Case Report

Intermaxillary Fixation Screws (IMF) & Surgery First Approach: A Novel Combination and Case Report

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ABSTRACT

Orthognathic surgery, a pivotal treatment for patients with significant facial aesthetic and occlusal concerns, traditionally involves a phased approach comprising preoperative orthodontics, surgery, and postoperative orthodontic treatment. However, the extended duration of conventional methods often leads to patient dissatisfaction. In response, the surgery-first approach (SFA) has emerged as an alternative, aiming to streamline treatment and reduce complexity. This case report explores the implementation of the SFA without preoperative orthodontics, focusing on its integration with intermaxillary fixation (IMF) screws. A 25-year-old male presented with severe mandibular retrognathia and facial asymmetry. The radiographic evaluation confirmed the skeletal discrepancy, prompting a surgical solution. Utilizing three-dimensional (3D) planning software, LeFort I osteotomy for maxillary advancement and bilateral sagittal split osteotomy (BSSO) for mandibular setback was planned. IMF screws were strategically placed to stabilize the maxillomandibular complex intraoperatively. Immediate postoperative orthodontic adjustments-initiated dentition alignment and leveling. Regular follow-up ensured treatment progress and stability. The use of IMF screws in the surgery-first approach facilitated precise surgical movements, accelerated treatment timelines, and enhanced patient comfort. This adjunctive technique represents a promising avenue for improving surgical precision and patient outcomes in orthognathic surgery. Further research is warranted to explore the long-term stability and broader applicability of this approach across diverse patient populations.

KEYWORDS
Arch bar; IMF Screw; Orthognathic surgery; Surgery-first-approach

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INTRODUCTION

Patients with significant facial or dentoalveolar issues often need orthognathic surgery, which usually includes three main steps: pre-surgery orthodontic work, the surgery itself, and post-surgery orthodontics [1, 2]. However, the usual way of doing this can take a long time, usually 2 up to 3 years, which can make patients dissatisfied [3, 4]. In response to this challenge, the surgery-first approach has resurfaced

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after many years. A novel method integrating orthodontics into orthognathic surgery was introduced with the aim of streamlining the treatment process and reducing its complexity [5, 6]. Although the surgery-first approach offers benefits such as accelerated treatment and simplified procedures, it is not without drawbacks [1,7]. There's a risk that the jaw might go back to its previous position after the surgery. However, research shows that it can be really helpful for patients with minor issues or complex problems related to their oral function [8, 9, 10].

Intermaxillary fixation (IMF) screws holds significant importance in both maxillofacial trauma management and orthognathic surgery, playing a vital role in stabilizing facial structures and restoring normal function. For the first time, Arthur and Berardo demonstrated a new IMF technique using bone screws, essentially a bone-borne appliance [11]. This approach leads to achieving dental occlusion through bone-to-bone fixation by effectively addressing teeth-related issues [12]. Traditionally, arch bars have been the practical method, but in modern practice, IMF screws are gaining popularity due to their ease of use, compatibility with plating systems, patient comfort, improved oral hygiene, and minimal trauma to surrounding soft tissues [13,14]. However, it is essential to note the possibility of complications such as iatrogenic dental root injury, which can be mitigated through surgical skill and expertise [13].

After surgeries like sagittal split ramus osteotomy (SSRO) and intraoral vertical ramus osteotomy (IVRO) for fixing a jutting jaw, surgeons use it post-surgery to achieve optimal occlusion and skeletal alignment [15,16]. Instead of using hooks and wires like before, they now prefer using IMF screws inserted at the anterior teeth region in cases requiring significant mandibular setback or counterclockwise rotation. This approach helps reduce the strain on anterior teeth during the initial postoperative phase until muscle function adjusts accordingly [15].

In this case, we show a novel facet of the surgery-first approach in orthognathic surgery, specifically focusing on its implementation without the need for preoperative orthodontics. We aim to elucidate the utilization of this surgical method in conjunction with both arch bars and IMF screws.

CASE REPORT

This procedure was with the personal concurrence and approval of the patient and was approved by the Research and Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.DENTISTRY.REC.1402.052).

DECLARATION OF PATIENT CONSENT

We had all necessary patient permission form in his possession. The patient has agreed on the form that his pictures and other clinical data may be published in the publication. The patient was aware that while every attempt would be made to hide identification and that name and initials would not be disclosed.

A 43-year-old man presented with dissatisfaction regarding his facial aesthetics and occlusal function. He was referred to Mashhad Dental Clinic in 2023 with no significant medical history and was otherwise healthy. Clinical examination revealed a convex facial profile, maxillary retrusion, and mandibular protrusion. Intraoral findings included a missing anterior stop and a right-side posterior crossbite. Periodontal health and dental integrity were within normal limits.

Cephalometric analysis indicated a skeletal Class III relationship, characterized by mandibular prognathism (SNA: 80°, SNB: 86°, ANB: -6°). A three-dimensional cone-beam computed tomography (CBCT) scan provided detailed anatomical insights necessary for surgical planning. The surgical team performed model surgery and virtual surgical planning to predict postoperative outcomes and fabricate surgical splints.

The multidisciplinary treatment plan included a surgery-first approach without pre-surgical orthodontics, relying on IMF screws for postoperative occlusal and maxillofacial stabilization. Surgical objectives were: Maxillary advancement via Le Fort I osteotomy and Mandibular setback using bilateral sagittal split osteotomy (BSSO).

The patient underwent the following surgical procedures under general anesthesia:

1. **Le Fort I Osteotomy:** Mobilization and 5 mm advancement of the maxilla.
2. **Bilateral Sagittal Split Osteotomies:** 6 mm setback of the mandible.

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3. **Intermaxillary Fixation Screws Placement:** Strategic positioning of screws in the maxilla and mandible to stabilize the mandible and therefore occlusion.
4. **Rigid Fixation:** Securing segments with titanium plates and screws.

Intraoperative checks confirmed satisfactory occlusal alignment, which was maintained using IMF screws.

Postoperative care included:

- Antibiotics, analgesics, and anti-inflammatory medications.
- Liquid-to-soft diet for six weeks.
- Rigorous oral hygiene instructions.
- Regular follow-up appointments to monitor healing and occlusal stability.

Figure 1 depicts the aesthetic presentation of the patient's facial features, which served as the primary concern prompting the patient's complaints. Figure 2 illustrates the occlusal discrepancies and intraoral findings corresponding to the noted aesthetic concerns. Also, Figure 3 shows the lateral view of the patient's radiograph before surgery.

To facilitate immediate stabilization and postoperative immobilization of the maxillomandibular complex, intermaxillary fixation (IMF) screws were planned for intraoperative use.

Under general anesthesia, the surgery was initiated with a LeFort I osteotomy, allowing for precise repositioning of the maxilla. Following the maxillary advancement, attention was turned to the mandible, where bilateral BSSO was performed to setback the mandible to achieve ideal occlusion and facial harmony. During the surgical procedure, IMF screws were strategically placed to provide stable intermaxillary fixation, allowing for immediate postoperative stability and facilitating the surgery-first approach (Figure 4).

Immediate postoperative orthodontic adjustments were made to initiate alignment and leveling of the dentition. The patient was provided with instructions for postoperative care, including dietary modifications and oral hygiene practices. Regular follow-up appointments were scheduled to monitor the progress of orthodontic treatment and assess the stability of the surgical outcome (Figures 5 & 6).

At six months post-surgery, the patient exhibited significant improvements in facial aesthetics and occlusal function. The occlusion was stable with a positive overjet of 2 mm, and there were no signs of relapse. The patient expressed high satisfaction with both the functional and aesthetic outcomes (Figure 4).

DISCUSSION

The surgery-first approach (SFA) for orthognathic surgery offers immediate facial aesthetic improvements, significantly enhancing patient satisfaction and psychological well-being. Unlike the traditional method that includes a lengthy pre-surgical orthodontic phase, the SFA permits immediate surgical intervention, reducing the total treatment time by up to 6-12 months.

Figure 1: The demonstration of facial condition before surgery

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Figure 2: Occlusion status before surgery

Figure 3: Pre-operative radiograph image by lateral view

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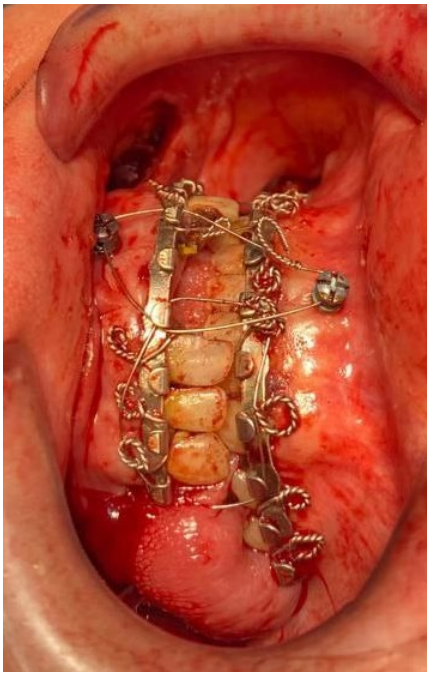

Figure 4: Application of IMF Screw in surgery

Figure 5: 1-year follow-up

On the other hand, Intermaxillary fixation (IMF) screws could be essential in the SFA due to their multiple benefits. They secure the occlusion postoperatively, minimizing the risk of relapse. Compared to traditional wiring methods, IMF screws are less intrusive and more comfortable for patients. They also simplify occlusal adjustments during the postoperative phase.

Case selection will be one of the most important points that should be considered in such cases. In this case, the patient's severe Class III malocclusion required both maxillary advancement and

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Figure 6: Postoperative lateral radiographic image

mandibular setback. The surgical plan was designed, involving Le Fort I osteotomy and bilateral sagittal split osteotomy (BSSO), aimed to correct both vertical and horizontal discrepancies. IMF screws were critical in ensuring the stability of the newly established occlusion, which is crucial for the success of the SFA.

Our study shows a guide that the dispensation of intermaxillary fixation screws in the surgery-first approach offers several advantages. By providing immediate stability and immobilization of the maxillomandibular complex [12], IMF screws allow for early postoperative orthodontic adjustments and expedited orthodontic treatment. The limitations of pre-surgery orthodontic treatment for jaw problems are that the natural movement of teeth may not align with the treatment plan. Despite efforts to prepare the teeth for surgery, factors like chewing and muscle strength can affect the outcome, often requiring further orthodontic adjustments post-surgery. Conversely, post-surgery orthodontic work tends to better align with natural tooth movement, especially in certain types of jaw issues [17]. This approach minimizes the duration of the orthodontic preparation phase, thereby reducing overall treatment time and improving patient satisfaction [18].

Consistent with the study by Sahoo and Mohan, we also did not observe iatrogenic damage to the root; however, Coburn et al. reported a case of tooth loss due to the use of IMF Screw [12,19].

CONCLUSION

The application of IMF screws in the surgery-first approach represents a valuable adjunctive technique that enhances surgical precision, accelerates treatment timelines, and improves patient outcomes. Further research and clinical studies are warranted to evaluate the long-term stability and efficacy of this approach in different patient populations.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Borges TM, Sol I, de Castro Rodrigues CM, Peres Lima FGG, Silva CJ, Furtado LM. Surgery First Approach in Orthognathic Surgery - Considerations and Clinical Case Report. *Ann Maxillofac Surg* 2021 Jul-Dec;**11**(2):349-351. doi: 10.4103/ams.ams_8_21.
2. Gandedkar NH, Chng CK, Tan W. Surgery-first orthognathic approach case series: Salient features and guidelines. *J Orthod Sci* 2016 Jan-Mar;**5**(1):35-42. doi: 10.4103/2278-0203.176657.
3. Proffit WR, White RP, Sarver D. Combining surgery and orthodontics: Who does what, when?. In: Contemporary Treatment of Dentofacial Deformity. 2003; pp. 245-267.
4. Epker BN, Fish L. Surgical-orthodontic correction of open-bite deformity. *Am J Orthod* 1977 Mar;**71**(3):278-99. doi: 10.1016/0002-9416(77)90188-9.
5. Nagasaka H, Sugawara J, Kawamura H, Nanda R. "Surgery first" skeletal Class III correction using the Skeletal Anchorage System. *J Clin Orthod* 2009 Feb;**43**(2):97-105.
6. Yu HB, Mao LX, Wang XD, Fang B, Shen SG. The surgery-first approach in orthognathic surgery: a retrospective study of 50 cases. *Int J Oral Maxillofac Surg* 2015 Dec;**44**(12):1463-7. doi: 10.1016/j.ijom.2015.05.024.
7. Peiró-Guijarro MA, Guijarro-Martínez R, Hernández-Alfaro F. Surgery first in orthognathic surgery: A systematic review of the literature. *Am J Orthod Dentofacial Orthop* 2016 Apr;**149**(4):448-62. doi: 10.1016/j.ajodo.2015.09.022.
8. Saghafi H, Benington P, Ju X, Ayoub A. The surgery-first approach for orthognathic correction of maxillary deficiency-is it stable? Three-dimensional assessment of CBCT scans and digital dental models. *Int J Oral Maxillofac Surg* 2024 Sep;**53**(9):763-770. doi: 10.1016/j.ijom.2024.02.006.
9. 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 Feb;**72**(2):376-90. doi: 10.1016/j.joms.2013.08.013.
10. Hernández-Alfaro F, Guijarro-Martínez R, Molina-Coral A, Badía-Escriche C. "Surgery first" in bimaxillary orthognathic surgery. *J Oral Maxillofac Surg* 2011 Jun;**69**(6): e201-7. doi: 10.1016/j.joms.2011.01.010.
11. Arthur G, Berardo N. A simplified technique of maxillomandibular fixation. *J Oral Maxillofac Surg* 1989 Nov;**47**(11):1234. doi: 10.1016/0278-2391(89)90024-4.
12. Sahoo NK, Mohan R. IMF Screw: An Ideal Intermaxillary Fixation Device During Open Reduction of Mandibular Fracture. *J Maxillofac Oral Surg* 2010 Jun;**9**(2):170-2. doi: 10.1007/s12663-010-0049-0.
13. Hashemi HM, Parhiz A. Complications using intermaxillary fixation screws. *J Oral Maxillofac Surg* 2011 May;**69**(5):1411-4. doi: 10.1016/j.joms.2010.05.070.
14. Barodiya A, Thukral R, Agrawal SM, Chouhan AS, Singh S, Loksh Y. Self-tapping Intermaxillary Fixation Screw: An Alternative to Arch Bar. *J Contemp Dent Pract* 2017 Feb 1;**18**(2):147-151. doi: 10.5005/jp-journals-10024-2006.
15. Ueki K, Marukawa K, Shimada M, Nakagawa K, Yamamoto E. The use of an intermaxillary fixation screw for mandibular setback surgery. *J Oral Maxillofac Surg* 2007 Aug;**65**(8):1562-8. doi: 10.1016/j.joms.2006.10.071.
16. Shepherd JP, Dohvoma CN, Harradine NW. Screw fixation after mandibular sagittal split osteotomy: an intra-oral approach. *Br J Oral Maxillofac Surg* 1991 Oct;**29**(5):325-9. doi: 10.1016/0266-4356(91)90119-p.
17. Choi JW, Lee JY, Yang SJ, Koh KS. The reliability of a surgery-first orthognathic approach without presurgical orthodontic treatment for skeletal class III dentofacial deformity. *Ann Plast Surg* 2015 Mar;**74**(3):333-41. doi: 10.1097/SAP.0b013e318295dcce.
18. Jeong WS, Choi JW, Kim DY, Lee JY, Kwon SM. Can a surgery-first orthognathic approach reduce the total treatment time? *Int J Oral Maxillofac Surg* 2017 Apr;**46**(4):473-482. doi: 10.1016/j.ijom.2016.12.006.
19. Coburn DG, Kennedy DW, Hodder SC. Complications with intermaxillary fixation screws in the management of fractured mandibles. *Br J Oral Maxillofac Surg* 2002 Jun;**40**(3):241-3. doi: 10.1054/bjom.2001.0771.

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