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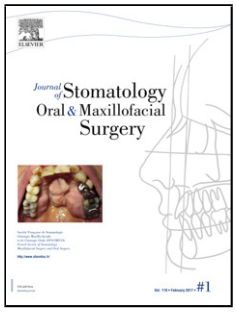

Vertical lengthening genioplasty: a new osteotomy technique

Marine Anquetil MD Jean-Philippe Perrin MD Morgan Praud Jacques Mercier MD Pierre Corre MD PhD Hélios Bertin MD PhD student

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TITLE

Vertical lengthening genioplasty: a new osteotomy technique

AUTHORS NAME AND AFFILIATIONS

Marine Anquetil[a] (MD)

marine.anquetil@chu-nantes.fr

Jean-Philippe Perrin[a] (MD)

jeanphilippe.perrin@chu-nantes.fr

Morgan Praud[a]

morgan.praud@chu-nantes.fr

Jacques Mercier[a] (MD)

jacques.mercier@chu-nantes.fr

Pierre Corre[a,b] (MD, PhD)

pierre.corre@chu-nantes.fr

Hélios Bertin[a,c*] (MD, PhD student)

helios.bertin@chu-nantes.fr

Tel: +33 (0)2 40 08 36 79

Fax: +33 (0)2 40 08 36 68

*Corresponding author

[a]Service de chirurgie Maxillo-faciale et stomatologie, CHU de Nantes, 1 place Alexis Ricordeau, 44093 Nantes Cedex 1, France

[b]Laboratoire d'Ingénierie Ostéo-Articulaire et Dentaire (LIOAD), Faculté de Chirurgie Dentaire, 1 Place Alexis Ricordeau, 44042Nantes, France

[c]Laboratoire des sarcomes osseux et remodelage des tissus calcifiés (PhyOs, UMR 1238), faculté de médecine, 1 rue Gaston Veil, 44035 Nantes cedex, France

ABSTRACT

Vertical insufficiency of the chin imbalances the orofacial and aesthetic parameters of the lower third of the face. We here propose a new osteotomy technique for chin lengthening. Our procedure is based on a single osteotomy and it does not require any interposition of a bone graft. In our experience with seven patients, we report good aesthetic and morphometric outcomes at one year.

KEYWORDS: Genioplasty; orthognathic surgery; chin lengthening; surgical procedure

INTRODUCTION

The chin plays a major role in orofacial functions and the aesthetic balance of the lower third of the face. It can be deficient in its vertical dimension [1], leading to patient dissatisfaction in terms of aesthetics.

There have been very few papers to date in the literature describing the surgical techniques for chin lengthening [2–10]. Among these techniques, genioplasty is always either combined with a graft interposition (allograft or biomaterial) or associated with a local pedicled bone graft.

We aimed to showcase a new surgical technique to increase the vertical dimension of the symphysis without resorting to interpositional grafting, and to present the clinical results obtained with this procedure.

SURGICAL PROCEDURE

The intervention is performed under general anaesthesia. After subperiosteal injection with 1% xylocaine-adrenaline, a standard intraoral incision of the lower lip is carried out from canine to canine. The subperiosteal dissection allows for exposure of the entire symphysis and emergence of the mental nerves that are protected.

An inverted trapezoid is drawn on the median chin, with a longer upper base, and a shorter lower base corresponding to the continuity of the future horizontal cutting line (Fig. 1a). The trapezoid height is adjusted to correspond to the vertical elongation needed. Osteotomies of the trapezoid are made through the anterior cortical bone and the cancellous bone using a piezoelectric device, leaving the posterior cortical bone intact. A conventional bicortical osteotomy is performed, horizontally, with an oscillating saw, from the inferior border of the mandible to the inferior base of the trapezoid on both sides. The saw is then tilted to reach and cut the posterior cortical bone of the lower base of the trapezoid (Video).

After meticulous haemostasis, the inferior fragment is positioned lower and the trapezoid bone is used as a wedge to elongate the chin (Fig. 1b). The resulting gap is filled spontaneously by a blood clot, and platelet-rich fibrin (PRF) is sometimes used. The fixation is achieved with a central screw or with two lateral steel wires (Fig. 1c).

A surgical drain is introduced, and the closing is achieved using absorbable stitches. A genioplasty dressing is put in place for 5 days to reposition the soft tissues and to

prevent a hematoma.

DISCUSSION

Patients lacking in terms of the vertical dimension of the chin exhibit specific clinical and cephalometric parameters. These tend to comprise a deep labiomental fold, a prominent protruding chin/pogonion, and an upward and curved lower border of the mandible. Sometimes, there is also an associated bi-retro-alveolism/retro-dentoalveolar position.

Various techniques have been described to lengthen the chin (Fig. 2). To our knowledge, there has not been a study to date comparing the different strategies for lengthening of the chin. Converse and Wood-Smith first described the “sandwich” procedure to increase the vertical dimension, using a horizontal osteotomy combined with a bone graft of the iliac crest on the entire height of the bone defect [2]. Wessberg modified the original technique slightly by interposing iliac corticocancellous bone in the anterior part of the osteotomy [8]. The use of an autogenic graft from the skull [9] or bank bone [3], and also the use of biomaterials such hydroxyapatite or coral [1,7] to fill the osteotomy have since been reported. More recently, Lee et al. described the interposition of a central bone fragment from the genioplasty to lengthen the chin [5]. This technique derives its advantage from the transfer of a pedicled bone flap with the muscle attached on the posterior side, thereby reducing the potential risk of complications with a bone/biomaterials graft (instability, infection, and resorption) [5,10]. Finally, Lee et al. described a genioplasty variant that leaves a small amount of bone in the middle portion of the proximal segment to lengthen the chin [6]. The advantages and drawbacks of these different procedures are listed in Table 1. The use of an autogenous iliac bone graft appears to have the best long-term outcomes in chin lengthening, as evidenced by Kim et al. who showed a high predictability of 1:0.96 hard and soft tissue changes in the vertical plane at 6 months in 23 patients, without any complications [4]. The use of an alloplastic implant has been described by some authors to increase the bony pogonion [11], but this is not adequate to correct a vertical deformity [12].

We describe a novel technique for lengthening genioplasty, based on a single osteotomy line and an inverted trapezoid design. Our strategy does not require any graft interposition. The piezoelectric device allows shaping of the anterior segment of the trapeze; limiting the surgical time, as the posterior wall of the trapeze is left in place. Furthermore, in most chin deficiencies, the dental roots of the mandibular incisors have a posterior direction; conservation of the posterior wall helps to prevent damaging the teeth. Finally, excessive muscle detachment on the posterior mandibular symphysis is also avoided. In our experience, 7 patients have been operated with this technique and good aesthetic and morphometric outcomes were achieved (Fig. 3), with stable results at one year after the procedure (Fig. 4). The lengthening genioplasty can be isolated in patients with an Angle's Class 1 occlusion, or associated with other orthognathic procedures in patients with impaired occlusion. This procedure needs to be compared with the other surgical techniques that are available in terms of aesthetic and morphometric results, and in terms of long-term stability.

CONCLUSION

This novel chin osteotomy technique adds to the therapeutic arsenal for chin lengthening in patients with anterior vertical insufficiency of the mandible.

DECLARATION OF INTEREST

None

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None.

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FIGURE LEGENDS

Figure 1. The surgical technique for chin lengthening. Schematic representation of the osteotomy design (a and b), perioperative photograph of the internal fixation with two steel wires (c).

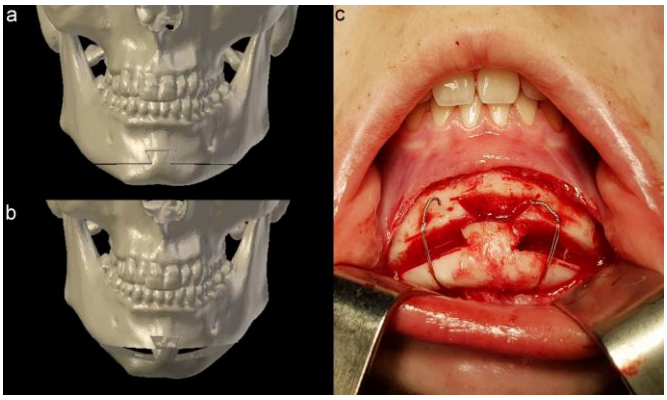

Figure 2. Schematic description of the techniques described to lengthen the chin. The “sandwich” procedure is based on the use of a bone graft or biomaterials to fill the defect (a). Lee’s technique to lengthen and narrow the chin uses one horizontal and three vertical sections; the central two segments are rotated 90° and used as an interpositional bone flap (Lee, 2013) (b). Technique of chin lengthening and narrowing based on a discontinued horizontal osteotomy leaving a bone block in the middle portion, allowing for a chin elongation (c) (Lee, 2014).

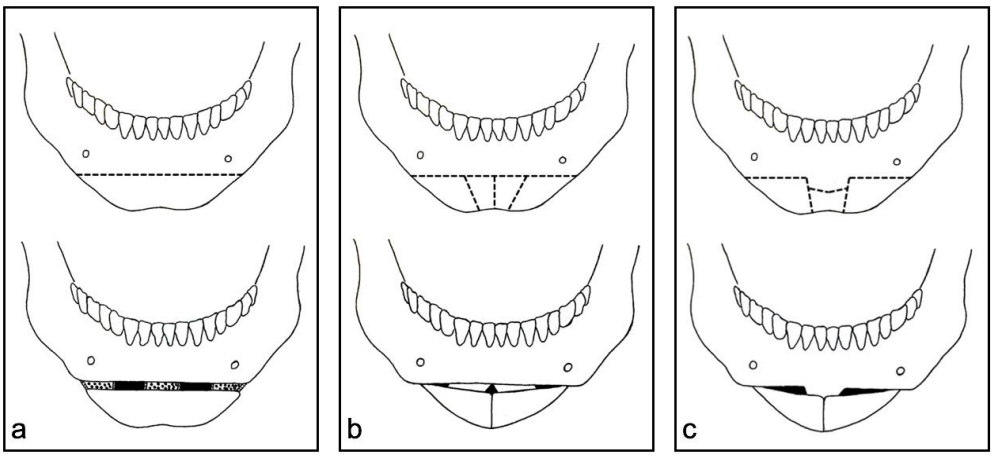

Figure 3. Frontal and lateral photographs of a fourteen-year-old patient with a vertical insufficiency of the lower third of the face (a and b). Frontal and lateral postoperative photographs at one year after the chin lengthening (c and d).

Figure 4. Preoperative (a and b) and one-year postoperative (c and d) lateral cephalograms and panoramic X-rays.

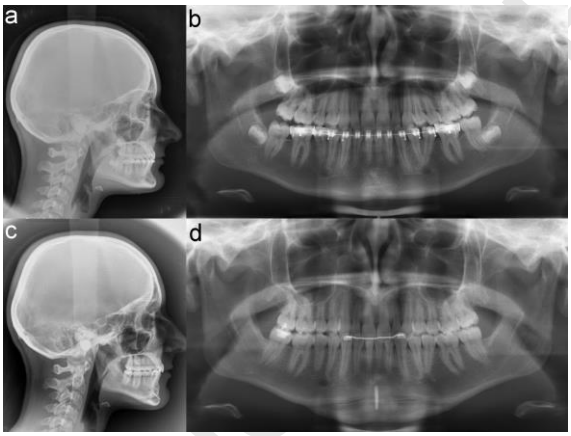

Table 1. The advantages and drawbacks of the surgical procedures used for chin lengthening.

	Advantages	Drawbacks
Autogenous bone graft	Stable over time High predictability of soft tissue response Low risk of infection No foreign body reaction	Donor site morbidity
Biomaterials	No resorption No donor site	Low resistance to torsional forces, fractures High risk of infection
Local pedicled bone graft	No donor site Good stability	Multi-segmental osteotomies