Osteotomy in Genioplasty by Piezosurgery

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Background: The chin is the most prominent and median sector of the lower third of the face giving harmony to nose and lips. The authors present the application of piezoelectric scalpel for the correction of different chin deformities. The distinctive characteristics of this device allow the authors to avoid or reduce the immediate genioplasty complications.

Methods: Fifty-five patients of defective chin have been treated from January 2006 to April 2008. Intraoral genioplasty was performed during the correction of dentofacial dysmorphisms or associated with nasal surgery. The authors used a piezoelectric cutting device to perform different osteotomies and if necessary, interpositional graft was used to stabilize bony segments.

Results: Piezosurgery has been associated with a fewer number of postoperative complications, especially as regard intraoperative bleeding, nerve injuries (immediate and late), hematomas and seromas, asymmetry (immediate and early). The mean time for completing the complete procedure of genioplasty with piezosurgery was almost the same compared with the saw and drill.

Conclusion: Genioplasty represents one of the most common ancillary procedures and may be associated with corrective surgery of dentofacial dysmorphisms. Mental nerve injuries, asymmetries, intraoperative bleeding are the main immediate complications of genioplasty. Distinctive characteristics of ultrasonic piezoelectric osteotomy are selective cut of mineralized structure with less risk of vascular and nervous damage (microvibrations), intraoperative precision (thin cutting scalpel and no macrovibrations), blood free site (cavitation effect). In the authors’ experience, piezoelectric scalpel, compared with saw and drill, enables them to reduce or avoid immediate complications of chin surgery, helping the surgeon to reach patients’ satisfaction.

Key Words: Genioplasty, osteotomy, piezoelectric bone surgery, piezosurgery

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Corticosteroid therapy, history of osteoporosis, thyroid disease, diabetes mellitus, postmenopausal women, coagulation alterations, patients with any history of systemic, autoimmune, oncologic condition that would affect or for which treatment would affect bone and corrective tissue remodeling at local and systemic level; at last, psychiatric conditions that could interfere with treatment rendered. All the patients were exhaustively informed about the surgical procedure and its complications and all of them gave both verbal and written consent. The principles outlined in the Declaration of Helsinki have been followed. The research is exempt from approval of the local institutional review board being the piezosurgery and the materials a standard in the actual surgical procedure and no more experimental.

Clinical pictures (front, profile, 3/4 views) and radiographs (Panorex, profile and antero-posterior cephalogram X-rays) were taken before the surgery. The surgical planning included clinical analysis and cephalometric study according to Arnett’s analysis.17

We actually individualize the surgical treatment. Anyway we selected patients in whom we performed a mean 6 mm chin advancement (5.7–6.3 mm) and 1 to 2 mm chin bone lowering measured at the pogonion.

In group A we utilized a piezoelectric cutting device (Piezosurgery Medical II- Mectron spa, Carasco, Italy) with MT1-10. In group B we utilized a reciprocating saw (Stryker Core System), in the irrigation fluid was NaCl solution in both the groups.

Surgical Technique

All the surgeries have been performed by endotracheal anesthesia (nasal intubation).

After infiltration of 10 cc of naropine 7.5 mg plus adrenaline 0.5 mL, vestibular incision by scalpel is performed. We then go through the muscles with a Colorado electrocautery tip at 25 W power, we undermine the peristomeum with a Pritchard and make 3 bone marks by MT1-10 tip piezoelectrical device in group A, by a pencil in group B. Group A received a less extended undermining due to the fact that it does not damage the soft tissues.

The line of osteotomy must be performed at least 5 mm below the mental foramen in order to respect the roots of the mandibular teeth.18 In group A the entire procedure is performed by the piezoelectric device, without the aid of osteotomes to complete the splitting of bone surfaces. Bone cuts are done at power 6 and irrigation level 3. The pressure on the tip must be done with continuous shift as it allows the tip to clean and cut with continuous irrigation. It is clearly possible to feel the posterior cortical bone and that we reach the soft tissues which are never damaged by the tip reducing bleeding. On the contrary, in group B it is better to split the surfaces with osteotomes in order to avoid deepening the saw in soft tissues while on the posterior surface of the bony chin.

The most important areas to be cared are the mandibular margins below the mentalis nerve to avoid asymmetries after the osteotomy. At the completing of the procedure we even do not need the chisel to separate bone surfaces. We utilized 1 g of interpositional allografts (Bio-Oss-collagen, Geistlich Pharma, Wolhusen, Schweiz) in all of our procedures to fill all the residual empty spaces between bone surfaces. The mandibular bony segments were fixed with titanium miniplates (Osteomed 2.0 Orthognathic System, Glendale, CA) and screws (4 for each miniplate). The mucosa was sutured with absorbable suture (Vycril 4-0, Ethicon, Johnson&Johnson, Somerville, NJ). During the perioperative management, the antibiotic therapy was endovenous ampicillin associated with sulbactam (1 g three times a day), whereas pain was controlled with ketoprofen 100 mg on request. The clinical follow-up was at 1, 4, 7, 14 (intraoral suture removal), 30 days, then 2, 6 and 12 months. The radiological follow-ups were taken after 1 day and 6, 12, 24 months.

Bleeding has been calculated deducting the amount of saline solution used for intraoperative irrigation to the overall aspirated fluids. Length of surgery has been timed by a manual Hanhart chronometer: start time was the mucosa incision, end time was the completion of the mucosa suture.

Each Piezosurgery tip and saw were used for 1 surgery. Labiomental sensibility was evaluated at each clinical control by pin brick sensation, static 2-point test, moving 2-point test.

CLINICAL CASE

A 28-year-old woman underwent chin surgery by Piezosurgery. She was affected by a defective chin (see Fig. 1A–D). Under general anesthesia, an intraoral genioplasty was performed associated with open rhinoplasty. The chin was lowered 2 mm and moved forward 6 mm (see Fig. 2A–D). Surgery time was 28’12”. Intraoperative bleeding was 138cc. See the pre and postop x-rays showing the precision of the bone osteotomy with piezo device (see Fig. 3A, B).

At the surgery time, she referred a monolateral deficit of sensibility of the labiomental region, which was completely healed at the 60 day follow-up. No other complications were registered. See the result with harmonic profile (see Fig. 4A–D).

![FIGURE 1. (A) Preop front view of the skeletal second class associated with microgenia. (B) Preop side view of the patient where you can note the nasal hump and the microgenia. (C) Three-quarter preop view: overlong nasal tip and columellar exposure with weak chin. (D) Preop base view with deviated nasal tip on left side.

![FIGURE 2. (A) Postop front view showing the harmonic projection of the chin. (B) Postop side view with good esthetic result reduction of the nasal hump and balanced profile. (C) Three-quarter view good result on the social profile. (D) Base view: asymmetry has been solved.

![FIGURE 3. (A) Intraoperative preop view with reference lines. (B) Intraop view after bone fixation.
It is world accepted that genioplasty is a very useful aesthetic procedure to improve the harmony of the lower third of the face. Porous polyethylene and solid silicone allografts are probably the widest used material to improve facial appearance20 and apart from some cases of displacement due to wide dissection or trauma, or infection, which can be solved by removal, we can easily do such an operation in about 15 to 20 minutes average time also under local anesthesia. The main reported problem that was observed in solid silicone allografts was bone resorption with long-term unaesthetic outcomes.21 The actual extended silicon allografts show a reduced resorption rate.

As regard bone genioplasty, both intraoral and extraoral approaches have been described in scientific literature; in our practice, genioplasty is usually performed by intraoral approach. Surgical genioplasty is a relatively simple technique that is performed for aesthetic refinement, but it is not free of complications. Piezosurgery allows us to avoid or to reduce some of those ones. In order to cut a thick bone such as the mandibular one, we have utilized the MT1-10 insert, that it is not the keenest one (0.75 mm instead of 0.35 mm if the MT1-10S) but it is a good compromise between breaking strength and thinness. The lateral bone extension of the mandibular border of the chin was cut without risk for damage of the closest soft tissues. Bone has been cut with the piezoelectric scalpel for all its thickness with need of using a chisel and hammer to complete the posterior osteotomy. This is possible because the insert does not cut the soft tissues differently from rotating instruments or reciprocating saw.

Seventeen patients of group A referred a mild deficit of sensibility (12 monolateral and 5 bilateral) at the labiomental region which disappeared at 1 month follow-up, whereas in group B 22 patients (14 bilateral and 8 monolateral) had mild to moderate deficit which disappeared at 3 months follow-up. At 2 years of follow-up, no patient was reporting a nervous deficit.

Regarding hematomas: just 1 patient in group A instead of 4 patients in group B; the hematomas disappeared after 20 days. It is our opinion that these data are strongly related to the selective cutting action of Piezosurgery which does not hurt the soft tissues. The minor incidence of asymmetry in group A confirms the clinical efficacy and precision. According to our opinion, this result is strongly related to the major precision of the osteotomy at the mandibular border: as a matter of fact, the less undermining and the absence of microvibration and the lower risk of soft tissue injury allow a better surgical control of the maneuver.

The incidence of the remaining complications (infections, wound dehiscence, lip ptosis, skin dumpling, and gingival retraction) has been almost the same in the 2 groups that indicates the different cutting instrument seems not to influence the soft tissue healing.

The mean time for completing the complete procedure of genioplasty with piezoelectric saw (mean value of 27.53”) was almost the same compared with the saw and drill (mean value of 25’13’’): indeed, even though the piezoelectric cut is longer than the traditional one, many procedures in order to protect soft tissues can be avoided, with a gain of cutting precision. In our experience, learning curve for piezoelectric scalpel needs not more than 8 to 10 surgeries—considering that the only complication of an improper use of this instrument is the fracture of the insert.

The costs are 25% more for the piezo because they suggest a single-use tip for a single procedure. It is not a problem if we speak...
in terms of precision, better surgical control, and comfort to the patient in eventual local anesthesia.

CONCLUSIONS

In our experience, piezoelectric scalpel is an effective alternative to traditional rotating instruments in genioplasty. Piezoelectric cutting device, compared with traditional rotating instruments, enables us to reduce or avoid many complications (especially immediate and early ones) associated with this aesthetic surgical procedure.24–26

REFERENCES

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