

Narrowing and Lengthening Genioplasty with Pedicled Bone Graft in Contouring of the Short and Wide Lower Face

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Abstract

Background A short and wide lower face is perceived as unattractive and masculine. Simply contouring the mandibular body and angle is insufficient to make the lower face with short and wide features slimmer and more feminine. In many cases, vertical elongation of the chin together with a bone graft is necessary. This can cause infection, donor-site morbidity and height loss by resorption of the grafted bone. To prevent this problem, the authors performed a pedicled interpositional graft with the discarded bone from narrowing genioplasty, and the results were aesthetically satisfactory.

Methods From March 2010 to September 2011, 32 patients who received chin narrowing and vertical lengthening surgery at the authors' clinic were included in this study. For all the patients, the remnant mandibular bone at the stepoff from the site of the genioplasty to the mandibular angle was reduced concurrently.

Results No complications occurred, and all the patients were satisfied with their postoperative results.

Conclusion Harmonizing the vertical length and transverse width of the chin is essential to acquiring more favorable results in mandibular contouring. The authors

recommend pedicled interpositional bone grafting in narrowing genioplasty as a safe and useful method for aesthetic chin lengthening.

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Keywords Aesthetic chin lengthening · Mandibular contouring · Narrowing genioplasty · Pedicled interpositional bone grafting genioplasty

In East Asia, many patients with a square-shaped face aspire to have a more slender lower face. To address these issues, most desire to correct the contour of the mandibular angle, and various operative methods of “mandibular angle contouring” are available.

Recently, the chin has come to be considered as an essential component in lower face contouring, and the operative range has extended to the chin area from its former limitation to the angle area. For the wide chin, simply contouring the angle has failed to produce aesthetically satisfying results. Therefore, parasymphiseal tubercle resection and narrowing genioplasty often are performed simultaneously and have been introduced in several articles as adjuvant methods with angle reduction [1–3].

For the patient seeking an aesthetically harmonized lower face, vertical length should be regarded as another important point to keep in mind. If the patient presents with a short and wide chin, narrowing genioplasty and tubercle resection are not sufficient to achieve a more slender lower face. To produce better results for the short chin, vertical elongation can be regarded as a crucial step [4–6].

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Although orthognathic surgery is frequently required and applied for vertical elongation, many patients are hesitant about receiving the procedure, and some present with class 1 occlusion. In these cases, it is possible to acquire a more feminized and slender lower face by elongation of the chin alone. For vertical elongation of the chin, bone grafts or allografts have been recommended [5–10]. However, bone grafts have several disadvantages including donor morbidity, technical difficulty, and the possibility of bony absorption.

Until recently, we performed T-narrowing genioplasty for chin narrowing [2, 11], and the bony fragments obtained from the mandibular angle reduction were used as an interpositional graft for vertical elongation [6]. This method has the same disadvantages as a free bone graft and involves limitations in that the slope of the parasymphysis border cannot be altered for a more slender and feminized chin.

To correct these disadvantages, we devised a more reliable and simple method of elongating the chin by using the discarded central segment of the narrowing genioplasty as a pedicled interpositional graft. Moreover, steepening the slope of the chin in a short and wide lower face could produce a more slender contour.

Patients

From March 2010 to September 2011, 523 patients underwent T-narrowing genioplasty and mandibular angle reduction. Our vertical elongation method was applied to 32 of these 523 patients without a free bone graft. All were women ranging in age from 21 to 35 years (mean age, 26.8 years). The follow-up period ranged from 3 to 12 months.

Clinical photographs, computed tomography (CT) images, and cephalograms of the patients were analyzed preoperatively. We selected patients for vertical elongation surgery based on the vertical proportion of the lower face rather than the absolute length.

Many patients were not aware that a proportionately short chin makes the face look wider. Furthermore, most East Asians are reluctant to undergo lengthening genioplasty. Therefore, sufficient preoperative explanation on the ideal facial proportion needs to be given. Also, the fact that lengthening of the chin can produce a slender lower face should be clearly illustrated to the patient.

Methods

All operations were performed with the patient under general anesthesia. Through a conventional incision along the lower gingivolabial sulcus, the surgical field was

obtained with a subperiosteal dissection on the anterior surface of the chin. The incision extended laterally to the canines on both sides, separated from the incision for mandibular angle reduction. Connecting the two incision lines could easily lead to traction injury of the mental nerve by loss of the overlying soft tissue protecting it.

Once the mental nerve is located, subperiosteal dissection should be completed as a whole space through the mandibular angle to the chin, and the horizontal osteotomy line can be designed. When the route of the mental nerve in the mandibular body is fully elucidated through CT images and a cephalogram, the osteotomy line can be designed at the uppermost level just sufficient to avoid injury to the mental nerve. The uppermost positioning of the osteotomy line minimizes stepoff deformity by making a smoother transition to the line of angle contouring and facilitates fixation.

Vertical osteotomy lines at the median chin are designed to produce two segments forming an upside-down trapezoid. The exact vertical osteotomy width is determined from the frontal view and the CT images (Fig. 1). Usually, the upper width ranges from 8 to 12 mm, and the lower width ranges from 4 to 8 mm. The difference between the upper and lower widths usually is 4 mm, each segment having a 2 mm difference. Three vertical osteotomies including the midline are performed at the first, and whole horizontal osteotomy is accomplished in sequence.

After the osteotomy along the designed line, all the divided parts are assembled and fixed. Two vertical segments at the center of chin are rotated 90° and fixed with wire as each wide upper border is met at the median line. In this step, muscle in the posterior area of the chin should not be detached from the central segment. The muscle attachment to the midline of the chin is very adhesive, so the detachment during the 90° turn did not happen in all cases. Two lateral segments then are approximated at the midline with a wire passing bicortically and fixed to the upper main part with plates and screws. If necessary, chin advancement can be performed concurrently.

Bony gaps between the segments can be present to some degree after fixation, but this is not a significant concern if the bony gap does not contribute to contour deformity. Mandibular angle reduction can be performed additionally, during which osteotomy is performed along the lower mandibular border from the angle to the point of the stepoff. Finally, profuse saline irrigation and wound closure is performed with semicompressive dressing using elastic tape.

Results

All the patients were satisfied postoperatively without any particular complications. There was no contour irregularity

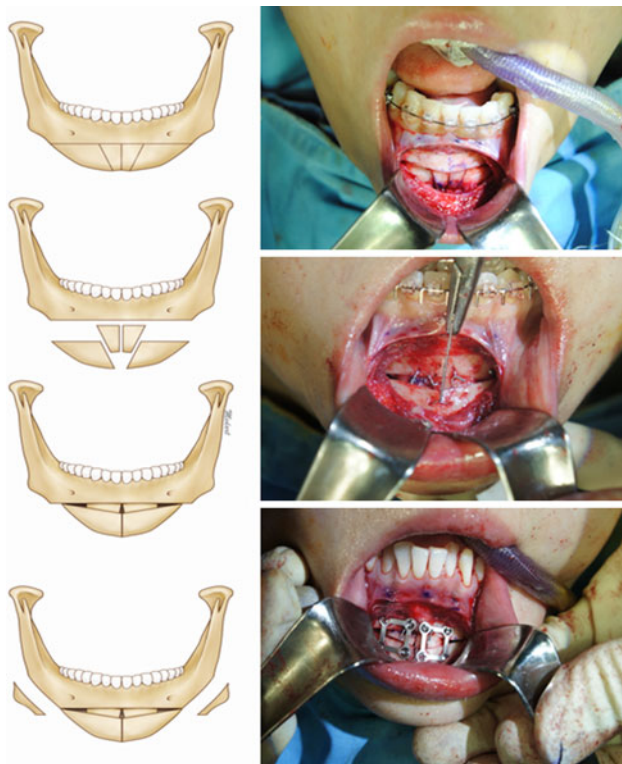


Fig. 1 *Left:* The horizontal and vertical osteotomy line is designed. The central two segments are rotated 90° and fixed to the upper main part. In this step, the muscle at the posterior chin should not be detached from the central segment. Two lateral segments then are approximated centrally. Mandibular angle reduction is extended to the horizontal osteotomy line for stepoff prevention. *Upper right:* After the osteotomy. *Right center:* Two vertical segments at the center of the chin are rotated 90°, and two lateral segments are approximated centrally with wiring. *Lower right:* Fixation with plate and screw

such as a stepoff deformity between the mandibular angle reduction and the chin-narrowing area. Lower lip sensory disturbance was present in two patients but resolved within 3 months. The patients were satisfied with changes that made their faces more slender-looking (Figs. 2 and 3).

Discussion

When patients seek cosmetic surgery to correct a wide lower face, many points need to be considered. Mandibular angle reduction is one of the most popular methods of lower facial contouring, and many plastic surgeons regard it as the treatment of choice. However, if the patient does not fit the operative indication, a slender look in the frontal view cannot be achieved. Furthermore, mandibular angle reduction alone can lead to an absence of the mandibular angle, producing an unnatural-appearing lateral view [12, 13]. Therefore, the parasymphysis and chin area should be considered as essential points in slenderizing the lower face. Recently, several



Fig. 2 **a** *Top:* Preoperative view of a 26-year-old woman. *Bottom:* Postoperative view at 6 months. **b** Pre- and postoperative three-dimensional computed tomography images

additional methods, such as “long lower body resection” including parasymphysis contouring, “tubercle resection,” and “narrowing genioplasty” have been performed as adjuncts to the simple management of the mandibular angle [1–3, 14].

Facial proportion is another essential point. In the short and wide lower face, the ratio of vertical length to horizontal length is rather small. This means that the entire feature of the short lower face appears wider than in a face with a normal ratio [4]. In these cases, simply reducing the horizontal length without vertical lengthening cannot produce satisfactory results. Performing advancement genioplasty to modify the weak chin in the short and wide lower face can result in an aesthetically displeasing appearance as the labiomental groove deepens [15].

Another point to be considered in making a more slender lower face is the slope of the mandibular lower border. The steeper the slope, the more slender the lower face appears.



Fig. 3 **a** *Top*: Preoperative view of a 24-year-old woman. *Bottom*: Postoperative view at 6 months. **b** Pre- and postoperative three-dimensional computed tomography images

The same holds true for the parasymphysis area. Long lower body resection, tubercle resection, and genioplasty all are performed based on the aforementioned principle. Also, in bimaxillary orthognathic jaw surgery, clockwise rotation of the jaw has the effect of steepening the slope. Vertical lengthening by a simple interpositional bone graft has no effect on the slope of the mandibular plane in the parasymphysis area. However, our method can change the slope of the lower border of the parasymphysis. By combining genioplasty with mandibular angle reduction, the entire slope of the mandibular lower border can be altered completely.

Another advantage of this technique is that in narrowing genioplasty, it is not necessary to detach the muscle during the central segment removal. In some cases of narrowing genioplasty without vertical lengthening, the detached muscle can appear as hardened tissue or as a conglomeration of the soft tissue under the chin for several months.

In contrast, patients who received vertical elongation showed no such complication due to uniform expansion of soft tissue on the chin. In some cases, central bulging of the soft tissue at the front midline mentum was observed due to central bunching of soft tissue with chin narrowing. However, this was present only during the immediate postoperative period and resolved spontaneously with time.

With our operative method, it is important to minimize the stepoff deformity between the genioplasty and mandibular angle reduction. With more narrowing or advancement of the chin, more stepoff deformity may occur. Stepoff deformity, although not usually discernible externally, can be a source of complaint by the patient because the bony protrusion can be palpated. To prevent this problem, the surgeon must use caution when designing the osteotomy line of the mandibular angle reduction along the whole mandibular body. If the stepoff still remains after all possible procedures, the problem could be solved by flattening the protrusion with a curved rasp. No palpable bony stepoff ever disappears even with time.

For vertical lengthening, free interpositional bone grafts from other donor sites have the possibility of instability, infection, and height loss by the resorption of grafted bone. Although reports on such complications were not found, those problems could certainly be encountered when free bone grafts are used. In contrast, our method has a much lower possibility of encountering these problems because the interposition grafted bone works as a pedicled bone flap with the muscle attached on its posterior side.

Commonly, the patient whose chief complaint is a wide lower face presumes that a large quantity of bone must be resected to achieve a slender face. Moreover, these patients simply attribute inadequate correction to insufficient bony resection of the mandibular angle area. For such reasons, many patients and plastic surgeons cannot help but be concerned about the amount of bone to be removed. However, if the course of the operation is determined based only on the size of the mandibular angle, without the facial proportions taken into consideration, aesthetically pleasing results may be difficult to attain.

From our experience, the slope at the mandible lower border and the harmony between the chin and the entire face has proved to be more important factors than the amount of resected angle. In mandibular contouring surgery, balanced postoperative facial proportions are more important than the amount of bone resected.

Conclusion

Harmonizing the vertical length and the transverse width of the chin is essential to acquiring better results in mandibular contouring. We recommend pedicled interpositional

bone grafting in narrowing genioplasty as a safe and useful method for aesthetic chin lengthening.

References

1. Park MC, Kang M, Lim H et al (2011) Mandibular tubercle resection: A means of maximizing the benefits of reduction mandibuloplasty. *Plast Reconstr Surg* 127:2076–2082
2. Park S, Noh JH (2008) Importance of the chin in lower facial contour: Narrowing genioplasty to achieve a feminine and slim lower face. *Plast Reconstr Surg* 122:261–268
3. Zhang Z, Tang R, Tang X et al (2010) The oblique mandibular chin–body osteotomy for the correction of broad chin. *Ann Plast Surg* 65:541–545
4. Rosen HM: Aesthetic guidelines in genioplasty: The role of facial disproportion. *Plast Reconstr Surg* 95:463–469; discussion 470–462, 1995
5. Li J, Hsu Y, Khadka A et al (2011) Contouring of a square jaw on a short face by narrowing and sliding genioplasty combined with mandibular outer cortex osteotomy in orientals. *Plast Reconstr Surg* 127:2083–2092
6. Baek RM, Han SB, Baek SM: Surgical correction of the face with the square jaw and weak chin: Angle-to-chin bone transfer. *Plast Reconstr Surg* 108:225–231; discussion 232, 2001
7. Rosen HM (1988) Surgical correction of the vertically deficient chin. *Plast Reconstr Surg* 82:247–256
8. Frodel JL, Sykes JM, Jones JL (2004) Evaluation and treatment of vertical microgenia. *Arch Facial Plast Surg* 6:111–119
9. Wolfe SA (1987) Shortening and lengthening the chin. *J Cranio-maxillofac Surg* 15:223–230
10. Kim GJ, Jung YS, Park HS et al (2005) Long-term results of vertical height augmentation genioplasty using autogenous iliac bone graft. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontics* 100:e51–e57
11. Grime PD, Blenkinsopp PT (1990) Horizontal-T genioplasty: a modified technique for the broad or asymmetrical chin. *Br J Oral Maxillofac Surg* 28:215–221
12. Jin H, Kim BG (2004) Mandibular angle reduction versus mandible reduction. *Plast Reconstr Surg* 114:1263–1269
13. Jin H (2005) Misconceptions about mandible reduction procedures. *Aesthetic Plast Surg* 29:317–324
14. Satoh K (2004) Mandibular contouring surgery by angular contouring combined with genioplasty in orientals. *Plast Reconstr Surg* 113:425–430
15. Rosen HM (1991) Aesthetic refinements in genioplasty: the role of the labiomental fold. *Plast Reconstr Surg* 88:760–767