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Retromicrogenia Surgery by Double-Stage Genioplasty: Technical Note

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Abstract: The purpose of this work is to describe the technique of double-stage genioplasty and to bring out its interest in the important retromicrogenia l and its feasibility in the context. The study provides a descriptive and cross sectional study with prospective data collection, conducted in the department of Maxillofacial and Aesthetic Surgery of the Mohammed 6 Teaching Hospital of Marrakech, on two patients who have benefited a double-stage genioplasty. These are two clinical cases of retromicrogenia. The first (patient1) is subject to temporo-mandibular ankylosis, and the second (patient2) is subject to congenital with growth disorders of the dental arch, a tendency to class-II skeletal patterns, pro-alveoli, swallowing problems, and occurrence of recurrent mouth infections due to poor oral hygiene. They were treated, respectively, with double-stage genioplasty only and a combined procedure of double-stage genioplasty associated with Wassmund osteotomy at the same time. The patients were female, young on average 24 years of age. The average duration of the intervention was 1h10 minutes; the mandibular advances were on average 8mm per fragment. The dental articulation and the projection of the chin were satisfactory. Retromicrogenia is a rare pathology, the source of functional and morphologic complications. "Double-stage" advancement genioplasty is the treatment of choice. It allows a necessary advancement for a good reflection of the chin, and remains a simple technique, minimal, and ensuring good aesthetic and functional results over the long term.

Keywords: Genioplasty, Major Retromicrogenia, Double Stage Osteotomy, Projection of Chin

1. Introduction

A small chin in a position characterizes Retromicrogenesis too far back, with insufficient protrusion on the profile line. It is either congenital or acquired (sequelae from temporo-mandibular ankylosis), and causes morphological and functional problems, specifically, the aspect of a receding chin and sleep apnoea [1-4].

Double-stage Genioplasty fixes these anomalies by correcting the position of the chin in the 3 spatial planes without touching the teeth. This surgical procedure of repositioning the skeletal components of the facial structure is used to improve function and aesthetics [5].

But the most important thing is that it allows a reconciliation with the image that one has of oneself, and authorizes in this way a recovery of confidence.

Several genioplasty techniques have been described, but in the face of large chin deficit, double-stage genioplasty seems to be more effective in providing morphological and functional correction.

This technique will explain in detail in this work through two clinical cases.

2. Patients and Methods

2.1. Type and Period of Study

A descriptive and cross sectional study with prospective data collection, conducted in the department of Maxillofacial and Aesthetic Surgery of the Mohammed 6 Teaching Hospital of Marrakech, over a period of 2 years from January

2016 to December 2017 with a mean follow-up of 18 months.

Only two patients who have benefited a double-stage genioplasty were retained out of the 8 cases of genioplasty executed in this period of study. The two patients were assessed for pain, ability to speak, infection, haematoma, and any other complications in the immediate and late postoperative periods.

2.2. Variables Studied

The following variables have been studied:

Age, sex, etiology of genioplasty, anterior surgical and orthodontic treatment, preoperative morphological profile (occlusion type, chin recoil, mouth opening), preoperative analysis by cephalometry and dental molding, postoperative morphological profile (occlusion type, degree of advancement of the chin, oral opening), indication of surgery, duration of surgery, patient satisfaction, operative follow-up of clinical and radiological procedures, and technical note.

2.3. Technical Note

These are two clinical cases of retromicrogenia. The first (patient1) is subject to temporo-mandibular ankylosis (figure1.), and the second (patient2) is congenital with growth disorders of the dental arch, a tendency to class-II skeletal patterns, pro-alveoli, swallowing problems, and occurrence of recurrent mouth infections due to poor oral hygiene (figure 2.). They were treated, respectively with double-stage genioplasty only and a combined procedure of double-stage genioplasty associated with Wassmund osteotomy at the same time (Figure 3.).

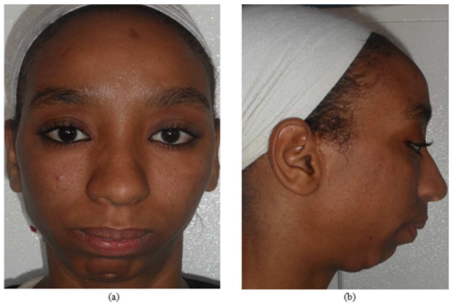


Figure 1. *preoperative image of the patient1, face and profile with a small chin very far back.*

Figure 2. *preoperative image of the patient2, face and three-quarter profile picture with a small chin back, with a tendency to class-II skeletal patterns, pro-alveoli.*

Figure 3. *Wassmund Ostétomy in association with a double stage genioplasty performed to patient 2.*

The procedure was conducted under general anesthesia with nasotracheal intubation, the patient was placed in a dorsal position with the head resting on a headrest and placement of an oropharyngeal packing.

The midline, canine, and premolar interdental mucosa are tagged with sutures to aid in accurate realignment of the wound margins. Supplementary local anesthesia with 2% lidocaine and 1:100.000 epinephrine (2 ampules per side) is infiltrated into the periosteal plane to achieve a bloodless dissection field. Before the incision is made, 10 minutes are allowed to elapse after injection of the local anesthesia.

The initial incision from canine to canine is made through mucosa at 10mm from the junction between the free mucous membrane and the attached mucous membrane.

The dissection was continued through the submucosal tissues and muscle then down to the periosteum. The periosteum was sharply incised and reflected from the anterior mandible to the inferior border.

During this dissection, care was taken to identify the mental foramen and protect the emerging mental nerve bundles.

Because the inferior border osteotomy usually extends the posterior to the mental foramen, the periosteum at the inferior border must be freed to at least the anterior third of the body of the mandible.

The nerve emerges at the foramen, which was generally found between the first and second premolar teeth and at the level of the origin of the mentalis muscle or 2 to 4 mm below the level of the bicuspid tooth apices.

The subperiosteal detachment exposed the entire anterior surface of the mandibular symphysis, while respecting the muscular insertions of the basilar margin.

The digastric muscles were dissected to reduce the muscular tension and to avoid the secondary recession. On the other hand, the hyoid muscles were left intact to allow a good vascularization and thus, subsequent consolidation of the bone fragments.

The midline should be scored vertically with a burr or saw to mark the correct position in case the fragments are moved. Then identified the two levels of the two parallel lines of horizontal osteotomy; a first pre-basilar line giving a fragment with 7-8 mm minimum height, the second line was 5mm below the apices at a distance from the lower dental nerve. (Figure 4.).

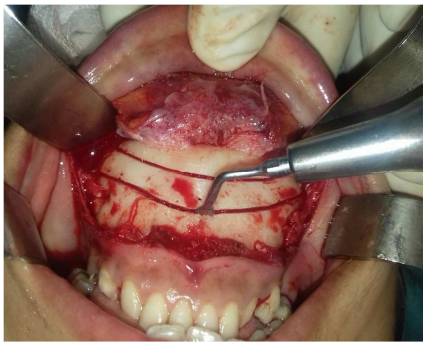


Figure 4. *Illustration of the features of osteotomy with piezotome in per operatory.*

The osteotomy sections were made with a piezotome and a diamond burr. A sagittal saw with a 30-degree bend should be used to facilitate an even cut while minimizing soft tissue trauma.

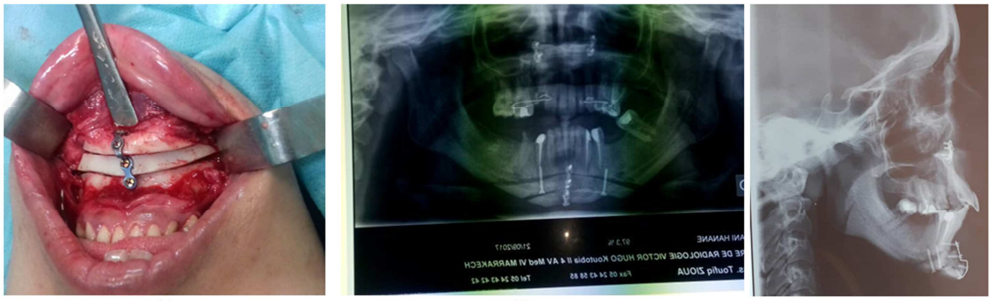
They had to be symmetrical in the three spatial planes and had to join the basilar edge laterally at the same distance. A finger was slipped in mouth behind the symphysis, in order to perceive the osteotomy instrument at the posterior cortical level.

The inferior and then the neighboring fragment were mobilized using fine osteotome which made it possible to complete the section of the internal table and then to dislocate the fragments downwards. The regularity of the sections was checked and supplemented as needed with a mold ball. A strict hemostasis was performed with electro-cauterization to prevent a hematoma of the mouth floor.

The positioning of the fragments was then carried out using the Kocher clamps following the cephalometric and clinical preoperative analysis. But classically, the previous advances of each fragment were 8 to 10 mm (figure 5.).

After checking the good cooptation between the fragments and the strict respect of the median line, the osteosynthesis was carried out by straight titanium plates of five to six holes, fixed by mono cortical screws and reinforced by three bi-cortical screws. 17 mm long and 2 mm in diameter, one median and two lateral (figure 6.).

Figure 5. *Illustration of the advancement of the two fragments after osteotomy compared to the desired profile.*



(a) (b)

Figure 6. *Illustration of progressive osteosynthesis of fragments (a) and postoperative radiological control of osteosynthesis.*

Remodeling of this fixed and solid assembly was done with a large burr to remove sharp edges, irregularities, and projections that could be felt laterally along the basal margin.

Closure was finally made end to end in two planes after hemostasis was assured.

An elastic bandage was then applied to the chin to mold its contours and prevent postoperative hematoma. Postoperative medical treatment consisted of analgesia (paracetamol 60 mg/kg/day for 5 days and then as required), intravenous prophylactic antibiotics for 24 h and then orally for a total of 7 days (amoxicillin + clavulanic acid 50 mg/kg/day), local antisepsis by mouthwash and dietary advice (cold meals for 48 h, then soft food).

3. Result

Patients were female, young on average 24 years of age. One patient in her history had benefited ankylosis surgery 4 years before genioplasty.

One retromicrogenia was of congenital etiology and the other was related to the complication to temporomandibular ankylosis during the period of growth.

The two retromicrogenia had a major recoil of chin, dental joint for class2 subdivision1 with pro-alveoli for patient2, and the other in class2 (patient1). No limitation of oral opening was made during the preoperative.

The average duration of the intervention was 1h10 minutes; the mandibular advances were on average 8mm per fragment.

Postoperative care was simple. The slight edema of the floor of the mouth (without respiratory signs) and mild hypoesthesia of the lip and the chin resolved over time, with preservation of chin symmetry and good oral capacity.

Oral opening and swallowing normalized around the 20th day.

The dental articulation and the projection of the chin were satisfactory (figure 7 and figure 8.).

Figure.7. *These figures illustrate preoperative and postoperative image face(a) and profile(b) of the patient1, face and profile with a good chin projection.*

Figure 8. *These figures illustrate preoperative image (a) and postoperative image(b) of the patient2, a good chin projection and dental articulation.*

4. Discussion

The chin is an important entity when it comes to facial aesthetics. It is sometimes a location for morphological abnormalities in the 3 spatial dimensions as in the case of retro-microgenia, reflecting a chin in posterior position, sources of the morphological and functional problems [1, 2] and therefore requiring correction.

The age of patients was on average 24 years old. This delay in management was explained on one hand by the lack of financial means and on the other hand by the priority correction of temporomandibular ankylosis. In theory, this technique can only be executed after the definitive canines have been placed, that is, around the age of twelve to thirteen, because the dental germs prevent the osteotomy, and coincide with the acquisition of the definitive measurements of the mandible [1, 6]. For sex, of course, though our patients were female, but however that there is no particular gender related predominance.

None of patients received prior orthodontic treatment that was normally required [7-8].

This genioplasty was performed as a substitute for orthognathic surgery, as was the case of the patient1 (sequential retromicrogenia with pro-alveolysi). Here, it would have been necessary to realize an orthodontic and surgical setup, followed by a mandibular advancement with sagittal osteotomy of the rising branches then a classic genioplasty [8-9]. But the patient was not able to bear the cost of orthodontic care, our choice fell on the technique "double-stage advancement genioplasty, or double rod" substitution. For patient2, it was indicated for a major chin recoil.

This technique can also be indicated in the long recoil with sleep apnea [10-11].

It can be applied alone or in combination with an osteotomy advancement or retraction of the maxillary. This is the case of patient2 where a wassmund osteotomy was associated to correct the major proalveolis [6].

The indication of a genioplasty must be demanded after clinical, cephalometric, and dental molding analysis (Figure 9).

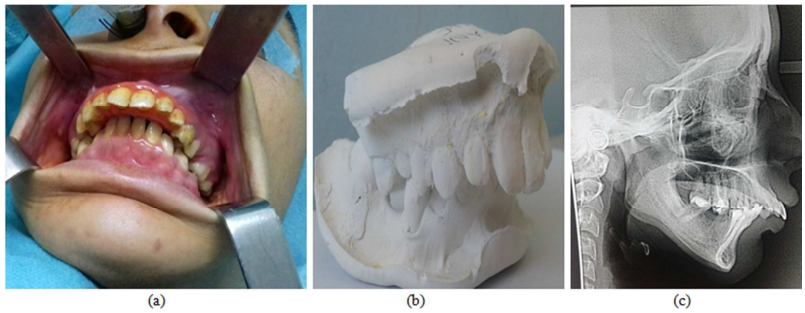


Figure 9. *These figures illustrate preoperative images of dental articulation (a), dental molding (b), and cephalometry(c) of patient 2.*

This analysis defined dysmorphosis and chin involvement in this deformity, in order to find a treatment goal by determining the ideal chin position based on a number of landmarks [2, 12-14].

The correct positioning of the bony chin as determined by cephalometric analysis is the guarantor of a good postoperative esthetic result. However, the indication of a genioplasty should not be based on cephalometric theoretical trace and must take into account the wishes of the patient, his/her psychic state, and the information provided by the clinical examination [6].

The articulator assembly of the dental molding allowed the simulation of surgical movements, especially in the patient receiving a Wassmund osteotomy [7].

The realization of this surgery (genioplasty) requires the mastery of certain anatomical notions:

-The path of the mandibular nerve, ends at 9.2 mm from the basilar border, and 5 mm below and in front of the foramen (antero-inferior loop), which makes it necessary to observe a minimum distance of 5 mm around the mandibular foramen during osteotomy [6, 15].

- The roots of the incisive-canine block are 13 mm long (central incisor), 17 mm long (canine), so a distance of 4 to 5 mm below these apices must be respected during the osteotomy [1, 6].

- The least "devascularizing" bone rods should be 8-11 mm thick with their posterior muscular attachments since the vascularization of the bony chin is double internal and external [16].

Several surgical techniques of genioplasty have been described:

Genioplasty with simple horizontal osteotomy, indicated in case of moderate deficit and sleep sleep apnoea [2].

It seems insufficient in the major setbacks [6].

Endoprosthesis augmentation genioplasty, which is an alternative to the horizontal symphysis advancement osteotomy, but is indicated only in the case of moderate antero-posterior deficit. Its disadvantages are numerous (infection, implant migration, osteolysis, peri-prosthetic hull giving a rigid aspect to the chin.) These prostheses are currently less and less used [6, 17].

Dual-stage genioplasty is a simple, repeatable, and useful technique in major and vertical anteroposterior deficit [18-19]. This technique also allows more relevant advanced chin with good chin projection while preserving the neurovascular bundle, thus preserving lip sensitivity without alteration of masticatory function nor labial incompetence.

Nevertheless, postoperative care of genioplasty is often complicated by labiomandibular hypoesthesia and mouth floor edema, delaying the resumption of normal functions.

Piezotome was used in one patient and diamond burr for another patient.

"Double-stage" genioplasty is currently being used more and more in large chin recoils because it is effective on advancing with about 8 to 10 mm per fragment while allowing the preservation of the vasculo-nervous network. On average, our gain in progress was 1.6 cm or 8 mm per fragment [6].

The average duration of our interventions was 1h10minutes; it depends on the experience of the surgeon and especially the instrument used for osteotomy. Therefore, it takes shorter with the piezotome, the oscillating saw, and longer with the diamond burr [6].

The inaccuracy of the cutter makes the electric saw, the piezotome, the most suitable instruments for osteotomies [20].

The fragments were stabilized by mini plates and bicortical screws, because they are more stable than the steel wire. But the preformed slabs can also be used [20].

No complications were found after an 8 months follow-up. Just a labial and chin hypoesthesia, a discreet asymmetry of the chin for the second case that will be treated through lipofilling (Figure. 7)

Acebal-Bianco et al have described several complications [21].

a) Surgical lesion of the lips, dissection of the mandibular nerve, dissection of the dental apex, dissection of the inferior alveolar nerve, hemorrhage. They are avoided through knowledge of regional anatomy [5-6].
b) In the early post-operative period: infection, compressive hematoma of the mouth floor, chin and lip hypoesthesia. [22].
c) In the long term, the evolution can be marked by ptosis of the soft parts or "witch's chin", necrosis of the fragment, secondary displacement after pseudarthrosis of the basilar fragment [10].

5. Conclusions

Retromicrogenia is a rare pathology, the source of functional and morphologic complications. “Double-stage” advancement genioplasty is the treatment of choice.

“Double-stage” advancement genioplasty is a useful genioplasty procedure that must be known because it finds its place in specific cases of strong chin deficit with the advantage of possible associations with other techniques. It allows a necessary advancement for a good reflection of the chin, and remains a simple technique, minimal, and ensuring good aesthetic and functional results over the long term.

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