Combined Rhinoplasty and Genioplasty

Long-term Follow-up

Dario Bertossi, MD; Massimo Albanese, MD; Matteo Turra, MD; Vittorio Favero, MD; Pierfrancesco Nocini, MD, DDS; Alessandra Lucchese, MD

Importance: Long-term follow-up reference for experienced clinicians dedicated to profileplasty.

Objective: To evaluate the long-term results and complications of combined rhinoplasty and genioplasty.

Design: Retrospective study including objective and subjective evaluation before and after 3 years of undergoing simultaneous open rhinoplasty and genioplasty among a cohort of 90 patients.

Setting: Academic medical center.

Patients: A total of 90 cases of combined rhinoplasty and genioplasty performed from January 2002 through January 2004 were reviewed to evaluate the stability of the esthetic result.

Main Outcome Measure: Long-term stability of the esthetic outcome of the simultaneous open rhinoplasty and genioplasty.

Results: Soft-tissue pogonion projection to the true vertical line and mandibular height (mandibular incisor tip to menton) were recorded. As far as reduction genioplasty patients are concerned, 45.6% of the patient population had a 100% stability after 3 years (0.25 mm resorption measured at the menton). On the other hand, if augmentation genioplasty patients are considered, 52.4% (22 patients with a vertical augmentation range from 4-6 mm; mean, 5.3 mm; and 25 patients with a sagittal augmentation from 6-8 mm; mean, 7.2 mm) had 100% stability after 3 years. The chin was stable with no more than 1 mm of recurrence.

Conclusions and Relevance: The results of the study indicate that the combined approach in correcting the facial profile is an effective procedure to achieve a more harmonic and consistent clinical outcome. The recurrence rate of less than 1 mm on the chin bone measurements is relevant to support this statement. An aesthetically proportionate face is strongly determined by the nasal-cervical relationship when observing the patient’s profile. Even after a successful rhinoplasty, the patient’s face can lack aesthetic attractiveness. Combined rhinoplasty-genioplasty is usually the best solution, particularly for patients with microgenia. It provides optimum patient satisfaction with a low incidence of recurrence.

Level of Evidence: 4.

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Failure to address the relationship between the nose and the chin is a common error in the preoperative evaluation of a rhinoplasty. Furthermore, aesthetic attractiveness is subjective; how it is judged varies according to age and culture. Although many researchers have sought to establish parameters that would lead to a "beautiful" face, the results may not always be as expected. A weak chin, inadequate lower facial height, or protrusive mandible can lead to less than satisfactory results when performing facial corrective surgery. Evidence shows that a significant number of patients requesting a rhinoplasty present mid lower face dysmorphism. A recessive chin, a procumbent lower lip, an exaggerated labiomental fold, and diminished or increased facial height are the most frequent features that can be observed in prerhinoplasty patients.

Genioplasty is an ancillary procedure that can be useful in many situations. In 1947, Hofer was the first to perform a genioplasty using an extraoral approach. As noted by Steinhäuser, Converse in 1950, Trauner in 1964, and Obwegeser in 1957 made important contributions to the surgical techniques. Nowadays the technique chosen will depend on the surgeon’s preference and training. Some surgeons prefer osteotomy techniques,
whereas others apply a silicon implant. Chin osteotomy is a technique that can present some surgical complications compared with alloplastic material insertion. Indications, complications, and surgical techniques can be similar for both methods; however, genioplasty is more suitable to correct an asymmetric or a vertical component of a chin deformity.

We studied a sample of 90 patients who underwent combined rhinoplasty and genioplasty from January 2002 through January 2004 with the aim of correcting a sagittal or a vertical defect. All patients were treated with a chin osteotomy involving a sagittal or a vertical change. Fourteen (16%) of the 90 patients treated for rhinoplasty and genioplasty belonged to our surgically pretreated patient population affected by class II (whenever the mandible is in a forward position with respect to the upper jaw) or III (whenever the mandible is in a backward position with respect to the upper jaw) dental deformity. No patients with functional problems were included. Fat or other filler injections were not considered because of their inability to correct relevant chin deformities with predictable results.6

METHODS

From January 2002 to January 2004, ninety patients were treated. None of the patients had a residual malocclusion, functional problems, or a metabolic disease. We did not include patients from 2005 to the present to have an homogeneous sample because we changed surgical method. Because the procedures used in this study were not experimental and are in daily clinical use, the study did not require authorization by the hospital’s ethics committee.

The most important aspect of diagnosis is the clinical examination from the anterior, lateral, and three-quarter views. This allows assessment of the soft-tissue facial heights—the anterior, sagittal, and vertical relationships between the nose and chin (deformities) to establish facial harmony and balance and to provide an efficient and effective treatment.

Preoperative evaluation was performed by the same surgeon (D.B.) who determined a treatment plan. Photographs were taken from frontal, lateral, three-quarter, and basal angles; lateral cephalometric radiographs were obtained with the patient’s teeth in centric occlusion. The extraoral examination highlighted a list of problems that were then confirmed using cephalometric analysis.

The photographs of each patient were analyzed for the following: (1) the type of nose deformity, (2) the type of chin deformity, and (3) overall facial proportions. Comparing the photographs with the radiographs, the chin deformities were classified as follows: (1) micrognathia: totally hypoplastic and retruded mandible and teeth in class II malocclusion; (2) retrognathia: normally developed mandibular body but retruded with respect to upper jaw and class II malocclusion; and (3) microgenia: localized underdevelopment of the anterior portion of the mandible and soft tissues.8 Patients with other chin deformities, such as macrogenia, asymmetries, bifid chin, and posttraumatic sequelae, were excluded from the study.

The ideal profile has been described in the literature by many authors.7,11 We used the analysis of Arnett et al12 to measure the soft-tissue profile of the patients. Evaluation in the lateral plane in the natural head position with the teeth in centric occlusion and the lips in light contact is usually the most valuable assessment in determining vertical and anteroposterior position of the jaws. The prominence or retrusion of either jaw and the relative position of the nose was assessed in relation to the true vertical line running from the subnasale point and perpendicular to the Frankfort horizontal plane. We monitored the horizontal and vertical bone sagittal stability using cephalometric measurements on the pogonion, menton, and B points by superimposing the radiographs of the patient. The following values were measured: the soft-tissue Pogonion projection to the true vertical line and mandibular height (mandibular incisor tip to menton).

GENIOPLASTY SURGERY

All procedures were performed using general anesthesia. A combination of 2% Xylocaine 1:100 000 mixed with a 1:1 ratio of a physiologic saline solution was injected into the oral vestibule followed by waiting 15 minutes for vasonecstriction. An incision was made between the canines 6 mm below the attached mucosa using a No. 15 scalpel and then continued with the electric scalpel down to the bone surface. Soft-tissue detachment was then performed. The peristium was exposed and bone markings were made with a pencil, and then holes were made with a drill. Marking the midline is particularly helpful to fix the bone segment in a symmetrical position. Osteotomies and osteotomies were performed using a reciprocating saw, taking care to make the osteotomy line below the mental foramen to prevent nerve injury (Figure 1). Bone segment fixation was done with titanium mini-plates and screws. After fixation, bovine-derived cancellous bone granules (Bio-Oss; Geistlich) were inserted in the bone gap, particularly at the mandibular border. Before mucosal closure, mentalis muscle reattachment was performed to avoid chin and cervical layer ptosis. We used 4 Vicryl sutures for muscle and 5-0 Vicryl sutures for the mucosa. An elastic tissue adhesive band was applied to the chin for 2 days to reduce edema and prevent hematoma formation.

The day after surgery, a clinical neurosensory test was performed to evaluate inferior alveolar nerve function. The test was repeated 12 months later.
We analyzed the nasal defects using the Gunther et al.\textsuperscript{13} method. All rhinoplasties were performed using an open approach. Almost all patients (85\%) were treated with a cephalic resection of the lateral crura, generally leaving at least an 8-mm residual strip. All nasal tips were treated with 1 polydioxanone 5-0 intradomal suture to remodel the tip. Medial oblique osteotomies and lateral curved basal osteotomies were performed in all patients. None of the patients had intranasal packing but had trans-septal Vicryl rapid (Ethicon) 4-0 sutures placed. We applied thin adhesive strips (Steri-Strips, 3M) with thermoplastic packing for 7 days and then applied thin adhesive strips without the thermoplastic packing for another 7 days. Azithromycin, 500 mg/d, was given for 3 days as an antimicrobial drug, and betamethasone, 4 g, was given every 8 hours for 24 hours starting immediately after surgery as an anti-inflammatory medication. A combination of intravenous ketoprofen, 1 g, in 100-ml isotonic sodium chloride solution was used the day of and the day after surgery. Omeprazole, 20 mg/d, was given for 4 days. Two and 12 months after surgery, healing was evaluated, residual inferior alveolar nerve function was observed with a second neurosensory test. The bone remodeling was checked using panoramic radiography and teleradiography in the lateral and frontal projections. At these sessions, postoperative photographs were also taken. By comparing preoperative with postoperative photographs, a complete view of the healing process was available and by comparing radiographs, the exact changes in the patient’s facial structures were recorded.
REPORT OF CASES

CASE 1

A 23-year-old woman presented with a class III malocclusion that we had surgically corrected 2 years previously. The patient then came to have her nose corrected (Figure 2 and Figure 3). In the preoperative evaluation, she presented with a slight nasal dorsal hump and a slight vertical and horizontal defect in the chin. We performed an open rhinoplasty, positioning 2 nasal spreader intradomal sutures, and a 5-mm chin augmentation. The postoperative period was uneventful. The photographs taken before the procedure and 12 months after (Figures 2, 3, 4, and 5) show a noticeable improvement in the patient’s aesthetics.

CASE 2

A 24-year-old woman came to have her nasal deformity corrected. During the preoperative assessment, we evaluated the following: excess in nasal dorsum length, a nasal hump, excess nasal tip width, a slight sagittal chin defect, and a double contour of the chin (Figure 6 and Figure 7). We proposed a nose-chin correction. A rhinoplasty with an open approach was performed. We resected 3 mm of the lateral crura bilaterally and removed the nasal hump. We then sutured the domes with intercartilaginous and intracartilaginous sutures with polydioxanone 5-0. We repositioned the chin sagittally by 5 mm. The resulting facial aesthetics show a noticeable improvement when compared with preoperative control (Figures 6, 7, 8, and 9).
Nasal function and aesthetics were good in all patients after the surgical procedure. None of the patients experienced nasal complications. One patient developed an allergic reaction to the thin adhesive strips and was treated for 10 days with a combination of betamethasone and gentamicin ointments. Postoperative slight residual nasal deformities have been observed in some cases according to the literature.14

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Aufricht was the first to discuss the nose to chin relationship, saying that “... they are important components of the profile which are markedly interrelated...” “the prominence of one will influence the relative prominence of the other.”16,p233) He was also the first to do a chin augmentation using the dorsal nasal hump. Today genioplasty15 is an easy surgical procedure that can be done by osteotomy or by positioning alloplastic materials, but some controversies have yet to be addressed.16-18 When performing a genioplasty, we prefer an intraoral approach with an incision line running between the 2 canines. Zide and Ellis19 have commented on the importance of the mentalis muscle in chin surgery. Chaushu et al20 have shown that when the mentalis muscle insertion is not precisely reattached, this leads to chin and submental-cervical soft-tissue ptosis. For this reason, we avoid a wide muscular detachment (not >5 mm below the teeth apex) and tape the chin with 3 adhesive elastic bands for 2 days followed by an elastic dressing during the night for 15 days. With regard to the choice between advancement osteotomy21 compared with an autologous or heterologous graft, some surgeons are concerned that allografts can rarely become infected or cause bone resorption in the recipient site, may be incorrectly placed or may undergo subsequent displacement.22

No infection, bone resorption, or fixation instability was found in our patients as reported in some series.23-25

Another unclear point concerns fixation and long-term stability. A soft-tissue ratio response of 0.8 to 0.9 was observed both for advancement (mean, 4-8 mm) and for vertical increase genioplasty (mean, 4-10 mm). Polido and Bell26 observed similar values to those that we recorded, and Segner and Hölting27 published an article about stability that showed higher variability. Our clinical results give priority to titanium mini-plates, which are pliable and can be easily shaped or preshaped. Some investigators suggest using biocompatible materials, such as polyactic polyglycolic acid,28 but we do not use these materials due to the lower hard-tissue stability and the possibility of granuloma formation. After fixation, we carefully reattach the mentalis muscle at the proper site for reasons discussed earlier.29

All of our patients were treated with an open rhinoplasty. None showed major complications, such as hematoma, severe residual asymmetries, or functional impairments. The esthetic result was evaluated after 12 months and was deemed successful. The findings of this study agree with the work of Guyuron and Raszewski,30 who state that a chin osteotomy is a safe procedure that is well established and can be applied

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**RESULTS**

We treated 90 patients (10 men and 80 women) who underwent a combined rhinoplasty and genioplasty from January 2002 through January 2004. Ages ranged from 18 to 49 years with a mean age of 27.7 years. None of our patients received alloplastic implants. Aesthetic results were evaluated clinically by using the analysis method of Arnett et al.12 Almost all the soft-tissue values were consistent with the normal ranges indicated by Arnett et al, with a 0.82-mm range of defect/excess, confirming that the desired results had been achieved. We found 14 cases of micrognathia (16%), 33 of retrognathia (37%), and 43 of vertical chin hyperdevelopment (48%).

In patients who received a chin reduction (46%), the mean postoperative value measuring lower incisor tip to soft-tissue Pogonion was 5.6 with 100% stability after 3 years (<0.25-mm resorption measured to the menton; mean long-term postoperative value of lower incisor tip to soft-tissue Pogonion, 5.34 mm). In patients who received a chin augmentation (52%) (22 with a vertical augmentation from 4-6 mm; mean, 5.3 mm; and 25 a sagittal augmentation from 6-8 mm; mean, 7.2 mm), there was a tendency to recurrence (<1 mm) after 3 years, with mean postoperative value (a soft-tissue Pogonion to the true vertical line) of 6.5 mm and a 3-year follow-up mean value of 5.6 mm (Table).

After surgery, none of the patients developed a chin hematoma, but almost all the patients (85%) had perioral paresthesia/hyposthesia as a result of the traction on the inferior alveolar nerve during the surgical procedure. This hyposthesia affected 30% of the total sensitivity on postoperative day 1 and gradually decreased until it completely disappeared at 2 months after surgery. No evidence of hyposthesia was noted at the neurosensory test (at the 12-month follow-up). All patients had slight intraoral scarring, but this did not cause retraction of the attached gingiva on the central incisors. None of the patients developed chin or cervical soft-tissue ptosis. No late postoperative complications were observed.

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**Table. Chin Deformities Correction Procedures and Average Values of Chin Repositioning**

<table>
<thead>
<tr>
<th>Patients, No. (%)</th>
<th>Chin Surgery</th>
<th>Average Value</th>
<th>Average Value, 3-y Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 (46)</td>
<td>Vertical reduction</td>
<td>Lower incisor tip to soft-tissue Pogonion; immediate postoperative, 5.6 mm</td>
<td>Lower incisor tip to soft-tissue Pogonion; long-term, 5.34 mm</td>
</tr>
<tr>
<td>2 (2)</td>
<td>Burr sagittal remodeling</td>
<td>Soft-tissue Pogonion to TVL; immediate postoperative, 6.5 mm</td>
<td>Soft-tissue Pogonion to TVL; long-term, 5.6 mm</td>
</tr>
<tr>
<td>22 + 25 (24, 28)</td>
<td>Sagittal increase</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: TVL, true vertical line.
individually or in combination with a rhinoplasty, achieving good results and avoiding the added costs of an alloplastic material. This conclusion benefits both the patient and the surgeon.

CONCLUSIONS

In 3 years, we have recorded data on 90 simultaneous nose-chin correction surgical procedures. Comparing the patients’ photographs and radiographs obtained before and after the procedure, good results can be seen. The 2 main goals of the procedure, that is, correction of the deformity in the nose and chin as well as an overall improvement in aesthetic attractiveness, were obtained in a single surgical session, avoiding external scarring and the cost of the alloplastic material.

To obtain a good result, one must observe the following.

1. Accurate case selection, which implies recognizing the coexistence of defects in the nose and chin.
2. Accurate preoperative evaluation with photographs and radiographs to know what correction is needed and to identify structures that are to be preserved.
3. Correct surgical procedure (chin muscle, inferior alveolar nerve preservation, and accurate bone fixation with titanium mini-plates).

Another aspect to consider is the surgical impact on the patient. By using a simultaneous nose-chin correction procedure, the patient does not require a second surgical session, thus reducing postoperative discomfort and reducing the overall cost. Moreover, when an osteotomy is used for chin correction, a higher level of predictability and stability is observed, and there are little or no complications except for transitory inferior alveolar nerve hypoesthesia. Furthermore, genioplasty can stretch submandibular soft tissues with better aesthetic outcomes. In our experience, the use of alloplastic implants gives much less predictability for a long-term fixed position, can cause bone resorption, and leaves a submental scar when placed from an extroral approach. Considering these results, single-session rhinoplasty and genioplasty should be proposed to the patient every time the aesthetic surgeon sees coexistence of nose and chin deformities.

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Correspondence: Dario Bertossi, MD, Department of Maxillo-Facial Surgery, University of Verona, Piazzale L. Scuro 10, 37134 Verona, Italy (dario.bertossi@univr.it).

Author Contributions: Study concept and design: Bertossi, Albanese, Turra, Nocini, and Lucchese. Acquisition of data: Bertossi. Analysis and interpretation of data: Favero. Drafting of the manuscript: Turra, Favero, and Lucchese. Critical revision of the manuscript for important intellectual content: Bertossi, Albanese, Favero, and Nocini. Statistical analysis: Bertossi, Lucchese. Administrative, technical, and material support: Turra and Favero.

Study supervision: Bertossi, Albanese, Turra, and Nocini.
Conflict of Interest Disclosures: None reported.

REFERENCES