Evaluation of the Goldman Tip Procedure in Modern-Day Rhinoplasty

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Objectives: To present a critical review of a single surgeon's long-term results using the Goldman tip procedure and to examine the current attitudes of a select group of experienced rhinoplasty surgeons concerning the Goldman tip procedure.

Design: A retrospective review was conducted of the medical records of all patients who underwent a Goldman tip procedure performed by the senior author (R.L.S.) between 1975 and 2001. Demographic data, long-term outcomes (minimum follow-up, 1 year), complications, and surgeon-patient satisfaction were analyzed. Also, surveys were mailed to a select group of 50 experienced rhinoplasty surgeons. The survey recipients were asked about their current use of the Goldman tip procedure and any concerns about the technique.

Results: A total of 166 cases were eligible for analysis. The mean age of the patients was 33.7 years, and a large percentage of the patients (43.4%) were male. The overall complication rate was 5.4%, with a revision rate of 1.2%. The survey response rate was 78% (39/50). Of the respondents, 14 (41%) are still using the Goldman tip procedure in their practice, although most of them use the technique relatively infrequently. The most common concerns regarding the procedure were unnatural appearance (41%), thin skin (13%), and adverse functional sequelae (8%). Nearly one third of the respondents had no major concerns about using the technique.

Conclusions: The Goldman tip procedure is a safe, effective technique for a select group of patients. A polling of experienced rhinoplasty surgeons revealed that only a small subset of surgeons support the continued viability of the Goldman technique as a surgical option.

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The desire to predictably create the ideal, nonsurgical, normal-appearing nasal tip has been the driving force for many talented and innovative surgeons. Yet, corrective surgery of the nasal tip remains one of the most challenging aspects of cosmetic rhinoplasty. Over the past century, as our understanding of nasal anatomy and its response to surgical manipulation has evolved, so, too, have the techniques of rhinoplasty. However, despite the obvious progress made in this field, no technique is without controversy.

With the exception of some minor alterations in technique, the Goldman tip procedure remains a time-honored and time-tested tool for the rhinoplasty surgeon. Although trends in rhinoplasty have changed since the inception of Goldman’s technique, his basic philosophy has withstood the test of time. In an era in which overresected, “cosmetic”-appearing noses are no longer in vogue, the Goldman tip procedure exemplifies a conservative, cartilage-sparing approach to nasal tip surgery. Furthermore, when performed correctly, in the appropriate patient population, it can provide the rhinoplasty surgeon with a predictable means of obtaining long-term, natural-appearing results (Figure 1).

Misconceptions regarding the Goldman technique may have evolved from a misunderstanding of the basic principles and philosophy of vertical dome division. Through critical analysis of the senior author’s (R.L.S.) 30-year experience with the Goldman technique, we intend to demonstrate the utility of this procedure and to define its relevancy and use in modern-day rhinoplasty. A select group of experienced rhinoplasty surgeons were surveyed concerning their current perceptions of the Goldman technique and their current indications for the use of this procedure.
Patients were selected from the senior author’s computerized rhinoplasty database, which includes information regarding patient demographics, preoperative analysis, operative techniques, postoperative results, and complications. Although this database does not include the senior author’s entire surgical experience, 1271 rhinoplasty cases with postoperative follow-up of at least 1 year were available for review. The records of all patients were entered into the database in a randomized fashion, without prior consideration of this study.

Sequential photographs were critically analyzed with respect to any complication(s) arising in the postoperative period. Each patient’s chart was reviewed for complaints of functional problems and/or patient dissatisfaction. The complications identified included tip asymmetry, columellar retraction, alar collapse, bossae formation, tip underprojection, tip overprojection, and tip overrotation. Age, sex, previous nasal surgery, and ethnic background were also recorded (Table 1). For comparison, similar data were analyzed in cases involving patients who had undergone rhinoplasty in which a tip technique other than the Goldman tip procedure was used (ie, Simons modification of vertical dome division, complete strip procedures, “hockey-stick” modification of vertical dome division, and suture techniques) (Table 1).

Table 1. Demographic Characteristics of Patients Undergoing Nasal Tip Surgery*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Goldman Tip (n = 166)</th>
<th>All Other Tips (n = 1105)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (range), y</td>
<td>33.7 (12-82)</td>
<td>28.9 (13-72)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>72 (43.4)</td>
<td>214 (19.4)</td>
</tr>
<tr>
<td>F</td>
<td>94 (56.6)</td>
<td>891 (80.6)</td>
</tr>
<tr>
<td>Primary rhinoplasty</td>
<td>147 (88.5)</td>
<td>945 (85.5)</td>
</tr>
<tr>
<td>Revision rhinoplasty</td>
<td>19 (11.5)</td>
<td>160 (14.5)</td>
</tr>
<tr>
<td>Ethnic background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>106 (64)</td>
<td>906 (82)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>39 (23)</td>
<td>162 (15)</td>
</tr>
<tr>
<td>African American</td>
<td>14 (8)</td>
<td>8 (1)</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>6 (4)</td>
<td>24 (2)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (1)</td>
<td>5 (0.5)</td>
</tr>
</tbody>
</table>

*All values other than age are expressed as number (percentage).

In an attempt to gain a better understanding of the current use and overall experiences with the Goldman technique, a questionnaire was developed and arbitrarily distributed to 50 respected rhinoplasty surgeons across the United States, Europe, and Canada. The surgeons were chosen based on their rhinoplasty experience (at least 10 years in practice) and reputation within the rhinoplasty community. They represent a diverse group with training in both endonasal and external techniques, and representatives of both the American Board of Facial Plastic and Reconstructive Surgery–American Academy of Facial Plastic and Reconstructive Surgery and the American Board of Plastic Surgery were included in the survey group. Survey recipients were asked to approximate the percentage of their practice that is focused on rhinoplasty, as well as the percentage of revision rhinoplasties that they perform each year. They were instructed to identify the surgical techniques in which they were primarily trained (endonasal, external, or both) and to approximate the percentage of cases, both primary and revision, in which they use the techniques. Furthermore, the surgeons were asked whether they learned the Goldman technique during their training or adopted it later in their career, and whether they have abandoned its use in their current practice. They were also asked to quantify their use of the Goldman technique and to define the specific cases in which they found the Goldman technique useful. Finally, they were asked to list any undesirable results or complications associated with the Goldman technique.

Methodology

The Goldman tip procedure was used in 166 (13.1%) of the 1271 cases reviewed. The mean age of the patients was 33.7 years. There were 72 male patients (43.3%) and 94 female patients (56.6%). Patient follow-up ranged from 1 to 18 years, with a mean follow-up of 3.8 years. The procedure was performed in 147 primary cases (88.5%) and 19 revision rhinoplasties (11.5%). The ethnic backgrounds of the patients varied, with whites representing approximately 64% of the cases; Hispanics, 23%; and African Americans, 8%; The rest of the patients were of Middle Eastern or Asian descent. The Goldman tip procedure was used in a greater percentage of nonwhite patients compared with the “control group.” Patients who underwent a tip surgery other than the Goldman technique were on average slightly younger (28.9 years vs 33.7 years).
years) and were predominantly female (80.6% vs 56.6%) (Table 1). The percentage of primary vs revision surgery was similar in both groups. A total of 9 untoward sequelae were identified in 8 of the 166 cases, representing an overall complication rate of 5.4%.

However, only 2 (1.2%) of the 8 patients required revision surgery as a result of patient and/or surgeon dissatisfaction.

Thirty-nine of the 50 surveys were returned, for an overall response rate of 78% (Table 2). Interestingly, although 14 (41%) of the 34 surgeons who were exposed to the Goldman technique during their careers continue to use the Goldman procedure in their current practice, only 5 of them do so with any significant regularity (>5% of total rhinoplasties). Also, nearly 59% of the surgeons who were trained to use the Goldman technique either have never performed it in practice or have since abandoned it completely. Ironically, despite the relatively few advocates of the Goldman tip procedure, nearly one third of the respondents stated that they had no major concern about using the technique. Of the rest of those surveyed, 16 (43%) were concerned about unnatural results, 5 (13%) were concerned about using the procedure in patients with thin skin, and 3 (8%) were worried about possible functional sequelae (Table 2).

**COMMENT**

Although Goldman\(^1\) alluded to the concept of vertical dome division in his 1954 article titled “Surgical Tips on the Nasal Tip,” it was not until 3 years later that he published the first article in which he outlined his surgical technique in detail. Goldman\(^2\)’s 1957 landmark article, “The Importance of the Mesial Crura in Nasal-Tip Reconstruction,” outlined a unique approach for attaining and maintaining tip projection without the use of implants or grafts. Although he illustrated his cartilage-splitting incision at the angle of the lobular dome in a vertical manner, the term vertical dome division was not used to describe the technique at that time. In fact, the term was not introduced into the literature until the 1980s, when it was coined by Simons,\(^3\) one of his former students.

The Goldman tip procedure, as originally described, is performed via an endonasal cartilage delivery approach and emphasizes the importance of the medial crura in tip repair.\(^4\) Although vertical dome division can be performed via an external approach, it has always been our preference, particularly in primary rhinoplasty, to use an endonasal delivery technique. By using the inherent strength of a chondrocutaneous strut fashioned from the 2 medial crura of the lower lateral cartilages, and their proper positioning to the caudal septum, the desired change in projection and rotation can be achieved. With this technique, there is no attempt to reconnect the cut medial and lateral edges of the alar cartilages, which theoretically would restrict the desired movement of the transected cartilage. Furthermore, in only 37% of our cases was it necessary to use additional cartilage between the medial crura to increase the strength of the already-formed chondrocutaneous strut. Generally, the addition of a columellar strut in the Goldman technique is reserved for patients with either thick skin or an extremely ptotic situation (Figure 2). As stated in Goldman’s 1957 article, “advantage is taken of the architecture of the mesial crura and the caudal margin of the septum for purposes of creating an esthetic tip which will not have an unnatural appearance.”\(^2\)

Although Goldman advocated his tip technique in nearly all situations, our position is less dogmatic. Review of the database reveals that the Goldman technique was used in only approximately 10% to 15% of our cases, and tended to be used more frequently in males, older patients, and nonwhites compared with all other tip techniques. Our indications for the use of the Goldman procedure have evolved with time, and certainly the degree of cartilage excision in the tip and along the dorsum has become far more conservative. A review of the senior author’s experience with this technique has clearly defined a distinct subset of patients who are most likely to benefit from the Goldman technique. This subset includes patients who have tips with poor projection, marked biffidity, heavy skin, and vertical displacement of the alar cartilage (Figures 3, 4, and 5). Also, the aging nose, which often demonstrates ptosis as a result of skin laxity, bony resorption, or disassociation of the upper and lower lateral cartilages, can also be dramatically improved with the Goldman technique (Figure 6). Furthermore, we agree with Friedman et al\(^4\) regarding the utility of this technique in revision surgery to correct nasal tip defects that might otherwise prove refractory to treatment. More succinctly, the Goldman tip technique is best used when significant changes in either nasal tip projection or direction are required.

### Table 2. Rhinoplasty Survey Results From 39 Surgeons

<table>
<thead>
<tr>
<th>Complication</th>
<th>No. of Patients</th>
</tr>
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<tbody>
<tr>
<td>Tip/alar symmetry</td>
<td>2</td>
</tr>
<tr>
<td>Underprojection</td>
<td>2</td>
</tr>
<tr>
<td>Overprojection</td>
<td>1</td>
</tr>
<tr>
<td>Alar collapse</td>
<td>2</td>
</tr>
<tr>
<td>Overrotated tip</td>
<td>1</td>
</tr>
<tr>
<td>Synechial web</td>
<td>1</td>
</tr>
</tbody>
</table>

| Years in practice, mean (range)       | 24.4 (9-50)     |
| Percentage of practice focused on rhinoplasty, mean (range) | 34.9 (5-80)     |
| Percentage of revision rhinoplasty, mean (range) | 34.3 (5-80)     |
| Exposed to Goldman technique during residency or fellowship training, No. (%) | 13/34 (38)      |
| Adopted Goldman technique later in career, No. (%) | 2               |
| Still using Goldman technique in current practice, No. (%) | 14/34 (41)      |
| Abandoned Goldman technique in current practice, No. (%) | 7/34 (21)       |
| Never performed Goldman technique in practice despite learning it during training, No. (%) | 13/34 (38)      |
| Major concern with the Goldman technique, No. | 7/34 (21)       |

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Anecdotally, the Goldman tip procedure has been associated with the undesirable postoperative sequelae of underprojection, tip asymmetries, bossae, valve collapse, and alar retraction. These complications, however, are likely the result of combining excisional techniques with the incisional techniques of vertical dome division, and not a direct consequence of simply dividing the domes. It is this basic misunderstanding of the difference between these philosophies that leads to undesirable outcomes. Many surgeons have advocated removing large amounts of lower lateral cartilage as a means of increasing tip rotation. This method relies heavily on postoperative fibrosis to accomplish the desired change in rotation and in turn leaves the lateral alar support structurally weakened. Therefore, the possibility of alar retraction, lateral wall collapse, and/or bossae formation is much greater. With increased emphasis placed on conserving cartilage, especially with regard to the width of the lateral crura, problems with nasal tip asymmetries and unnatural-appearing results are less common with vertical dome division than with techniques involving intact caudal borders and excessive cartilage excision. By maintaining adequate support laterally, ie, by not removing more than 30% of the width of the lateral crura, and by reestablishing medial support by the creation of a chondrocutaneous strut,
nal tip support is preserved and there is less susceptibility to the scar contracture forces that are responsible for bossae formation. This is particularly true in cases in which the preoperative analysis reveals thin skin, firm alar cartilage, and interdomal bifidity. It is imperative that the surgeon recognizes this situation preoperatively and makes a concerted effort to reestablish strong medial support and avoid overexcision of cartilage laterally.

As mentioned previously, we found our revision rate to be relatively low (1.2%) with the Goldman tip technique. In the 2 cases that required revision surgery, both patients complained of unilateral nasal obstruction. Examination revealed unilateral alar collapse as the underlying cause. One patient required a standard onlay graft of conchal cartilage to correct the alar collapse. The second case was of particular interest, as this patient presented preoperatively with weak alar cartilages and a preexisting unilateral alar collapse. He also displayed mildly dysmorphic facial features, with evidence of maxillary/midfacial hypoplasia. Special care

Figure 4. An 18-year-old man with an overprojected nasal dorsum, poor lobular projection, and retrognathia is shown at presentation (A-D) and 2 years after undergoing nasoseptal reconstruction with the Goldman tip technique and mentoplasty (E-H). Note the strong, natural-appearing dorsal profile on lateral views (F and G), as well as the increase in lobular distance, without the use of grafts or implants.

Figure 5. A 22-year-old man presented with a ptotic nasal tip, an overprojected dorsum, and a high septal angle (A-D). Note the active nature of the tip on smiling view (C). Same patient 6 years after undergoing a Goldman tip procedure (E-H). Note the formation of a natural double break and maintenance of tip position on smiling view (G).
was taken to preserve lateral crural cartilage; however, there was worsening of the airway obstruction after surgery. On examination, a web of scar tissue was identified at the junction of the transected left dome. This finding along with the preexisting alar collapse caused further narrowing in the region of the internal nasal valve. It should be noted that this case represents the only time in which the senior author has witnessed the formation of a vestibular web/synechiae between the divided medial and lateral crura. Conchal cartilage onlay grafts, lysis of the intradomal synechiae, and placement of a composite graft were required to correct the complication. In retrospect, performing the Goldman tip procedure in the setting of preexisting alar collapse and weak cartilage support further illustrates the importance of maintaining lateral strength and even possibly considering measures to additionally strengthen the lateral crura in such a situation.

Analysis of the survey revealed that the most common indications cited for using the Goldman tip procedure were noses with poor projection (n=9), thick skin (n=9), bulbous/wide tips (n=7), tip ptosis (n=5), and ethnic noses (n=5). Overprojected tips (n=4), revision surgery (n=2), infantile lobules (n=2), asymmetry (n=2), and traumatic/congenital deformities (n=1) were also listed as indications, although less frequently. These findings are consistent with, and support our own philosophy regarding, the indications for and use of the Goldman tip procedure in modern-day rhinoplasty. Although the analysis of our survey revealed that a relatively large percentage (41% [n=14]) of surgeons continue to use the Goldman technique, fewer than 15% (n=5) do so on a consistent basis. Furthermore, the remaining 59% (n=20) of those surgeons trained in the use of the Goldman tip procedure either have never performed the technique in their practice or have subsequently abandoned its use. Most commonly, these surgeons reported that they were uncomfortable with the technique and that in their experience it produced a surgical and unnatural appearance. Interestingly, the majority of surgeons who abandoned the Goldman technique had used the procedure in fewer than 1% of their total rhinoplasties. This finding supports the notion that a surgeon is unlikely to perform a procedure that he or she is uncomfortable with when alternate methods are available. It should be noted, however, that the surgeons who had more experience with the technique did not echo the same concerns regarding the potential for an unnatural and surgical appearance; instead, they were more concerned with asymmetry and cartilage visibility in cases involving thin-skinned patients. Although we understand this concern, we have found that placing additional crushed cartilage in the tip may help to camouflage any minor cartilage irregularities and soften the tip and infratip lobule regions. Furthermore, we tend to use the Simons modification of vertical dome division more frequently in our thin-skinned patients, as they rarely need the additional strength and structural support that thicker-skinned patients require.

In summary, the Goldman tip procedure is best described as a conservative restructuring of the lobule, with minimal excision of cartilage. Knowledge of the correct indications and use of the technique can certainly add to the armamentarium of the complete rhinoplasty surgeon, and once the surgeon becomes comfortable with the concept of “dividing the domes,” he or she will come to realize that the Goldman technique represents a safe and effective procedure to use when treating nasal tip deformities. We cannot stress enough, however, that a technical understanding of this procedure is essential for maximizing outcomes.6-10

CONCLUSIONS

Over the past 2 decades, the teaching in rhinoplasty has encouraged improved visualization, better medial support, and conservative cartilage excision. Interestingly enough, these are all standard philosophical tenets of the Goldman tip procedure. In our experience, the Goldman technique has proved to be a reliable option for the treatment of certain nasal tip deformities, with a low complication rate. Also, the results of a survey of respected
rhinoplasty surgeons suggest that the Goldman tip procedure is still used in modern-day rhinoplasty, albeit infrequently.

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REFERENCES