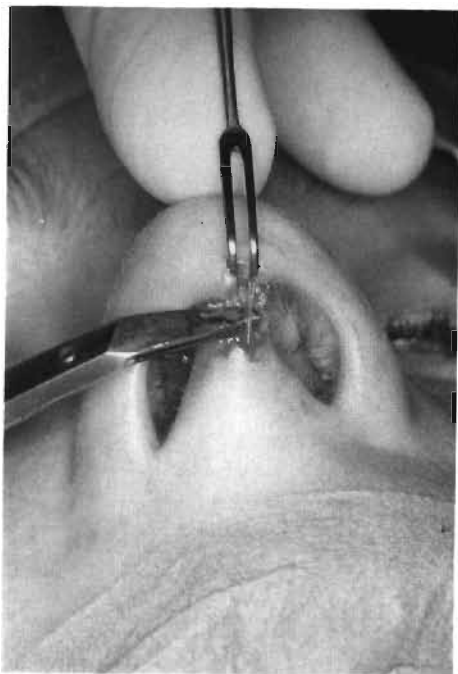


Figure 4
The columellar flap is elevated with Converse scissors, atraumatic forceps and small skin-hooks.



Figure 5
The columellar artery is cauterized with monopolar needle cautery device.



Figure 6
The S-STE is elevated by using three point counter-retraction in an avascular plane using the cutting needle cautery device.



Figure 7
After lateral dissection of the lower lateral cartilages, the nasal dorsum is exposed after superior retraction.



Figure 8
The middle third of the nasal skeleton is exposed after elevation of a perichondrial-periosteal flap and mucoperichondrial septal flaps.

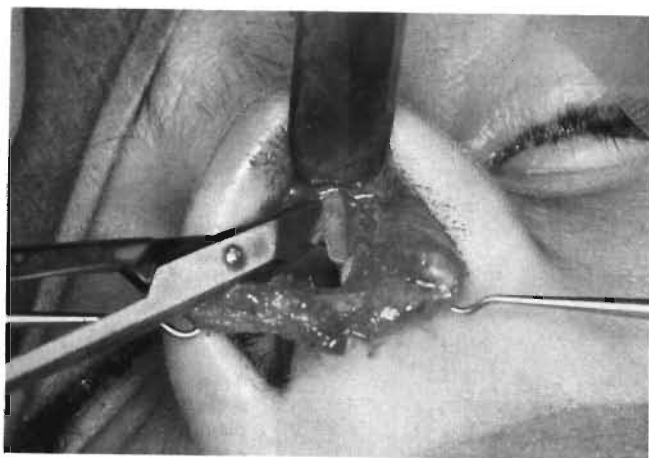


Figure 9
The upper lateral cartilages are dissected from the nasal septum.



Figure 10
Septoplasty is executed and donor material harvested.



Figure 11
A columellar strut is sculpted, inserted and fixated between the medial crura of the lower lateral cartilages.



Figure 12

A spreader graft is placed in the nasal dorsum in a five layer reconstruction.



Figure 13

The incision is closed with 6-0 nylon sutures taken care to evert the skin edges. The marginal incision is closed with 5-0 Vicryl® suture.



Figure 14

The nasal dorsal skin is taped to the skeleton and a cast is applied.

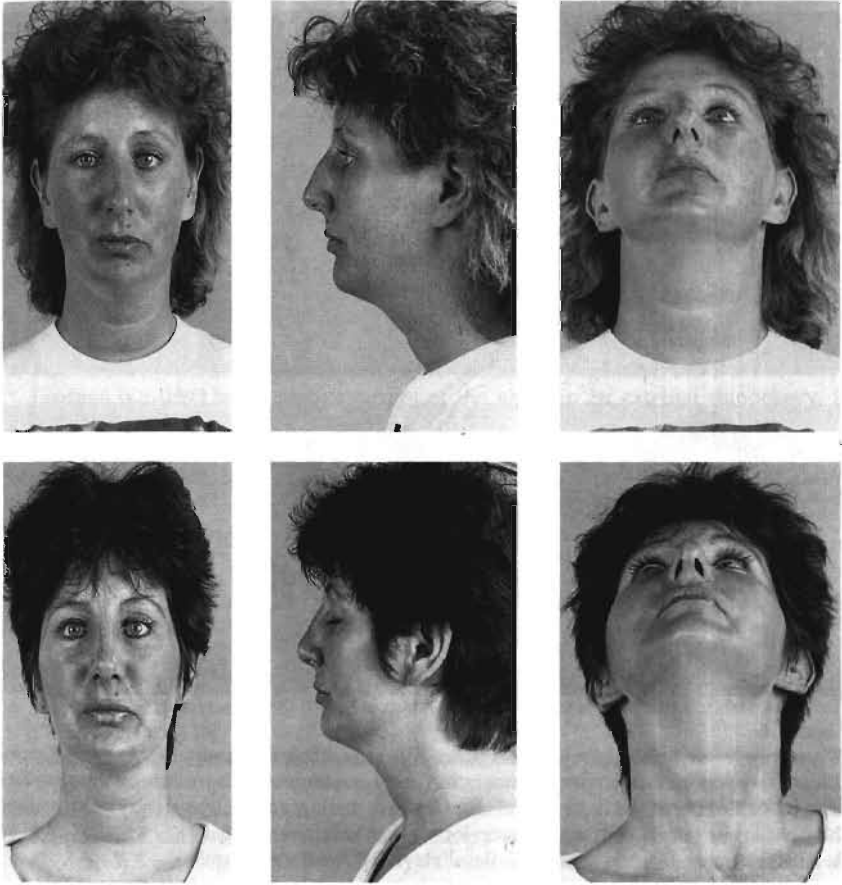


Figure 15

35 year female with longstanding functional and aesthetic complaints. After standard pre-operative assessment a reduction rhinoplasty via an external approach was executed. The nasal septum was adjusted to the midline and shortened 2 mm. After separation of the Cartilaginous septum and the Upper lateral cartilages the dorsal septum was lowered. Tip asymmetry was corrected after bilateral vertical dome division, wedge resection of 2 mm of cartilage of 2 mm and approximation with permanent sutures. The bony hump was chiseled down. The open roof was closed after fading paramedian and low lateral osteotomies. A columellar graft and a thin tip graft derived from the Cartilaginous septum were adjusted.

A. Anterior view. B. Lateral view. C. Basal view. D-F. Result after one year.

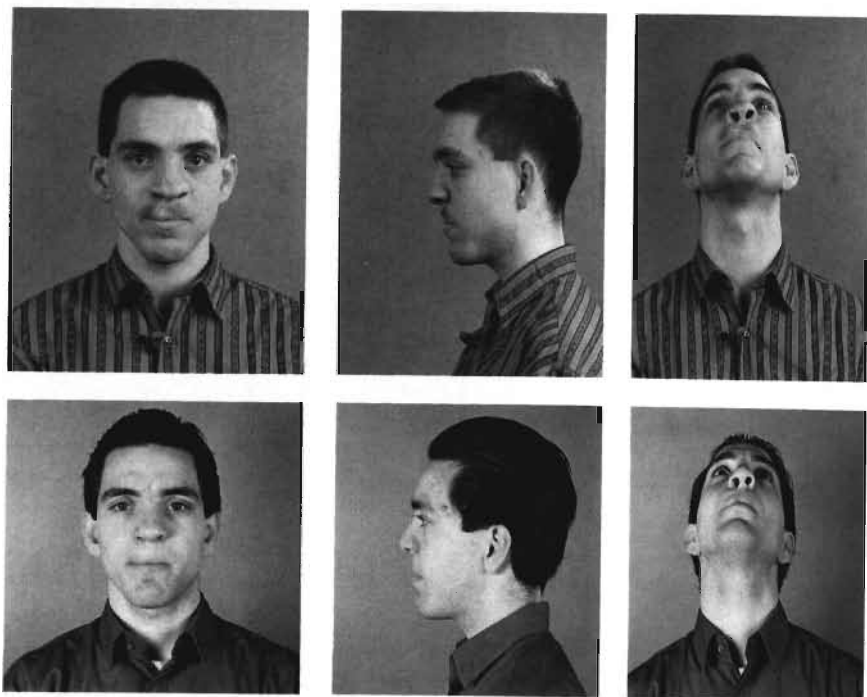


Figure 16

21 year male with cleft lip repair and functional and aesthetic nasal complaints. An external septorhinoplasty was executed with augmentation using an autologous cartilage columellar strut, tip plasty after repositioning of the right medial crura and adjustment of a double layered onlay graft to reshape the right lower lateral cartilage, infratip lobule graft and suture techniques.

A. Anterior view. B. Lateral view. C. Basal view. D-F. Result after 6 months.

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Chapter IV

CARTILAGE GRAFTS FOR THE NASAL LOBULE

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ABSTRACT

Control over nasal tip projection is essential in rhinoplasty. Nasal projection is defined as the length of the perpendicular drawn from the anterior facial plane to the tip-defining point. The nasal lobule shield-type graft, made of autologous cartilage, is one of the most important methods to maintain projection on the long run. The graft may also control length, (counter)rotation of the nose and refinement of the tip. The external approach facilitates in-situ suturing and sculpting of the graft.

Between 1989 and 1992, 300 patients underwent an external rhinoplasty. In 94 (31%) an autologous graft for the nasal lobule was used. The aesthetic result was approved by the vast majority of the patients. Nasal tip rigidity resolved in all patients within one year postoperatively. One patient needed revision surgery, because of graft resorption. The concept, history, technique and indications are discussed. Grafting of the nasal lobule is a relative new, versatile technique in rhinoplasty. An increase of the use of grafting in rhinoplasty can be expected.

INTRODUCTION

"He who masters the tip, masters rhinoplasty". This saying still holds true for the contemporary rhinoplasty surgeon. There is a plethora of techniques for nasal tip surgery testifying to the difficulties involved. A relatively new trend in nasal tip surgery is "cartilage grafting". Tip grafts do increase control over projection, rotation and refinement of the nasal tip. The concept of cartilage tip grafting complies with modern rhinoplasty techniques in which emphasis is on conservation and rearrangement of tissues rather than on reduction, aiming to increase the predictability of long term results.

Our experience with cartilage tip grafts in a series of 94 patients is described. The potential for increased control over support, projection and contour has led to satisfactory and predictable results in patients with difficult aesthetic problems. Our low revision rate in this series testifies to the versatility of cartilage grafting in the nasal tip.

THE CONCEPT of TIP GRAFTING

Rhinoplasty aims to improve the appearance of the nose by changing the bony/cartilaginous framework under the skin-soft tissue envelope (S-STE). The ideal nose may be characterized by four planes (dorsal, two lateral and basal) smoothly fading into well defined ridges which create pleasing light reflexes on the skin of the nose^{1,2,3}. The creation of these characteristics depends largely on two factors. The nasal skeleton (N-S) must be adequately structured and the overlying (S-STE) must adapt to this newly formed skeleton. Any reduction in the size of the N-S creates a relatively discrepancy of the S-STE size and skeletal volume. If the discrepancy is small, contraction will be minimal and unimportant. When there is a significant disproportion between the N-S and S-STE, the unsupported S-STE is left to shrink to the reduced N-S. However, the S-STE is limited in pliability and contractibility,

especially in the aged and thick sebaceous skinned patient. Because of this limited pliability of the S-STE, a dead space may be created which will fill with scar tissue. The S-STE will thicken by contraction which, together with scar tissue, will blunt and obscure any contours the surgeon has created leading to an amorphous lower nasal third^{4,5}.

The pliability of the S-STE, which can only rarely be enhanced by thinning and scoring, may well be the most uncertain factor in reduction rhinoplasty. To eliminate this uncertain factor modern rhinoplasty aims to prevent any significant disproportion between the size of the N-S and S-STE thereby increasing the predictability of long term results. Emphasis is laid on conservation, rearrangement and augmentation rather than on reduction.

Significant reduction of the N-S still might occur in the correction of the under-projected nasal tip or when tip projection is lost during surgery. Often the nasal dorsum is reduced to match the underprojected tip. This may lead to an unnaturally low nasal profile and does increase the discrepancy between the N-S and S-STE. Moreover, intra-operative loss of tip projection already presents a loss of volume of the N-S. As stated before, draping the S-STE over a stronger projection structure will allow better shape and tip definition. Thus, the key to a more natural appearing higher dorsal profile and improved tip aesthetics is adequate and balanced nasal tip projection.

The importance of tip support in the control of tip projection has been stressed by many authors. The three major supporting mechanisms responsible for the relatively mobile tip, are the medial crural footplate attachments to the caudal border of the septum, the attachment of the alar cartilages to the U.L.C.'s, and the size, shape and resilience of the medial and lateral crura. Considering some of the "routine" steps in rhinoplasty, one can easily see that some projection may well be lost during surgery. With the (hemi-)transfixion and inter (or intra-) cartilaginous incisions used in the more traditional, closed approach, two major support structures may be violated causing ptosis. Reducing the size and resilience of the lateral crura is another "routine" step in rhinoplasty, weakening the support of the nasal tip. Various procedures have been described to increase nasal tip projection, which is one of the most difficult objectives in nasal tip surgery⁶. Basically these techniques involve increasing the height of the medial crura at the expense of the lateral crura by using sutures, scoring and/or vertical transection of the alar cartilages⁷⁻¹⁰. However, the projection achieved with these methods is often limited. Goldman's technique implies radical changes in the nasal tip anatomy¹⁰. The vagaries of healing related to this may lead to asymmetry, pinching and an unnatural "tent pole" appearance.

By contrast, cartilage grafts fixed on the (strengthened) underlying cartilaginous bed offer added structural support and increased control over projection, rotation and refinement. The increased control of projection allows a more natural appearance with a high dorsal profile and a tip that still projects above the profile line.

As mentioned, strong supporting mechanisms are a prerequisite for adequate nasal tip projection. The concept of tip grafting includes a stable basis for the grafts. If the existing support of the nasal tip is weak or some of it is lost during surgery, the supporting structures must be strengthened and/or reconstituted before grafting the nasal tip.

HISTORICAL PERSPECTIVE

Since the 1960's cartilage grafting in the nasal tip has been described by various authors. Onlay grafts onto the dome of the alar cartilages were first suggested by Goldman¹¹ and Peck¹². These surgeons mainly sought to increase tip projection. These autologous cartilage grafts were put in a pocket via an internal incision. Long term follow-up showed no resorption of cartilage. However, onlay grafts appeared to produce an unnatural, single point light reflex. Moreover, some grafts become displaced because of inadequate fixation. Overall, these types of grafts have not found wide acceptance. Millard¹³ has described the use of cartilaginous grafts fixed between the medial crura with a curved upper part lying over the under projected domes of uni-lateral cleft lip noses. Pollet¹⁴, Falces and Corney¹⁵ have used the same type of graft bilaterally, placed via a longitudinal mid-columellar incision, for the underprojected nasal tip. These grafts appear difficult to curve in a controlled fashion and have not gained general acceptance. Moreover, the suggested exposure is limited. Anderson¹⁶ has popularized the use of cartilaginous columellar struts for a sturdier support of the nasal tip. The strut is placed between the medial crura down to the level of the nasal spine. One should think of the columellar strut as a lengthener and strengthener of the medial crura. A columellar strut can only increase projection if it extends above the alar domes, however, this may lead to a stiff, unnatural appearance. The major purpose of columellar struts, then, is preventing retrodisplacement of the nasal tip. Premaxillary grafting described by Webster¹⁷ is another alternative to increase projection by building a base for the medial crural feet to rest on. However, these grafts cannot be routinely used as the nasolabial angle may change on grafting.

The "shield" graft, as introduced by Sheen¹⁸ and applied successfully by others is an excellent concept addressing not only tip projection but also tip shape¹⁹⁻²² (Figure 1). These grafts were originally placed in a subcutaneous pocket by an endonasal approach. Johnson^{23,24} and Adamson²⁵ have advanced Sheen's concept a step further by employing the external approach combined with columellar struts to provide adequate support. The external approach allows accurate positioning, sculpturing and suturing of the tip graft to the alar cartilages with a very low risk for displacement.

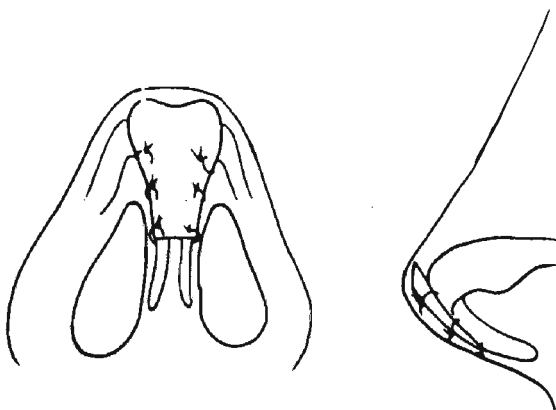


Figure 1
Schematic drawing of a tip
graft in basal and lateral
view.

TECHNIQUE

Exposure

The external approach has become an accepted alternative to the more traditional endonasal approach in rhinoplasty^{4,9,24-31}. By combining a broken mid-columellar incision with bilateral marginal incisions, the skin can be lifted off the nasal skeleton. The excellent exposure offered by the external approach is a distinct advantage over the endonasal approach, especially in nasal tip surgery. The exposure of the external approach allows more accurate diagnosis of tip deformities and meticulous correction with the cartilages in situ. This contrasts with the endonasal approach offering only tunnel vision on often distorted structures. Using the external approach, the tip graft can be sutured to the underlying tip cartilages and sculptured in situ. The graft will become an integral part of the tip with little risk of displacement.

Graft harvesting

Autologous cartilage grafting material has distinct advantages over other materials for nasal reconstruction because of its superior long term survival rates, its easy availability in the head and neck region and because of its low risk of infection and resorption when implanted in the nose³². Septal cartilage is ideal for tip grafting because of its flat shape and stiffness. It can be harvested through a Killian incision leaving the attachments of the medial crura to the septum intact or via a hemitransfixion incision, when the caudal septum needs modification. The graft is best taken from the thick areas of the septum, lying at the junction with the perpendicular plate of the ethmoid and vomer. Other parts of the septum, leaving a dorsal and the caudal strut of at least one cm, can be used as a columellar strut.

If insufficient septal cartilage is available, cartilage may be obtained from the concha of the ear. Here the anterior incision, offering better exposure, is camouflaged below and beneath the crest of the antehelical fold. As long as the lateral walls are preserved and the antehelical fold is not violated, there will be no change in the ultimate appearance of the ear by removing even the entire cyma and cavum conchae³². However, Johnson⁴ suggests to preserve the root of the helix, leaving an intact strip of cartilage between the removed cyma and cavum conchae to prevent medial displacement of the pinna. Tip grafts are preferably taken from the area adjacent to the ear canal to include the thickened part of the cavum concha in the graft. This part has a natural curvature which, when judiciously used, mimics the double break of the nasal tip. However, septal cartilage is preferred to ear cartilage as the latter is more pliable and generally more strongly curved.

Sculpting

The shape and size of the graft should be individually adapted, varying with the nose. A flat rectangular piece of cartilage is carved so that one end is notched in the center, leaving the blunted corners approximately 6-8 mm apart to form two tip defining points. The graft narrows away from the tip so that the width of the base is 3-4 mm. The length of the graft will vary, but usually is around 10-12 mm. In some cases the graft may extend along the entire length of the columella to increase

support and/or to augment a retracted columella, and acts as a columellar "batten". This particular graft serves as a volume filler and does not add extra structural support to the nose. The thickness of the graft may vary from 1 to 3 mm. The most inferior portion of the graft is thinned and the edges are beveled to blend the tip graft into the underlying structures. A double tip graft may be used to increase dorsal length and to add strength to weak grafts, such as those from the ear. Final precise sculpting can be performed in-situ, after fixation of the graft to the alar cartilages. If only augmentation of the columella is desired, a "batten" is used. This graft offers a volume augmentation, without a significant increase in structural support.

Grafting

A stable base is a prerequisite for tip grafting. A columellar strut is used in all cases to lend strength to the medial crura and increase their support. The graft extends from 1-2 mm above the nasal spine to the level of the angle just below the domes of the alar cartilages. This sandwich construction is fixed to the septum for three weeks with a non absorbable mattress type suture. To create a symmetrical bed for the graft and especially when there is a hanging columella, the caudal margins of the medial crura may be trimmed. A long septum may also require caudal trimming. Any sculpting of the lateral crura may be performed, making sure to leave a strip of cartilage at least 6-7 mm in width to prevent weakening of the graft base. The tip graft is secured by 4 to 6 prolene sutures to the underlying dome and crural cartilage. The exact position depends on the specific indication defined pre-operatively. The effect on the lateral contour of the nose is depicted in Figure 2 A-D.

INDICATIONS

Cartilaginous grafting in the nasal tip may be indicated in patients where additional support, projection, contouring or camouflaging is required (Figure 3-5 A-F). Lack of adequate tip projection has been the primary indication in our series. With tip grafting the nasal dorsum can be maintained at a higher level, leading to a stronger, more natural appearing nasal projection. Providing the graft is well shaped and positioned, a well-defined shape for the dome region of the tip may be produced. Using tip grafts the width between the domes, the degree of tip definition, and lobular shape can be modified. In patients with thick skin and weak lower lateral cartilages, tip grafting is the only precise method to add definition to the area of the dome.

Asymmetry or irregularity can be camouflaged which makes the graft especially suitable for the nasal deformity associated with a cleft-lip. After transection of the domes of the alar cartilages, tip grafts may be used to camouflage the sharp edges of the divided alar cartilages. Dorsal length may be increased by 2 to 3 mm by using a very thick or sometimes double layered tip graft. This small increase in dorsal length or counter rotation of the nasal tip may significantly improve the overall appearance of the short or over-rotated nose.

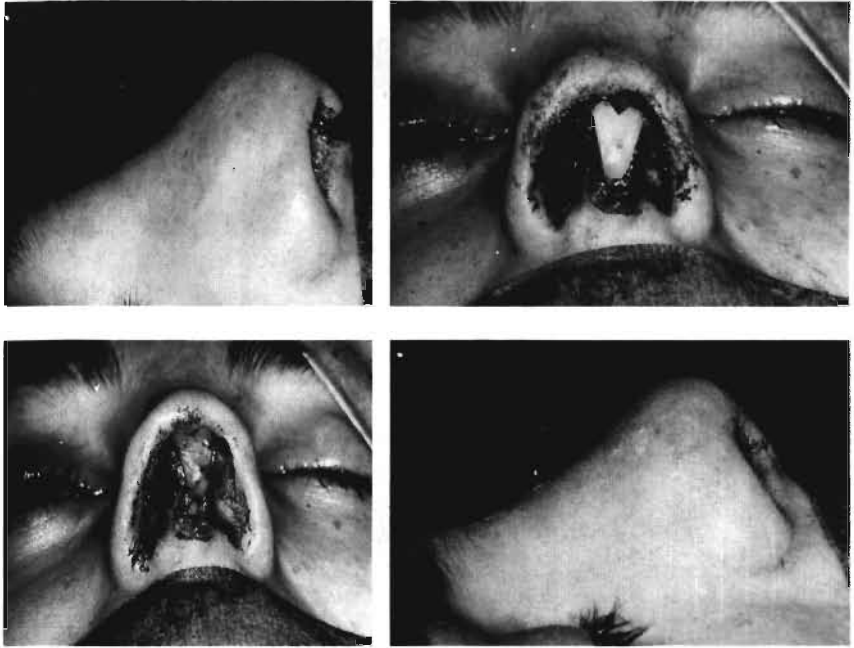


Figure 2

A. Dorsal profile before tip grafting. Note the round, undefined nasal tip. **B.** The three dimensional sculptured tip graft, placed on the medial crura of the lower lateral cartilages, before fixation and in-situ refinement. **C.** After fixation with Prolene® sutures. **D.** Dorsal profile after tip grafting and closure of the mid-columellar skin incision.

MATERIAL and METHODS

We retrospectively reviewed 300 consecutive patients having rhinoplasty. From this group 94 (31%) were selected who had autologous tip grafts as part of the surgical correction. The assessment sheet was studied to determine pre-operative complaints and expectations. The worksheet was used to evaluate the surgical technique. Criteria to evaluate the results included patient satisfaction, critical postoperative appraisal by the surgeons (TDZ, HDV), and by comparison of the pre- and post-operative standard photographs of the face.

RESULTS

Of the 300 patients, tip grafts were used in 94 (31%) patients as part of a functional and/or cosmetic external rhinoplasty procedure, between 1989 and 1992. The surgery was performed by TDZ (N=24) and HDV (N=70). The ages ranged from 18-53, with an average age of 28. There were 60 woman and 34 men. Fifty-nine patients were having primary rhinoplasty, and the remaining 35 (37%) had previous (septo)rhinoplasty elsewhere. Thirteen (14%) patients had undergone nasal surgery



Figure 3

A-C. Female patient with round, undefined, slightly underprojected nasal tip. D-F. Eight months postoperatively. Nasal tip contour and definition improved. Nasal tip now leads the dorsal profile.

before on two occasions, and 4 (4%) patients three times or more. In two patients (2%) a cleft lip rhinoplasty was executed. Forty eight (51%) patients underwent surgery for purely cosmetic reasons and 46 (49%) for functional and cosmetic reasons. In all cases the tip graft was secured to the underlying skeleton with an average of four prolene 6-0 sutures. We have not had any problems in closure or healing of the columellar incision after tip grafting. There has been no graft rejection or infection requiring removal of the graft. In 2 (2%) patients a suture was extruded via the nasal vestibule, respectively two and seven months postoperatively, fortunately not leading to movement of the graft. A slight resorption was noted in 2 (2%) patients.

The vast majority of the patients are satisfied with the aesthetic result, achieved by tip grafting. Complaints of nasal tip rigidity or an "unfamiliar feeling", was registered in approximately 25% of the patients, but disappeared in all patients spontaneously within one year postoperatively. One of our earlier patients needed revision surgery for a cartilaginous "pollybeak" as the graft base was not stable

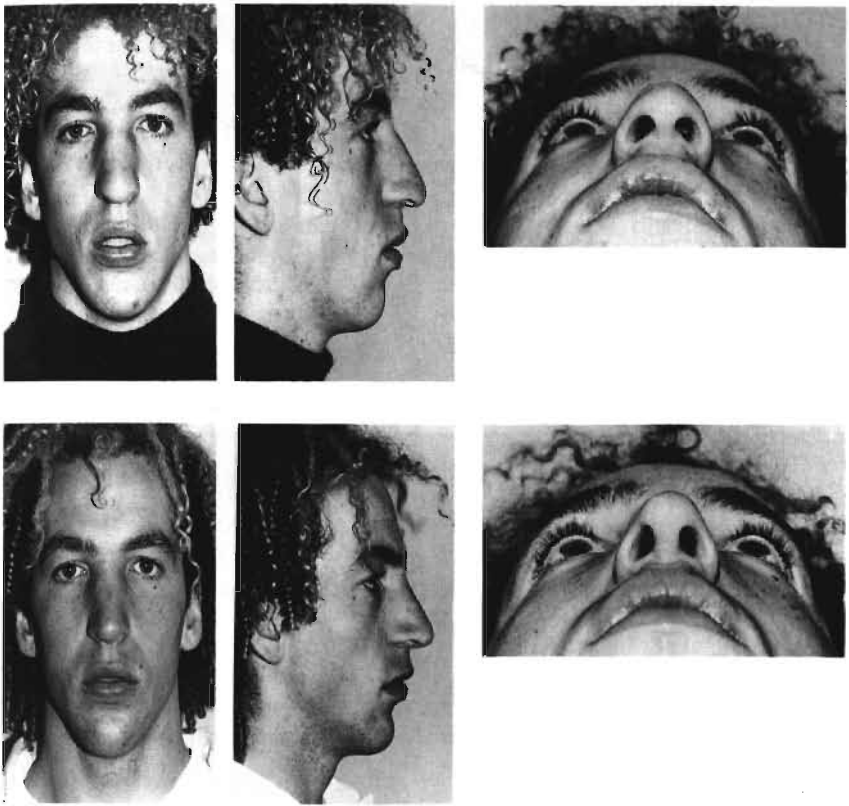


Figure 4

A-C. Male patient showing broad, undefined and underrotated tip, because of flaccid lower lateral cartilages. D-F. Eight months postoperatively. Tip graft used to increase tip projection, increase tip definition and rotation. Strong high nasal dorsum now matches the augmented nasal tip.

enough to support the S-STE, which had led to postoperative tip drop. One patient with slight resorption of the tip graft developed a soft tissue "pollybeak". The thick skin did not adapt itself to the underlying cartilage, and the patient needed revision surgery.

DISCUSSION

Today, emphasis is also on achieving a restructured anatomy which approximates normal anatomy as much as possible, and on a natural, esthetically unoperated look. The limited contractibility and pliability of the S-STE, especially in patients with thick skin, remains the major unpredictable factor in rhinoplasty. This factor can be controlled by creating a stronger projecting underlying nasal skeleton to which the



Figure 5

A-C. Female patient with functional and aesthetic complaints, a high narrow nasal dorsum, with a tension tip configuration. **D-F.** Twelve months postoperatively. Nasal tip definition and rotation increased, after bilateral mediocephalic and vertical dome resection. The nasal dorsum was adapted to the reconstructed tip, by resection of the bony-cartilaginous hump and bilateral spreader grafts.

S-STE will more easily adapt itself. It is clear that the height of the nasal dorsum is primarily dictated by the projection of the nasal tip.

Tip grafting has enlarged our surgical armamentarium to meet three major goals in rhinoplasty: control over tip projection, shape and rotation.

Depending on the shape and position of the graft, the tip can be projected to the desired level, the region of the dome sculptured into a proper shape and width, and the length of the nose increased if necessary. The external approach to rhinoplasty has earned, through its many advantages, world wide respect and recognition. In contrast with the endonasal approach, the external approach offers excellent exposure, the ability to fix the graft to the underlying structure, and to shape the graft in situ. Moreover, columellar struts, necessary to build a strong foundation for the graft, can easily be placed through the external approach.

These columellar struts are an integral part of the concept of tip grafting. The columellar scar has not posed any problem in healing or patient acceptance, this in spite of the bulk of the tipgraft and the increased projection which might have put stress on the columellar closure line and jeopardize the healing process. In view of the large number of non-absorbable sutures that have been used in our series, the risk of suture extrusion is small. Suture extrusion can largely be prevented by burying the knots in the tissues. In our series, there have been two patients with postoperative "pollybeak" deformity, for which there were two different reasons. A cartilaginous "pollybeak" developed as the tip dropped in the postoperative phase, probably because the foundation of the graft was not strong enough. A soft tissue "pollybeak" developed in another patient, probably because the graft was positioned too high above the (modified) alar domes. This graft was under too much tension to support the S-STE. Subsequent partial resorption created a dead space with accumulation of fluid and scarring needing revision surgery. In retrospect, the supratip dead space should have been filled with a cartilage domal onlay graft to support the tipgraft.

Admittedly, many years of follow-up will be necessary to assess resorption of the cartilage. Kamer²⁰ described a series of 34 patients with tip grafts. Slight resorption was noticed in two patients after infection of the graft. Johnson⁵ confirms the versatility of the cartilaginous graft with respect to resorption. So far has been seen in two patients in our series. We suspect that the cartilage graft was possible too thin and was partially absorbed because of the stress to support the heavy skin of these patients. Patients with thin skin pose other problems, as the graft should blend imperceptibly with the surrounding structures, avoiding unnatural points and ridges, which may only become apparent after years of follow up.

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Chapter V

LATERAL AUGMENTATION OF THE MIDDLE THIRD OF THE NOSE WITH AUTOLOGOUS CARTILAGE IN NASAL VALVE INSUFFICIENCY

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ABSTRACT

Nasal valve insufficiency (N.V.I.) is a troublesome clinical entity for the patient as well as the Otorhinolaryngologist. Etiological factors include congenital causes, trauma, aging, and iatrogenic. Pathology is frequently located in the middle third of the nose, consisting of the upper lateral cartilages (U.L.C.'s) and the cartilaginous septum (C.S.).

The N.V. is the plane through the caudal edges of the U.L.C.'s and the C.S., and is part of a larger three-dimensional area called the nasal valve area (N.V.A.). The N.V.A. is considered to have the narrowest cross-sectional area of the entire airway. Between 1989-1992 32 patients with nasal obstruction due to an incompetent N.V. were surgically treated by lateral augmentation with autologous cartilage "spreader" grafts, placed between the C.S. and the U.L.C.'s to widen the apex of the N.V.A. In all cases the external approach for rhinoplasty (O.S.R.) was used. After a mean follow-up of 18 months, 27 patients were evaluated by a self-administered questionnaire, head- and neck examination, nasal endoscopy, photography and video documentation of the N.V.A. The patient's subjective opinion was used in the assessment of the surgical success. In 48% of the patients there was complete resolution of complaints. An overall improvement of nasal patency was seen in 81% of the cases. No major complications occurred. The indications, technique and results are presented.

INTRODUCTION

Surgical treatment of N.V.I. demands a thorough knowledge of nasal anatomy and physiology. Pre-operative assessment is essential to determine the cause and location of the nasal obstruction. The structures of the N.V.A. should be carefully examined, and should include septal deflections, abnormalities of the pyriform crest, malformation of the nasal spine, deformities of the columella, the anterior aspect of the inferior turbinate, nasal mucosal swelling or hypertrophy due to infectious, allergic or non-specific stimuli. Collapse of the N.V.A. may also occur due to an angle between the C.S. and the free caudal end of the U.L.C.'s of less than 10-15 degrees, lack of rigidity of the U.L.C.'s, and scarification after previous nasal trauma or surgery. Also with aging there is loss of tip projection and counter rotation, influencing nasal patency. Pre-operative assessment may include a patency test, suggested by Adamson (1991).

SURGICAL ANATOMY

The cartilaginous dorsum extends from the anterior septal angle cephalically to the osseo-cartilaginous junction, where it is overlapped by the nasal bones. This area ("K-area") is the center of support of the nasal roof. The U.L.C.'s separate from the C.S. to end in free curved margins in a variety of individual variations. Except for the distal end, the U.L.C.'s fuse in the midline with the C.S. encased in the same perichondrial sheet (Figure 1). This forms a T-shaped construction which supports

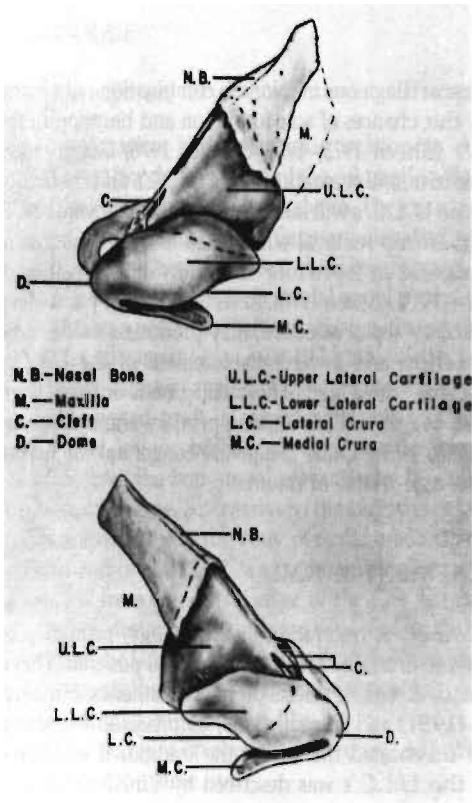


Figure 1

Schematic drawing of the nasal skeleton according to Hinderer. (From *Rhinology*. Vol VIII - No 1, March 1970. Mexico Congress)

the nasal dorsum and contours the dorsum. Laterally the junction with the pyriform aperture is formed by fibro-fatty tissue attachments. Accessory sesamoid cartilages are not uncommon in this area. Inferiorly the caudal edge of the U.L.C.'s tends to curl upwards ("returning") and is overridden by the cephalic margin of the lateral crus of the lower lateral cartilages (L.L.C.'s). Connective tissue between the U.L.C.'s and the L.L.C.'s forms the remaining part of this scroll region. The angle between the C.S. and the U.L.C.'s increases from caudally to cranially.

PHYSIOLOGY

The N.V.A. represent the narrowest part of the entire airway (Kern 1977, 1978, 1983, Sulisenti 1989). The N.V.A. widens and narrows under the influence of nasal musculature during respiration and should be considered a physiological phenomenon. It is thought to be beneficial because it tends to limit excessively high inspiration airflows that might exceed the ability of the nose to condition the incoming air. The capacity of the N.V. to withstand the transmural pressure prevents a collapse on inspiration. Tissue rigidity of the N.V.A. and activity of the alar muscles are essential for this nasal function to be effective.

ETIOLOGY

Rhinoplasty using traditional intercartilaginous incisions in combination with hemi- or transfixion incisions increases the chances of scar formation and blunting in the vicinity of the apex of the N.V. (Sheen 1975, 1978, Stucker 1976, Goode 1985, Adamson 1987, Tardy 1990). Transmucosal separation of the U.L.C.'s and the C.S. or resection of the caudal border of the U.L.C.'s will influence the N.V. (Converse 1977, Courtiss 1983, Peck 1984). Dorsal hump removal which excises large amounts of U.L.C.'s, inadequate infractions causing an "open roof" deformity or malposition of cartilage remnants will damage the N.V. (Sheen 1978). Resection of large parts of the C.S., as seen in the classic submucous septal resection, may produce a saddle nose deformity, a ballooning phenomenon and inward displacement of the U.L.C.'s (Sulsenti 1989). In general, the patient with a high bony-cartilaginous dorsum, short nasal bones, and long flaccid and weak U.L.C.'s seeking primary rhinoplasty are prone to complications (Sheen 1984, 1988). Other factors are congenital, such as in the Caucasian with a narrow nose, age-related or traumatic.

HISTORY OF SURGICAL TREATMENT OF N.V.I.

Surgical treatment of N.V.I. is aimed at restoration of physiology, primarily by replacing deficient structures with identical tissue in their original position. This is preferably accomplished without undesirable effects on nasal aesthetics. Hinderer (1969), Tardy (1976, 1985), Kern (1991) and Sulsenti (1989) emphasized the role of septal deflections in N.V.I. and advocated the use of the traditional endonasal incisions. Surgical correction of the U.L.C.'s was described by Cinelli (1941) and Fomon (1950). The rotation technique of the L.L.C.'s was described by Rettinger and Masing (1981). The use of different types of grafts was advocated by Cinelli (1941), Fomon (1950), Walter (1969), Desprex (1975), Hurst (1978), Sheen (1984), Lapidot (1985), Goode (1985), Ochi (1988) and Jovanovic (1991) and Adamson (1991).

SPREADER GRAFT

Surgical treatment of N.V.I. with lateral augmentation is a relatively unknown technique. Uni- or bilateral insertion of autologous cartilaginous grafts paramedian to the C.S. pushes the U.L.C.'s in a lateral direction away from the C.S., thus opening up the apex of the N.V. and increasing the N.V.A. Originally the grafts were placed in a submucoperichondrial pocket exposed by the closed technique. However, precise placement and fixation are difficult (Sheen 1984, 1988). The open approach simplifies the placement of spreader grafts (Johnson 1990).

TECHNIQUE

Surgical exposure

A midcolumellar broken-line skin incision is connected with bilateral marginal incisions. After development of the columellar flap the nasal dorsal skin is elevated from the cartilaginous nasal skeleton. The caudal septum is exposed and superior bilateral mucoperichondrial flaps are elevated with an extension underneath the U.L.C.'s, taking care not to tear the flaps (Figure 2). Cartilage is harvested from the C.S., L.L.C.'s or the ear. If no caudal septal pathology co-exists, cartilage can also be obtained by a posterior "Killian" incision, thus preserving tip support. A caudal and dorsal cartilage strut of at least 10-15 mm width prevents columellar retraction, loss of tip projection or sagging of the dorsum (Figure 3).

A stick shaped graft is carved with an average measurement of 18x1.5x3 mm. Sometimes longer, broader or even double grafts are demanded. A bony graft, derived from the bony nasal septum, may be useful to restore an overly collapsed bony nasal bridge. Alternatively, the spreader graft can be placed so as the cephalic portion extends into the bony pyramid and supports a collapsing nasal bone. The caudal end of the U.L.C.'s are identified and preserved. The U.L.C.'s are sharply dissected from the dorsal edge of the C.S. (Figure 4). The length of the grafts is measured, designed and inserted between the dorsal edge of the C.S. and the medial border of the U.L.C.'s (Figure 5 A-B). A 5x0 vicryl suture with a P-3 cutting needle is used to fixate three layers at the desired position parallel to the septum with mattress suture technique (Figure 6 A-B).

Dorsal refinement finishes the procedure. All other rhinoplasty maneuvers can be executed at the same time.



Figure 2

Superior view on cartilaginous dorsum. The upper lateral cartilages, septal angle and caudal septum exposed.



Figure 3

Septal cartilage is harvested, preserving a caudal and dorsal strut.

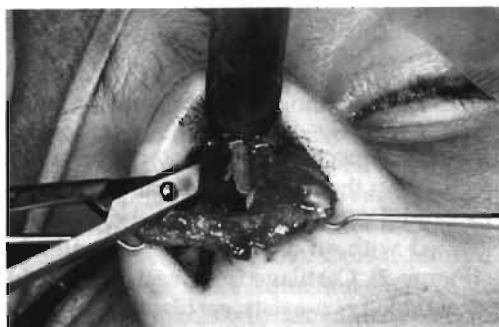


Figure 4
Converse scissors are used to dissect the upper lateral cartilages and the nasal septum.



Figure 5 A-B
Spreader graft is placed between the dorsal edge of the septum and medial border of the upper lateral cartilages.



Figure 6 A-B
The graft is meticulously sutured in place taken care to avoid dorsal irregularities.

MATERIAL and METHODS

We retrospectively reviewed 130 consecutive rhinoplasty patients and selected 32 patients with N.V.I., all of them operated by the senior author (TDZ) between 1989 and 1991. The patients were admitted for surgery after routine head- and neck examination, nasal endoscopy and photography, video documentation of the N.V.A., standard rhinoplasty photography and assessment of nasal mucosal pathology as seen in allergic or non-allergic rhinitis. Selection criteria were persistent severe nasal obstruction due to a N.V. collapse which interfered with daily activities, even after nasal decongestion with a vasoconstrictor! Patients with caudal septal deflections or rhinitis were excluded from the study. The assessment sheet was studied to determine pre-operative complaints and objective findings related to the middle third and the N.V. area. The worksheet was studied to determine the aesthetic and reconstructive techniques used in the reconstruction. Patient satisfaction was one of the main criteria used to evaluate the result included patient satisfaction postoperative appraisal by the surgeon and an independent researcher, and comparison of pre-operative and postoperative photographs and videodocumentation.

RESULTS

Thirty-two patients with an average age of 40 years (range: 18-65) suffering from N.V.I. underwent surgery for the middle third pathology. There were 20 males and 12 females. The Cottle sign was positive in all cases. In addition introduction of a ring curette at the apex of the N.V.A., which pushes the caudal end of the U.L.C.'s in super-lateral direction, provided subjective improvement of nasal patency. History revealed previous nasal surgery in 66% (21/27) of patients (Table 1). The pre-operative symptoms are listed in Table 2. The external approach was used to expose the cartilaginous skeleton. Donor material was harvested from the C.S. in 75% (24/27), conchal ear cartilage in 19% (6/27) and L.L.C.'s in 6% (2/27). Thirty-two patients with N.V.I. but without caudal septal deflections were augmented with spreadergrafts (62) and columellar struts (23) to retain tip projection. Others had tip surgery (17) consisting of either (medio) cephalic resections and/or vertical dome divisions and resuturing to obtain tip rotation (12) and tip refinement (5). At Table 3 the adjuvant procedures performed are listed. After an average follow up of 18 months (range: 5-36) 27 patients were evaluated after completion of a self-administered questionnaire. An overall subjective improvement of nasal patency was seen in more than 88% (22/27). In 4 (10.8%) patients no changes occurred. In one (1.2%) nasal breathing was worse after surgery. Almost 50% (13/27) appeared to be completely free of symptoms (see Table 4). On a success rating scale of 1-10 (1=bad, 5=reasonable, 10=perfect) an average improvement in nasal patency of 4.1 was noted. Pre-operatively there was an average judgement of 2.3 (range: 1-5). Postoperatively the average was 6.4 (range: 1-10). Subjective result in primary surgery (N=9) and revision surgery (N=18) were compared with the total group (N=27). The most favorable improvement on nasal breathing was achieved in the

TABLE I

Previous surgery

N = 21 (66%)

nasal septum	17	(81%)
turbinate	7	(33%)
rhinoplasty	6	(28%)

TABLE II

Pre-operative (N1) and postoperative (N2) symptomatology, and resolution (%) of symptoms.

N = 27	N1	N2	%
nasal obstruction	27	14	48
nasal aesthetics	11	2	82
loss of smell/taste	9	3	66
pharyngitis	10	5	50

TABLE III

Adjuvant procedures

N = 32	N	%
columellar strut	23	71
alar cartilage surgery	17	53
* (medial)cephalic resection	12	37
* vertical dome division	5	16
dorsal hump reduction	12	37
osteotomies	7	21
* infracture	6	19
* outfracture	1	3
turbinate resection	3	9

TABLE IV

Nasal obstruction

N = 27	N	%
improvement	22	81
unchanged	4	15
worsened	1	3
* free of symptoms	13	48

first group (88%; 8/9). Result after secondary surgery scored 77% improvement (14/18). An overall improvement was seen in 81.4% (22/27).

The overall aesthetic result was appreciated by all patients but three. Only 23% (6/27) were aware of the columellar scar. In two cases a single-sided minor irregularity was noted, due to overriding skin edges. No columellar scar revision was required. Other complications related to the external approach were not seen. A septal hematoma was aspirated by needle drainage. Graft resorption or displacement and protrusion of permanent suture material were not seen. In figure 7 A-H a case is presented, with a schematic operation plan depicted in lateral and A-P direction.

DISCUSSION

Small alterations in the vicinity of the N.V.A. after surgery or trauma may have immediate and disproportionate effects. Although the effect of cosmetic rhinoplasty on nasal patency can be minimized by meticulous surgery and profound knowledge of nasal anatomy and physiology (Berry 1981, Adamson 1990), nasal surgery sometimes results in tip ptosis, counter rotation, saddling of the nasal dorsum, scarification, weakening of the nasal skeleton by excision of cartilage, or malposition of different parts of the nose. Before secondary surgery the nasal history should be "read" carefully in the correct sequence in order to establish complete understanding of the dysfunction. Only few authors have reported on the possible values of lateral augmentation of the nose with spreader grafts in selected cases as a method of prevention or reconstruction for N.V.I. (Sheen 1984, Johnson 1990, Adamson 1991). No previous study has evaluated the use of spreader grafts. Lateral augmentation is studied most purely in those patients with N.V.I. based on congenital, developmental and age-related factors, after excluding those with septal deflections and turbinate hypertrophy. This study was designed to determine the effect of spreader grafts on clinical symptoms related to impaired nasal breathing, nasal cosmesis and activities of daily living within this patient selection. Standardized pre- or postoperative evaluation of nasal patency is still difficult, because the present methods of measuring still fails to provide reproducible results. The physiology of the nose is influenced by many rapidly changing factors, such as nasal cycle, allergen exposition, environmental factors, mucosal inflammation, stress a.o. The available nasal airway evaluation techniques, like computerized rhinomanometry have been improved the last years, but still do not solve the previous mentioned problem of variation of parameters. Acoustic rhinometry for assessment of the N.V.A. is a promising new technique, but the equipment is not yet commercially available. A relatively simple home office method is the "Adamson nasal patency test": The patient is asked to describe the patency of each nostril, based on a scale of 0 (no patency at all) - 10 (perfect patency). Then a small probe or ringcurette is used to sequentially elevate the L.L.C.'s and U.L.C.'s, i.e. to attempt to simulate the situation after the attachment of an onlay cartilage graft to strengthen the collapsing L.L.C., or a spreadergraft to strengthen a collapsing U.L.C. The patient is asked again to describe their nasal patency using a number. This is repeated after surgery.

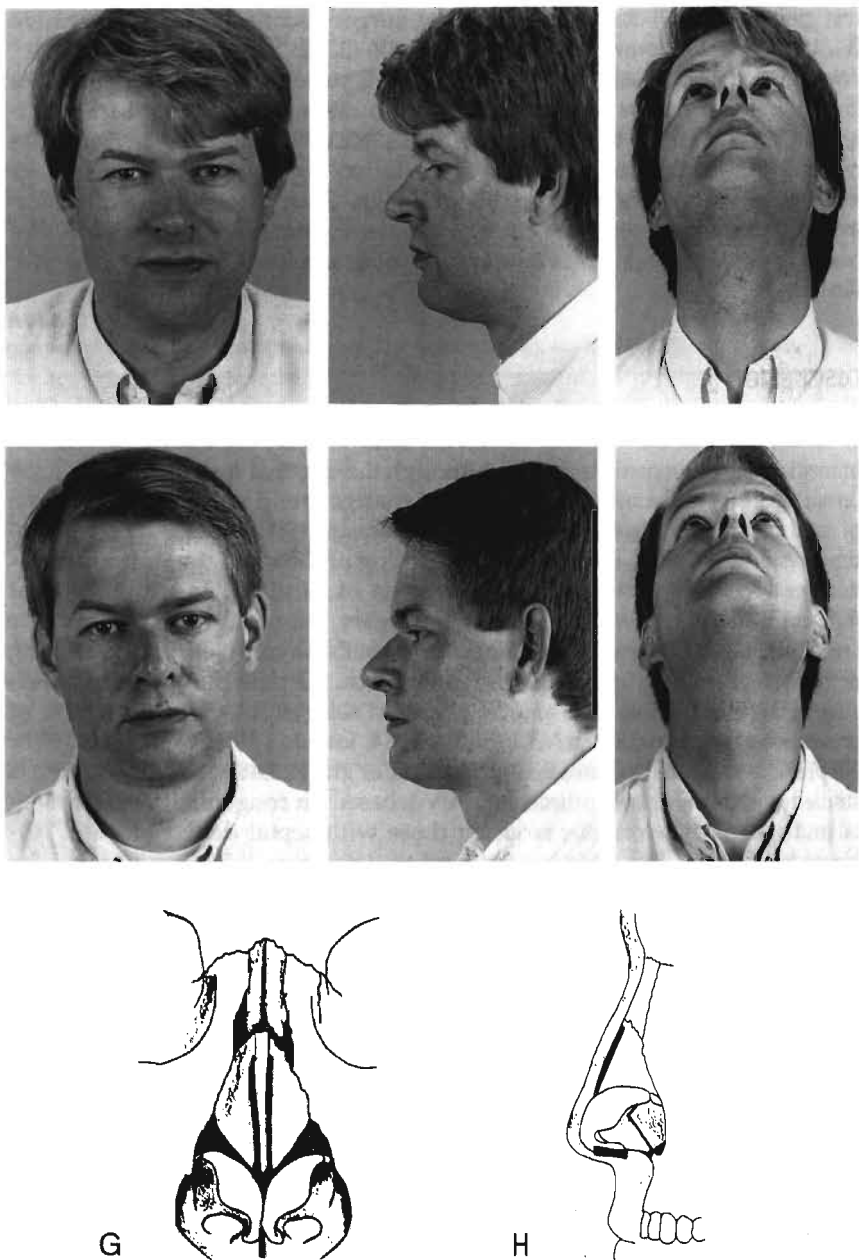


Figure 7
34-year old male with short nasal bones, thin weak upper lateral cartilages and a pinched nose appearance suffering from impaired nasal breathing due to a bilateral nasal valve insufficiency. An external approach for rhinoplasty was used to insert bilateral spreader grafts and a columellar strut derived from the nasal septum. Note the broadening of the middle third of the nose.
A. frontal view. **B.** lateral view. **C.** basal view. **D-F.** one year result. **G-H.** surgical plan.

In this study, nine patients without previous surgery of trauma were included in the study. In all but one subjective improvement of an average of 4.8, varying from (1-9) on a scale from 1-10 was seen. Those patients with nasal surgery (18) and/or nasal trauma (3) had acceptable results as well. The technique of choice for reconstruction depends on the surgeon's personal preferences and experience. The external approach in septorhinoplasty (O.S.R.) has brought new perspective to the surgical treatment of N.V.I. The O.S.R. enables the surgeon to intraoperatively assess the cause of the obstruction, as it relates to existing pathology (Goodman 1978, 1981, Wright 1981, Anderson 1982, Adamson 1987, Mayer 1988, Zijlker 1990). The extra-mucosal access to the N.V. is facilitated with the O.S.R., minimizing further tissue damage. The ability to secure the grafts with sutures is an added benefit to O.S.R.

CONCLUSION

Lateral augmentation of the nose is useful in selected cases in functional and aesthetic nasal surgery. The O.S.R. has proven itself to be a reliable technique, offering better understanding of pathophysiology in N.V.I. and enabling the surgeon to more precisely place and fix the grafts. Pre- and postoperative visualization of the external and internal nose by photography and videodocumentation for clinical and medicolegal reasons is mandatory.

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Chapter VI

A FIVE LAYER NASAL SEPTAL PERFORATION CLOSURE USING THE EXTERNAL APPROACH

T.D. ZIJLKER
H.D. VUYK

ABSTRACT

Nasal septal perforations (N.S.P.) cause changes in nasal physiology, sometimes leading to troublesome symptomatology. Most N.S.P. results from iatrogenic trauma. Therefore prevention by meticulous executed reconstructive techniques in septorhinoplasty is mandatory. Surgical treatment of N.S.P. is considered a major challenge in rhinology. The closed as well as the external approach are used for exposure of N.S.P. We prefer the external approach for rhinoplasty, using a mid-columellar incision and bilateral marginal incisions in combination with two-sided mucoperichondrial- mucoperiosteal flaps derived from the nasal septum, floor of the nose and lateral nasal wall and interposition with connective tissue free grafts on both sides with reconstruction with autologous ear cartilage for structural support. This retrospective study analyses our experiences with 7 patients surgical treatment of N.S.P. with a maximum diameter of 2.5 cm. In all patients complete closure and improvement of complaints was achieved with five-layer closure. The external approach is merely a different way of exposure facilitating this difficult surgery.

INTRODUCTION

Nasal septal perforations are defined as defects in the nasal septum. The defect exist of a cartilaginous or sometimes larger bony-cartilaginous deficit and missing mucosa and perichondrium on both sides. N.S.P. cause certain patho-physiologic changes which may cause nasal crusting, nose bleeding, nasal obstruction, whistling, pain and headache. The most frequent etiologic factor is iatrogenic trauma after nasal (septal) surgery and trauma from repeated nose picking, but an increasing number of patients with cocaine abuse and concurrent N.S.P. is seen. N.S.P. are mostly asymptomatic and require no therapy. Symptomatic N.S.P. can be treated conservatively, prosthetically, or surgically. The surgical treatment of large, anterior N.S.P. associated with little residual cartilage and bone is technically difficult. The excellent exposure offered by the external approach using a midcolumellar incision with bilateral marginal incisions seemed to have specific benefits in the exposure of N.S.P. The use of a five layer reconstruction reconstitutes the original physiological state. Mastoid periosteum, fascia temporalis and conchal cartilage were used as graft donor sites.

Seven patients were treated between 1988-1992 in a series of almost 400 external rhinoplasty approaches. In all cases complete closure and symptomatic improvement was obtained.

ETIOLOGY

The vast majority of N.S.P. results from trauma with or without secondary infections¹ (Table 1). Most trauma is iatrogenic, surgical trauma during septoplasty being one of the main causes²⁻⁴. Other traumatic causes include tight nasal packing or splinting, bilateral cauterization for control of nasal blood loss or turbinate hypertrophy, and repeated nose picking. Inadequately treated septal hematoma may

TABLE I

Etiology of nasal septal perforations.

TRAUMA

Nasal septal surgery
Nasal packing
Bilateral cauterization
Trans-nasal intubation
Cryosurgery
Nose picking
Extra nasal trauma with septal hematoma

INFECTION

Septal abscess
Tuberculosis
Syphilis
Wegener's granulomatosis
Lupus erythematosus
Sarcoidosis
Rhinoscleroma

INHALANT IRRITANCY

Cocaine abuse
Caustic fumes

NEOPLASM

Carcinoma
Lethal midline granuloma

result in a septal abscess and lead to N.S.P. sagging of the dorsum. Various diseases predispose to N.S.P. These include granulomatous diseases, auto-immune disorders with vasculitis s.a. Wegener's granulomatosis, neoplasms, and rare infections such as tuberculosis and syphilis. Cocaine abuse may be a growing factor causing N.S.P. in modern society. Chronic exposure to certain industrial inhalants such as chromic acid or other chemicals seem to cause N.S.P. as well. N.S.P. may occur spontaneously without any well defined cause. When granulation tissue is present, especially at the anterior margin, a sample and biopsy should be considered for bacteriologic and histopathologic examination.

PREVENTION

"The best treatment is prevention". All nasal surgery meant to correct deformities should aim to preserve the structural integrity of the nose. Septoplasty or intraoperative reconstruction with autologous cartilage is essential to prevent loss of strength, support and rigidity of the nasal septum, N.S.P., scar formation, saddle nose deformity and ballooning phenomenon, with decreased nasal patency as final result. Meticulous septal surgery may prevent complications like N.S.P.: large (bi)-lateral mucosal tears should be repaired. The use of splinting, hemostatic suture techniques

for flap approximation, and non-adhering absorbing nasal packing soaked in antibiotic containing ointment removed within 24 hours are advisable. Septal hematomas are treated aggressively. Electra cautery for nasal bleeding should not be performed bilaterally and simultaneously in corresponding septal areas.

SYMPTOMS

An estimated two-thirds of N.S.P. is either asymptomatic or causes minimal symptoms. However, larger anterior localized perforations may cause crusting, nasal obstruction, rhinorrhea, epistaxis, whistling, uncomfortable sensations while inhaling cold air and sometimes headache. The incidence of troublesome symptoms depends on the size and location of the N.S.P.² Nasal obstruction is caused by excessive turbulence in the inspiratory airflow. Nasal valve insufficiency is not seldom seen, due to tendency to saddle nose deformity and distortion of the upper lateral cartilages⁵. Crusting and mucosal hypertrophy can be another important factor, worsened by chronic rhinosinusitis, atrophic rhinitis, or previous radiotherapy for a neoplasm.

TREATMENT

Treatment may be conservative, prosthetic or surgical. Limited success is obtained with repeated application of nasal wash-outs with saline solution, ointments and temporary nasal packing to decrease the degree of crusting. Facer and Kern⁶ advocated the use of silicone buttons to close the perforation, stop the whistling and control the bleeding. However, in our experience is not well tolerated by the patient. The prostheses nowadays are pre-fabricated and commercially available.

TABLE II

External approach for nasal septal perforations.

ADVANTAGES

- Superb access
- Binocular vision
- Controlled graft interposition
- Mobilization of mucosal flaps
- Concurrent rhinoplasty

DISADVANTAGES

- External nasal incision
- Prolonged operation time

Surgical closure

In general, surgery should aim at reconstruction of the bilateral lacking mucosal and perichondrial layers and the cartilage and/or bone.

The replacement of lacking tissue with flaps and free (composite) grafts is advocated. The literature describes many methods for surgical closure of N.S.P. The plethora of different techniques described suggests a certain degree of difficulty involved. Younger⁷ and Vuyk¹ published a review of surgical techniques for N.S.P. closure.

Mucosal flap repair

Mucosal flaps with interposed autologous grafts are the mainstay of surgical therapy today⁸⁻¹². The flaps carry their own blood supply, which is the basic principle of mucosal flap design. Gollom¹² proposes that mucosal flaps should lie in the same axis as the blood vessels to minimize the random portion of any flap used. In general, flaps should be broadly based. Understanding the anatomy of blood supply to the nasal cavity is essential. According to their donor site, we distinguished flaps derived from the septum, nasal floor/lateral nasal wall, inferior turbinate and buccal sulcus. One sided closure with unilateral flaps derived from the inferior turbinate (a two-stage procedure!), has not proven its value in a large series of patients⁴. The use of an interposed connective tissue graft has improved the success rate of surgical closure, especially in larger perforations¹¹⁻¹². Free autologous fascia temporalis or periosteum supportive grafts depends completely on the ingrowth of blood vessels from the surrounding tissues, comparable with the concept of the use of a fascia temporalis graft in tympanoplasty. Wright¹³ has demonstrated adherence within 24 hours between the graft and the recipient site and quick revascularization. Therefore, the graft is thought to serve as an underlayer until epithelialization is completed. Others have suggested to use more rigid material like bone or cartilage to prevent late re-perforation.

MATERIAL and METHODS

Surgical technique

The operation begins with incising the flap margins using a rigid 0 degree, nasendoscope. A midcolumnellar broken-line skin incision is connected with bilateral marginal incisions (Figure 1). The nasal skin is carefully elevated from the underlying nasal skeleton, providing full exposure of the supportive structures. The caudal edge of the cartilaginous septum is exposed after dissection of the intercrural ligaments. Bilateral septal flaps are elevated and the U.L.C.'s are dissected from the dorsal edge of the septum, taking care not to tear the mucoperichondrial flaps. After lateral retraction of the U.L.C.'s, the mucosal flaps are extended to the perforation and sharply separated. The flap separation is continued by bilateral superior and inferior tunnels, until the extent of the cartilaginous defect is visible and measured.

In our patients advancement flaps were used derived from the nasal floor and lateral nasal wall, in combination with interposition of two layers connective tissue free

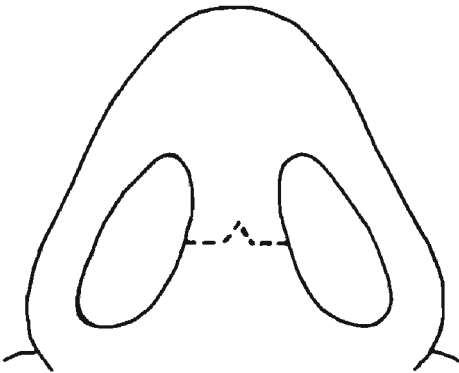


Figure 1
Midcolumellar broken-line skin incision. The incision is almost parallel to the relaxed skin tension lines and supported by the medial crura.

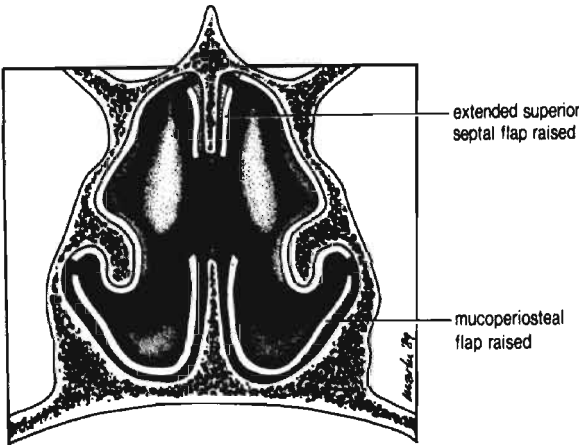


Figure 2
Development of mucoperiosteal flaps from the nasal floor and lateral nasal wall in continuity with the mucoperichondrium of the nasal septum. (From Vuyk & Zijlker. *Nasal septal Perforations*. In *Otolaryngology*. Revised Edition-1991. J.B. Lippincott Company).

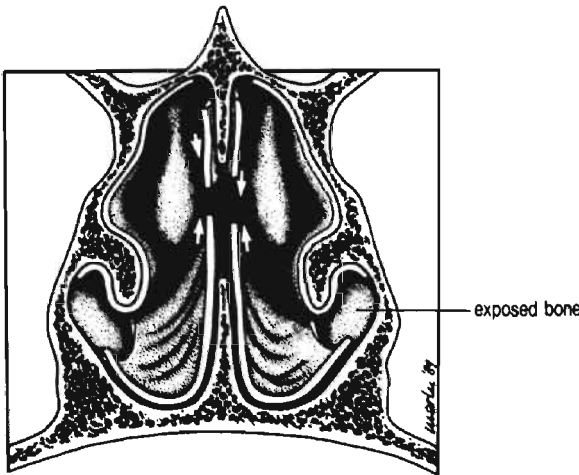


Figure 3
Advancement of inferiorly and superiorly developed flaps from the nasal septum, nasal floor, and lateral nasal wall. (From Vuyk & Zijlker. *Nasal septal Perforations*. In *Otolaryngology*. Revised Edition-1991. J.B. Lippincott Company).

grafts on both sides of the perforation and cartilage from the ear. The septal flaps were extended in continuity with the mucoperiosteum of the floor of the nose and the lateral nasal wall up the curvature of the attachment of the inferior turbinate (Figure 2-3). These flaps can be based anteriorly (on the branches of the superior labial artery that originates from the facial artery) or posteriorly with supply from the posterior septal branch of the sphenopalatine artery.

The type of flap movement to close the defect can be either by transposition or rotation depending on the flap design. Rotation flaps or bipediced flaps are preferred because they have a broader base with good blood supply. The septal flaps may be extended superiorly as well; mucosa is mobilized from the dorsal portion of the N.S.P. to the undersurface of the U.L.C.'s and nasal bones. A bipediced flap may be created with a relaxing incision approximately 5-10 mm lateral to the junction of the septum and the nasal dorsum. The flap is used to cover the dorsal portion of the perforation. When a reduction rhinoplasty is performed by lowering the nasal dorsum, relatively larger mucosal flaps will be available. This flap may best be used on one side, leaving mucoperichondrium attached to the other side to nourish the cartilage. The goal is to close the defect completely on both sides avoiding opposing suture lines. For this purpose different types of flaps are used on each side.

The connective tissue grafts, preferable periosteum, are obtained through a high post-auricular temporal skin incision, the cartilage through a ventral approach of the auricle. The size of the grafts depends upon the size of the septal defects. The connective tissue grafts should overlap the defect on both sides and the cartilage should just fit in place. After insertion of the grafts tissue adhesive (Fibrin Glue) is used to secure, and stabilize the reconstructed area. The mucosal flaps are approximated, using non-traumatic forceps, and sutured without tension with fast absorbable 5-0 polyglycolic acid Vicryl sutures.

Most patients with N.S.P. demands a reconstruction of the weakened nasal skeleton, to restore and maintain nasal tip support and projection or dorsal contour. The U.L.C.'s are sutured back to the septum. The supratip region is reconstructed with a buried mattress suture and a columellar strut and/or tip graft is used. Nasal septal splints are adjusted with horizontal mattress sutures. The marginal incision is closed with 5-0 Vicryl® simple sutures and the columellar incision with 6-0 Prolene®, taking care to evert the skin edges. A non-adherent absorbing dressing (Telfa®) is applied, soaked in antibiotic ointment. The nose is taped and a cast applied. Peri-operative antibiotic prophylaxis is given intravenously. The dressing is removed within 24 hours. The splints are usually left in place for two to three weeks. The nose is cleaned with nasal washouts with saline solution. Crusting is prevented by the use of an abundant amount of ointment. The surface of the donor sites heals strikingly well with proper postoperative management.

RESULTS

Seven patients were surgically treated for N.S.P. with an external approach for rhinoplasty, between 1988 and 1993. The diameter of the perforations was less than 25 mm in size (range 10 - 25 mm). The mean follow up was 18 months (range 3 - 48).

In all cases but three previous nasal surgery had been performed. The two non-iatrogenic N.S.P. included one case of cocaine abuse and one case in which no cause was detected. All seven perforations were completely closed by the described technique. No complications related to the external approach were registered.

DISCUSSION

Surgical closure of N.S.P. is considered as one of the challenges in reconstructive nasal surgery. However, the experience for reconstructive surgery for N.S.P. is usually limited. During the training of an Otolaryngologist emphasis is laid on prevention of N.S.P. The success rate of surgical closure varies depending on the etiology, size and localization of the N.S.P. and the expertise of the surgeon. The size of the perforation, and its relation to the size of the entire nose limits the chances of surgical closure. Rettinger¹⁸ described a simple radiological method of N.S.P. assessment. In every study the size of the N.S.P. should be taken into consideration, when results are compared and judged.

Apparent the choice for a closed or external approach fully depends on the personal preference and skills of the surgeon. Excellent results are achieved with both the closed and external approach^{2,12,14-16,19-21}.

The external approach offers certain advantages which facilitates the procedure, especially because of the wider exposure. (Table II). The external approach is also advocated because of the versatile reconstruction of tip supporting mechanisms, which are usually lost to some degree in N.S.P. patients. The technique differs from the closed approach mainly the excellent mid-line view from above over the superior and posterior edge of the N.S.P. Binocular vision provides better control of this narrow, three dimensional space. Bimanual surgery in a surgical field with more space for instrumentation facilitates surgical dissection, mucosal flap mobilization, controlled graft interposition and a possible concurrent limited rhinoplasty, which may help to mobilize the mucosal flaps by a push down or reduction rhinoplasty. The external approach enhances ones ability to primarily close the N.S.P. and one stage treatment of concurrent abnormalities such as a saddle nose deformity. Romo et al²¹ advised the mid-face degloving technique for large N.S.P., after prior failed attempts of surgical closure, however circular scar contraction in the nasal vestibulum is a certain risk!

However, different techniques of flap repair are advocated¹⁹. Rettinger et al²⁰ advocated an unilateral wide-pedicled flap from the nasal septum in combination with a labial/buccal sulcus mucosal flap in larger N.S.P., with an success rate of 66% (12/18) (Figure 4 A-B). We practiced this technique in three previous treated cases of N.S.P. Apart from one failure, in two cases reduction with 50 % of the N.S.P. was achieved. The labial buccal sulcus flap caused scar contraction with upper lip asymmetry in one patient. In all three patients subjective improvement was noted. The use of tragal cartilage and perichondrium interposition was described by Eviatar et al²². Fairbanks⁹⁻¹¹ has suggested three layer closure using endonasal mucoperichondrium-periosteal flaps with only fascia interposition which enhances closure rate significant! Arnstein¹⁶ suggested two sided interposition with periosteal

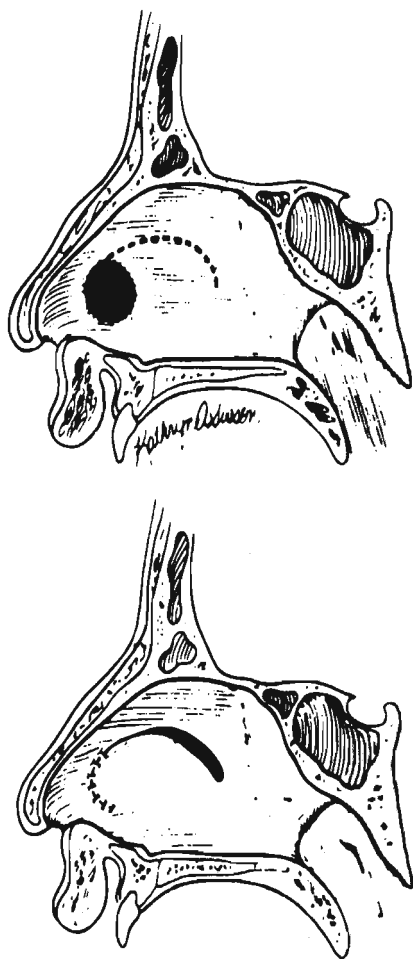


Figure 4

A-B. Broad posterior-based mucoperichondrial advancement and rotation flap from the septum. (Karlson MS, Ossoff RH, Sisson GA (1982) A compendium of intranasal flaps. *Laryngoscope* 82, 774).

grafts of the N.S.P. Our earlier experiences with one sided flap repair over more than 30 patients using an inferior turbinate flap was disappointing. Earlier attempts using endonasal and sublabial-premaxillar approach proved to be troublesome. We now propose a five layer reconstruction in N.S.P. Watertight closure will enhance healing of mucosal suture lines. The cartilage interposition will support the reconstruction and hopefully prevent late re-perforation.

CONCLUSION

Five layer closure is considered the basis for success in this small series. The external approach enhances flap mobilization and fixation as well as interposition of free grafts forming a physiologic five layer closure of the N.S.P.

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Chapter VII

NASAL DORSAL CYST AFTER RHINOPLASTY

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ABSTRACT

Nasal dorsal cyst formation after rhinoplasty is considered a rare complication. These cysts are due to entrapment of mucosal remnants in the subcutaneous space. Meticulous surgical technique aimed at preserving the mucosal lining intact may prevent cyst formation. Surgical excision with the external approach for rhinoplasty is a reliable treatment. A case of nasal dorsal cyst after previous rhinoplasty is presented. After two years no sign of recurrence is noted.

INTRODUCTION

Rhinoplasty is considered a major challenge in facial plastic and reconstructive surgery. In fact, the nose is the most prominent part of the face. Moreover failures are difficult to correct and may put the surgeon's reputation at stake. Late complications of rhinoplasty are not common, but may be serious and difficult to manage. Nasal dorsal cyst formation is such a rare complication. Only several case reports have been presented in the literature^{3-6,8-11}. This case report adds one more patient with a nasal dorsal cyst to the previous reported cases. The aetiology, prevention and management of this rare condition following rhinoplasty will be discussed.

CASE REPORT

In 1978 a 31 year old female underwent a submucous septoplasty five years after her first rhinoplasty. In 1979 she was surgically treated, because of an apparent dorsal swelling present for already several years. An attempt to remove the swelling failed using an endonasal approach, as the cyst ruptured at the beginning of the procedure. The swelling recurred in a few month's time. In 1988 she was seen with complaints of continuous pressure over the nasal dorsum and an unaesthetic appearance of her nose.

On inspection (Figure 1 A-B) the swelling was obvious. The nasal tip was relatively overprojected, considered the very low bony and cartilaginous dorsum, which has been overresected previously. The overlying skin was extremely thin, with some telangiectasis.

An external approach for adequate exposure was used in an attempt to radically remove the lesion and reconstruct the dorsal profile. The swelling could be removed in toto. The large dorsal defect caused by previous overaggressive surgery was reconstructed with homologous cartilage. As some resorption of the graft is to be anticipated over the years a slight overcorrection was carried out. The nasal tip was set back by reducing the length of the lateral crura of the alar cartilages at the hinge area, with concomitant reduction of the medial crural height at both sides. After two year follow up our patient is free of complaints and no sign of a recurrence is seen (Figure 2).



Figure 1

A-B. Nasal dorsal cyst: pre-operative photographs. The cartilaginous and bony dorsum are extremely low with a relatively overprojected nasal tip.



Figure 2

Postoperative result after eighteen months follow-up. The cyst is removed in toto, the dorsal defect reconstructed with homologous cartilage. Some overcorrection performed in view of a possible slight resorption in the future.

AETIOLOGY

Most nasal cysts are attributed to entrapment of nasal mucosal remnants in the subcutaneous space. Such entrapped mucosal remnants can be considered a free graft and may lead to development of a cyst. Entrapment of epithelium from the nasal vestibule or mucosal lining may be caused by transcutaneous (lateral) osteotomies. In this case, the high bony and cartilaginous dorsum had been excessively reduced during the first operation. The cyst is probably caused by free mucosal remnants, as there was no direct connection between the cyst with the internal nasal lining. One may conclude that cysts are likely to occur once intranasal mucosal lining is violated and mucosal remnants become displaced, which are allowed to remain subcutaneously.

PREVENTION

In order to prevent iatrogenic cyst formation it is important to keep the mucosal lining intact during the subsequent rhinoplasty maneuvers or to restore meticulous the disturbed mucosal lining. In an external approach for rhinoplasty, mucosal lining can easily be preserved when subperichondrial and subperiosteal tunnels are developed over the nasal septum and underneath the nasal dorsum before any surgical alterations are made to these structures.

MANAGEMENT

Complete surgical extirpation of the lesion, with reconstruction of the resulting defect, set the goals of surgical treatment of this rare condition. Satisfactory exposure of the area is mandatory in this respect. Exposure can be obtained by using traditional endonasal or external incisions^{1,2,7,12}. Direct exposure with incisions in the dorsal skin over the cyst is the third option to be considered. The endonasal approach using inter- or intracartilaginous incisions offers limited exposure. The external approach using bilateral marginal and transverse columellar incisions is recommended as it offers excellent exposure greatly facilitating complete extirpation of the lesion and reconstruction of the defect. With careful closure techniques, the columellar incision will heal to an almost invisible scar. In contrast, direct dorsal approach, even when a geometrically broken line incision is used, does preclude direct reconstruction of the defect and may well result in a visible scar on the nasal dorsum.

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General discussion

Rhinoplasty has gone through a remarkable development during the last decades. In facial plastic and reconstructive surgery rhinoplasty is recognized as a difficult procedure with a long learning process, characterized by trial and error¹.

External rhinoplasty is a relatively old technique enjoying a growing interest. With its excellent exposure external rhinoplasty is thought to integrate all the modern concepts of rhinoplasty, and should be especially useful for grafting with autologous cartilage³⁶.

Because of the external, visible scar and potential columellar flap loss after tissue necrosis, the external approach received criticism and was rejected by many for a long time for also emotional reasons. This despite the fact however that external incisions of the nasal alar base and for eyelid surgery are generally accepted!

The differences between closed and external rhinoplasty are primarily based on the use of various incisions and exposure. The closed approach combining inter-cartilaginous (I-C) and trans-cartilaginous incisions (T-C) to deliver the alar cartilages resembles the external approach in terms of tissue undermining except for a small portion of columellar skin. However, this small difference offers improved exposure and a challenging opportunity to experience a different concept in rhinoplasty i.e. complete exposure of the nasal skeleton after superior retraction of the skin-soft tissue envelope (S-STE) which brings the bony-cartilaginous framework into direct vision. An immediate correlation between the pre-operative assessed pathology is made and the actual deformities are studied in an undistorted way and meticulous correction can be done.

With respect to evaluate of a surgical method, this technique for rhinoplasty in particular, it is important to realize that in contrast with other research models, comparing results of two different techniques for exposure in septorhinoplasty in a single patient is impossible. Even in revision surgery after earlier executed primary closed rhinoplasty, a honest comparison is not justified. With this limitation in mind, we have endeavoured to evaluate the external approach for septorhinoplasty in aesthetic and reconstructive nasal surgery. The subjective result in our rhinoplasty patients was compared with the pre-operative systematic (photographic) analysis of the face and the in- and external nose and the postoperative (photographic) assessment.

The following presumptions are investigated: (1) External rhinoplasty is a safe, reliable surgical technique; (2) External rhinoplasty has specific advantages; (3) External rhinoplasty has no absolute contraindications.

Shortly after its re-introduction in 1970 in North America, Goodman²⁻³ considered the external approach indicated for a wide variety of nasal deformities. Today the external approach is used by an increasing number of surgeons, by some even in almost all rhinoplasty patients, unless the nasal pathology can be analyzed adequately during the pre-operative assessment and the same result can be achieved after a closed rhinoplasty in the hands of a single rhinoplasty surgeon⁴⁻¹¹. Since 1989

at our department, in more than 90 % of the septorhinoplasties were executed in the external approach.

In chapter II a review of different methods for pre-operative photographic analysis is presented. Analysis and proper planning is the key to successful rhinoplasty¹²⁻¹³. Life-size photographs made in a standard projection provide an accurate and practical method for nasal assessment and surgical planning¹⁴. A number of rhinoplasty surgeons use computerized imaging systems for simple record keeping, enhancing realistic self-evaluations, teaching and research purposes¹⁵. The patient's contribution to the process of analysis and planning is enhanced by the use of computer graphics. Expectations of the outcome of aesthetic surgery are better estimated and will become more realistic. Pre-operative assessment of the patient's personality, psychological eligibility and expectations is seen as being as important as the physical assessment and technical part of rhinoplasty¹⁶. The facial plastic surgeon reshapes the face, which has been called "landscape of human interaction"²¹. He must guide the patient through a surgical, social and psychological transformation. The patient's motivation and expectation of surgery, degree of social support, history of (active) coping with previous life-events, and psychopathology have to be taken into serious consideration¹⁷⁻²⁰.

In chapter III the experience in a series of 130 consecutive external rhinoplasties is described. Results and complications related to the external approach are discussed. For many years the discussion about the external approach was polarized²³⁻²⁴. The most important controversies focus on the degree of tissue trauma; the columellar scar and skin loss after columellar flap elevation. Other objections concentrate on injury of the medial crura, cartilage suturing with permanent suture material with the risk of secondary infection or extrusion, excessive supratip scar formation, violation of tip supporting structures, prolonged edema, and hypesthesia of the nasal tip, and the extended operation time. Endonasal rhinoplasty complication incidence rates vary between 5-12%²⁵. Data from the external rhinoplasty literature do not indicate a higher incidence of post-rhinoplasty sequelae²⁶⁻³⁴. In 8 % in our study (minor) complications were registered. This study, nor data from the literature consider the complications a realistic problem^{27,35-39}. Burgess²⁶ considered inadvertent incision of the anterior margin of the lower lateral cartilage at the juncture of the lateral and medial crura as the most common complication in external rhinoplasty. This confirms the observation made by Jugo²⁷ in a series of 492 patients. In our series, review of the surgical data revealed 4 (3%) patients with this complication (see chapter III). Intranasal monofilament sutures for cartilage (graft-) fixation are frequently used in external rhinoplasty for fixation and reconstruction purposes. After several hundreds of permanent intranasal sutures, neither suture extrusion nor secondary infection seem to be a problem. The risk of soft tissue scar formation and supratip deformity ("pollybeak") is a potential rhinoplasty sequela in both the closed and external approach. The external approach offers an opportunity for facilitated, visual controlled correction of a soft tissue "pollybeak" in secondary rhinoplasty⁴⁰.

The S-STE is incised at the mid-columella region, interrupting the vascular supply and lymphatic drainage, and elevated in an avascular supraperichondrial plane. To our experience prolonged postoperative edema is noticed no more often than is seen in endonasal delivery technique, when atraumatic surgical techniques and instru-

ments are used in the exact same tissue planes. The postoperative period of hypesthesia of the nasal tip may be somewhat longer, but after no longer than 12 months all problems resolved. The prolonged surgery has only relative significance if a satisfactory result is obtained with more confidence and certainty, especially in revision surgery. Generally, the procedure will take longer, due to the unparalleled view providing new options for diagnosis and correction.

Tip support is considered very important in nasal aesthetics. Incisions in septorhinoplasty may violate different major and/or minor nasal tip support²², which may cause tip ptosis. If I-C incisions and infra-cartilaginous ("marginal") incisions are combined the alar cartilages can be delivered. However, incision and subsequent destruction of one of the major tip support with an I-C incision, and dissection of the intercrural ligament and distorted anatomy in delivering the alar cartilages, makes this technique less ideal.

In external rhinoplasty a minimal amount of tip support is lost by the approach itself after dissection of the interdomal or intercrural ligaments and release of the attachment of the alar cartilages to the overlying skin and musculature. The fibrous attachment between the upper lateral cartilages (U.L.C.'s) and the lower lateral alar cartilages is not necessarily violated in all procedures in contrast with closed rhinoplasty. The external approach offers an opportunity for precise assessment of the injury causing in tip ptosis, and secure reconstruction with autologous grafts and/or suture techniques.

In chapter IV-VI the experience with autologous grafting in aesthetic and reconstructive rhinoplasty is studied. The grafts are used for the columella, nasal tip, nasal dorsum and nasal septum⁴¹⁻⁴². Grafts are preferably made of autologous cartilage derived from either the nasal septum, ear or rib. Allogenic grafts are seldom necessary, only in cases of a lack of sufficient donor material. Grafting for maintaining tip support has been developed during the recent years^{38,43-49}. The columellar graft tends to strengthen and lengthen the medial crura, maintaining tip projection. The graft can be placed in the closed approach either using a transfixion incision, longitudinal external columella splitting incision, transverse mid-columellar incision, or by an intra-oral incision. These approaches have certain disadvantages; immediate loss of tip projection after a transfixion incision is contradictory to the aimed effect of a strut; the splitting incision gives a long visible scar, the transversal a small visible scar and intra-oral incision potential infection after contamination from the oral cavity. The transversal incision is preferred, leaving as much as possible intact of the connective tissue, because of the exact positioning and suture fixation. The graft is "tailor-made" to prevent undesired aesthetic effects. For patients with resected or structurally inadequate medial crura, support of the entire framework must be provided. The columella graft forms an integral part of the concept of grafting the nasal lobule. Control of nasal tip projection, shape, rotation and refinement is the key to successful rhinoplasty. Tip projection can be increased by the use of autologous cartilage grafts to the nasal lobule which are sutured and sculpted in-situ⁵⁰⁻⁵¹. These grafts can be the shape of a shield that accentuates the normal double break on the profile view. The underlying framework must be strong enough to support the graft. The risk of graft slippage is minimized when the graft

is sutured to the medial crura with non-absorbable sutures. Johnson⁵² uses tip grafts in more than 90 % of his rhinoplasty patients! In our study we used the tip graft in more than 30 % of our patients. This number is expected to rise in the future. No problems with respect to the columellar skin closure due to the bulk of the nasal tip graft and subsequent increase of tip projection were encountered in these studies. Nor have we seen problems of graft rejection or secondary infection. The use of an external approach for placement and fixation of the tip graft has minimized the chance of displacement causing tip asymmetry, which was encountered in the closed approach⁴⁷. Graft absorption still remains difficult to assess. Many years of follow-up are needed.

In chapter V the technique of "lateral" augmentation with autologous cartilage or "spreader" grafts and suture fixation in a multilayer dorsal reconstruction in the surgical treatment of alar insufficiency using the external approach is described. The results and complications are discussed. The external approach provides an extra-mucosal access to the middle third of the nose and enhances proper diagnosis and management of middle third deformities; (1) "pollybeak"; (2) cartilaginous pyramid deficiency; (3) middle third collapse; (4) middle third curvature; (5) middle third irregularities⁴¹. In contrast, grafting of the middle third of the nose for alar insufficiency is considered a difficult procedure in the closed approach with sub-mucoperichondrial undermining providing only small pockets parallel to the cartilaginous dorsum⁵³⁻⁵⁴.

For surgical treatment of nasal valve insufficiency (N.V.I.), Walter⁵⁵ and Goode⁵⁶ have advocated composite grafts in a modified Z-plasty. We believe Z-plasty using a medially based composite skin-L.L.C. flap widens the nasal valve area, but influences (supra-) tip aesthetics and induces scar tissue in the alar region with possible retraction!

In this specific pathology we prefer to use the external approach^{10-11,42}. The extra-mucosal access to the middle third of the nose minimizes the risk of (renewed) iatrogenic trauma to the N.V.A.. The grafts are placed under visual control, which enhances exact location and fixation of the optimal "spreader". The technique showed promising results in patients with middle nasal third collapse causing alar insufficiency in primary and secondary septorhinoplasty. Lateral augmentation is strongly advocated as an adjuvant procedure not only in reconstructive, but also in aesthetic rhinoplasty.

In chapter VI the experience with septal reconstruction in nasal septal perforations (N.S.P.) is presented. The plethora of different techniques described for surgical reconstruction of nasal septum testifies to the degree of difficulty involved! The external approach enhances the surgical exposure of N.S.P.'s by its unparalleled view in this hidden, narrow, slit-like three-dimensional space. The concept of a five layer reconstruction of the N.S.P. is described.

We use primary mucosal flaps derived from the nasal septum, floor of nose and lateral nasal side-wall, and interposition of free connective tissue grafts, including two layers of connective tissue and one layer autologous (ear-)cartilage. This reconstitutes the original (five) layered structure of the nasal septum.

Chapter VII describes the external approach for the nasal dorsum in acquired and congenital deformities. A case of nasal dorsal cyst after closed rhinoplasty is presented, treated while using an external approach for the nasal dorsum. The indication, technique and complications are discussed.

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Summary and conclusions

The external approach for septorhinoplasty is an old but relative unknown technique. It serves as an alternative to the closed approach for septorhinoplasty. The latter uses intranasal incisions and is practiced since the end of the 19th century. In contrast the external approach uses a transversal broken incision through the mid-portion of the columella in combination with bilateral marginal incisions. The S-STE is partially elevated from the nasal skeleton. A dorsal perichondrial-periosteal flap is developed and the nasal framework exposed. After correction of the nasal pathology the S-STE is replaced over the reshaped nasal skeleton, redraped and sutured. The procedure is characterized by permanent visual control over the operation field and the surgical manoeuvres. Surgery is facilitated and tissue- trauma is limited by approaching the right tissue planes.

This thesis describes the clinical experience with the external approach for septorhinoplasty used in a large group of consecutive rhinoplasty patients, with functional and/or aesthetic nasal disorders. The question is put forward, whether the external approach is a safe, reliable technique and which are the indications or contraindications. The preface points to the discussion about the merits of both the closed and external rhinoplasty approaches. The discussion was primarily held in North America and to a lesser degree and somewhat later also in Europe. In the Netherlands external rhinoplasty was not an issue for discussion nor it was a topic in the training program of Otolaryngology. This was possible due to the degree of satisfaction with the closed approach and/or lack of familiarity with the technique. Rhinoplasty is considered a difficult procedure which is hard to teach. Just because of the enhanced exposure, external rhinoplasty has become an integrated part of the rhinoplasty training program in North America, during the last two decades. The apparent lack of interest in our country and the increased popularity elsewhere has initiated this study.

Chapter I presents a historical review of the development of external incisions in rhinoplasty. The most relevant clinical contributions of pioneers of facial plastic surgery are highlighted. The columellar approach using a mid-columellar broken line incisions with bilateral marginal incisions has become accepted as the mostly practiced approach in external rhinoplasty .

In Chapter II a review of pre-operative photographic analysis is given. Emphasis is placed on the importance of pre-operative analysis and planning with life-size photographs, made in standard directions.

In Chapter III the concept of open structure rhinoplasty is presented, as well as the clinical experience with 130 consecutive rhinoplasty patients. External exposure is combined with the concept of nasal augmentation with autologous donormaterial. The in-situ sculpted (cartilaginous) grafts are sutured to the nasal skeleton. The nasal parameters are changed by limited reduction and sacrifice, followed by augmenta-

tion and reconstruction using autologous grafts to the columella, nasal lobule, tip, cartilaginous and/or bony nasal dorsum. The external approach enhances pre-operative diagnosis of nasal pathology, instant feed-back during surgery, leading to a faster learning process and potential better, more consistent results.

The risk of complications is considered low. Especially in cases with an expected increase in nasal tip projection, such as seen in severe saddle deformity, cleft lip rhinoplasty or other congenital deformities, extra care and attention has to be paid to a tension-less wound closure.

In Chapter IV the concept of grafting to the nasal lobule is presented, as well as the history, indications and technique. The clinical experience of the use of autologous grafts to the nasal lobule in 94 patients is described. Emphasis is placed on the nasal parameters such as projection, rotation and refinement, and the role of this type of graft in corrective rhinoplasty. The results were evaluated after comparison pre-operative and postoperative taken life-size photographs, and monitoring the patients subjective opinion.

In Chapter V the technique of lateral augmentation of the nasal dorsum with autologous cartilage grafts is presented in 32 patients with nasal obstruction due to N.V.I. The grafts are placed between the dorsal edge of the cartilaginous nasal septum and the medial border of the U.L.C. The N.V.A. is widened and restructured. In 72 % improvement of nasal patency was noted. In 48% the nasal complaint of obstruction totally disappeared. In one patient (3%) a subjective worsening occurred and in 15 % no changes were noted. None of the patients had complaints about the aesthetic effect of the grafting to the middle third of the nose.

In Chapter VI a concept is presented of reconstruction of a N.S.P. using the external approach and a five layer reconstruction of the nasal septum with autologous donormaterial. The mucosal adaptation is acquired by using mucosal flaps of different design, which are derived from the nasal septum, floor of the nose and lateral nasal sidewalls. After primary closure three layers of tissue are added; tailor-made autologous conchal ear cartilage and two layers of connective tissue derived from the temporalis muscle and cranial periosteum. In all (7) patients total closure of the septal perforation was obtained. The diameter of the N.S.P. varied between 10-25 mm. The results are compared to previous results with alternative methods for closure of N.S.P.

The external approach enhances the difficult surgical techniques by facilitated instrumentation and improved visual control over the deep localized surgical field. However the follow-up is still too short to evaluate the chance on late perforations.

In Chapter VII a case of a nasal dorsal cyst is presented. A rare condition after rhinoplasty, which is hard to treat in the closed approach. The case represents the diagnostic problems encountered and the treatment of acquired pathology of the nasal dorsum.

Full exposure of the nasal skeleton and S-STE in an undistorted way enhances knowledge of nasal anatomy and tip-dynamics in rhinoplasty. Surgery is facilitated, leading to more a more precise approach of the encountered tissues while exploring the exact planes with greater ease. After having observed several hundreds of external rhinoplasty patients to our opinion tissue trauma and bloodloss are decreased. Grafting procedures for augmentation, restructuring and/or refinement have evolved significantly due to the external approach. Nasal refinement is enhanced by meticulous, precise sculpting of the nasal skeleton with instant intra-operative visual control and appreciation by palpation. This has lead to more controlled aesthetic and reconstructive nasal surgery.

Although the columellar incision is very small and insignificant, a different concept for septorhinoplasty has once again come into focus after a relatively long and interrupted history of the use of external incisions in nasal surgery. The results of this thesis leads to the conclusion that external rhinoplasty is safe when the basic principles of rhinoplasty and soft-tissue surgery are respected. The morbidity of the technique, summarized in a consecutive series of rhinoplasty patients can be compared to those obtained in a closed technique. The columellar flap viability and scar healing are of no real significance to the decision whether to use the external approach. This holds true for the patients as well as the surgeon! External rhinoplasty is well suited for the "aesthetic" rhinoplasty patient with so called "minimal" pathology. The approach adapts perfectly to the concept of limited reduction followed by reconstruction of the nasal skeleton and adaptation of the S-STE to the reduced bony and cartilaginous framework. The external approach is recommended to become a part of the training program in the teaching hospitals, especially in the early experiences with rhinoplasty surgery.

The statement "External rhinoplasty is a controversial operation" is no longer valid.

Samenvatting en conclusies

De externe septorhinoplastiek is een oude, doch relatief onbekende chirurgische techniek. De benadering kan als alternatief dienen voor de traditionele, gesloten benadering, welke eind 19e eeuw werd ingevoerd. Bij de externe septorhinoplastiek wordt bij voorkeur gebruik gemaakt van een transversale "gebroken" huidincisie door het midden van de columella. De incisie wordt verbonden met bilaterale endonasaal gelegen zgn. "marginale" incisies, waarna een partiële ondermijning volgt van de bedekkende huid over de columella, neustip en neusdorsum en eventueel elevatie van het perichondrium en periosteum volgt. Nadat expositie van het neusskelet en de onderliggende neuspathologie heeft plaatsgevonden, wordt de afwijking op basis van een tevoren opgesteld plan naar wens op vorm en functie gecorrigeerd. Hierna wordt de huid teruggeklapt en de wond gesloten.

De ingreep is gekenmerkt door de voortdurende visuele per-operatieve controle op het gehele neusskelet en een hierdoor gemakkelijkere instrumentatie, waardoor de nauwkeurigheid toeneemt en onnodig weefseltrauma mogelijk kan worden voorkomen.

Dit proefschrift beschrijft de klinische ervaringen met deze benadering, welke vrijwel zonder uitzondering werd toegepast bij een populatie opeenvolgende patiënten met functionele en/of esthetische klachten van de neus.

De vraag wordt gesteld of de techniek een veilige en betrouwbare methode is bij de expositie van de anatomie en behandeling van de pathologie van de in- en uitwendige neus. Tevens wordt de vraag gesteld welke indicaties in het bijzonder in aanmerking komen voor deze benadering, en welke de (absolute) contraindicaties en welke de kenmerkende voor- en nadelen zijn.

Tijdens de introductie wordt gewezen op de reeds lang bestaande controverse tussen voor- en tegenstanders van het concept. De hieruit voortvloeiende polemiek werd in het begin voornamelijk in Noord Amerika gevoerd en pas later en in mindere mate in Europa. In Nederland was de belangstelling onder de Keel-, Neus- en Oorartsen voor de externe benadering lange tijd gering tot afwezig, vermoedelijk wegens de onbekendheid met de mogelijkheden, dan wel door tevredenheid met de gehanteerde gesloten benadering. Hierdoor ontbrak feitelijk een wetenschappelijke discussie over de klinische relevantie van de externe benadering bij de septorhinoplastiek.

In het algemeen wordt aangenomen dat de (gesloten) septorhinoplastiek een moeilijk te onderwijzen en te leren chirurgische procedure is, die pas na een lange periode van intensieve oefening eigen is te maken. Opvallend is het feit dat de externe benadering wordt onderwezen in opleidingsinstituten in Noord Amerika bij voorkeur in de beginfase van de training. Dit is mogelijk wegens de hoge didactische waarden en het inkorten van de duur van het leerproces.

In hoofdstuk I wordt een historisch overzicht gegeven van toepassing van externe incisies, die toegang verschaffen tot de in- en uitwendige neus t.b.v. correctieve neuschirurgie. De belangrijkste klinische en wetenschappelijke bijdragen van de

betrokken chirurgen, worden in een chronologische volgorde gepresenteerd. Het gebruik van een transversale incisie door de midden van de huid van de columella gecombineerd met bilaterale endonasale "marginale" incisies is de meest frequent gehanteerde externe benadering van het ogenblik.

In hoofdstuk II wordt een overzicht gegeven van de beschikbare methoden voor pre-operatieve fotografische analyse van de patiënt. Analyse en zorgvuldige planning wordt een eerste vereiste geacht voor een uiteindelijk voor beide partijen bevredigend resultaat. De pre-operatieve "levensgroot" uitvergroete afbeeldingen van het aangezicht in de standaard projecties, gevolgd door herhaalde postoperatieve fotografische evaluatie en kritische vergelijking is een efficiënte, relatief goedkope methode. Het systematisch opstellen van een operatieschema, rationaliseert een "artistieke" getinte operatie tot een meer planmatige ingreep met een in hogere mate voorspelbare resultaat. Uiteindelijk zal veelvuldige herhaling van dit proces tot een toename van de diagnostische vaardigheden en inzichten moeten leiden.

In hoofdstuk III wordt het concept van de externe septorhinoplastiek beschreven, alsmede de door de auteur geprefereerde techniek aan de hand van de klinische resultaten bij 130 opeenvolgende patiënten. De externe benadering wordt gecombineerd met het concept van augmentatie met bij voorkeur autoloog materiaal, veelal neus en/of oorschelpkraakbeen. Door de betere expositie via de externe benadering is een exacte modellering en in-situ fixatie aan het onderliggende neusskelet met (niet-) resorbeerbaar hechtmateriaal een innovatieve ontwikkeling in de neuschirurgie, waardoor de mogelijkheden tot correctie en behoud van nasale vormgeving zijn toegenomen. Door middel van implantaten in de columella in combinatie met een autoloog kraakbeenimplantaat voor de neustip, kunnen de diverse parameters, zoals de projectie, rotatie, contrarotatie, lengte en verfijning van de vorm van de neus worden beïnvloed. De externe techniek bevordert de diagnostiek van nasale misvormingen. Het leerproces wordt bekort door de visuele en simultane palpatoire terugkoppeling en toegenomen controle over de per-operatieve chirurgische handelingen. Het risico op complicaties gerelateerd aan de benaderingswijze op zich is beperkt en blijkt te vergelijken met de gesloten techniek. Een wezenlijk verhoogd risico op een wondstoornis doet zich in theorie voor bij de reconstructie van ernstige congenitale of verkregen neusmisvormingen, waarbij een aanzienlijk toename van de projectie verwacht kan worden.

In hoofdstuk IV wordt het concept, historie, indicaties en techniek van augmentatie van de neustip door middel van autoloog kraakbeen beschreven aan de hand de klinische ervaringen bij 94 patiënten. Het belang van controle over de projectie, rotatie en verfijning van de vorm van de neustip wordt benadrukt. Het autologe tipimplantaat blijkt een belangrijk hulpmiddel om deze gewenste controle te verkrijgen, indien in-situ bewerking plaats heeft gevonden na fixatie aan het onderliggende skelet met (niet-) resorbeerbaar hechtmateriaal. Een stugheid en ongevoeligheid van de neuspunt bleken tijdelijke klachten en bovendien binnen een jaar verdwenen te zijn.

In Hoofdstuk V wordt de studie beschreven naar de klinische toepassing van kraakbeenimplantaten in het neusdorsum ter reconstructie van het middelste eenderde deel van de neus t.b.v. de patiënt met een neusklepinsufficiëntie.

Deze conditie met als gevolg een niet optimale neusademhaling is voor velen een dagelijkse veelal continue klacht, die o.m. interfereert met een ongestoorde slaap. Bij alle patiënten werden zgn. "spreiderimplantaten" geplaatst tussen de dorsale begrenzing van het neusseptum en de mediale begrenzing van de cartilago triangulares. Op deze wijze wordt de apex van de ruimte gevormd door het neusseptum en de caudale rand van het cartilago triangulare verruimd en verstevigd. De fysiologie van de neusklepregio en aetiologie van anterieure neusobstructie worden beschreven. Een historisch overzicht van de overige chirurgische behandelingsmethoden laat zien dat het gebruik van "spreiders" in het neusdorsum een relatief onbekende techniek is. Naar alle waarschijnlijkheid is dit te wijten aan het feit dat dit gedeelte van de neus veelal een lastige en vaak incomplete expositie kent. De klinische resultaten laten een gunstig resultaat zien. In 72 % trad verbetering op van de neusademhaling, terwijl in 48 % de klachten geheel verdwenen. Bij een patiënt (3%) trad een subjectieve verslechtering op en bij de overigen (15%) geen verschil met de pre-operatieve situatie. Geen van deze patiënten met functionele klachten bleek overigens ontevreden met het uiteindelijke esthetische resultaat.

In Hoofdstuk VI wordt de methode beschreven ter reconstructie van het neusseptum met een perforatie. Hierbij wordt gebruik gemaakt van de externe benadering en een uit vijf lagen bestaande reconstructie van het defect. Het sluiten van een neusseptumperforatie wordt algemeen erkend als een ingewikkelde procedure met een relatief laag succespercentage. Dit is reden om in een aantal gevallen af te zien van chirurgische behandeling.

Het voorgestelde concept is gericht op herstel van de normale fysiologie via primaire sluiting van het mucosale defect. Hiertoe wordt mucoperichondrium en mucoperiosteumflappen in het cavum nasi gemobiliseerd, aangevuld met het interpositie d.m.v. een implantaat van exact op maat vervaardigd autoloog oorschelpkraakbeen en twee lagen bilateraal aan te brengen bindweefsel, verkregen uit spierfascie van bijvoorbeeld de m. temporalis en (craniaal) periost. In de studie werden 7 patiënten betrokken, welke tussen 1988 en 1993 werden behandeld. In alle gevallen trad volledige sluiting op van de perforatie, met een diameter, variërend tussen 10 en 25 mm. De aetiologie van N.S.P. wordt beschreven evenals eventuele maatregelen ter preventie.

Tevens wordt een vergelijking getrokken tussen eerdere ervaringen opgedaan met andere technieken voor het sluiten van neusseptumperforaties. Door het verbeterde overzicht over diepliggende gedeelten in de neus en een toegenomen instrumentatie vrijheid wordt het sluiten van perforaties gemakkelijker gemaakt.

De postoperatieve controle periode is nog te kort om nu reeds uitspraken te doen over de kans op late re-perforaties.

In Hoofdstuk VII wordt aan de hand van casuïstiek de aetiologie, kliniek en chirurgische behandeling van verkregen neusdorsumpathologie beschreven, zoals een neusdorsumcyste ontstaan na een rhinoplastiek. De externe benadering met de

directe per-operatieve (visuele) controle werkt mogelijk preventief ter voorkoming van dergelijke late gevolgen en maakt de behandeling eenvoudiger.

Uit de in dit proefschrift verkregen resultaten kan nu worden geconcludeerd dat de externe benadering van het neusskelet ten behoeve van de correctieve neuschirurgie een veilige en betrouwbare methode is gebleken. De morbiditeit van de externe benadering, welke werd toegepast bij een serie opeenvolgende patiënten, verschilt niet van die welke wordt gezien bij de gesloten benadering. De vitaliteit van de columellaflap en het uiteindelijke resterende litteken blijken geen argumenten (meer) te zijn om de techniek op voorhand te veroordelen danwel af te wijzen. Dit bleek te gelden voor de patiënten alsmede voor de objectieve onderzoeker, hetgeen aansluit bij eerdere studies. Wel moet men bedacht zijn op het toenemende risico op een gestoorde wondgenezing bij de reconstructie van ernstige congenitale of post-traumatische neuspathologie, waarbij een aanzienlijk toename van de projectie geïnduceerd moet worden. Uiteraard wordt in alle gevallen uitgegaan van de premisse, dat de techniek in alle gevallen lege artis wordt uitgevoerd.

De overtuiging dat de externe benadering alleen gereserveerd dient te blijven in geval van gecompliceerde congenitale danwel posttraumatische neuspathologie kan worden verlaten gelet op de resultaten verkregen bij die patiënten, die om overwegende esthetische redenen werden behandeld voor zgn. "minimale" afwijkingen. Dit is conform de observaties elders, zelfs in landen met zwaarwegende medico-legale implicaties in de gezondheidszorg.

De specifieke voordelen van de externe benadering zijn gelegen in een versnelling van het leerproces door de directe visuele per-operatieve terugkoppeling tussen hetgeen pre-operatief was vastgesteld en geanalyseerd en de werkelijkheid. Derhalve is er bij een systematische consequente aanpak en beoefening van de externe benadering een toename te verwachten van de diagnostische vaardigheden, wetenschappelijke inzichten, en resultaat. De externe benadering dient onderwezen te worden in de opleidingsklinieken Keel-, Neus- en Oorheelkunde en een standaard onderdeel te vormen van het chirurgisch arsenaal van iedere Keel-, Neus- en Oorarts. De verandering van inzicht in de tot voor kort overwegende reductieve procedure naar een ingreep waarbij behoud van structuur en vorm op korte maar vooral ook op langere termijn op de voorgrond staan, wordt mede door de toepassing van de externe benadering gestimuleerd. De implementatie van een groeiend scala technieken voor gecontroleerde augmentatie gedurende de afgelopen jaren is hiervan een eerste bewijs. Door de visuele controle en directe benadering is een vermindering van het chirurgisch weefseltrauma te verwachten, hetgeen de reconvalescentie periode bekort.

Dit proefschrift pleit voor toepassing van de externe benadering. Zij krijgt de voorkeur behoudens bij de patiënten waarbij de pathologie pre-operatief exact kan worden geanalyseerd en hetzelfde resultaat kan worden verkregen met de gesloten techniek. De keuze is zuiver persoonlijk.

Dit proefschrift hoopt een bijdrage te hebben geleverd aan de verdere ontwikkeling van de plastische en reconstructieve aangezichtschirurgie in Nederland binnen het specialisme Keel-, Neus- en Oorheelkunde.

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VIDEOTAPE

Open approach for septorhinoplasty by Adamson P.A.

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External approach in aesthetic septorhinoplasty by Zijlker T.D. (1993)

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De collegae specialisten uit het Academisch Ziekenhuis Maastricht, in het bijzonder van de afdeling Pulmonologie, Paediatric, Dermatologie, Anesthesiologie en Radiologie met wie ik zeer plezierig heb kunnen samenwerken gedurende de afgelopen jaren.

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Het secretariaat Keel-, Neus- en Oorheelkunde, in het bijzonder mej. Anouk Brandts, die het manuscript en overige publicaties met grote toewijding en zorg tot in de perfectie verzorgd heeft.

Van groot belang is de bijdrage geweest van de Audiovisuele Dienst van het Academisch Ziekenhuis Maastricht. De medewerkers hebben gedurende de afgelopen jaren altijd klaar gestaan om de klinische en wetenschappelijke vorderingen fotografisch en/of op video vast te leggen.

De patiënten, die hun vertrouwen schonken en zonder wie dit onderzoek niet mogelijk was geweest.

Mijn echtgenote, Patrice en mijn twee "mannen", Derk en Mees, voor alles wat zij voor mij betekenen.

Curriculum vitae

De auteur werd op 31 augustus 1953 geboren te Waardenburg. Nadat in 1972 met succes het eindexamen H.B.S.-B aan de R.H.B.S. te Zaltbommel was behaald, werd na uitloting in 1972 een jaar later de studie Geneeskunde aan de Rijksuniversiteit Groningen aangevangen. In 1976 werd hij benoemd tot Senator van het Groninger Studenten Corps "Vindicat atque Polit". In augustus 1981 werd het artsexamen behaald. Van september 1981 tot april 1982 was hij werkzaam als arts-assistent niet in opleiding aan de afdeling Keel-, Neus- en Oorheelkunde van het Academisch Ziekenhuis der Vrije Universiteit te Amsterdam. Op 1 april 1982 werd een aanvang genomen met de opleiding tot Keel-, Neus- en Oorarts onder leiding van Prof.dr. G.B. Snow en Dr. T. Bottema, B-opleider in het Westeinde Ziekenhuis te Den Haag. Op 1 april 1986 vond inschrijving in het specialistenregister plaats. Van 1 april 1986 tot 1 april 1993 was hij verbonden als stafmedewerker aan de vakgroep Keel-, Neus- en Oorheelkunde van het Academisch Ziekenhuis Maastricht (Hoofd: Prof.dr. E.H.M.A. Marres). In deze zeven jaar ontwikkelde hij zich binnen het subspecialisme rhinologie. Hiertoe werden stages gevolgd o.m. in het Academisch Ziekenhuis van de Universiteit van Erlangen-Nürnberg te Erlangen, Duitsland o.l.v. Prof.dr. G. Rettinger. De functionele, oncologische, reconstructieve en esthetische chirurgie van de neus werden evenals de functionele endoscopische chirurgie van de neusbijholten binnen de kliniek geïntroduceerd, verder ontwikkeld en uitgedragen. In 1989 en 1991 werd mede op zijn initiatief een tweetal internationale nascholingscursussen over plastische en reconstructieve aangezichtschirurgie gehouden te Maastricht. Hij is medeoprichter en secretaris van de landelijke werkgroep Plastische en Reconstructieve Aangezichtschirurgie en lid van de Europese, Canadese en Amerikaanse Academie voor Plastische en Reconstructieve Aangezichtschirurgie. Sedert 1 april 1993 is hij werkzaam als Keel-, Neus- en Oorarts binnen de maatschap Keel-, Neus- en Oorheelkunde Oostelijk Zuid-Limburg, op de locatie Heerlen in het De Wever Ziekenhuis, waaraan een B-opleiding Keel-, Neus- en Oorheelkunde is verbonden en op de locatie Brunssum, in het Ziekenhuis St. Gregorius. Sedert 1980 is hij gehuwd en heeft twee zoons.

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