Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Review Article

An Updated Review of Surgery First Orthognathic Approach (SFOA)

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ABSTRACT:
Surgeon and orthodontist play an important role in management of skeletal malocclusion. In order to correct skeletal malocclusion, there are two types of surgical approach. i.e. orthodontics- first and surgery first approach. One of the major drawback related to Conventional orthognathic surgery treatment involves a prolonged period of orthodontic treatment (pre- and post-surgery) whereas , surgery-first orthognathic approach (SFOA) sees orthognathic surgery being carried out first, followed by orthodontic treatment for the purpose of aligning the teeth and occlusion. In surgery first approach, RAP helps to make possible proficient orthodontic treatment.
Keywords: Surgery-first orthognathic surgery, skeletal malocclusion, treatment time.

Received: 12 September, 2020 Accepted: 12 November, 2020

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This article may be cited as: Devar NM, Arunachalam P. An Updated Review of Surgery First Orthognathic Approach (SFOA). J Adv Med Dent Scie Res 2020;8(12):46-49.

INTRODUCTION

Surgery first orthognathic approach (SFOA) has gained popularity in the field of orthodontics. Orthognathic surgery is one of the best treatment choice for correction of various dentofacial deformities. The first orthognathic surgery procedure was performed by Hullihen in 1848 with many new techniques and newer methods[1]. Kondo and Aoba insisted orthodontic treatment alone to correct severe malocclusions where skeletal malocclusion remains untreated. Brachvogel *et al* in 1991 proposed the concept of "surgery-first and orthodontics second"[2,3]. The goal of the treatment settle the teeth and soft tissue into better position after surgery facilitating remaining orthodontic tooth movement and reducing the total orthodontic treatment period[4].

In Conventional orthognathic surgery (COS), presurgical orthodontics done to lessen the dental crowding, level the curve of Spee, decompensate the dental inclinations, remove any occlusal interferences and coordinate the upper and lower arches. Major drawback related to COS are prolonged treatment duration, gingival recession, gingival hyperplasia, dental caries, root resorption, deterioration in occlusal function, masticatory and speech discomfort and subsequent psychological problems due to delay in resolution of patients' chief complaint[5,6]. Furthermore, In presurgical phase there is a deterioration in the patients' facial profile which lead to a negative impact on the quality of life[7]. Luther et al have reported an average duration of 17 months for presurgical orthodontics[8], whereas Dowling et al and O'Brien et al have found the mean duration to be 15.4 months and 25 months, respectively[9,10]. Peiro-Guijarro et al concluded a mean total treatment duration of 14.2 months with a range of 10.2-19.4 months for SFOA[11].This current review article discusses about surgical protocol , treatment planning, indication and contraindication.

INDICATIONS[12]

- Well-aligned to mild crowding

- Flat to mild curve of Spee
- Normal to mild proclination/retroclination of incisors
- Minimal transverse discrepancy
- This approach is also indicated in cases in which decompensation is needed.

CONTRAINDICATIONS[13]

- Severe crowding
- Arch in-coordination
- Severe vertical or transverse discrepancy
- Patients with high expectations of treatment outcomes in terms of dental esthetics and stable occlusions.

GUIDELINES OF SURGERY-FIRST APPROACH- SFOA PROTOCOL

There are two methods in surgery first approach 'surgical-driven' approach and 'orthodontic-driven' approach.

1. The 'surgical-driven' approach corrects both the jaw and dental deformities via the surgical procedure[14].
2. The 'orthodontic-driven' approach corrects the jaw deformity by surgery and the dental deformity through orthodontics[15,16].

- The protocol was suggested in 2003 at Tohoku University in Sendai city of Japan.Orthodontic-driven procedure that make use of the miniplates (SAS) for orthodontic movement following correction of the jaw deformity.
- Preoperatively, the appropriate treatment goals for an individual are made using diagnostic aids such as dental casts, radiographs and photographs
- The upper and lower dentitions are bonded and banded. Arch wires are placed 1-week to 1-month postoperatively used for the alignment, while the osteotomized jaw bones are held steadily by the rigid fixation.
- In model surgery, maxilla and mandible are set up in a proper molar relationship and with a positive overbite. The molar relationship could be set up in Class I in cases of non extraction or bimaxillary first premolar extraction, Class III in cases of lower first premolar extraction, and Class II in cases of maxillary first premolar extraction.
- The postsurgical orthodontic treatment could start on as early as 1-week to 1-month postoperatively by considering the postoperatively accelerated orthodontic tooth movement.
- Orthopedic appliances, such as a facemask or chin cap for Class III patients for maintenance of jaw bone position for the period of orthodontic tooth movement.
- Surgical splint may be placed in the mandibular arch for maxillary surgery. It consists of four ball hooks and a lingual arch.
- In case of moderate to deep mandibular curve of Spee and proclined lower incisors in Class II mandibular retrognathism, the anterior segment of the mandible could be levelled and intruded surgically through anterior segmental osteotomy .Consequently, that mandible could be advanced properly.
- In case of wide maxilla ,where transverse discrepancy more than a molar width on each side could be synchronized surgically by a three-piece Le Fort I osteotomy of the maxilla whereas for narrow maxilla, surgically assisted rapid palatal expansion could be best treatment option.
- The mandible could be surgically advanced to an edge-to-edge incisor relationship and without occlusal contact in the posterior teeth and later mandibular anterior teeth could be orthodontically intruded where mandible rotates upward and forward for posterior occlusal contact and a better chin projection.
- Sendai SFOA suggested the modified bilateral sagittal split osteotomy combined with a T-shaped miniplate fixation for mandibular surgery. It prevents the condylar dislocation due to a buccal step adjacent to mandibular second molar area, consequently minimizing the risk of relapse tendency.
- In Post-surgical orthodontics**,** removable Gelb-type splint is maintained for about four to six weeks after the surgery. After the removal of splint, different dental movements in sagittal, vertical and transverse planes are achieved using SAS[17].
- Leelasinjaroen et al post orthodontic treatment may be initiated immediately post-surgery[18], whereas Kim et al suggested to wait four-six weeks before commencing with the orthodontic treatment[14].

TREATMENT PLANNING

- The surgical movement of the jaws should be larger as contrast to the conventional orthognathic surgery, to permit for decompensation of teeth post-surgery.
- The transverse discrepancy can be determined either during surgery or post-surgery with the help of archwires and elastics.
- Molar relationship can be used as a guide for ITM.

- The model surgery might end up in ITM comprising of two occlusal stops in the posterior and one in the anterior region[19].
- In low angle case, the deep bite can be treated during surgery by bringing the anterior teeth into edge to edge bite with no contact between the posterior teeth. The posterior teeth are then extruded postsurgically for correcting the bite[20].
- In high angle case, the anterior open bite is modified by clockwise rotation of maxilla and anticlockwise rotation of mandible to counter postsurgical relapse[20].
- In case of crowding, inclinations and improvement of facial profile, extraction is mandatory. Sharma et al recommended that extraction should be done if the angulation of the upper incisor to occlusal plane is less than 53 degrees[20].

STABILITY AFTER SURGERY-FIRST APPROACH

The factors responsible for instability of SFOA are large overjet, a deeper curve of Spee, a greater negative overjet and greater mandibular setback[21]. Wang et al concluded that the final treatment outcome in both SFOA and COS were similar[22]. For sagittal plane, Kim et al have found greater relapse of around 2.4 mm in SFOA as compared to 1.6 mm in COS[14] whereas vertical plane, Liao et al have reported increased counterclockwise rotation[23].

CONCLUSION

Correcting skeletal malocclusions through SFOA has the advantages of shortened total treatment time and early response to a patient's need. Another important factor are experience of surgeon and orthodontist for planning the proper treatment plan. More recently, rapid prototyping technology combined with SFOA has aided in virtual setup, treatment simulations and surgical splint fabrication, leading to improved treatment accuracy by eliminating the error. SFOA is time saving procedure and drawbacks can be overcome by proper case selection, treatment planning and efficient communication between the orthodontist and maxillofacial surgeon.

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