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SURGERY FIRST ORTHOGNATHIC APPROACH – A REVIEW

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ABSTRACT

Combination of Surgery and Orthodontic treatment has created new and exciting opportunities in the treatment and management of patients with Dentofacial deformities. As the phase of Presurgical Orthodontics, preceding the Orthognathic surgery in the conventional approach involves prolonged treatment duration and temporary worsening of facial profile, the concept of SURGERY FIRST ORTHOGNATHIC APPROACH (SFOA) was introduced in which the Orthognathic surgery is done first followed by Orthodontic treatment. SFOA promptly accomplishes facial esthetic enhancement and reduction in overall treatment duration. This article provides an overview of history, indications, contraindications, advantages, disadvantages, treatment protocol and stability of Surgery First Orthognathic Approach.

INTRODUCTION

Orthognathic surgery is a versatile procedure for the correction of dentofacial deformities with the aim of improving esthetics and functional outcome.

The term ‘Orthognathic surgery’ was first coined by HULLIHEN[1] in 1849, who is referred as the Father of Orthognathic surgery.

In 1957, TRAUNER and OBWEGESER[2] reported Sagittal split ramus Osteotomy which marked the beginning of modern era of Orthognathic surgery.

Conventional orthognathic approach includes three stages – Presurgical Orthodontics, surgical and Post surgical Orthodontics. Presurgical Orthodontics results in temporary

worsening of facial profile, which will have negative impact on patients' self- esteem, level of satisfaction and quality of life.[3] Since conventional approach involves two phases of Orthodontic treatment presurgical and postsurgical, there is prolonged duration of treatment.[4]

To overcome these challenges in conventional approach, the issue of Surgery first approach was first raised by SKAGGS[5] in 1959.

In 1988, BERHMAN and BERHMAN[6] stated- it is better with "Building house and moving furniture" and introduced the concept of '*Surgery first and Orthodontics Second'.*

In 1991, BRACHVOGEL[7] defined the potential advantages of Surgery first approach as dental arch alignment after surgery is similar to Orthodontic treatment in any class I case and Post surgical relapse can be easily addressed with post operative orthodontics.

In 2009, NAGASAKA[8] et al of Tohoku University in Sendai, Japan proposed Surgery First approach for patients with skeletal deformities.

With meticulous presurgical planning and execution of surgery, the postsurgical orthodontic therapy becomes straight forward, swift and patients can get expected treatment outcome in a much lesser time period.

Indications[9]

- Well aligned to mildly crowded teeth
- Normal Incisor inclination to mild proclination or retroclination
- Flat to mild curve of spee
- Minimal transverse discrepancy
- Severe soft tissue imbalance

Contraindications

- Severe vertical and transverse discrepancy which require definite decompensation
- Severe crowding
- Severe Arch incoordination
- Severe abnormal inclination of upper and lower anteriors

Types of surgry first orthognathic approach

- **Orthodontically driven style**
- **Surgically driven style**

Orthodontically driven style

Skeletal problems are treated with orthognathic surgery and Dental problems are addressed orthodontically with Skeletal anchorage system.

Post surgically, occlusion should be set up to reveal the true extent of decompensation to correct it Orthodontically.

Surgically driven style

Both skeletal and dental problems are addressed in the surgical phase.

Cases with normal incisor inclination with no crowding, normal curve of spee very minimal vertical and transverse discrepancy with no asymmetry are indicated.

Post surgically occlusion should be in treatable class I malocclusion requiring minimal intervention.

Protocol in SFOA

Pre surgical phase

Surgical phase

Post surgical phase

Pre surgical

Involves no presurgical orthodontic treatment.

In case of an occlusal prematurity, minimal orthodontic treatment is done.

Banding and Bonding of brackets done with wires placed for stabilization. If it is not done before surgery brackets placement in post operative period will be difficult due to swelling, trismus and discomfort.

Sugawara and Nagasaka[9] suggested the conventional bonding protocol in SFOA. They recommended that the fixed appliance should be placed just before the surgery with 0.022x0.028 slot and 19x25 SS wire is adapted to individual teeth just before the surgery Various other protocols are suggested by Liou et al[10] who recommends no placement of arch wire, Ching et al[11] and Carlos et al used 0.016x0.022 NITI and 0.016x0.016 NITI wire respectively to facilitate immediate tooth movement after surgery.

Transitional occlusion determination

Planned occlusion that is determined during model mock surgery is Transitional Occlusion.[9] It is also referred as Surgical Temporary Occlusion, Intended Transitional Malocclusion, Treatable malocclusion.

Immediately after surgery, Transitional occlusion is set up so that, existing malocclusion lies within the Orthodontically manageable envelope.

Key elements of transitional occlusion set up

- Molar relationship is a key factor to determine temporary occlusion[12]
- Midlines must be coinciding
- Extraction should be considered as a treatment plan, If Upper incisor inclination to occlusal plane is less than 53-55[9,13]
- Establish positive overjet and occlusion with 3 point contact if incisors are normally inclined. In case of abnormally inclined incisors, 2 point contact is established.[13]
- Intercanine and intermolar width maintained

Surgical phase

Treatment guidelines

Anteroposterior and vertical decompensation in class iii cases

- Anteroposterior decompensation is achieved by extraction of maxillary first premolars and anterior segmental osteotomy in a Class III case with Proclined maxillary incisors. Clockwise rotation of maxilla by Lefort I osteotomy uprights the upper incisor inclination.
- Class I molar relationship is set with an excessive overjet and lower incisors are aligned postoperatively to obtain a normal overjet in a class III case with moderately retroclined and crowded lower incisors.
- Severe retroclination and crowded lower incisors in a Class III case is decompensated anteropostriorly by extraction of lower first premolars, Anterior segmental osteotomy, setting up the molars in a class III molar relationship with an excessive overjet, then the lower incisors could be aligned postoperatively to obtain a normal overjet.[10]
- Class III case with deep mandibular curve of spee is levelled surgically by anterior segmental osteotomy.

Anteroposterior and vertical decompensation in class ii cases

Mandible is surgically advanced to an edge to edge incisor relationship in skeletal class II cases with mandibular retrognathism and after surgery, mandibular anterior teeth are orthodontically intruded.[14]

Transverse arch co ordination

Wide maxilla with transverse discrepancy more than a molar width on each side is coordinated surgically by 3 piece Lefort I osteotomy of maxilla.

Wide maxilla with transverse discrepancy less than a molar width is coordinated post operatively by orthodontic treatment.

Surgically Assisted Rapid Palatal Expansion is done in case of narrow maxilla.

Post surgical phase

Orthodontic treatment is begin by 4-6 weeks post surgically taking up the advantage of Regional Acceleratory Phenomenon[15] which speeds up the orthodontic tooth movement and reduces treatment duration.[15,16]

The surgical splint should be removed for orthodontic tooth movement.

Dental alignment, arch coordination and settling of occlusion are the goals of Orthodontic treatment in surgery first approach which takes approximately 6-12 months.[16]

Stability in SFOA

Post surgical stability in SFOA is poor and questionable compared to conventional orthognathic surgery.[17,18,19,20]

Causes of Post surgical Instability in SFOA

- The unstable occlusion with increased overjet and increased curve of spee after surgery is unfavourable to stability.
- Compressive forces of masseter muscle cause mandibular autorotation after the removal of surgical splints within 4 weeks post operatively.
- Regional Acceleratory phenomenon accelerates post operative orthodontic tooth movement which also causes the immediate rotational relapse.

Measures to overcome postsurgical instability in SFOA

- Skeletal relapse due to semi stable postsurgical occlusion can be partly overcome with the help of Rigid Internal Fixation.[21]
- Use of skeletal Anchorage system[3] such as Miniscrews, Miniplates Chincup and use of surgical stents or 3D printed surgical wafers reduces skeletal relapse.

Advantages of SFOA

- Reduction of total treatment duration to 1-1.5 years.[15,16]
- Shortened treatment duration is attributed by
  - Regional Acceleratory Phenomenon
  - Direction of post surgical orthodontic tooth movement is parallel to natural dental compensation and muscle adaptation.
- Improves patients social and psychological well being by early correction of dentofacial deformity

Disadvantages of SFOA

- Predicatablity of final occlusion is difficult.
- Time consuming Transitional occlusion setup.
- Post Surgical Instability and relapse.
- Case selection and proper treatment planning is of utmost important because even minor errors are very difficult to manage post surgically.

CONCLUSION

The optimal esthetic and functional outcome, significant reduction in treatment duration, high patient satisfaction led Surgery First Orthognathic Approach (SFOA) a reasonable, cost effective method to manage skeletal malocclusion in selected cases.

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