MINI REVIEW

Trends in orthognathic surgery

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Yadav V. Trends in orthognathic surgery. Dent Case Rep. 2022; 6(6):12-13.

ABSTRACT

Orthognathic surgery has developed significantly, gradually broadening the range of procedures that can be performed in addition to those that were initially only intended to address malocclusion and the facial profile. Today, it is employed, for example, to treat obstructive sleep apnea and for simply aesthetic purposes. From creating a surgical plan to printing the surgical splint, orthognathic surgery now uses the most recent advancements in three-dimensional digital technology. More complex surgeries are now possible thanks to these procedures.

Key Words: *Craniofacial surgery; Orthognathic surgery; Maxillo-mandibular complex; Orthodontic*

INTRODUCTION

In the realm of craniofacial surgery, orthognathic surgery is frequently carried out to treat malocclusion, issues with the facial profile, and Obstructive Sleep Apnea (OSA) [1]. Repositioning the maxilla, mandible, and chin is the aim of orthognathic surgery, and frequent techniques include LeFort I osteotomy and Bilateral Sagittal Split Osteotomy (BSSO) with or without osseous genioplasty [2].

The American surgeon Simon P. Hullien performed the first mandibular osteotomy for the surgical correction of prognathism and class III malocclusion in 1849 [3]. Postoperatively, the skeletal prognathism was rectified, but the treatment of the malocclusion was clearly limited, leading to edge-to-edge malocclusion anteriorly. Since the 1970s, orthodontic therapy has gained popularity for the treatment of malocclusion, and it is frequently combined with orthognathic surgery to cure both the malocclusion and the skeletal profile.

Through orthognathic surgery, dental function and cosmetic goals should be accomplished simultaneously. To do this, skeletal movement and soft tissue alterations must be taken into account. Orthognathic surgery's surgical objectives have changed in recent years to focus more on aesthetics [4]. No one would be willing to accept that the functional goal of attaining optimal dental occlusion would have to come at the expense of the cosmetic outcomes. The surgical objectives are to produce a visually well-proportioned face, soft tissue that is well-supported by the skeleton, and an appealing facial countenance during the planning and surgical processes.

ORTHODONTIC TREATMENT

Conventional approach

The orthodontic-first strategy is the name given to the usual method. Prior to orthognathic surgery, preoperative orthodontic therapy is carried out to disclose the true skeletal discrepancy and to realign the maxilla and mandible in order to achieve a stable surgical occlusion and prevent postoperative occlusal instability. Despite these benefits, preoperative orthodontic treatment has a number of significant drawbacks that cause patients great inconvenience.

Surgery-first approach

Orthognathic surgery followed by postoperative orthodontic therapy without preoperative orthodontic treatment is the definition of the "surgery-first method". The term "modified-surgery strategy" refers to preoperative orthodontic therapy that is minimized to fewer than six months [5].

SURGICAL PLANNING

Virtual surgical planning

According to other papers, the surgery-first approach offers the advantages of shortening overall treatment times, favouring postoperative orthodontics, enhancing facial aesthetics early on, and treating OSA early on [6]. The surgery-first approach is typically appropriate for patients who do not need extensive preoperative care, such as those who have

- well-aligned to mildly crowded anterior teeth,
- a flat to mild Spee curve,
- normal to mildly proclined or retroclined incisors, and
- a minimal transverse discrepancy.

Virtual surgical occlusion set-up

A crucial stage in organizing orthognathic surgery, the surgical occlusion set-up is especially important when using the surgery-first strategy. The standard approach, which makes use of a dental model

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Received:02 Nov, 2022, Manuscript No. puldcr-23-6149, Editor assigned:07 Nov, 2022, Pre QC No. puldcr-23-6149 (PQ), Reviewed:21 Nov, 2022, QC No. puldcr-23-6149 (Q), Revised: 23 Nov, 2022, Manuscript No. puldcr-23-6149 (R), Published:27 Nov, 2022, DOI: 10.37532. pulacr-22.6.6.12-13.

and is based on 2D lateral cephalometric analysis, was widely applied. However, there have been reports of a number of drawbacks to the conventional approach, including

- patient discomfort during the dental impression procedure,
- the lengthy nature of model surgery,
- the inconvenience of storing dental casts, and
- the possibility of inadvertently breaking dental casts [5].

SINGLE-SPLINT TECHNIQUE AND DOUBLE-SPLINT TECHNIQUE

Either the single-splint technique or the double-splint technique could be used for orthognathic surgery. The maxillomandibular complex is positioned using free-hand positioning with only one final splint in the single-splint approach. The final splint is applied to position the other segment in the double-splint procedure, which is distinguished by the use of an intermediate splint to position the maxilla/mandibular segment first [7]. It's unclear which procedure produces better surgical results, though.

After LeFort I osteotomy and BSSO, the maxillary and mandibular segments are fixed temporarily in the intermaxillary space using the single-splint approach, and a final occlusal splint is applied. The findings from the preoperative 3D analysis are used to reposition the maxillomandibular complex, which is then fastened to the stable upper maxillary basis. Based on the upper incisor display, the intercommissural line, the paranasal fullness, the Ricketts E-line, the lower face proportions, and the midline coordination, the maxillomandibular complex's position might be slightly modified [7]. The single-splint approach is advantageous for accomplishing soft tissue symmetry goals because it allows for mild under- or over-correction of bony mobility.

Since the time when 2D cephalometry was employed in conjunction with model surgery, the double-splint approach has been a well-established procedure. The double-splint approach has the significant benefit of a quick procedure that is less reliant on the skill of the surgeon. The double-splint approach, which uses a 3D-printed intermediate splint, has made it possible to transmit the precise 3Dplanned skeletal movement to surgery thanks to recent advancements in 3D virtual analysis and production systems [8].

MANDIBLE-FIRST APPROACH AND MAXILLA-FIRST APPROACH

The choice of whether to operate on the mandible or maxilla first during two-jaw orthognathic surgery utilizing the double-splint approach is still debatable and is determined by how comfortable the surgeon is with the surgical technique and sequence. A complete LeFort I osteotomy is performed first, with the maxillary segment being repositioned using an intermediate splint. Next, a complete BSSO is performed, and the distal section of the mandible is repositioned using a final splint. Wide mouth openings are not necessary for complete BSSO since they could change the fixed maxillary position. According to Salmen et al. and Liebregts et al. the maxilla-first sequence was more accurate in the setting of targeted maxillary impaction and with the majority of surgical manoeuvres [9,10].

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