The Influence of Bolus of Methylprednisolone on Postorthognathic Surgery Symptoms: A Controlled Clinical Trial

Giulia Amodeo, MD,†* *Edoardo Cerbelli, MD,*† *Annalinda Pisano, PhD,*‡ *Luciana Minieri, MD,*†§* *and Domenico Scopelliti, MD*†

Objective: Despite improvements in maxillary and mandibular osteotomy, complications still result in around 20%. Post and intraoperative standard therapies, based on the use of betamethasone and tranexamic acid, could help to minimize the onset of side effects. The aim of the study was to compare the role of a supplementary bolus of methylprednisolone rather than the standard therapy in the onset of postoperative symptoms.

Methods: The authors enrolled 10 patients, affected by class 2 and 3 Dentoskeletal, submitted to the institution for maxillomandibular repositioning osteotomy between October 2020 and April 2021. Patients were divided into 2 groups as follows: 5 patients (group *A*) received standard therapy consisting of the administration of 4 mg of betamethasone, intraoperatively, and 1 g of tranexamic acid in 2 administrations. The remaining 5 patients (group *B*) received a supplementary bolus of 20 mg methylprednisolone before the end of the surgery.

All patients received, in the postoperative period, 4 mg of betamethasone every 12 hours, for 3 days. Postoperative outcomes were evaluated with a questionnaire evaluating speaking discomfort, pain when swallowing, feeding discomfort, drinking discomfort, swelling, and ache. Each parameter was associated with a numeric rating scale ranging from 0 to 5.

Results: The authors observed that patients treated with a supplementary bolus of methylprednisolone (group *B*) had a statistically significant reduction of all postoperative symptoms as compared with patients of group *A* ($*P < 0.05$, $**P < 0.01$ Fig. 1).

Conclusion: The study highlighted that the additional bolus of methylprednisolone improved all of the 6 parameters investigated by the questionnaire submitted to patients, resulting in a faster recovery and improvement of the patient's compliance with surgery. Further studies with a larger population are needed to confirm preliminary results.

Key Words: Edema, hematoma, methylprednisolone, orthognathic, surgery

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Orthognathic surgery is the branch of surgery dealing with the repositioning of skeletal bases to improve both morpho-functional and esthetic function.[1] It is usually indicated in patients with dental-skeletal anomalies, syndromic deformities involving the craniomaxillofacial area, and disorders affecting the temporomandibular joint.

Therefore, the goal of this kind of surgery is the normalization of the occlusal relationship, with a correct harmonization of the soft tissues.[2]

Several studies have shown how skeletal malocclusion could lead to the development of different symptoms, such as decreased bite power, temporomandibular joint disorders, and alteration in mandibular kinetics.

Early intervention, with osteotomy for the repositioning of the skeletal bases, has shown a dramatic decline in the onset of dysfunctions in the temporomandibular joint, as well as an improvement in associated symptoms.[3]

Many studies have also shown how patients undergoing maxillomandibular repositioning surgery report a crucial psycho-physical improvement, with a significant impact on self-confidence.[4]

Although over the years surgical time has greatly decreased, thanks to the relevant improvement and predictability of the surgical technique, there is great heterogeneity, between different Centers within the same type of surgery in terms of postoperative course.[5]

Furthermore, the postoperative conditions of patients who underwent orthognathic surgery still represent an open issue.

Indeed, edema and hematoma, representing the most common postoperative manifestations, affect a patient's immediate perception.[6]

The aim of our study was to evaluate the addition of a bolus of methylprednisolone compared with standard therapy in minimizing the side effects.

METHODS

We enrolled 10 patients, affected by class 2 and 3 Dentoskeletal, submitted to our institution for maxillomandibular repositioning osteotomy between October 2020 and April 2021.

From the *Department of UOC Maxillofacial Surgery, San Filippo Neri Hospital, ASL Roma 1, Rome, Italy; †Smile House Fondazione ETS, Rome, Italy; ‡Department of UOC Anesthesiology and Reanimation, San Filippo Neri Hospital, ASL Roma1, Rome, Italy; and §Department of UOC Maxillofacial Surgery, San Filippo Neri Hospital, ASL Roma 1, Rome, Italy.

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Address correspondence and reprint requests to Giulia Amodeo, MD, Department of UOC Maxillofacial, San Filippo Neri Hospital, ASL Roma 1, Via Giovanni Martinotti 20, Rome 00135, Italy; E-mail: gamodeo@live.it

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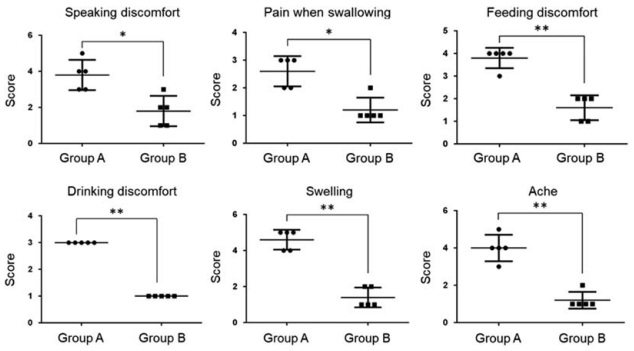

FIGURE 1. Correlation of painful symptoms with the type of treatment (group *A* and group *B*). Patients treated with methylprednisolone showed a reduction of postsurgery symptoms compared with group *A*. $*P < 0.05$, $**P < 0.01$ (Mann-Whitney test).

Patients were affected by the discrepancy in the maxillomandibular occlusion, complaining of painful symptoms during chewing, and temporomandibular joint disorders.

Patients underwent presurgical orthodontic treatment to make dental arches congruent, before the repositioning surgery. Surgery was conducted under general anesthesia, with nasal intubation.

Patients underwent maxillomandibular repositioning treatment Le Fort I (LFI) osteotomy and bilateral sagittal split osteotomy (BSSO) of the mandible.

Two out of 10 patients (25%) also underwent chin repositioning surgery. Patients were divided into 2 groups as follows: 5 patients received standard therapy represented by the administration, intraoperative, of 4 mg of betamethasone and 1 g of tranexamic acid, both of them in 2 administrations (group *A*).

The remaining 5 patients received a supplementary bolus of 20 mg methylprednisolone before the end of the surgery (group *B*).

The postoperative outcomes were evaluated according to the following questionnaire submitted to patients 24 hours after surgery. The parameters considered were the following: speaking discomfort, pain when swallowing, feeding discomfort, drinking discomfort, swelling, and ache. Each parameter was associated with a numeric rating scale where 0 represents "no perceived noise", whereas 5 corresponds to "disorder perceived as disabling".

Mann-Whitney test for analysis of nonparametric values was used. Results were considered statistically significant if the *P* value was <0.05.

The present study follows the guidelines according to the Declaration of Helsinki on medical protocols and ethics.

The treatment plan respects the Declaration of Helsinki and the patient signed a written consent aware of the treatment goals and of the possible consequences and complications.

Due to the retrospective nature of this study, it was granted an exemption in writing by our hospital.

RESULTS

We enrolled 10 patients affected by class 2 and 3 Dentoskeletal; the median age was 23 years and the male/female ratio was 1. Three out of 10 patients (30%) were smokers and no comorbidity has been reported. Five patients (defined as group *A*) (50%) received intraoperatively, 4 mg of betamethasone and 1 g of tranexamic acid in 2 administrations, followed by 4 mg of betamethasone every 12 hours, for 3 days.

Five patients (defined as group *B*) (50%) received a supplementary bolus of 20 mg methylprednisolone before the end of the surgery.

The result of the questionnaire was summarized in Supplemental Tables (Supplemental Digital Content, Table A, http://links.lww.com/SCS/F138 and Supplemental Digital Content, Table B, http://links.lww.com/SCS/F139; group *A* and group *B*, respectively).

In particular, the average score of each parameter was the following: speaking discomfort: 3.8 (group *A*) and 1.8 (group *B*); pain swallowing, 2.6 (group *A*) and 1.2 (group *B*); feeding discomfort: 3.8 (group *A*) and 1.6 (group *B*); drinking discomfort: 3 (group *A*) and 1 (group *B*); swelling, 4.6 (group *A*) and 1.4 (group *B*); and Ache: 4 (group *A*) and 1.8 (group *B*). We observed that patients treated with a supplementary bolus of methylprednisolone (group *B*) had a statistically significant reduction of all postoperative symptoms as compared with patients of group *A* ($*P < 0.05$, $**P < 0.01$ Fig. 1).

DISCUSSION

The main issue related to bimaxillary surgery is represented by the significant postoperative edema that negatively affects the patient's surgery success perception with a consequent lengthening of the functional recovery.

The aim of our study was to evaluate the role of an additional bolus of methylprednisolone in the standard therapy in patients treated with LFI and BSSO. As described, standard treatment consisted of the administration, intraoperatively, of 4 mg of betamethasone and 1 g of tranexamic acid in 2 administrations followed by 4 mg of betamethasone every 12 hours, for 3 days.

Tranexamic acid has been used for years to manage postoperative hematoma, not only in maxillofacial surgery but also in orthopedic, neurosurgical, and cardiac surgery.[6,7] It is an antifibrinolytic that competitively inhibits the activation of plasminogen to plasmin; the latter is an enzyme that degrades fibrin plug, fibrinogen, and other plasma proteins, including procoagulant factor V and VIII.[8] Rummasak et al[9] showed that, although blood loss is usually within the limits of not requiring any transfusion, it can occasionally be massive, with losses ranging from 200 mL to 3400 mL. Several studies showed intraoperative and postoperative blood loss reduction in patients treated with tranexamic acid, both in elective and emergency surgery, with no increase in mortality related to thrombotic cardiovascular events.[10] According to Apipan et al,[11] 10 mg/kg of body weight is the dose associated with the reduction of intraoperative and postoperative bleeding. According to our results, the administration of tranexamic acid led to a reduction of the entity of the 6 parameters investigated by the questionnaire. As regards postoperative edema, glucocorticoids have always played a crucial role in the postoperative management of patients treated with repositioning of the skeletal bases. Also known as corticosteroids, they have the greatest anti-inflammatory power of all steroids, being able to reduce edema, pain, trismus, nausea, and vomiting, and promoting nerve healing. Their antiedema, pain relieving, and anti-inflammatory effect has been exploited for several years in postoperative management, although there is still no literature agreement as concerns their function related to wound healing, suppression of the adrenergic system, and osteonecrosis. They also work to reduce endothelial permeability, decreasing the amount of fluids, proteins, and macrophages.[12]

Their positive effect in oral surgery in reducing postoperative discomfort and sequelae, especially in the third molar surgery, is well known. It is almost certain that swelling and, to some extent, trismus could be significantly reduced by the use of corticosteroids.[13–28]

The positive effects of steroids in maxillofacial surgery were emphasized in many studies, in particular in reducing facial edema after LFI osteotomy and BSSO.[29] Kim[30] showed the positive effect of these drugs in nerve injury healing, highlighting that the use of steroids during or after surgery can effectively prevent temporary injuries by reducing pressure created by edema.

The main steroids used in postoperative therapy are represented by betamethasone, methylprednisolone, dexamethasone, hydrocortisone, and prednisolone.[31] Methylprednisolone is 5 times more potent in its anti-inflammatory properties compared with hydrocortisone (cortisol), with minimal mineralocorticoid activities.[12]

The onset of action of intravenous methylprednisolone succinate is within 1 hour, with a duration of 1 to 5 weeks. It has an oral bioavailability of ~88%, and the half-life elimination is of 0.25 hours, with an oral half-life of 2 to 5 hours. It has hepatic metabolism and undergoes urinary excretion.[32,33] There are only a few studies investigating the role of methylprednisolone in reducing postoperative symptoms, and these are especially related to oral surgery. In particular, in impacted 3 molars, authors agreed on the positive role of methylprednisolone in reducing postoperative edema, pain, and trismus.[34,35]

As concerns orthognathic surgery, there are only 3 studies focusing specifically on the role of methylprednisolone. The authors agreed in acknowledging the role of these drugs in reducing edema and inflammation, especially during the first postoperative hours.[36,37] Indeed, our study is in line with previous reports confirming the effectiveness of standard therapy, also in orthognathic surgery. According to our knowledge, this is the first study that investigates the role of an additional bolus of methylprednisolone in standard care. Our results showed the statistically significant effect of methylprednisolone in the reduction of all 6 parameters investigated, especially swelling and ache.

Further studies with a larger population are needed to confirm our preliminary results.

CONCLUSIONS

Our study highlighted that the additional bolus of methylprednisolone to the standard therapy improved all 6 parameters investigated by the questionnaire submitted to our patients, resulting in a faster recovery and improvement of the patient's compliance with surgery.

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