



Surgery First Approach in Orthognathic Surgery - An Evidenced Based Approach

Aditya Pawar*

Department of Orthognathic Surgery, Pravara Institute of Medical Sciences, India

Abstract

The surgery first approach provides an alternative treatment protocol in orthognathic surgery cases. The conventional ortho-surgical approach includes preoperative orthodontics which requires 7 to 20 months and will result into temporary worsening of facial profile. Surgery first approach shortens the treatment period and reduces facial profile worsening by addressing skeletal discrepancy first. The Induction of RAP phenomenon also increases post-operative orthodontic tooth movement and helps in reduction of treatment time. The indications of SFP have been proposed in literature but no consensus exists. Depending upon the existing literature this article aims to provide specific guideline for surgery first approach, its limitations, pre and post orthodontic protocols and stability.

Keywords: Orthognathic surgery; SAF (Surgery First Approach); Temporary anchorage device

Introduction

“Beauty lies in the eyes of beholder” The famous phrase used by Margaret Wolfe Hungerford, can't be true for this contemporary world which thrives for esthetics. The word esthetics refers to the idea of beauty. Face is the most noticeable part of the human body, the face also plays an important role in human interactions, including during social activities. The skeletal structure of face can show variability in its structure and can show some deformity, the term dentofacial deformity describes skeletal maxillo-mandibular abnormalities. These abnormalities cannot be solved with orthodontic treatment alone and might need surgical intervention. These surgical procedures to treat these skeletal deformities have been termed as Orthognathic surgery, the term orthognathic surgery was coined by Harold Hargis. Surgical correction of dentofacial deformities started around 1849 in the USA by S. R. Hullihan, a general surgeon, was limited to the correction of the mandible. In the twentieth century, Edward Angle (orthodontist) and Vilray Blair (surgeon) worked together and orthognathic surgery was born. Obwegeser was the first to develop LeFort I osteotomy to move the maxilla in all three dimensions, reporting a large series of maxillary osteotomy cases in 1969, these orthognathic patients can be treated with the conventional orthodontics-surgical approach and Surgery First Approach (SFA). Nowadays many of the orthognathic cases are being treated with surgery first approach, a significant number of orthodontists believe that surgery first approach yields better patient co-operation and quick results. The great dilemma still exists about surgery first approach, its indications, case selection, limitations and complications. This article aims at reviewing the existing literature and suggests treatment protocol based on evidence.

Historical Background

During the last 40 years, investigators have placed sporadic emphasis on the surgery-first approach in orthognathic surgery. In 1959 Skaggs was the first to suggest surgery first approach to treat orthognathic cases [1]. In 1977, when the orthodontics-first approach showed popularity, Epker and Fish suggested that for the surgical repositioning of skeletal and/or dent-osseous segments, the surgical procedure should be performed prior to the orthodontic treatment “Build the house and then move the furniture” concept popularized by Behrman and Behrman stated that normalized jaw position will normalize surrounding soft tissue will aid in post-operative tooth movement and will reduce treatment timing [2,3]. The orthognathic “surgery first” approach was introduced by Nagasaka et al. to correct skeletal dysplasia without pre-surgical orthodontic preparation which has gained popularity in recent years; most papers cited this article [4]. According to literature various skeletal problems such as skeletal class III, skeletal class II, Patients with skeletal asymmetry, open bite cases can be treated with surgery first approach depending upon case specifications. General perception about surgery first approach in comparison to conventional orthodontic first approach is that this approach reduces treatment time, brings about immediate soft tissue changes and hence

OPEN ACCESS

*Correspondence:

Aditya Pawar, Department of Orthognathic Surgery, Pravara Institute of Medical Sciences, Loni, India, Tel: 9518987737;

E-mail: drortho2909@gmail.com

Received Date: 16 Oct 2020

Accepted Date: 20 Nov 2020

Published Date: 02 Dec 2020

Citation:

Pawar A. Surgery First Approach in Orthognathic Surgery - An Evidenced Based Approach. *J Surg Tech Proced.* 2020; 4(3): 1042.

Copyright © 2020 Aditya Pawar. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

improved aesthetics; this approach is beneficial for patients suffering from obstructive sleep apnea. Surgery first approach improves patient cooperation as facial profile is immediately improved and hence helps in post-operative orthodontic compliance [3-8].

Discussion

Guidelines for surgery first approach based upon evidence

Surgery first approach can be used for a wide variety of skeletal deformity depending upon severity and special characteristic of malocclusion. Patients selected for surgery first approach mainly require a team approach of orthodontist and oral surgeon. Adopting surgery first approach is entirely case specific approach. Baek et al. [9] in their study laid down certain general criteria for selecting a case which can be treated with surgery first approach, Patient showing little or no crowding in upper and lower arch, with no or little transverse discrepancy, minimum vertical discrepancy, arches showing mild to moderate curve of speed, patient needing extractions, these criteria suggested by Baek et al. [9] cant establish exact indication and contraindication about surgery first approach and are preferably dependent on experience of surgeon and orthodontist. Various case report in literature shows that discrepancies severe than this can also be treated successfully with surgery first approach [10-13]. Predictability of final outcome in surgery first approach is more difficult than conventional orthodontics first approach, in conventional approach standard treatment objective can be established twice (before and after pre-surgical orthodontics) but in the case of surgery first approach the final treatment objective should be established before surgery. The problems such as transverse discrepancies, arch asymmetry, facial asymmetry, and deep bite are difficult to simulate, so accurate prediction of occlusion after surgery is difficult. The newly developed virtual planning software can be used for 3D simulation for surgery first approach [14]. The difficulty in using this software is that it can't predict the occlusion and soft tissue movement accurately, so the discrepancy between virtual and actual treatment planning still exists. Soft tissue changes impose great difficulty in surgery first approach, predicting ideal esthetic is almost impossible [15]. Patients having crowding in arches might require extractions; these patients require partial orthodontics to manage this crowding this concept was introduced by Hernandez-Alfaro and Guijarro-Martinez and referred to as "surgery early" [16]. This can be used when criteria for surgery first approach are not met completely. According to Liou et al. [17] incisor inclinations should be close to normal for surgery first approach. Severely proclined or retroclined incisors could be a problem in this approach. In the comparative study by Ellen Wen-Ching Ko et al. [18] showed that lower incisor proclination returned to an initial inclination similar to initial status after treatment, hence pre-surgical decomposition of incisors tends to prolong treatment time with little or no significant benefit. Inferior sub apical osteotomy can also be used to surgically decompensate incisors Suggested by Hernandez-Alfaro et al. [19]. Transverse discrepancies proposed a great dilemma while going for surgery first approach; transverse discrepancies are often accompanied by facial asymmetry. Most authors believed that these problems can't be solved without dental decomposition and hence discourage surgery first approach in transverse discrepancies [20]. Maxillary expansion can be achieved by different procedures such as segmenting maxilla during Lefort1 osteotomy, Surgically Assisted Rapid Palatal Expansion (SARME), Mini-Screw Assisted Rapid Palatal Expansion (MARPE). Some patients with a narrow palatal arch need posterior impaction of the

maxilla and posterior open bite to achieve expansion of arch, in such cases we can attempt surgery first approach, this approach to treat maxillary transverse discrepancies possess great risk such as necrosis of maxillary fragments [21]. Surgery first approach aided by mini screw anchorage and rapid palatal expansion devices are useful in such situation [22]. In case of long face syndrome having anterior open bite, conventional approach will aim to level the curve of speed first this leveling procedure will worsen the open bite initially, it will need more amount of maxillary impaction to close this open bite. The decomposition of open bite in conventional approach might show relapse after surgery which can cause deep bite situations. The surgical first approach to treat anterior open bite will require less time than conventional approach [23]. Rapid accelerated phenomenon plays an important role in surgery first approach. Post-operative orthodontic tooth movement facilitates by regional accelerated bone remodeling which is induced after surgery in 1977, Epker and Fish described that bone turnover or remodeling in the entire bone area receiving operation greatly increases following osseous surgery, this facilitates orthodontic tooth movement [24]. Frost further observed this RAP in long bones in 1989 [25,26]. Liou et al. [27] hypothesized that the phenomenon of postoperatively accelerated orthodontic tooth movement might be related to increases in osteoclastic activities and metabolic changes in the dent alveolus caused by the orthognathic surgery. Biomarkers of osteoclastic activity (such as C-terminal telopeptide of type I collagen) and osteoblastic activity (such as serum alkaline phosphatase) could increase 1 week (osteoclastic) and 1 month (osteoblastic) after surgery, with elevated levels lasting for 3 to 4 months. Orthognathic surgery might, therefore, trigger 3 to 4 months of higher bone metabolism postoperatively, which might then induce accelerated orthodontic tooth movement.

Pre-surgical orthodontics

In surgery first approach fixed orthodontic appliances are bonded preoperatively, a passive rigid arch wire is adapted according to tooth position and ligated. Mini-screws if needed are placed preoperatively. Regarding postoperative orthodontics, there can be several options for pre-surgical preparation for the SFA according to the literature [28].

- Surgical Arch should be placed without orthodontic arch wire
- TAD can be placed prior to surgery which can be used for inter-maxillary fixation
- Preoperative placement of conventional passive, rectangular wires attached with surgical hook (with/without anchor screws).

Post-operative management

Post operatively surgical splint should be in place for 2 to 6 weeks various studies showed that postoperative occlusion depends upon surgical splint [8,9,12]. It is a highly unstable occlusion, and can progress to malocclusion quickly. The presence of unfavorable occlusal contacts after surgery can induce unexpected mandibular positions. This might influence the long-term outcome of the surgery. Post-surgical splints should be stable and the presence of any occlusal interference should be removed by modifying the splint. The Surgery first approach cannot achieve optimal postoperative occlusion, the postoperative management in the surgery-first and conventional approaches are different. Thorough follow-up with the orthodontist with continuous interactive communication is needed especially

for cases utilizing the SFA. The use of TADs and interdental corticotomies for desired tooth movement can be beneficial [4]. Sugawara et al. [28] suggested that there can be the two types of SFA: An orthodontically driven style and a surgically driven style. When the surgical treatment is utilized not only for correction of skeletal problem but also for the dental problem, it can be named as “surgery-driven style”. The establishment of realistic surgical goals for final orthodontic settlement is important. Orthodontist and oral surgeon should always consider limitations of orthodontic tooth movement while formulating surgical intervention.

Stability

The various studies carried out to identify parameters for instability in SFA stated that large over jet, deeper curve of speed, a greater negative over jet and greater mandibular set back can be the reason for failure [18]. The studies which did 6 months follow up concluded that occlusal instability due premature contacts might lead to relapse during post-surgical bone healing [19,28].

Conclusion

Surgery first approach provides alternative approach to conventional orthognathic surgery approach. Accurate diagnosis and case selection should be done by experienced orthodontist along with oral surgeon. This treatment modality brings about immediate facial esthetic improvement and addresses a patient's chief complaint; this increases patient's compliance during post-surgical orthodontic treatment. The phenomenon of RAP increases tooth movement and reduces total time period required for treatment. Predictability of final outcome of surgical treatment further needs research. Experienced orthodontist and oral surgeon should critically examine the patient and take decision for surgery first approach.

References

- Skaggs JE. Surgical correction of prognathism. *Am J Orthod.* 1959;45(4):265-71.
- Epker BN, Fish L. Surgical orthodontic correction of open bite deformity. *Am J Orthod.* 1977;71(3):278-99.
- Behrman SJ, Behrman DA. Oral surgeons' considerations in surgical orthodontic treatment. *Dent Clin North Am.* 1988;32(3):481-507.
- Nagasaka H, Sugawara J, Kawamura H, Nanda R. “Surgery first” skeletal Class III correction using the skeletal anchorage system. *J Clin Orthod.* 2009;43(2):97-105.
- 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(7):557-63.
- Dingman R. Surgical correction of mandibular prognathism: An improved method. *Am J Oral Surg.* 1944;30(11):683-92.
- Hernandez Alfaro F, Guijarro Martinez R, Molina Coral A, Badia-Escriche C. “Surgery first” in bimaxillary orthognathic surgery. *J Oral Maxillofac Surg.* 2011;69(6):201-7.
- Hernandez Alfaro F, Guijarro Martinez R, Peiro 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(2):376-90.
- Baek S, Ahn HW, Kwon YH, Choi JY. Surgery-first approach in skeletal class III malocclusion treated with 2-jaw surgery: Evaluation of surgical movement and postoperative orthodontic treatment. *J Craniofac Surg.* 2010;21(2):332-8.
- Keim RG. Surgery first orthognathics. *J Clin Orthod.* 2009;43(2):778.
- Assael LA. The biggest movement: Orthognathic surgery undergoes another paradigm shift. *J Oral Maxillofac Surg.* 2008;66(3):419-20.
- 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(3):781-5.
- Liou EJ, Chen PH, Wang YC, Yu CC, Huang CS, Chen YR. Surgery first accelerated orthognathic surgery: Orthodontic guidelines and setup for model surgery. *J Oral Maxillofac Surg.* 2011;69(3):771-80.
- Kim JH, Park YC, Yu HS, Kim MK, Kang SH, Choi YJ. Accuracy of 3-dimensional virtual surgical simulation combined with digital teeth alignment: A pilot study. *J Oral Maxillofac Surg.* 2017;75(11):2441.e1-e13.
- Baik HS, Kim SY. Facial soft-tissue changes in skeletal Class III orthognathic surgery patients analyzed with 3-dimensional laser scanning. *Am J Orthod Dentofac Orthop.* 2010;138:167-78.
- Hernandez Alfaro F, Guijarro Martinez R, Molina Coral A, Badia Escriche C. “Surgery first” in bimaxillary orthognathic surgery. *J Oral Maxillofac Surg.* 2011;69(6):e201-7.
- Liou EJ, Chen PH, Wang YC, Yu CC, Huang CS, Chen YR. Surgery first accelerated orthognathic surgery: Orthodontic guidelines and setup for model surgery. *J Oral Maxillofac Surg.* 2011;69(3):771-80.
- 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(5):1469-77.
- Wang YC, Ko EW, Huang CS, Chen YR, Takano Yamamoto T. Comparison of transverse dimensional changes in surgical skeletal Class III patients with and without presurgical orthodontics. *J Oral Maxillofac Surg.* 2010;68(8):1807-12.
- Liao YF, Chiu YT, Huang CS, Ko EW, Chen YR. Presurgical orthodontics versus no presurgical orthodontics: Treatment outcome of surgical orthodontic correction for skeletal class III open bite. *Plast Reconstr Surg.* 2010;126(6):2074-83.
- Lee KJ, Park YC, Park JY, Hwang WS. Mini screw-assisted nonsurgical palatal expansion before orthognathic surgery for a patient with severe mandibular prognathism. *Am J Orthod Dentofac Orthop.* 2010;137(6):830-9.
- Epker BN, Fish L. Surgical orthodontic correction of open bite deformity. *Am J Orthod.* 1977;71(3):278-99.
- Frost HM. The biology of fracture healing. An overview for clinicians. Part I. *Clin Orthop Relat Res.* 1989;248:283-93.
- Frost HM. The biology of fracture healing. An overview for clinicians. Part II. *Clin Orthop Relat Res.* 1989;248:294-309.
- Jeong TM, Kim YH, Song SI. Anchor plate efficiency in postoperative orthodontic treatment following orthognathic surgery *via* minimal presurgical orthodontic treatment. *Maxillofacial Plast Reconstr Surg.* 2014;36(4):154-60.
- Kim JY, Jung HD, Kim SY, Park HS, Jung YS. Postoperative stability for surgery-first approach using intraoral vertical ramus osteotomy: 12 month follow-up. *Br J Oral Maxillofac Surg.* 2014;52(6):539-44.
- Kim CS, Lee SC, Kyung HM, Park HS, Kwon TG. Stability of mandibular setback surgery with and without presurgical orthodontics. *J Oral Maxillofac Surg.* 2014;72(4):779-87.
- Sugawara J, Nagasaka H, Yamada S, Yokota S, Takahashi T, Nanda R. The application of orthodontic miniplates to Sendai surgery first. *Semin Orthod.* 2018;24(1):17-36.