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KEYWORDS

• Genioplasty • Chin deformity • Genioplasty technique

KEY POINTS

- Genioplasty procedures are mostly performed as part of the orthognathic surgical correction of dentofacial deformities.
- The clinical and radiographic assessment of the chin should, therefore, form part of the overall orthognathic assessment of patients.
- Genioplasty is not a substitute for mandibular surgery to place the mandible in the correct sagittal position.
- The shape of the chin is just as important as its position.
- The surgical technique of the 3-dimensional correction of the chin is discussed in a step-by-step fashion with tips and traps for each step.

Introduction

Intuitively, the functional nature of the chin evades us; however, the importance of the chin in completing facial harmony is fundamental. It is, thus, a basic requirement for any physician wishing to practice orthognathic surgery to be well versed in the identification of genial morphology that detracts from facial harmony and the surgical techniques required for its correction.

The identification and classification of morphologic characteristics that detract from facial harmony is most effectively accomplished by clinical examination. It is a skill that is acquired and refined by constant examination of faces; but the clinician may also use cephalometric guidelines to confirm the diagnosis, assist in treatment planning, as well as to develop a surgical prediction of the treatment outcomes.^{1,2} Since its original description by Trauner and Obwegeser,³ the technique has undergone numerous modifications and refinements.⁴⁻⁷ As a result several variations exist; however, the technique presented here has served the authors well.

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Surgical technique

Infiltration with vasoconstrictor

The area of dissection is infiltrated with a local anesthetic containing a vasoconstrictor (epinephrine in a concentration of 1:100,000) 10 minutes before surgery.

Mucosal incision

The mucosal incision is placed roughly 5 mm superior to the buccal sulcus in the labial mucosa from canine to canine (Fig. 1).

- Care must be taken to identify the branches of the mental nerve, which are often visible.
- Placement of the incision must provide for a soft tissue cuff of mucosa and muscle to suture and should be placed well away from the attached mucosa of the teeth to prevent gingival recession.

Muscular incision

The incision is then completed down to the bone (see Fig. 1).

- The mental nerve should be avoided where it exits from the mental foramen by not carrying the incision too far posteriorly.

Periosteal stripping

- Stripping of the periosteum should strive to maintain the periosteum intact, and avoid total denudation of the chin as this will result in unpredictable soft tissue changes (see Fig. 1).

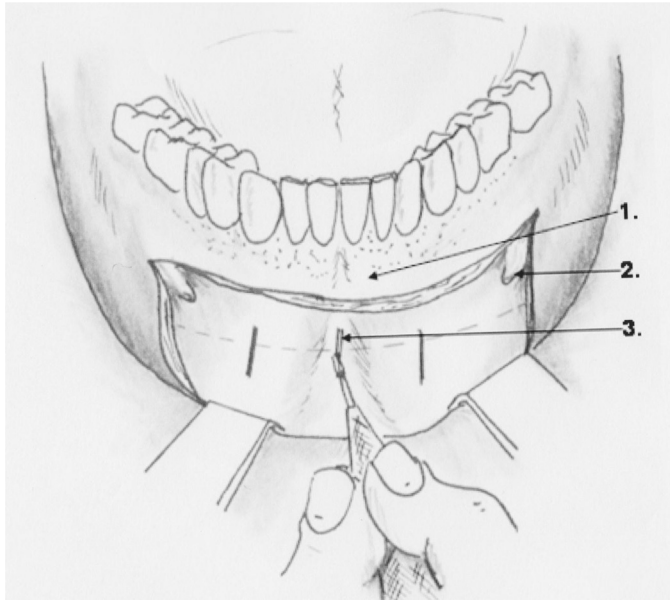


Fig. 1 Placement of reference marks. (1) The incision is placed in the buccal sulcus leaving at least 5 mm of nonkeratinized mucosa superior to the incision. (2) The mental nerve is identified and protected. (3) Reference marks are placed to assist in accurate repositioning of the genial segment.

- At this stage, the mental nerve is identified and protected on both sides.

Placement reference marks

The midline of the chin is marked in the superior segment and continued down onto the genial segment to provide a landmark for accurate repositioning (see Fig. 1).

- If the surgeon wishes further landmarks (usually in cases when correction of chin asymmetry is required), it may be placed bilaterally to the midline.
- At the same time, a hole is drilled into the inferior portion of the midline mark to allow for the future placement of a holding wire.

Performing the horizontal osteotomy

While protecting the mental nerves, the osteotomy is commenced preferably with an oscillating saw (Fig. 2). The design of the osteotomy is influenced by the aesthetic requirements.⁸

Correction of anteroposterior chin deformities

- For only anterior augmentation or reduction of the chin, the osteotomy should be performed in a horizontal plane (Fig. 3). The height of the osteotomy will influence the shape of the mental area and the depth of the labio-mental fold (see Fig. 3).
- However, by changing the angulation of the osteotomy, the vertical dimension will be influenced by either sliding the genial segment upwards (when advancing the chin) or downwards (when setting the genial segment back) (Fig. 4).

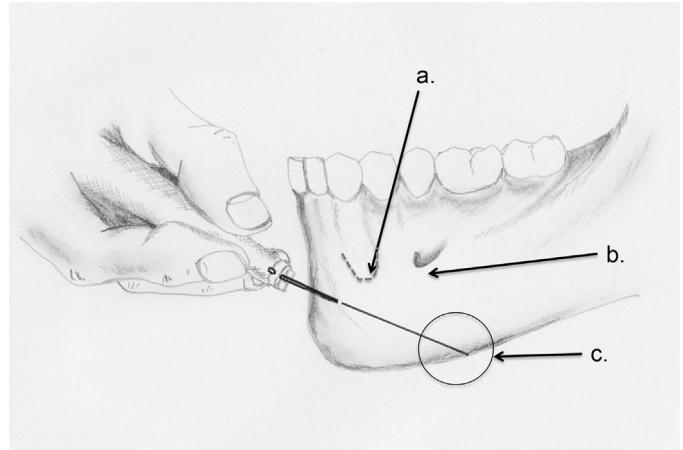


Fig. 2 (a) The horizontal osteotomy is performed using an oscillating saw. (b) Care should be taken to perform the osteotomy at least 5 mm below the root apex of the canine tooth and the mental foramen. (c) Ensure that the osteotomy is carried through the lower border of the mandible.

Correction of the vertical dimension of the chin

In addition to the change in angulation, the height of the chin can further be controlled by osteotomy of a segment of the genial bone or augmentation by down grafting:

- The height of the mental area can be reduced by removal of a preplanned segment of bone from the genial area (Fig. 5).
 - Perform the first osteotomy low enough to facilitate performing the second osteotomy from the superior aspect.
 - The desired osteotomy cuts are partially completed at the chosen height. The inferior portion of the osteotomy is completed before the segment to be removed is mobilized.
 - Complete the lower osteotomy and mobilize the genial segment.
 - Remove the intersegmental bone and place rigid fixation.

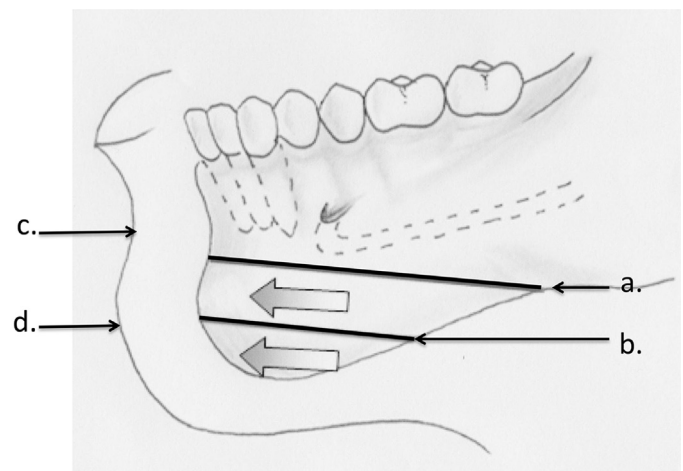


Fig. 3 The height of the osteotomy will influence the shape of the chin. (a) A high osteotomy will make the labio-mental fold more obtuse (c) and shallower. (b) A lower osteotomy will augment the tip of the chin (d) and increase the depth of the labio-mental fold.

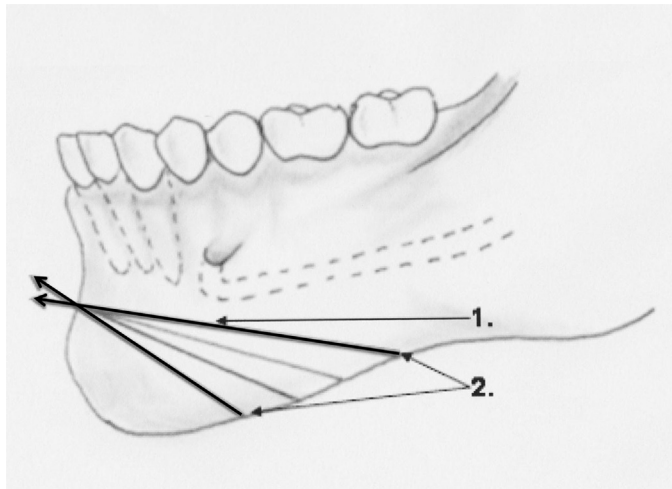


Fig. 4 (1) The horizontal osteotomy is performed at least 5 mm below the apex of the canine root and the mental foramen. (2) Advancement genioplasty along a high angle will reduce the height of the chin, and the opposite will occur with a setback procedure.

B. The vertical dimension of the chin can be increased by down grafting the genial segment (Fig. 6).

- Following mobilization of the genial segment, 2 straight bone plates (or an H- or X-shaped plate) are placed on the superior aspect.
- The genial segment is then held in position using the positioning wire.
- The bone plates are then secured to the genial segment. At least 2 screws should be placed inferiorly and superiorly.

Correction of the transverse dimensions of the chin

A. Widening the posterior aspect of the chin

- If transverse changes are required, the midline osteotomy should be completed and a midline plate secured across the midline (Fig. 7).
- The genioplasty osteotomy is then completed to mobilize the genial segment,² and a wire is then placed through

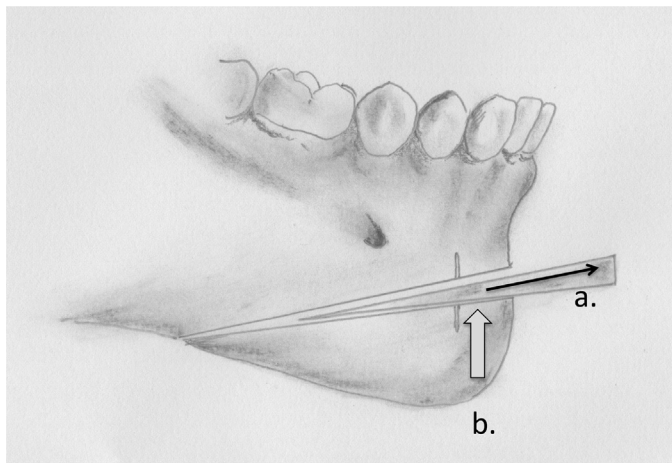


Fig. 5 Vertical reduction genioplasty. (a) A predetermined segment of bone is removed from the genial segment. (b) The genial segment is repositioned superiorly and fixated.

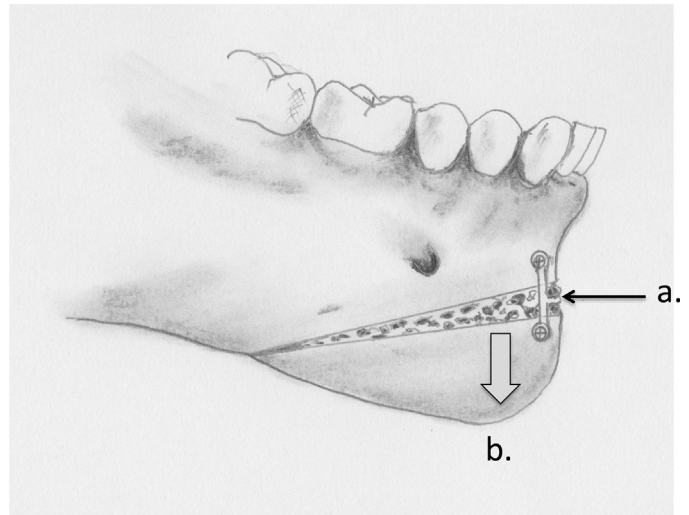


Fig. 6 Vertical augmentation genioplasty. (a) The genial segment is repositioned inferiorly and the defect grafted. (b) The amount of vertical increase is predetermined and the segment fixated with 2 bone plates.

the midline hole in the anterior cortex to aid with repositioning of the chin (Fig. 8).

- An instrument is placed in the midline osteotomy; the two genial segments are mobilized, and the segments are widened using the plate as fulcrum. A graft is inserted to maintain the widened dimension and to aid healing.
- The aesthetic changes are now assessed clinically.
- Once the desired position has been obtained, 2 holes may be drilled roughly 1 cm lateral to the midline bilaterally and tricortical screws placed (alternatively, bone plates may also be used).

B. Narrowing the posterior aspect of the chin (Fig. 9)

- The same technique is followed as for widening of the chin; however, once the genial segment is mobilized, a small triangular segment of bone is removed in the midline.
- The genial segments are then bent medially using the bone plate as a hinge to narrow the chin.

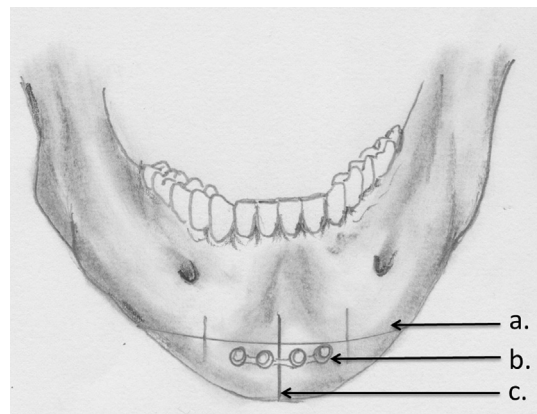


Fig. 7 Widening the posterior aspects of the chin. (a) The position of the horizontal osteotomy is marked. (b) Before the horizontal osteotomy is performed, a bone plate is placed over the center of the genial segment. (c) The centerline osteotomy is performed and the genial segment mobilized.

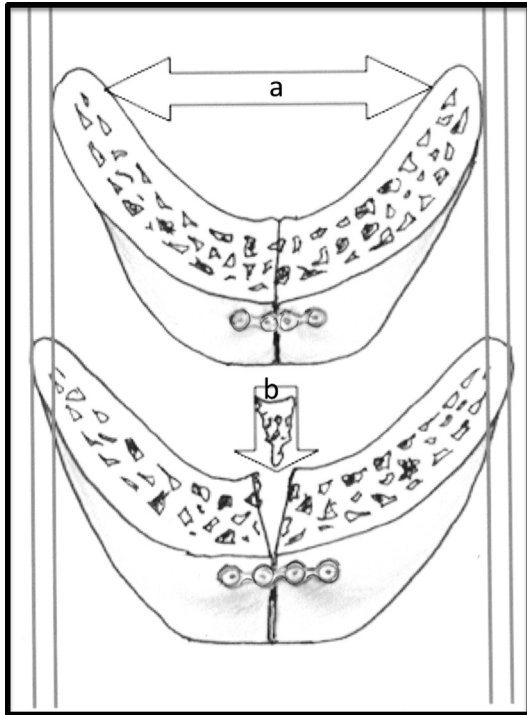


Fig. 8 Widening the posterior aspects of the chin. (a) The centerline osteotomy is completed and the genial segments widened using the bone plate as a hinge. (b) A small bone graft is placed in the defect.

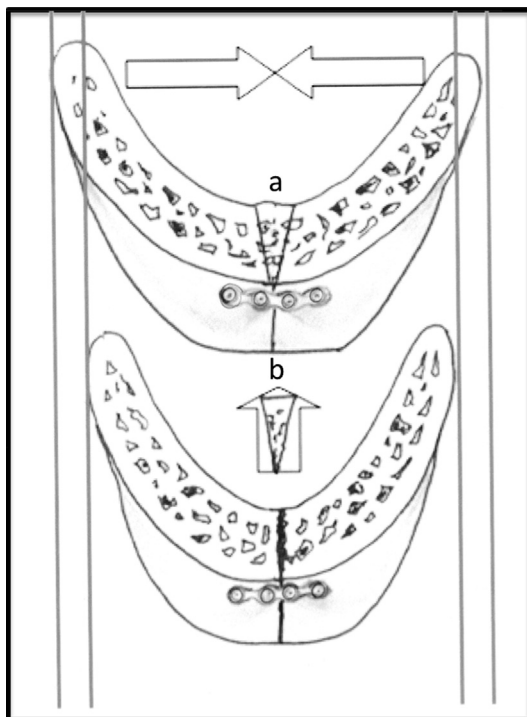


Fig. 9 Narrowing the posterior aspects of the chin. (a) Following mobilization of the genial segment, the centerline osteotomy is completed. (b) A small triangular segment of bone is now removed from the posterior aspect of the genial segments and the genial segments are narrowed by using the bone plate as a hinge.

- C. Widening the anterior aspect of the chin (Fig. 10)
 - A predetermined amount of widening of the anterior aspect of the chin can be achieved by performing a midline osteotomy in the genial segment.
 - The width is increased by moving the segment laterally (a) and to graft the midline defect.
 - The segments and bone graft are secured by means of bone plates (Fig. 10).
- D. Narrowing the anterior aspect of the chin (Fig. 11)
 - A predetermined amount of bone is osteotomized from the center of the genial segment.
 - The segments are moved medially and fixated by bone plates (Fig. 12).

Correction of chin asymmetry

- A. Correction of transverse chin asymmetry (Fig. 13)⁹
 - The required amount of lateral slide of the genial segment can be determined using a posteroanterior cephalometric radiograph.
 - Reference marks indicating the required slide are essential to achieve chin symmetry.
 - The osteotomy is performed on a horizontal plane, and the genial segment is mobilized.
 - The reference marks are aligned, and 2 tricortical screws are placed.
- B. Correction of a lower border cant of the chin (Fig. 14)
 - Mandibular asymmetry often involves a cant of the lower border of the chin.
 - The cant may be corrected by either unilateral down grafting or reduction of the genial segment or a combination of the two. The correction method will be determined by the height of the chin.
- C. Propeller osteotomy (Figs. 15 and 16)
 - The propeller osteotomy is often indicated for the correction of a severe lower border mandibular cant. Severe cants are often present in patients with unilateral condylar hyperplasia.
 - The first osteotomy is performed parallel to the lower border of the chin, whereas the superior osteotomy is performed parallel to the horizontal plane (often the interpupillary plane).

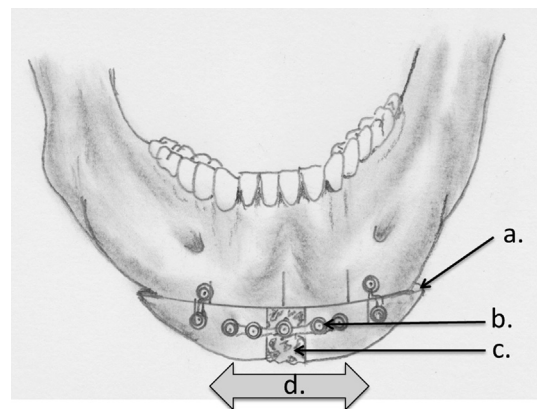


Fig. 10 Widening the anterior aspect of the chin. (a) The genial segments are moved laterally to a predetermined width and fixated. (b) A bone plate is placed across the midline defect to fixate the segments. (c) A bone graft is placed into the defect and the graft fixated by the bone plate. (d) The anterior aspect of the chin is made squarer.

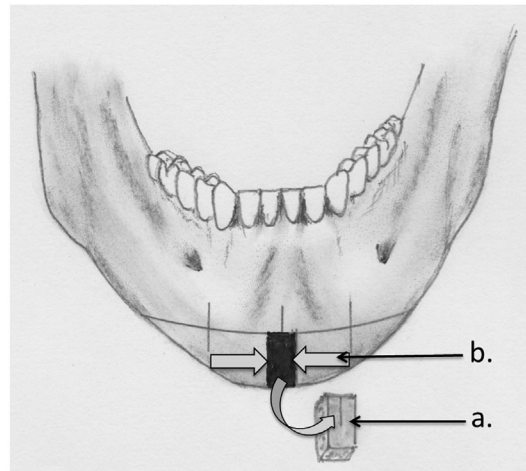
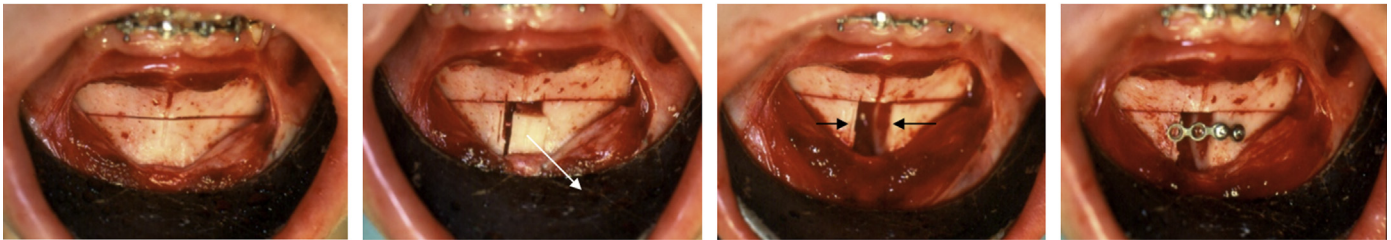
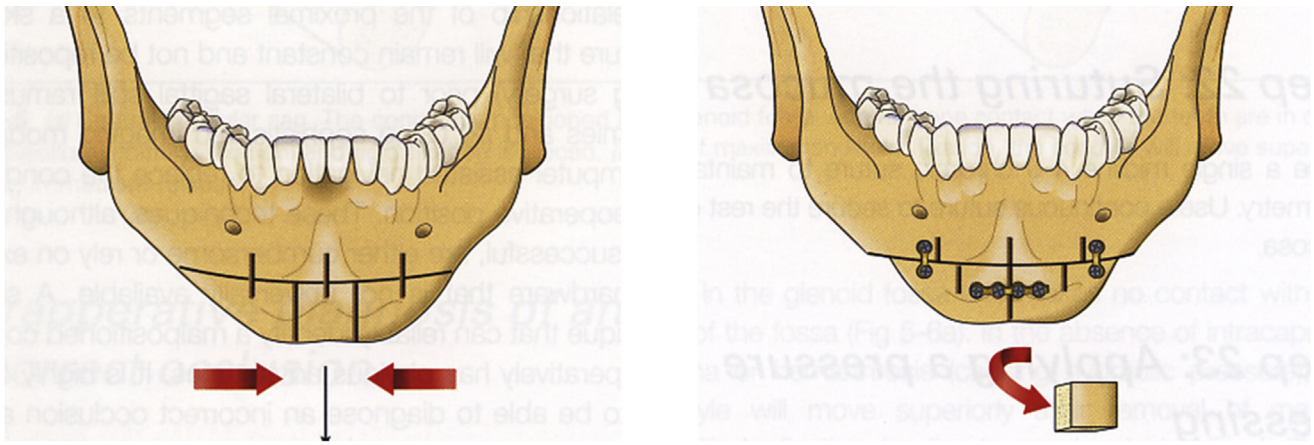


Fig. 11 (a) A predetermined amount of bone is removed from the center of the genial segments (From Reyneke JP. Essentials of orthognathic surgery. Hanover Park, IL: Quintessence, 2010; with permission). (b) Guided by the reference marks, the defect is closed by moving the segments medially.

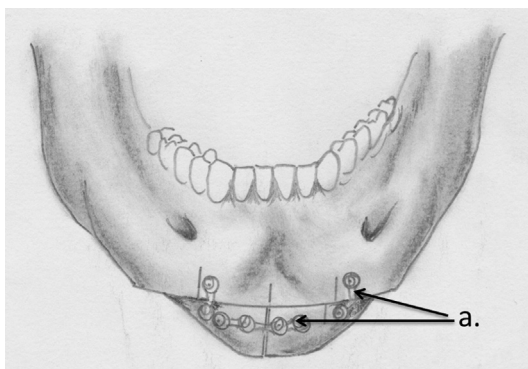


Fig. 12 (a) The genial segments are fixated across the midline and to the mandible.

- The triangular segment is rotated by 180°, and the segments are fixated.

Options of fixation

Options available for fixation of the genial segment include the following:

1. Two tricortical screws (Fig. 17)
2. Prebent genial plates
3. Bilateral 1.5-mm plates (Fig. 18)

Tricortical screws are only suitable for advancement genioplasty, whereas the last 2 options may be used for advancement, setback, vertical, and transverse changes.

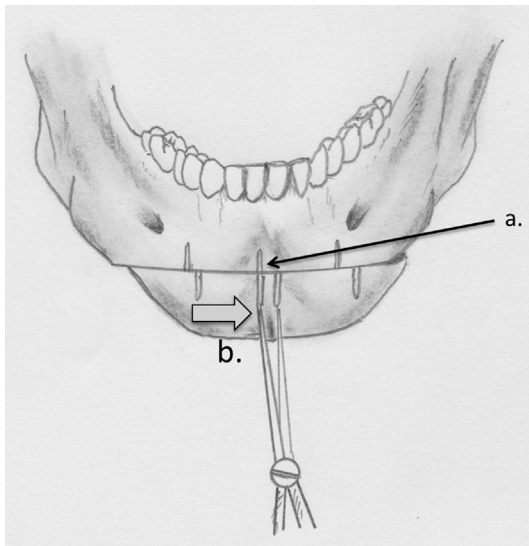


Fig. 13 Correction of horizontal chin asymmetry. (a) The osteotomy is performed on a horizontal plane and the genial segment moved to the right, in this case. (b) The clinician is guided by the reference marks.

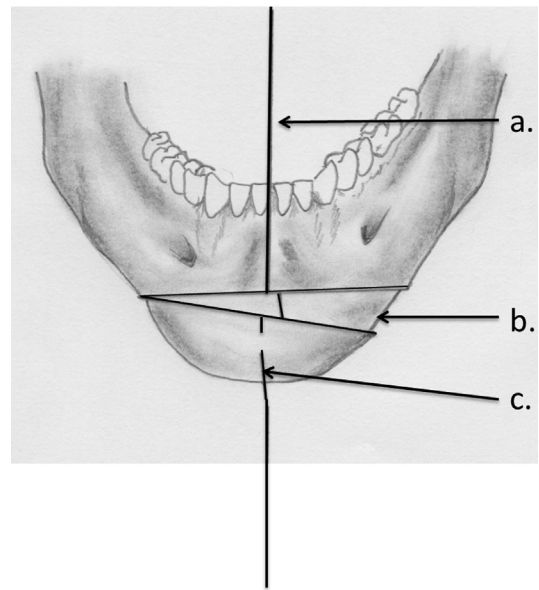


Fig. 16 The propeller genioplasty. (a) The dental and facial midline. (b) The rotated bone segment. (c) The centerline reference mark of the genial segment.

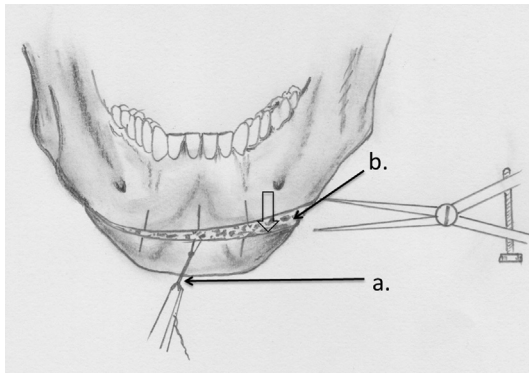


Fig. 14 Correction of a chin cant. (a) The left side of the genial segment is repositioned inferiorly using the positioning wire. (b) A bone graft placed in the defect.

Reassessment of the esthetic result

- The final chin shape can be assessed intraoperatively.

Closure of the wound

The predictability of the soft tissue changes relating to the genioplasty depends on the amount of denudation of the chin and on the method of closure.

- Careful closure of the genial musculature should be obtained before closure of the mucosa.
- As usual, the mucosa should be closed with a running suture and a minimum amount of mucosa used to avoid shortening of the lower lip.

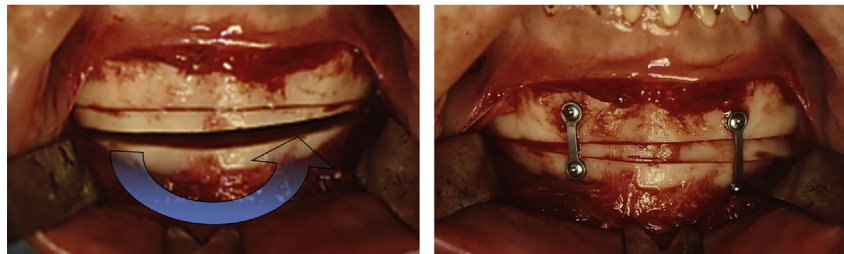
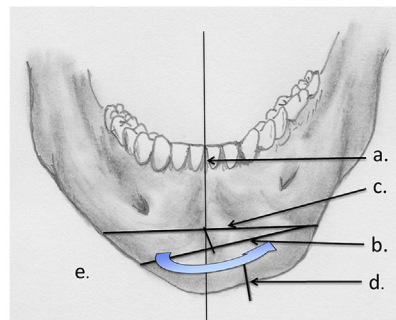


Fig. 15 The propeller genioplasty. (a) The facial midline is marked on the superior aspect of the chin. (b) The first osteotomy is performed parallel to the lower border of the chin. (c) The second osteotomy is performed parallel to the horizontal. (d) Mark the center of the lower genial segment. (e) The bone segment will be rotated by 180°.

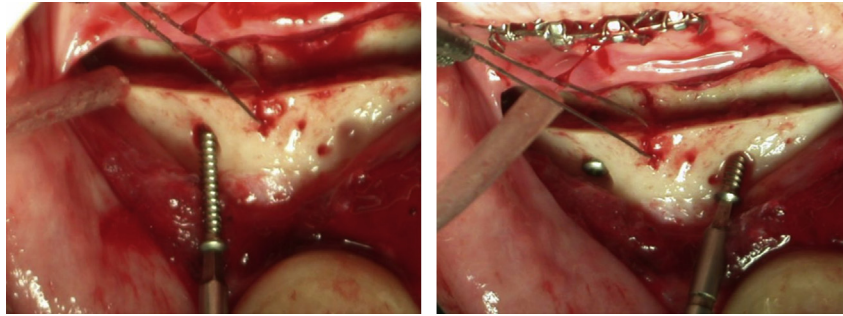


Fig. 17 Tricortical screws secure the genial segment in its preplanned position.

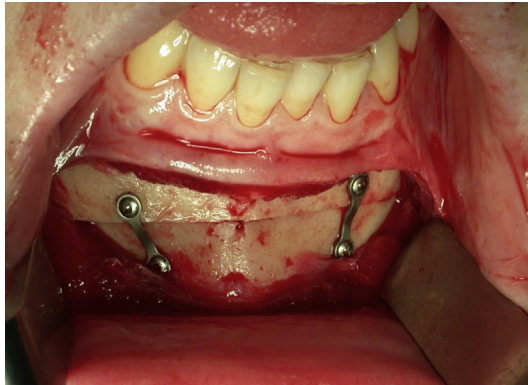


Fig. 18 1.5-mm mini-plates are an alternative form of fixation.

Placement of a pressure bandage

A pressure bandage is placed and removed on the third postoperative day.

- The bandage will support early reattachment of the musculature to the bone.
- The pressure dressing prevents excessive swelling and postoperative hematoma formation.

- It will enhance recovery and also prevent soft tissue ptosis.

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