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The sagittal mandibular osteotomy under local anesthesia and intravenous sedation: Four years of multicenter experience

Today many surgical procedures involving head and neck areas can be performed under local anesthesia and intravenous sedation. The authors add to this list the sagittal osteotomies of the mandibular rami, thereby avoiding the need for general anesthesia and a hospital stay. The authors designed a protocol to be followed in a multicenter study (Milan and Barcelona) and applied it in 35 clinical cases with Class II malocclusion. The surgical procedure was performed with the Monitored Anesthesia Care technique, a combination of regional anesthesia and intravenous sedation. The results were good in all the clinical cases; skeletal correction of Class II was achieved in all patients and there were no intraoperative or postoperative complications. The major advantage of this technique is the functional control of the temporomandibular joint, which avoids displacements caused by gravity and the muscular relaxation commonly seen under general anesthesia. Furthermore, this protocol allows a reduction in costs, duration of surgery, and patient morbidity and convalescence. When this technique is accepted without hesitation, all Class II patients with only mandibular deficiency deformity may be treated in the most suitable way, thus providing the most satisfactory outcomes for the patient, orthodontist, and surgeon. (Int J Adult Orthod Orthognath Surg 2002;17:267–271)

An increasing number of surgical procedures involving the head and neck are now performed under local anesthesia assisted by intravenous sedation.[1–4] Techniques such as genioplasty, maxillary corticotomy for palatal expansion, and blepharoplasty, as well as a number of esthetic and temporomandibular joint (TMJ) functional procedures are routinely accomplished under these conditions. In our clinical practice we have also placed and removed intraoral mandibular distractors for the treatment of Class II malocclusion under local anesthesia along with intravenous sedation. In most of these clinical cases, patients are discharged from the hospital within 2 hours after surgery, once they have recovered the ability to walk and self-orientate as the effects of sedation wear off. Hospitalization is thereby reduced to less than 24 hours in all of them, leading to the concept of "outpatient orthognathic surgery."[5–9]

The reduction of hospitalization is a result of advances in surgical techniques (rigid bone fixation and no maxillomandibular fixation), along with an improvement in anesthetic procedures (drugs with shorter half-life). These have remarkably reduced postoperative morbidity.

Having experienced no problems in the procedures previously mentioned, we concluded that we could possibly perform sagittal osteotomies of the mandibular rami under the same conditions, avoiding the need for general anesthesia and hospitalization, thus making this type of surgery feasible on an outpatient basis. To this end, we designed a protocol to be followed within a prospective multicenter study (Milan and Barcelona); this protocol would provide the study with the required homogeneity in both the selection of cases and the recording of results, not only from an objective point of view (problems found

during the surgical procedure, achievement of desired skeletal correction), but from a subjective one (degree of discomfort reported by the patients during and after surgery).

A preliminary report on this procedure has been published.[10] Here, we wish to present the results of 4 years of experience on 35 patients and our conclusions about this procedure, focusing on its surgical aspects. The orthodontic aspects of this procedure will be the subject of a future publication.

Materials and methods

The procedure was first performed in 1998, and since then a total of 35 patients have been treated by this method. Only 2 patients were operated on by both Raffaini and Alfaro together, and the rest of the patients were operated on by either one or the other surgeon, but always following the same protocol.

Twenty-seven patients showed an isolated skeletal Class II malocclusion of low to moderate severity, so that they needed only mandibular advancement for correction. The remaining 8 patients had mandibular asymmetry with a chin deviation of at least 3 mm, Class II malocclusion on one side, and Class III malocclusion on the other side due to the presence of a defective or excessive hemimandible, respectively. In 4 of these asymmetric patients, a genioplasty was also performed to center the chin symphysis and optimize the final result.

In 5 patients, a median mandibular osteotomy was performed to match the transverse dimension of the mandibular arch to that of the maxilla; in another 4 patients, a closed rhinoplasty, without septoplasty and nasal bone fracture, was executed for esthetic reasons. Finally, in 6 patients it was necessary to remove impacted third molars because they were in the splitting area. No complications or unfavorable fractures were recorded performing the sagittal split osteotomy (SSO) in the presence of third molars, but this did occur with the execution of an inferior border osteotomy, as already mentioned in other articles.[11]

Information given to the patients included that for the usual orthognathic procedures, plus an addendum where the possibility of the eventual need to perform nasotracheal intubation and general anesthesia was explained, in case problems occurred for either the surgeon or the patient during the surgery.

Twenty-five of the patients were women and 10 were men, with ages that ranged between 17 and 29 years (mean 22.6). All patients had undergone previous orthodontic treatment to ensure a satisfactory occlusion postsurgically.

Surgical technique

The surgical procedure is performed in the usual operating room for orthognathic surgery with the so-called Monitored Anesthesia Care (MAC), which is a combination of local or regional anesthesia and intravenous sedation. Patients are first monitored for heart parameters, blood pressure, and oxygen saturation, and a peripheral vein is canalized. After basal parameters are checked, the anesthesiologist initiates intravenous sedation to allow for infiltration of local anesthesia without discomfort. This initial sedation is achieved with a combination of a benzodiazepine (for its sedative and amnesic effects), short-lasting narcotics (to reduce pain), and ultrashort-acting hypnotics (to reduce the degree of consciousness for a minimal time period).[3,12]

Soon after the initial sedation, the surgeon injects the local anesthetic (Marcaine plus epinephrine 1:50,000, Astra Zeneca) at the level of the lingula and the buccal and lingual side of the ascending ramus and the buccal side of the body of the mandible. Since this is done bilaterally, both regional block of the inferior alveolar, buccal, and lingual nerves, as well as infiltrative anesthesia, are achieved. During the procedure, additional infiltration with xylocaine plus adrenaline 1:200,000 (Astra Zeneca) to better control local anesthesia may be necessary.

The surgical technique does not diverge essentially from the classical one, but there are some specific changes. Limited degloving of both the medial aspect of the ascending ramus and the buccal aspect of the body of the mandible at the level of the first and second molars is done with a

Figs 1a and 1b Intraoperative views of a Class II patient treated by bilateral sagittal split osteotomy, as previously described, and closed rhinoplasty during the same surgery.

wide periosteal elevator, circumscribing only the area where osteotomies will be performed. This results in reduced postoperative edema.

The osteotomy tracing is performed in the following sequence:

1. Milling of the internal oblique line is performed in front of the lingula with an oval bur.
2. External corticotomy is performed at the level of the second molar by means of a short reciprocating saw (Osteomed), extending to the inferior mandibular border.
3. Finally, a sagittal osteotomy is made with the same type of saw connecting the notch previously done at the lingual cortical cranially with the distal vestibular corticotomy. The corticotomy made by means of a saw allows for an easier splitting of the mandible.

After completion of the osteotomy design on both sides, a miniplate, whose size must be equal to the amount of advancement desired, is placed on the distal corticotomy and fixed primarily only at the proximal fragment.

The split is achieved combining the use of wedged osteotomes and distractors (Tessier, Postnick, Krekmanov). Gradual separation of the fragments is done with care to allow for eventual identification of the neurovascular bundle. At this stage of the procedure, the assistant's help in firmly grasping the anterior mandibular fragment is vital to prevent an eventual airway obstruction due to its posterior displacement. Also, aspiration and control of bleeding must be particularly cared for at this point of surgery.

Once the splitting has been completed, temporary maxillomandibular fixation (MMF) is made with or without the help of an occlusal guide splint, depending on the precision of intercuspation. Thereafter, the surgeon proceeds to the fixation of the rami, placing the screws in the distal segment and verifying at the same time the position of both condyles by means of the dynamic cooperation of the conscious patient. Once the segments have been fixed, the MMF is released, and the adequate positioning of the joint as well as the occlusion achieved are checked by asking the patient to actively open and close his mouth (Figs 1a and 1b). Thus, incorrect placement of the fragments can be easily detected and corrections can be made immediately. After thorough hemostasis is performed, incisions are closed with running sutures of Vicryl Rapid (Johnson & Johnson).

In the 8 patients with mandibular asymmetry, it was necessary to eliminate a few excess millimeters of bone at the proximal segment to achieve correct rotation and centering of the mandible. In 4 of these cases, a genioplasty was also performed to obtain perfect symmetry of the chin.

The patient is released from any MMF, although sometimes 2 Class II box elastics are placed at the level of the premolars to allow for active opening exercises from the early postoperative period.

Once surgery is complete, the patient is placed in a recovery room, and ice packs are applied. After the ability to walk and vital signs have been checked, the patient is discharged from the hospital.

Antibiotics, anti-inflammatory drugs, and pain medication are prescribed. Contact through telephone is facilitated for the first 48 hours with both the surgeon and

the anesthesiologist. After the first 48 hours, a follow-up visit takes place, and subsequent appointments for control are made routinely after this kind of surgery.

Results

In all cases, skeletal correction of the Class II malocclusion was achieved, with mandibular advancement that ranged between 4 and 8 mm (mean 5.5 mm). In 12 of the 35 patients, a tripod occlusion (with contact at the front and molar areas) was left and further corrected by orthodontic extrusion of the premolars. In the 8 cases of asymmetry, mandibular rotation of 3 to 5 mm was done, with a mean advancement of 4.5 mm on one side and a mean backward movement of 3 mm on the other side. In the 4 patients in whom a genioplasty was performed, the aim was only to center the chin.

Surgical time was reduced compared to the standard procedure, ranging between 25 and 45 minutes. The cases of rami surgery plus genioplasty each lasted 60 minutes. Although the execution of the procedure by 2 experienced surgeons allowed for the shortening of the duration of surgery, this does not seem absolutely necessary.

None of the patients required intubation and general anesthesia during the procedure, and there was no need to readmit any of them after the hospital discharge. All patients recovered their own capacities within 1 or 2 hours after surgery, with a postoperative stay in the hospital that ranged from 1.5 to 6 hours (mean 2.5 hours). Subjectively, postoperative swelling and discomfort were similar to those observed in patients who underwent the same procedures under general anesthesia.

There were no intraoperative or postoperative complications, and no unpleasant results were recorded. In fact, all patients showed a high degree of retrograde amnesia with regard to the surgical procedure, and all them considered the experience satisfactory. Four patients experienced vomiting postoperatively (within the first 6 hours), which was effectively controlled with anti-emetic drugs.

Postoperative nutrition consisted of an enriched liquid diet for the first 7 days and a soft diet subsequently for the first month, as is prescribed for the usual protocol.[13]

Discussion and conclusion

In our regular practice there are already numerous esthetic, orthognathic, and traumatologic procedures that are commonly performed under local anesthesia plus intravenous sedation, namely rhinoplasty without septoplasty and nasal bone fractures; genioplasty with osteotomy; alloplastic implants in the zygomatic, chin, and mandibular areas; removal of buccal fat pad; blepharoplasty; cheiloplasty; maxillary corticotomy for orthopedic expansion; dentoalveolar osteotomies; bone grafting for alveolar ridge atrophy; osteogenetic distraction with mandibular osteotomies; reduction and fixation of mandibular, maxillary, or zygomatic fractures; and TMJ arthroscopy. The ultimate step would be the performance of the most classical osteotomies in orthognathics: the Obwegeser-Dal Pont and the Le Fort I.

Bilateral sagittal split osteotomy for mandibular advancement is the surgical procedure of choice for the treatment of Class II malocclusion with mandibular deficiency.[14] The implications of a procedure done under general anesthesia and hospitalization are obviously the main reason that prevents both patients and orthodontists from choosing this ideal treatment, leading themselves into more "compromise" approaches which, though less invasive, achieve less satisfactory results not only in terms of stability but also esthetics. In addition, the traditional orthodontic treatment for the Class II takes longer than any other surgical-orthodontic combined approach. However, because no general anesthesia and hospital stay are needed with the present protocol, and with the reduction of surgical time and morbidity, there could well be an increase in the demand for this type of surgery from both patients and orthodontists, thus overcoming much of the reluctance with which the classical procedure is regarded.

Significantly, mandibular advancement under these conditions is as effective as that performed under general anesthesia and nasotracheal intubation but has as advantages reductions in time of surgery, TMJ dysfunction, morbidity, convalescence (similar to that of third molar extraction), and expense. In effect, although cost containment was not the aim of our new protocol, it is obvious that, in

the absence of complications, the procedure done under this manner becomes much cheaper. This could encourage its use in place of other "compromise" orthodontic treatments.[15]

Patients have not complained about intra- or postoperative disturbances, other than the usual degree of swelling also present in patients undergoing the usual protocol. Recovery of our patients has been for the most part similar to that of patients who undergo third molar removal in the same setting. Moreover, they all have expressed great satisfaction regarding the reduced time of treatment.

Setting aside other considerations, objectively the major advantage of this technique is the chance to control functionally the TMJ in actual conditions and without the distortions caused by gravity and muscular relaxation commonly seen under general anesthesia.[16] In fact, incorrect positioning of the condyle into the glenoid fossa, both posterior and medial, may lead to remodeling and resorption and cause surgical relapse. We checked our 35 clinical cases during a follow-up period (range, 1 to 4 years; mean 2.5 years) and the results confirm the stability and efficacy of the surgical procedure.

Nevertheless, if this protocol is to be performed routinely, it is mandatory to enlist an anesthesiologist skilled in this type of surgery, with broad experience, since the most important problems are airway obstruction and possible aspiration of blood or saliva. Drugs used during surgery may also be improved, providing more controlled hypotension, although this is not such a big problem, provided that vasoconstrictors commonly used for local anesthesia have proven to be powerful enough for the control of bleeding.

Once this protocol is accepted without reluctance, all Class II patients with only mandibular deficiency may be treated in the most suitable way, thus providing the most satisfactory outcomes for the patient, orthodontist, and surgeon. Moreover, when this procedure becomes standard it can also be used for the treatment of Class III malocclusions as well as mandibular asymmetries.

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