Open vs Closed Approach to the Nasal Pyramid for Fracture Reduction

Michael J. Reilly, MD; Steven P. Davison, MD, DDS

Objective: To compare an open vs a closed approach to the nasal pyramid for the initial repair of nasal fractures.

Methods: Retrospective medical record review of 49 patients with acute nasal fractures treated by a single surgeon during a 5-year period. Patients underwent a closed approach to the nasal pyramid (Boise elevator only) or an open approach using rhinoplasty techniques, including rasping, osteotomies, and cartilaginous resection or augmentation. Patients were further categorized based on whether septoplasty was performed. The primary outcome measure was the revision rate (RR).

Results: All 49 patients with acquired nasal deformities underwent repair within 3 weeks of the date of injury. The cohort was filtered into the following 5 groups: group 1 (closed approach to the nasal pyramid; RR, 1/15 [6.7%]), group 2 (closed approach to the nasal pyramid with septoplasty; RR, 3/4 [75.0%]), group 3 (open approach to the nasal pyramid; RR, 0/10 [0.0%]), group 4 (open approach to the nasal pyramid with septoplasty; RR, 1/15 [6.7%]), and group 5 (prior cosmetic septorhinoplasty; RR, 5/5 [100.0%]).

Conclusion: In patients with nasal fractures and associated septal deviation requiring septoplasty, RRs may be notably reduced by using an open approach to the nasal pyramid at the time of the initial repair.

Arch Facial Plast Surg. 2007;9:82-86

There are more than 50,000 nasal fractures per year in the United States, making the nose the most commonly fractured bone in the face and the third most commonly fractured bone in the body.1 An estimated 39% of all facial fractures involve the nasal bones.2 Closed reduction has been the treatment paradigm for nasal fractures for more than 5000 years.3 Patient satisfaction rates with this procedure range from 62% to 91%, while surgeon satisfaction rates are typically much lower (21%-65%).4 Although not all dissatisfied patients pursue further surgery, 15% to 50% of those having closed reduction of a nasal fracture will ultimately undergo revision rhinoplasty.5 This has led individual surgeons to consider taking a more aggressive initial approach. Some surgeons advocate open septoplasty along with closed reduction of nasal fractures, while others add standard osteotomies to their repair technique.6-9 Other surgeons have reported success using full septorhinoplasty as the procedure of choice.10,11

Given the assortment of philosophical approaches to nasal fracture repair and the ostensible need to tailor this surgery to the individual patient, we undertook a 5-year review of patients with acute nasal fractures to determine if certain groups of patients enjoyed superior results based on the surgical technique used. We specifically asked the following questions: Does an open approach to the nasal pyramid reduce reoperation rates? Are there identifiable risk factors that increase the likelihood of reoperation?

Methods:

Following institutional review board approval, a retrospective medical record review was performed on all patients with acute nasal fractures who underwent repair during a 5-year period (January 1, 2001, to December 31, 2005) by a single surgeon (S.P.D.). Case logs were reviewed, and patients with an International Classification of Diseases, Ninth Revision code of 802.1 (nasal fracture) or a Current Procedural Terminology code between 21315 and 21335 (nasal fracture repair) were
identified. Patients who underwent repair more than 3 weeks from the date of reported injury were excluded from the study.

Medical records were then appraised for the following patient data: age, sex, mechanism of injury, time to repair, need for revision, intraoperative details, and duration of follow-up.

Figure. Group 4 female patient, aged 32 years at the time of nasal fracture. A, Anterior view 12 days after experiencing bilateral nasal bone fractures from a soccer injury. She had an associated septal fracture and deviation. B, Lateral preoperative view 12 days after injury reveals a prominent dorsal hump and a preexisting underrotated tip. C, Anterior view 11 months after surgery shows straightening of the nasal dorsum with improved dorsal aesthetic lines. Osteotomies were performed to mobilize the dorsum, and septoplasty was performed to alleviate nasal obstruction and internal tugging forces. D, Lateral view 11 months after surgery reveals reduction of the nasal dorsum and improvement in tip rotation. Rhinoplasty techniques, including dorsal rasping and delicate caudal cartilage resection, were used at the time of the initial repair.
Patients were studied. Fifty-nine patients had undergone prior septoplasty (group 4; RR, 1/15 [6.7%]). Five patients had undergone prior cosmetic septorhinoplasty (group 5; RR, 5/5 [100.0%]). All data were analyzed using the non-parametric Kruskal-Wallis test and were found to be statistically significant (P<.01, indicating a probability of <1 in 100 that the observed differences in RRs is due to chance).11

Data may be analyzed with respect to an open vs a closed approach to the nasal pyramid. Four (21.1%) of 19 patients who underwent a closed approach to the nasal pyramid required revision, as did 6 (20.0%) of 30 patients who underwent an open approach to the nasal pyramid; however, 5 of 6 revisions in the open group were performed in patients who had undergone prior cosmetic septorhinoplasty (Table 2). When excluding patients who had undergone prior cosmetic septorhinoplasty, there was only 1 revision (4.0%) among 25 patients who underwent an open approach to the nasal pyramid.

These data should also be examined based on whether septoplasty was performed. Among the patients who did not require septoplasty (groups 1 and 3), there was only 1 revision (4.0%) among 25 cases, as already noted (Table 3). This denotes a high success rate for patients without substantial septal trauma regardless of the approach to the nasal pyramid. However, in comparing the 3 groups of patients who required septoplasty (groups 2, 4, and 5), there is wide variation in RRs (RR range, 6.7% [1/15] to 100.0% [5/5]) (Table 1), with an overall RR of 37.5% (9/24) (Table 3).

There is potential for selection bias in a retrospective review, especially in one that assesses the outcomes from different surgical techniques. In our series, patients with less severe fractures (ie, unilateral and greenstick) underwent a closed approach to the nasal pyramid. In patients with more complex fractures (ie, collapsed, openbook, comminuted, and bilateral), the operating surgeon typically used an open approach to the nasal pyramid.

### Table 1. Revision Rates Based on Group and Reason for Revision

<table>
<thead>
<tr>
<th>Group</th>
<th>Procedure</th>
<th>No. of Patients</th>
<th>No. (%) of Revisions</th>
<th>Reason for Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Closed approach to the nasal pyramid</td>
<td>15</td>
<td>6 (6.7)</td>
<td>Cosmetic</td>
</tr>
<tr>
<td>2</td>
<td>Closed approach to the nasal pyramid with septoplasty</td>
<td>4</td>
<td>3 (75.0)</td>
<td>Obstructive</td>
</tr>
<tr>
<td>3</td>
<td>Open approach to the nasal pyramid</td>
<td>10</td>
<td>2 (20.0)</td>
<td>Combined</td>
</tr>
<tr>
<td>4</td>
<td>Open approach to the nasal pyramid with septoplasty</td>
<td>15</td>
<td>1 (6.7)</td>
<td>Combined</td>
</tr>
<tr>
<td>5</td>
<td>Prior cosmetic septorhinoplasty</td>
<td>5</td>
<td>5 (100)</td>
<td>Combined</td>
</tr>
</tbody>
</table>

### Table 2. Revision Rates Based on Open vs Closed Approach to the Nasal Pyramid

<table>
<thead>
<tr>
<th>Groups</th>
<th>Procedure</th>
<th>No. of Patients</th>
<th>No. (%) of Revisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>Closed approach to the nasal pyramid</td>
<td>19</td>
<td>4 (21.1%)</td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>Open or closed approach to the nasal pyramid</td>
<td>30</td>
<td>6 (20.0%)</td>
</tr>
<tr>
<td>3, 4</td>
<td>Open approach to the nasal pyramid with septoplasty (excluding prior cosmetic septorhinoplasty)</td>
<td>25</td>
<td>1 (4.0%)</td>
</tr>
</tbody>
</table>

### Table 3. Revision Rates Based on Performance of Septoplasty

<table>
<thead>
<tr>
<th>Groups</th>
<th>Procedure</th>
<th>No. of Patients</th>
<th>No. (%) of Revisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 3</td>
<td>Open or closed approach to the nasal pyramid</td>
<td>25</td>
<td>1 (4.0%)</td>
</tr>
<tr>
<td>2, 4, 5</td>
<td>Open approach to the nasal pyramid with septoplasty</td>
<td>24</td>
<td>9 (37.5%)</td>
</tr>
</tbody>
</table>

*Five of 6 revisions were in patients who had undergone prior cosmetic septorhinoplasty.

(84)
This would place the patients who underwent a closed approach to the nasal pyramid at an advantage for more successful repair; however, this was not found to be true in our series.

While many facial trauma surgeons prefer to operate within a 7- to 10-day period following injury, the patients included in this study were operated on up to 21 days after the date of injury. Therefore, these data may not be generalizable to patients who undergo repair at earlier time points.

It is important to acknowledge the small number of patients in 2 of the treatment groups (group 2 [n = 4] and group 5 [n = 5]). However, the statistical significance calculated using the Kruskal-Wallis test is valid even when certain groups include as few as 3 observations.\(^{11}\)

Finally, there is the possibility of bias from patients who may not have returned to the same physician for revision surgery. We do not believe that these numbers are likely to be higher in one particular group than in another; therefore, this would not substantially affect the observed data.

**COMMENT**

It has been suggested in the literature that patients undergoing repair for nasal fractures have lower postoperative expectations than patients undergoing cosmetic rhinoplasty.\(^{9}\) Therefore, traditional practices have emphasized an approach allowing minimal intervention that will produce a functional and aesthetic result.\(^{12-14}\) Unfortunately, many of the less invasive techniques have led to high rates of revision. In our review of 49 patients with acute nasal fractures, using an open approach to the nasal pyramid yielded an overall lower RR, especially among patients with traumatic septal deformity requiring septoplasty.

In 1984, Murray et al\(^6\) performed pioneering work in understanding the integral relationship of septal anatomy in nasal fracture repair. In cadaveric noses, these authors identified a characteristic C-shaped fracture of the nasal septum extending anteroinferiorly from the perpendicular plate down into the quadrangular cartilage. In the same study, the C-shaped fracture pattern was found consistently in patients who had deviation of the nasal dorsum by more than half its width.\(^6\) Murray et al speculated that it is the failure to release the energy stored in the overlapping portions of the displaced septum that results in tugging forces on the nasal pyramid. Therefore, they advocated open repair of the nasal septum in conjunction with nasal fracture reduction. Investigators of other studies\(^7,8\) have drawn similar conclusions.

Our study supports the principle of the septum as a key factor in nasal fracture repair. We identified its equally important role as an indicator of the degree of nasal trauma. The implication is that patients requiring septoplasty are likely to have experienced a more severe nasal fracture.\(^4\) In our series, patients requiring septoplasty who did not undergo a concomitant open approach to the nasal pyramid had a high RR (75.0% [3/4]). However, in patients requiring an open septoplasty who also underwent an open approach to the nasal pyramid, the RR was much lower (6.7% [1/15]). Therefore, the need for septoplasty can be a signal that open pyramid work is likely to be beneficial.

Other authors have studied a spectrum of approaches to nasal fracture repair. Clark and Stiernberg\(^9\) evaluated the use of complete osteotomies at the time of the initial fracture repair. Staffel\(^4\) reviewed the medical records of 26 patients who had undergone closed nasal fracture repair and was concerned by the results. This led him to develop a new treatment algorithm for nasal fracture repair, a variation of which was used in our series. It comprises the following steps: (1) closed manipulation alone, (2) septoplasty, (3) osteotomies, and (4) full septrhinoplasty if necessary. After each step in the process, the patient is evaluated for evidence of nasal drift or deformity, and the algorithm is continued if any is present. In the same study, Staffel demonstrated a statistically significant improvement in results using a ranked grading scale in a prospective series of 79 patients treated by this approach. Based on the mechanics of nasal fractures discussed herein, this is a rational approach. A pitfall to this technique is that it requires the surgeon to ascertain any irregularities during surgery. Furthermore, it does not provide the surgeon with any preoperative indication as to which groups of patients are likely to need the more invasive algorithm. Based on the data from our series, patients requiring septoplasty should undergo a concomitant open approach to the nasal pyramid.

While controversial, some authors have investigated using full septrhinoplasty for the initial repair of nasal deformity caused by trauma. Fernandes\(^5\) found notable improvement in patient satisfaction as indicated by the patients’ report of obtaining a good result with full septrhinoplasty (89% vs 38%). None of the patients in that series required an external incision on the nose, and the mean time to repair was 15 days. This series lends validity to using rhinoplasty techniques in certain patients with nasal fractures, but it fails to recognize the group of patients who may save time and medical resources by undergoing simple closed reduction.

There are data suggesting an increased incidence of nasal fracture in patients who have undergone prior cosmetic septrhinoplasty,\(^15\) but there are no data (to our knowledge) that indicate an abnormally high RR after fracture reduction in this population. The findings presented herein suggest a need for extensive preoperative counseling and for obtaining informed consent in this patient population because of their high risk for revision surgery (group 5; RR, 100.0% [5/5]).

**CONCLUSIONS**

Results from this study support opening the nasal pyramid in the treatment of nasal fractures with associated septal deformity. In our series, this decreased the revision rate from 75.0% (3/4) to 6.7% (1/15). Our analysis also demonstrates that prior cosmetic septrhinoplasty places a patient at much greater risk for needing revision surgery following a new-onset nasal fracture (100% [5/5] in our series). These patients should be counseled to this effect before any surgical intervention is initiated.

**Accepted for Publication:** October 30, 2006.

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Author Contributions: Study concept and design: Reilly and Davison. Acquisition of data: Reilly and Davison. Analysis and interpretation of data: Reilly and Davison. Drafting of the manuscript: Reilly and Davison. Critical revision of the manuscript for important intellectual content: Reilly and Davison. Statistical analysis: Reilly and Davison. Obtained funding: Reilly and Davison. Administrative, technical, and material support: Reilly and Davison. Study supervision: Davison.

Financial Disclosure: None reported.

Previous Presentation: This study was presented at the Ninth International Symposium of Facial Plastic Surgery; May 1, 2006; Las Vegas, Nev.

REFERENCES


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