Enhancing the Orthognathic Surgery Experience: Treatment in 10 Weeks "Surgery First" Approach

Aylin Gallegos Salazar, Peter D Waite[1], Chung How Kau

Department of Orthodontics, University of Alabama Birmingham, [1]Department of Oral and Maxillofacial Surgery, The Children's Hospital, Birmingham, AL, USA

Abstract

This case report describes the successful treatment of a 25-year-old male with maxillary retrognathism, skeletal and dental Class III malocclusion, anterior and posterior crossbite, negative overjet and overbite, mild mandibular crowding, and lower midline deviation. The nonextraction treatment plan included: (1) maxillary and mandibular arch fixed appliance and (2) Le Fort 1 maxillary osteotomy and postsurgical orthodontic treatment. The orthodontic treatment was initiated with 0.022" preadjusted brackets bonded to all the teeth except the maxillary second molars, 2 days before the surgery without any archwires. Two weeks after the surgery, maxillary and mandibular arch alignment along with the occlusal adjustments was started with the use of 0.018" NiTi wires, in both arches. Optimum esthetic and functional results were achieved in 10 weeks after the surgery, with the cooperation of two specialties and the use of surgery first approach.

Keywords: Orthodontics, orthognathic surgery, surgery first

Introduction

Surgical-orthodontic treatment conventionally involves presurgical orthodontic preparation which often includes incisor decompensation, dental alignment, and arch coordination. In skeletal Class III patients, however, presurgical incisor decompensation will exacerbate a prognathic lip profile while waiting for orthognathic surgery which results in patient dissatisfaction.[1] ERAS (Enhanced Recovery After Surgery) is new concept that also applies to Orthognathic surgery.[2]

Patient satisfaction among patients with facial skeletal discrepancies is a fundamental issue for orthognathic surgery. The primary factor in determining the level of patient satisfaction after orthognathic surgery is the perception of the changes.[3] The orthognathic "surgery first" approach introduced by Nagasaka *et al*.[4] to correct skeletal dysplasias without presurgical orthodontic preparation has gained popularity in recent years. The main advantages of this method, are the possibility of eliminating the pre-surgery orthodontic treatment, surgically repositioning the jaws immediately into the desired position, and potentially shortening the posttreatment time through the regional acceleratory phenomenon (RAP).[5,6] This new approach is also frequently requested by patients because it is possible to see improvements in facial esthetics immediately and the duration of the therapy is significantly shortened.[7]

Access this article online

Quick Response Code:

Website: www.amsjournal.com

DOI: 10.4103/ams.ams_203_19

Developments in three-dimensional technology have provided new options for more precise planning of interocclusal relationships and jaw movements.[8-10] This report describes the treatment of a skeletal Class III patient using a "surgery first" approach which dramatically reduced treatment time.

Diagnosis and Etiology

A 25-year-old male presented to the Department of Orthodontics, University of Alabama at Birmingham with the chief complaint that "I want to improve my profile and bite." Clinical examination revealed a straight facial profile, hypoplastic midfacial soft tissue, adequate distance between the throat and chin. His malocclusion was complicated by 4 mm of anterior crossbite, bilateral posterior crossbite, -2 mm of overjet and mild crowding (2 mm) in the lower arch.

Address for correspondence: Prof. Chung How Kau, Department of Orthodontics, University of Alabama at Birmingham, 305, 1919 7th Ave South, Birmingham AL35294, USA.
E-mail: ckau@uab.edu

Received: 02-09-2019 **Revised:** 22-12-2019
Accepted: 04-01-2020 **Published**: 08-06-2020

How to cite this article: Salazar AG, Waite PD, Kau CH. Enhancing the orthognathic surgery experience: Treatment in 10 weeks "Surgery First" approach. Ann Maxillofac Surg 2020;10:227-31.

The maxillary dental midline was coincident with the facial midline, but the mandibular midline was deviated 4 mm to the left. There was no popping, clicking, or crepitation of the temporomandibular joint. Extra- and intra-oral photographs, upper and lower impressions were taken along with the lateral cephalometric and panoramic radiographs and cone-beam computed tomographic (CBCT) [Figures 1 and 2].

Dental casts showed an anterior crossbite of 4 mm and a posterior crossbite. On the left and right sides, the first molars were Angle Class III relationship. Mandibular incisors were slightly retroclined. The panoramic radiograph showed that all teeth were present except the third molars. Lateral cephalometric analysis revealed a retrognatic maxilla and a skeletal and occlusal Class III deformity with ANB −0.4. The E plane shows a retrusion of the upper lip.

Treatment plan

The patient was diagnosed with maxillary retrognathism, skeletal and dental Class III malocclusion, anterior and posterior crossbite, negative overjet and overbite, mild mandibular crowding, and lower midline deviation. The dental, skeletal, and soft-tissue treatment objectives for this patient were: (1) eliminate crowding in the lower anterior segment, correct anterior and posterior crossbite and overbite, coincident upper and lower midlines; (2) increase ANB with maxillary protraction; (3) improve the facial profile.

After careful consideration of all treatment alternatives, the final treatment plan was decided as surgery first approach by the patient. Nonextraction, maxillary and mandibular arch fixed appliance, followed by a Le Fort I maxillary osteotomy

Figure 1: Initial extraoral and intraoral photographs

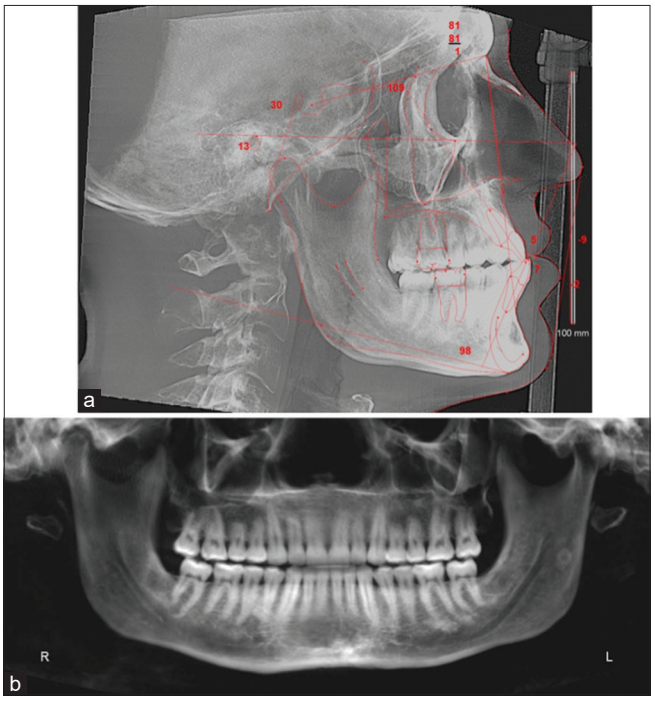

Figure 2: Pretreatment radiographs. (a) Lateral cephalometric radiograph with tracing. (b) Pretreatment panoramic radiograph

Figure 3: Postsurgical orthodontic correction

Figure 4: Final extraoral and intraoral photographs

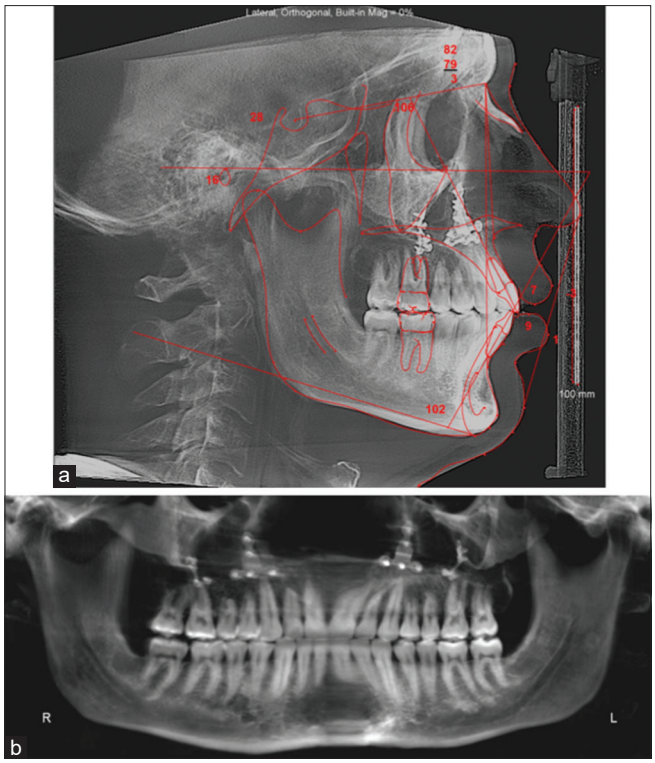

Figure 5: Posttreatment radiographs. (a) Lateral cephalometric radiograph with tracing. (b) Panoramic radiograph

Figure 7: One year after treatment extraoral and intraoral photographs

to advance the maxilla. Postsurgical orthodontic treatment with the use of 0.022" preadjusted brackets was also planned to correct discrepancies after the surgery.

Treatment progress

After the CBCT and dental casts were taken, surgery was discussed with an oral surgeon to determine the kind of maxillary movements during surgery. The 0.022" preadjusted brackets were bonded to all the teeth except the maxillary second molars, 2 days before surgery without any archwires;[3,11] to avoid producing any tooth movement and interfering with the

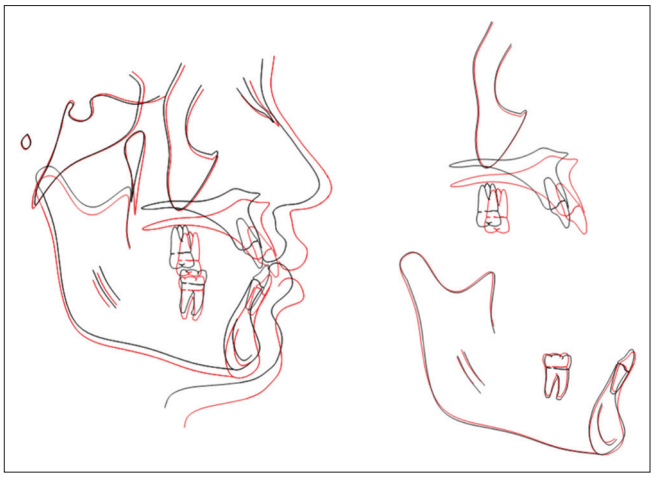

Figure 6: Superimposition of initial and final lateral cephalometric radiographs

Table 1: Cephalometric analysis

Measurement	Initial	Final
SNA(°)	79.9°	82.2°
SNB(°)	80.3°	81°
ANB(°)	−0.4°	2.7°
Lower lip to E-plane (mm)	−2.9	−2.7
Upper lip to E-plane (mm)	−10	−5

operating procedure. Four L-shaped plates were incorporated in the maxilla, one on each side on the nasomaxillary buttress and one on each side along the pterygomaxillary buttress. Instead of a final splint, the patient occlusion was stabilized with short intermaxillary elastics (3/16 - 4.5 oz). The patient was extubated without any complication. The patient was then transferred to the postoperative care unit and subsequently discharged after 2 days of postoperative observation and care. He was given Norco elixir, Zofran, Robaxin, and Guaifenesin as required for standard orthognathic surgery.

Two weeks after the successful competition of the surgery. Maxillary and mandibular arch alignment along with the occlusal adjustments were started with the use of 0.018" NiTi wires, in both arches, with interarch elastics (3/16 - 4.5 oz). Because of the minor crowding and the RAP response, the appointments were every 2 weeks [Figure 3]. Ten weeks after the surgery, preadjusted brackets were removed.

Treatment results

The brackets were removed after only 10 weeks of orthodontic treatment, with a marked improvement in the profile and the occlusion. Facial, intraoral, extraoral photographs, CBCT, and dental impressions were taken for final records. The posttreatment records show a balanced facial profile and occlusion. The maxillary movement was accomplished exactly as planned. Intraorally, the anterior and posterior crossbite was corrected, normal overjet and overbite were achieved, teeth were properly leveled and aligned, upper and lower midlines were coincided with the facial midline, and incisor

and canine guidance were obtained. The patient's soft-tissue profile improved significantly, the position of the upper lip improved; esthetically, pleasant smile arc was achieved with lip competency and adequate gingival display. Skeletally, ANB angle was increased to 2.7 [Figures 4, 5 and Table 1].

Initial and final cephalometric radiographs were superimposed [Figure 6]. The final outcome of our comprehensive treatment approach satisfied both functional and esthetic demands. Retrognathic maxilla and anterior crossbite were corrected successfully. Excellent stability was observed 12 months after treatment [Figure 7].

Discussion

The indication for the surgery-first approach has been widened with the help of new technology. CBCT allows a 3D treatment plan.[12-15] The "surgery first" approach has several biological and psychosocial advantages: patient satisfaction is guaranteed, the patient sees a major improvement in the profile at the beginning of treatment, and treatment time is reduced significantly. In the present case, we treated a skeletal Class III patient using the surgery's first approach.

In the conventional orthodontics-first approach, pre-operative orthodontic treatment is provided to ensure the best possible position of dentition in the individual jaws before surgery. However, the surgery-first approach goal is to provide the best possible normal jaw relations before the initiation of orthodontic treatment.[16] Brachvogel *et al*.[17] mentioned that postoperative orthodontic treatment would be similar to the dental arch alignment for Class I malocclusion. Hence, if 3D skeletal discrepancies between the maxilla and the mandible are corrected with surgery before orthodontic treatment, the postoperative orthodontic treatment is basically similar but not the same to the procedure for cases that have only dental malocclusions without any skeletal discrepancies.

When we talk about the stabilization after the surgery and initiation of postoperative orthodontic protocols, we will find many differences between authors. Nagasaka *et al*.[4] proposed the routine use of an occlusal splint after surgery. However, Hernández-Alfaro *et al*.[3] reported no increase in instability without this modus operandi. According to the author, only in cases of maxillary segmentation is the end splint left in place for 2 weeks.

In addition, some authors reported shorter stabilization time and earlier initiation of postoperative orthodontic treatment (ranging from immediately after surgery to 2 weeks after surgery).[3,6] Ko *et al*.[18] applied immediate postoperative leveling of the dentition to solve dental interference and arch compatibility. In the present case, we started with the alignment 2 weeks after surgery to take advantage of the RAP after surgery.

One of the most highlighted benefits of surgery's first approach is the reduction in treatment duration. Hernández-Alfaro *et al*.[3] reported a mean duration of 37.8 weeks (range, 24–52 weeks). Uribe *et al*.[19] reported a median treatment duration of 9.6 months. Yang *et al*.[20] reported a median total treatment time duration of 25 weeks (range, 25–45). The shortest published treatment time for postsurgical orthodontics has been 4 months in a Class III patient with open bite and crowding.[21] Our patient's total treatment time was only 10 weeks. This rapid treatment time can be explained by a combination of digital diagnostic planning, surgery management, and RAP. Yang *et al*.[20] mentions three anatomic and physiologic factors that contribute to the decrease in total treatment time. First, postoperative orthodontic direction, in accordance with spontaneous dental compensation, and mastication improve the efficiency of decompensation and arch coordination. Second, the orthodontic movement of teeth is easier with less occluded dentition, which usually occurs after the surgery in the SFA approach. Third, tooth movement is enhanced after the corticotomy by increasing the osteoclasts and osteoblasts, leading to bone turnover. Furthermore, one drawback of single jaw surgery is the inability to plan the occlusal plane of the maxillary dentition. Christou *et al*.[22] reported that this may affect the smile esthetics as the ultimate smile arch is determined by the preset plane of occlusion. In addition, the maxillary dental centerline is held hostage to the lower dentition and mandibular jaw base.

Conclusion

The surgery first approach significantly shortens total treatment time and is very favorably valued by patients and orthodontists. However, the limitations of this approach have been discussed and should be considered. Team approach between surgeons and orthodontists is a vital component for successful treatment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Proffit WR, White RP. Contemporary Treatment of Dentofacial Deformity. 3rd ed. Saint Louis: Mosby; 2003.
2. Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review. JAMA Surg. 2017;152:292-8.
3. Hernández-Alfaro F, Guijarro-Martínez R, Peiró-Guijarro MA. Surgery first in orthognathic surgery: What have we learned? A comprehensive workflow based on 45 consecutive cases. J Oral Maxillofac Surg 2014;72:376-90.

4. Nagasaka H, Sugawara J, Kawamura H, Nanda R. "Surgery first" skeletal Class III correction using the Skeletal Anchorage System. J Clin Orthod 2009;43:97-105.
5. Huang CS, Hsu SS, Chen YR. Systematic review of the surgery-first approach in orthognathic surgery. Biomed J 2014;37:184-90.
6. Liou EJ, Chen PH, Wang YC, Yu CC, Huang CS, Chen YR. Surgery-first accelerated orthognathic surgery: Postoperative rapid orthodontic tooth movement. J Oral Maxillofac Surg 2011;69:781-5.
7. Pelo S, Gasparini G, Garagiola U, Cordaro M, Di Nardo F, Staderini E, *et al*. Surgery-first orthognathic approach vs. traditional orthognathic approach: Oral health-related quality of life assessed with 2 questionnaires. Am J Orthod Dentofacial Orthop 2017;152:250-4.
8. Palomo JM, Kau CH, Palomo LB, Hans MG. Three-dimensional cone beam computerized tomography in dentistry. Dent Today. 2006;25:130, 2-5.
9. Bo Ic M, Kau CH, Richmond S, Hren NI, Zhurov A, Udovic M, et al. Facial morphology of Slovenian and Welsh white populations using 3-dimensional imaging. Angle Orthod. 2009;79:640-5.
10. Kau CH. Creation of the virtual patient for the study of facial morphology. Facial Plast Surg Clin North Am. 2011;19:615-22, viii.
11. Aristizábal JF, Martínez Smit R, Villegas C. The "surgery first" approach with passive self-ligating brackets for expedited treatment of skeletal Class III malocclusion. J Clin Orthod 2015;49:361-70.
12. Uribe F, Janakiraman N, Shafer D, Nanda R. Three-dimensional cone-beam computed tomography-based virtual treatment planning and fabrication of a surgical splint for asymmetric patients: Surgery first approach. Am J Orthod Dentofacial Orthop 2013;144:748-58.
13. Lightheart KG, English JD, Kau CH, Akyalcin S, Bussa HI, Jr., McGrory KR, et al. Surface analysis of study models generated from OrthoCAD and cone-beam computed tomography imaging. Am J Orthod Dentofacial Orthop. 2012;141(6):686-93.
14. Veiszenbacher E, Wang J, Davis M, Waite PD, Borbely P, Kau CH. Virtual surgical planning: Balancing esthetics, practicality, and anticipated stability in a complex Class III patient. Am J Orthod Dentofacial Orthop. 2019;156:685-93.
15. Kyteas PG, McKenzie WS, Waite PD, Kau CH. Comprehensive treatment approach for condylar hyperplasia and mandibular crowding with custom lingual braces and 2-jaw surgery. Am J Orthod Dentofacial Orthop. 2017;151:174-85.
16. Choi DS, Garagiola U, Kim SG. Current status of the surgery-first approach (part I): Concepts and orthodontic protocols. Maxillofac Plast Reconstr Surg 2019;41:10.
17. Brachvogel P, Berten JL, Hausamen JE. Surgery before orthodontic treatment: A concept for timing the combined therapy of skeletal dysgnathias. Dtsch Zahn Mund Kieferheilkd Zentralbl 1991;79:557-63.
18. Ko EW, Hsu SS, Hsieh HY, Wang YC, Huang CS, Chen YR. Comparison of progressive cephalometric changes and postsurgical stability of skeletal Class III correction with and without presurgical orthodontic treatment. J Oral Maxillofac Surg 2011;69:1469-77.
19. Uribe F, Adabi S, Janakiraman N, Allareddy V, Steinbacher D, Shafer D, *et al*. Treatment duration and factors associated with the surgery-first approach: A two-center study. Prog Orthod 2015;16:29.
20. Yang L, Xiao YD, Liang YJ, Wang X, Li JY, Liao GQ. Does the surgery-first approach produce better outcomes in orthognathic surgery? A systematic review and meta-analysis. J Oral Maxillofac Surg 2017;75:2422-9.
21. Yu CC, Chen PH, Liou EJ, Huang CS, Chen YR. A Surgery-first approach in surgical-orthodontic treatment of mandibular prognathism – A case report. Chang Gung Med J 2010;33:699-705.
22. Christou T, Betlej A, Aswad N, Ogdon D, Kau CH. Clinical effectiveness of orthodontic treatment on smile esthetics: A systematic review. Clin Cosmet Investig Dent 2019;11:89-101.