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Surgery first approach in orthognathic surgery: An overview

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Abstract

The “Surgery-first” approach, defined as a team approach between surgeons and orthodontists for orthognathic surgery without preoperative orthodontic treatment, is aimed at dental decompensation. 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 and makes use of the regional acceleratory phenomenon and the natural forces from the soft tissues and helps in greatly reducing the treatment time. This article will provide an overview of the surgical first orthodontic approach.

Keywords: Phenomenon, orthodontics, decompensation

Introduction

The term “orthognathic surgery” was first introduced by Hüllihen back in 1849 in the era when surgical procedures in orthodontics were uncommon^[1, 2]. 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. Orthognathic approach became a proven approach in correction of dentoalveolar malocclusion with skeletal discrepancy in 1960^[1].

A conventional orthognathic surgery involves three stages. Pre-orthognathic orthodontic treatment is done to relieve the dental compensations. It shows the true skeletal discrepancy preoperatively. It also involves leveling and aligning the teeth, divergence of roots adjacent to surgical sites where interdental osteotomies are planned. This step is followed by the actual orthognathic surgical procedure and finally the post-surgical orthodontic phase where finishing and detailing is done. The main drawback with the presurgical orthodontic step is when dental compensation is carried out, it worsens the patient’s profile. Also the duration of this procedure is relatively long, as tooth movement is against the direction of nature.

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^[3]. This article aims at reviewing the existing literature related to surgery first approach [SFA].

History

The introduction of the mandibular sagittal split ramus osteotomy by Trauner and Obwegeser^[5] in 1957, marked the beginning of the modern era of orthognathic surgery. Maxillary Lefort I osteotomy was first reported by Obwegeser^[4] to move the maxilla in all the three dimensions reporting a large series of maxillary osteotomy cases in 1969, which has become one of the most popular method for correcting skeletal class II or III deformities.

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^[6] in 1988 stated that normalized jaw position will normalize surrounding soft tissue will aid in post-operative tooth movement and

will reduce treatment timing. Later SFA was proposed by Nagasaka *et al.* in 2003 at Tohoku university in Sendai Japan for patients with skeletal deformity [7]. This approach has two significant advantages immediate correction of soft-tissue deformities and reduced treatment time.

Indications and Contraindications

The various indications for the surgical approach prior to orthodontic correction include mild crowding, near flat curve of Spee, slight proclination/retroclination of incisors, minimal transverse discrepancies, patients with facial asymmetries and patients that may be having a cleft lip or palate [8, 9]. Contraindications for SFA include patients that needs definite decompression, patients with severe crowding, arch incoordination and patients with severe vertical or transverse discrepancies [9].

Advantages of SFA [10]

- Immediate change in facial profile
- Chief complaint of the patient is addressed since the beginning of treatment
- Faster results
- Future orthodontic treatment becomes less complicated
- Easier to deal with relapses as compared to routine orthodontic treatment because decompensation is completed before surgery

Disadvantages of SFA [10]

- Planning may be time consuming as it needs to be very accurate to prevent any errors
- Predicting final occlusion is difficult
- Ideal occlusion may be hard to achieve if there are multiple dental interferences
- Patient selection is of utmost importance

Pre-surgical orthodontics in SFA

Timing of bonding

Bonding brackets in SFA cases can follow various guidelines given by different authors which are enlisted and according to the need of case and requirements they can be modified.

Sugawara and Nagasaka [7] - just before surgery.

Villegas [11] 1 week before orthognathic surgery.

Ellen wen ching [12] 1 month before surgery.

Federico Hernandez- 10-14 days after surgery.

Stabilizing/ Initial Archwires in SFA

Different protocols are generally used to prepare patients for the treatment. In most cases brackets and wires are placed right before surgery [9]. Passive stainless wires are most commonly used to prevent tooth movement but some orthodontists have opted for nickel-titanium wires [9].

Liou *et al.* [12] did not placed any orthodontic archwires before surgery. Ching *et al.* [13] used 0.016x0.022" superelastic NiTi wire. Baek *et al.* [14] suggested the archwire can be bonded directly to tooth surfaces to function as an arch bar a few days prior to surgery. Mini-screws if needed are placed preoperatively.

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 [15, 16]. 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.

Leelasinjaroen *et al.* [17] suggested postsurgical orthodontic treatment could begin as early as one week to one month postoperatively. Kim *et al.* [18] suggests to wait for 4-6weeks after surgery. The surgical splint and intermaxillary fixations is removed for tooth movement.

RAP: Regional acceleratory phenomenon

It was introduced in 1983 by Frost [19]. The regional acceleratory phenomenon (RAP) is a tissue reaction to a noxious stimulus that increases the healing capacities of the affected tissues. It is typical not only of hard tissues such as bone and cartilage, but also of soft tissues [21, 22]. The RAP is characterized by acceleration of the normal cellular activities, as an 'SOS' phenomenon of the body that has to respond to the new perturbation. In the alveolar bone, the RAP is characterized, at a cellular level, by increased activation of the basic multicellular units (BMUs), thereby increasing the remodeling space. At the tissue level, the RAP is characterized by the production of woven bone, with the typical unorganized pattern, that will be reorganized into lamellar bone at a later stage. It helps in increased orthodontic movement, increased remodeling and transient osteopenia [20].

Advantages over conventional approach

Chief complaint of the patient is addressed at the beginning of treatment with immediate improvement in facial profile and appearance, this leads to improved cooperation of the patient during orthodontic treatment. Overall treatment period is reduced. Post-op orthodontic treatment can be progressed rapidly. Treatment times as short as seven months have been reported [18]. The pre-surgical orthodontic phase in conventional three-step orthognathic surgery cases is the most time consuming step. Bypassing this step will result in an overall shortened treatment time to 1 to 1.5 years or less. The main factor which is responsible for rapid tooth movement is the regional acceleratory phenomenon (RAP) [23]. Decompensation can be performed effectively and efficiently. As with the help of SFA classIII cases are immediately corrected to near normal occlusion so tongue exerts pressure on lower incisors in aid to decompensation and helps in reduction of post-surgery orthodontics duration. It is also a boom in cases of OSA in relieving respiratory distress. If a surgical error or skeletal relapse occurs, compensation can be made with SAS [skeletal anchorage system] mechanics [24, 25].

Stability of SFA

The various studies carried out to identify parameters for instability in SFA stated that large over jet, deeper curve of Spee, a greater negative over jet and greater mandibular set back can be the reason for failure of the SFA. The studies which did 6 months follow up concluded that occlusal instability due premature contacts might lead to relapse during post-surgical bone healing [26].

Conclusion

With its direct and rapid bony modification with immediate improvement in facial patterns, SFA has proven to show satisfactory results and elevated acceptance among both operators and patients. Accurate diagnosis and case selection should be done by experienced orthodontist along with oral

surgeon as even the slightest error can be very difficult to correct.

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