VOLUME 99 • NUMBER 5 • APRIL 1997

PLASTIC AND RECONSTRUCTIVE SURGERY®

AMERICAN SOCIETY OF
PLASTIC AND RECONSTRUCTIVE
SURGEONS, INC.

Journal of the American Society of Plastic and Reconstructive Surgeons, Inc.
Official Organ of the American Association of Plastic Surgeons
Official Organ of the American Society for Aesthetic Plastic Surgery, Inc.
Official Organ of the American Society of Maxillofacial Surgeons

The Lateral Nasal Osteotomy in Rhinoplasty: An Anatomic Endoscopic Comparison of the External versus the Internal Approach

Rod J. Rohrich, M.D., John J. Minoli, M.D., William P. Adams, M.D., and Larry H. Hollier, M.D.

Dallas, Texas and New York, N.Y.

Reprinted from PLASTIC AND RECONSTRUCTIVE SURGERY *April 1997*

The Lateral Nasal Osteotomy in Rhinoplasty: An Anatomic Endoscopic Comparison of the External versus the Internal Approach

Rod J. Rohrich, M.D., John J. Minoli, M.D., William P. Adams, M.D., and Larry H. Hollier, M.D.

Dallas, Texas and New York, N.Y.

A precise and reproducible lateral osteotomy is a requirement for successful rhinoplasty. Two basic techniques have evolved: the external perforated method and the internal continuous method. The literature supporting the external perforated technique maintains that it contributes to a controlled, stable fracture and produces less nasal airway narrowing, hemorrhage, edema, and ecchymosis; however, the continuous internal method is used by many rhinoplasty surgeons. Our study was designed to compare the two techniques in the fresh cadaver nose using a blinded endoscopic evaluation of the nasal mucosa after the osteotomies were performed by one of these two techniques.

Nineteen fresh cadaver heads had an external perforated lateral osteotomy performed on one side and an internal continuous lateral osteotomy performed on the alternate side by an investigator with experience in the use of both osteotomies. In a blinded fashion, four different investigators used nasal endoscopy to detect mucosal perforations and bony irregularities. Eleven percent of the perforated osteotomies resulted in mucosal tearing as opposed to 74 percent of the continuous osteotomies ($p < 0.001$). This anatomic study confirms our clinical experience that the external perforated osteotomy results in a more controlled fracture with less intranasal trauma and can minimize the associated morbidity (hemorrhage, edema, and ecchymosis) in the rhinoplasty patient. (*Plast. Reconstr. Surg.* 99: 1309, 1997.)

The lateral nasal osteotomy is an integral part of rhinoplasty for reshaping lateral nasal contour, narrowing the nasal base, realigning the nasal dorsum, and correcting an open roof deformity.[1–3] Two of the most frequently used nasal osteotomies are the external (percutaneous) perforated and the internal (endonasal) continuous techniques.[2]

During rhinoplasty, the lateral osteotomy can be the least controlled aspect of the operation because of the potential for associated hemorrhage and subsequent edema.[4] Numerous complications have been reported, including infection, hemorrhage, excessive edema, anosmia, canalicular trauma, intracranial injury, aesthetic deformity, functional airway narrowing, and nasal obstruction.[5,6] The ideal nasal osteotomy technique delivers predictable control and precision to maximize the aesthetic and functional results while limiting the potential for complication.[2,5] Nevertheless, the optimal method of lateral nasal osteotomy in rhinoplasty remains controversial, as evidenced by the variety of techniques in use.[2,4–11]

Previous studies that compared a variety of lateral nasal osteotomy techniques used skin surface dissections to analyze results; however, they did not employ an endoscopic evaluation of the nasal mucosa.[2] The purpose of this study was to assess the incidence and degree of intranasal mucosal tearing produced by two lateral osteotomy approaches using an endoscopic evaluation in the fresh cadaver nose after the osteotomies.

Materials and Methods

Nineteen fresh cadaver specimens were used, ranging in age from 25 to 85 years and having a gender distribution of 10 males and 9 females. One of the investigators with rhinoplasty experience in each of the techniques performed all the osteotomies.

Since no hump reduction or open roof de-

From the Department of Plastic and Reconstructive Surgery at the University of Texas Southwestern Medical Center. Received for publication October 27, 1995; revised March 4, 1996.

Presented at the Annual Meeting of the Texas Society of Plastic Surgeons, in Dallas, Texas, on May 20, 1995; received the Thomas D. Cronin Plastic Surgery Award, Second Prize.

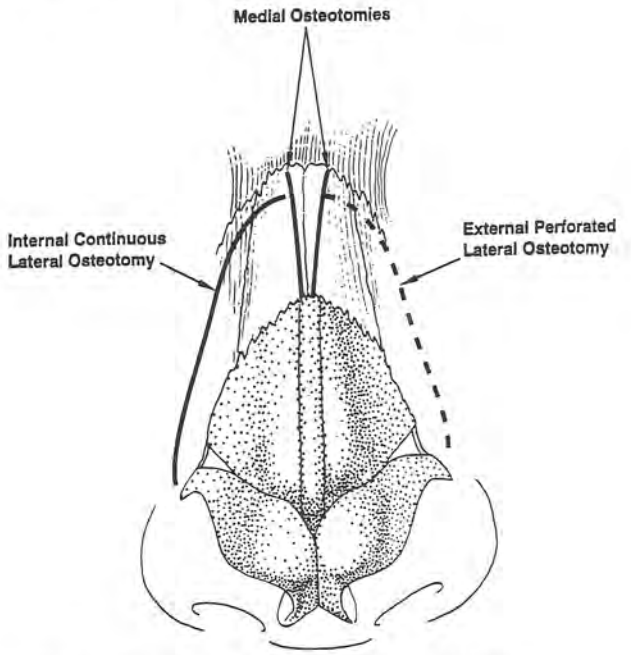

FIG. 1. Type and location of nasal osteotomies.

formity was created, medial osteotomies were performed through bilateral 3-mm intercartilaginous incisions with a straight 2-mm Parkes osteotome; this was done on all cadavers to facilitate the infracture and mimic the clinical situation. On one side, a 3-mm stab incision was made with a no. 15 scalpel blade on the lateral aspect of the nose along the nasofacial groove at the level of the inferior orbital rim. A straight 2-mm Parkes osteotome was used through this incision to perform an external perforated lateral osteotomy in a "high to low to high" pattern[1,2,9,10] (Fig. 1). On the alternate side, a 3-mm stab incision was made with a no. 15 scalpel blade in the nasal vestibule at the piriform aperture. A curved 2-mm Neivert osteotome (with the guard notch positioned medially) was used through this incision to perform an internal continuous lateral osteotomy in a "high to low to high" pattern along the nasofacial groove (see Fig. 1). Finally, the nasal pyramid was infractured digitally on each cadaver.

Blinded to the technique employed on each side, four independent examiners inspected the intranasal cavities of all cadavers with a 4-mm 30-degree rigid Storz endoscope illuminated by halogen. With particular emphasis on the identification of bony dehiscence/exposure and mucosal tearing, the examiners recorded the condition of the internal nasal anatomy on separate data sheets. The results were assessed by chi-squared analysis.

TABLE I

Endoscopic Mucosal Tearing Visualized after Internal/External Osteotomies

External perforated osteotomy	11% (2 of 19, $p < 0.001$)
Internal continuous osteotomy	73% (14 of 19, $p < 0.001$)

RESULTS

All examiners independently recorded identical findings from their separate endoscopic examinations (Table I). Two of the 19 (11 percent) external perforated osteotomy sites exhibited tearing of the nasal mucosa, while 14 of the 19 (74 percent) internal continuous lateral osteotomy sites demonstrated such tears ($p < 0.001$, chi-squared test) (Figs. 2 and 3). All mucosal tearing occurred just anterior to the middle turbinate. None of the cadavers had more than one perforation, and no bony dehiscences or exposures were identified.

DISCUSSION

Numerous techniques of lateral nasal osteotomies have evolved over the last century, incorporating the use of different instruments from the saw to the chisel.[1,2,12] Approaches to the nasal pyramid vary to include the oral, endonasal, and percutaneous routes.[1,2,4–11] Furthermore, the treatment of the nasal pyramid itself commonly involves either the perforated technique, which maintains periosteal support, or the continuous technique, which does not.[1,2,5,6,8] The continuous lateral nasal osteotomy is recognized for its ability to increase the mobility of the bony vault and to narrow the nose; however, in so doing, it can constrict the piriform aperture enough to compromise the airway as well as create significant soft-

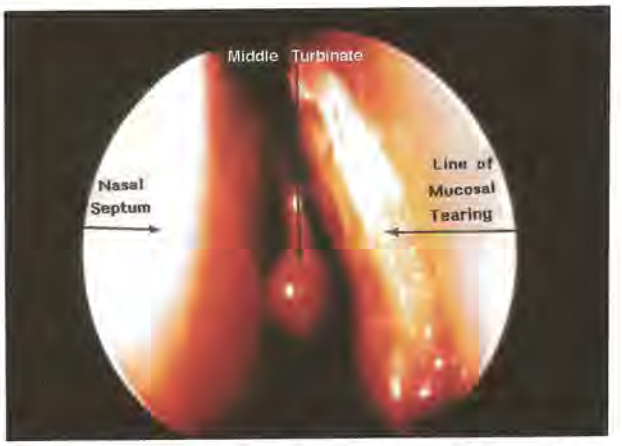

FIG. 2. Endoscopic view of mucosal tear with internal continuous osteotomy.

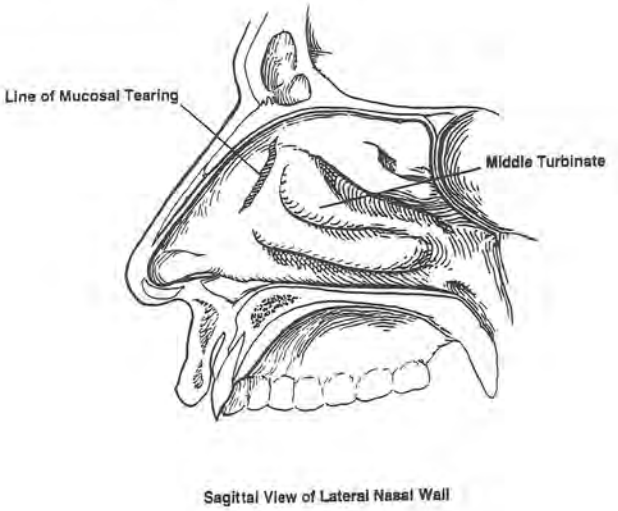

FIG. 3. Sagittal view of lateral nasal wall demonstrating mucosal tear anterior to the middle turbinate.

tissue displacement and subcutaneous air pocketing[5] (Table II). (The "high to low to high" osteotomy pattern, popularized almost 20 years ago, was developed specifically to minimize such airway narrowing by preserving a wedge of maxillary bone and adjacent nasal suspensory ligaments at the lateral base of the piriform aperture; at present, it is commonly and effectively used by many surgeons who still prefer the continuous lateral nasal osteotomy approach.[2,9,10])

In our experience, the lateral nasal approach is associated with an increase in hemorrhage, edema, and ecchymosis. This is substantiated in other studies and can contribute significantly to postoperative morbidity after rhinoplasty.[1,6]

Conversely, the perforated osteotomy preserves support of the periosteum and, in so doing, reduces lateral nasal wall collapse and minimizes hemorrhage and edema.[1,2,5,6,8] External access offers several advantages. It is controlled and direct, it reduces bleeding and swelling, and it offers consistent results, particularly along the superior portion of the osteotomy, which requires an exaggerated, oblique reach through the internal approach[2] (Table III).

TABLE II
Internal Continuous Lateral Nasal Osteotomy[5]

Advantages	Disadvantages
Increased mobility of bony nasal vault	Piriform aperture narrowing with nasal airway compromise
Consistent narrowing of nasal pyramid	Significant soft-tissue displacement
	Creation of air pocketing
	Increased hemorrhage, ecchymosis, and edema

TABLE III
External Perforated Lateral Nasal Osteotomy[2,8]

Advantages	Disadvantages
Preserved periosteal support	Nasal asymmetry
Limited nasal bone subluxation	External scarring
Reduced lateral nasal wall collapse	
Prevention of nasal airway compromise	
Reduced hemorrhage, ecchymosis and edema	

The results of this anatomic study are substantial in that four independent investigators recorded identical findings. The different outcomes of the two techniques did not include identifiable bony irregularities, since none were noted in any case. Rather, the difference was the incidence of mucosal trauma. Interestingly, regardless of technique, when mucosal tearing did occur, it was identified just anterior to the middle turbinate, corresponding to the direct line of the osteotomy.

This study's objective findings support our clinical experience of the past 10 years that the external perforated technique provides excellent control, is direct, and minimizes hemorrhage, edema, and ecchymosis postoperatively. Furthermore, in our clinical practice, scarring from the small external incisions overlying the nasofacial grooves has never been problematic; the scars are imperceptible.

Rod J. Rohrich, M.D.
Department of Plastic and Reconstructive Surgery
The University of Texas Southwestern Medical Center
5323 Harry Hines Blvd.
Dallas, Texas 75235-9132

ACKNOWLEDGMENTS

We would like to express our sincere appreciation to Dr. Jack B. Robinson, Jr., Director of Plastic Surgery Research, for his editorial input and statistical analysis, and to Dr. Lee K. Thornton, a UTSW general surgery resident who assisted in this anatomic project.

The Dallas Rhinoplasty Symposium Educational Fund provided the funding for this project.

REFERENCES

1. Rohrich, R. J. Rhinoplasty: Dorsal reduction and osteotomies. *Dallas Rhinoplasty Symp.* 12: 209, 1995.

2. Murakami, C. S., and Larrabee, W. F., Jr. Comparison of osteotomy techniques in the treatment of nasal fractures. *Facial Plast. Surg.* 8: 209, 1992.
3. Parkes, M. L., Borowiecki, B., and Binder, W. Functional sequelae of rhinoplasty. *Ann. Plast. Surg.* 4: 116, 1980.
4. Hilger, J. A. The internal lateral osteotomy in rhinoplasty. *Arch. Otolaryngol.* 88: 119, 1968.
5. Ford, C. N., Battaglia, D. G., and Gentry, L. R. Preservation of periosteal attachment in lateral osteotomy. *Ann. Plast. Surg.* 13: 107, 1984.
6. Goldfarb, M., Gallups, J. M., and Gerwin, J. M. Perforating osteotomies in rhinoplasty. *Arch. Otolaryngol. Head Neck Surg.* 119: 624, 1993.
7. Wright, W. K. General principles of lateral osteotomy and hump removal. *Trans. Am. Acad. Ophthalmol. Otolaryngol.* 854, 1961.
8. Diamond, H. P. Rhinoplasty technique. *Surg. Clin. North Am.* 51: 317, 1971.
9. Webster, R. C., Davidson, T. M., and Smith, R. C. Curved lateral osteotomy for airway protection in rhinoplasty. *Arch. Otolaryngol.* 103: 454, 1977.
10. Farrior, R. T. The osteotomy in rhinoplasty. *Laryngoscope* 88: 1449, 1978.
11. Parsa, F. D. Intraoral versus intranasal approach to lateral osteotomy. *Plast. Reconstr. Surg.* 90: 341, 1992.
12. Rubin, F. F. Reconstruction of the bony nasal pyramid: Three new instruments. *Arch. Otolaryngol.* 88: 279, 1968.

Discussion

The Lateral Nasal Osteotomy in Rhinoplasty: An Anatomic Endoscopic Comparison of the External versus the Internal Approach

by Rod J. Rohrich, M.D., John J. Minoli, M.D., William P. Adams, M.D., and Larry H. Hollier, M.D.

Discussion by Nicolas Tabbal, M.D.

Through an endoscopic examination, Rohrich et al. assess in this paper the impact of lateral nasal osteotomy on the intranasal anatomy. Two osteotomy techniques are compared, the frequently used continuous one, performed through an intranasal approach using a single guarded osteotome, and the percutaneous interrupted osteotomy, using a straight osteotome.

Nasal endoscopy on fresh cadavers clearly demonstrates an increased propensity for mucosal tears to occur when a single guarded osteotome is used (73 percent), even in the hands of an experienced operator. In contradistinction, mucosal injuries are noted less frequently (11 percent) when an interrupted osteotomy is performed using a straight osteotome. Several previous clinical studies[1,2] have alluded to an increased morbidity with use of the single guarded osteotome, in terms of both increased postoperative bruising and swelling and an excessive mobilization of the nasal bones with associated airway compromise. None of these observations, however, were correlated with objective intranasal findings. The presence of mucosal tears increases the risk of postoperative bleeding and reflects poorly on the approach used, indicating a lack of control in execution of this surgical step.

While this study does not categorically prove the advantage of the percutaneous interrupted approach in providing more control to this notoriously unpredictable step in a rhinoplasty, it clearly demonstrates its superiority in significantly lowering the incidence of intranasal mucosal disruptions when compared with a continuous osteotomy. It would be of great interest to compare in a follow-up study the percutaneous approach with the one used more frequently in clinical settings, namely, the intranasal approach using a straight osteotome. Since these two interrupted osteotomy techniques share the same instrument and differ only in their site of entry, any statistically meaningful difference between them can only be ascribed to the surgical access site. Should the percutaneous approach again prove superior, its main theoretical disadvantage, the generally favorable cutaneous scar on the cheek, should become less of a deterrent, a situation very similar to the choice between the open or closed approach to rhinoplasty.

Nicolas Tabbal, M.D.
521 Park Avenue
New York, N.Y. 10021

REFERENCES

1. Ford, C. N., Battaglia, D. G., and Gentry, L. R. Preservation of periosteal attachment in lateral osteotomy. *Ann. Plast. Surg.* 13: 107, 1984.
2. Goldfarb, M., Gallups, G. M., and Gerwin, J. M. Perforating osteotomies in rhinoplasty. *Arch. Otolaryngol. Head Neck Surg.* 119: 624, 1993.

Received for publication September 13, 1996.