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Case Study

Bilateral Sagittal Split Osteotomy with Mandibular Setback - A Case Report

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I N F O

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A B S T R A C T

Conventional orthognathic surgery has taken a back seat nowadays, and bilateral sagittal split osteotomy (BSSO) has been considered to be the surgery of choice for mandibular deformity correction since its popularisation in the 1950s. The uniqueness of the technique has made it a popular choice in the correction of mandibular prognathism, retrognathism, and asymmetry. Here, we present a case of skeletal class III facial deformity treated using conventional orthognathic surgery involving pre-surgical fixed orthodontic treatment followed by bilateral sagittal split osteotomy and post-surgical orthodontic treatment.

Keywords: Orthognathic Surgery, Mandibular Prognathism, Maxillary Retrognathism, Bilateral Saggital Split Osteotomy, Angle's Class Iii Malocclusion, Reverse Overjet

Introduction

With the reintroduction and popularisation of the Surgery First Orthognathic Approach (SFOA) by Brachvogel et al. and Nagasaka et al. in the 2000s, conventional orthognathic surgery has taken a back seat.[1] Although SFOA has a handful of significant advantages, it is important to note that it is not without limitations. Occlusion cannot serve as a guide during the surgical phase of SFOA and thus makes patient selection, treatment planning with simulation, accurate prediction of post-operative outcomes and expertise of surgeon/ orthodontist very crucial.[2] Although the aesthetics of the patient is achieved rapidly, the long-term stability of the results depends on the already mentioned factors. Thus, despite the prolonged treatment duration, conventional orthognathic surgery is preferred over SFOA in certain cases.[3]

Bilateral sagittal split osteotomy (BSSO) has been considered to be the surgery of choice for mandibular deformity correction since its popularisation in the 1950s by Trauner and Obwegeser.[4,5] The uniqueness of the technique has made it a popular choice for the correction of mandibular prognathism, retrognathism, and asymmetry.[6] Here, we present a case of prognathic mandible which has a higher lingula level, superiorly and buccally placed inferior alveolar canal at distal second molar and orthognathic maxilla with Angle's class III malocclusion (reverse overjet of 5 mm), having normal inspiratory and expiratory airflow, which was treated using conventional orthognathic surgery involving pre-surgical fixed orthodontic treatment followed by bilateral sagittal split osteotomy and post-surgical orthodontic treatment.

Case Report

A 20-year-old male patient reported to the Department of Oral and Maxillofacial Surgery at Chettinad Dental College and Research Institute with the chief complaint of forwardly placed front teeth and lower jaw for the past five years. History revealed that the patient was apparently normal 5 years ago after which the facial dysmorphia appeared and proceeded gradually to the

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present state. The patient presented with a history of undergoing orthodontic treatment for malaligned teeth for the past 4 months. Extraoral examinations revealed an apparent facial symmetry with a mesencephalic head form and leptoprosopic facial form. The facial profile was concave with anterior divergence while the mentolabial sulcus was shallow with the chin in a protruded position. The lip nasolabial fold was flattened with competent lips. Mouth opening was adequate and all temporomandibular joint movements were normal with no joint noises on auscultation. Intraoral examination revealed Angle's class III malocclusion with a proclined upper incisor and retroclined lower anterior teeth. Mild spacing was present in upper and lower anterior teeth which were in class III canine relation. The upper and lower brackets were intact. The patient was advised an orthopantomogram and lateral cephalometry. Cephalometric analysis was done using Steiners, Downs, Wits, COGS, McNamara, Ricketts, Holdaway and Tweed's analysis. Skeletal (Table 1), dental (Table 2), soft tissue (Table 3) and pharyngeal parameters (Table 4) were assessed. The skeletal component of cephalometry revealed a class III skeletal base with orthognathic maxilla and prognathic mandible with increased mandibular length. The dental component of cephalometry revealed proclined and forwardly placed upper incisors and retroclined lower incisors.

Table 1.Skeletal Parameters

Skeletal Parameters	Values
ANB	-4 degrees
Wits appraisal	-13 mm
Overjet	-4 mm
Convexity of point A	-6 mm
SNA	82 degrees
N perpendicular to Point A (McNamara)	-2 mm
Maxillary depth (Ricketts)	94 degrees
SNB	87 degrees
Facial angle (Downs)	96 degrees
Mandibular length (condition - pt B)	123 mm
Mandibular length (Go-Me)	74.5 mm
Mandibular length (Go-Pog)	75 mm

A: Point A, N: Nasion, B: Point B, S: Sella turcica, Go: Gonion, Me: Menton, Pog: Pogonion

Table 2.Dental Parameters

Dental Parameters	Values
U1 to A Pog	8 mm
U1 TO NA	38 degrees
U1 to NA	5 mm
L1 to A Pog	5 mm
L1 to NB	5 mm
L1 TO NB	22 degrees
U1 to SN	121 degrees
IMPA	82 degrees
Overjet	-4 mm

IMPA: Incisor Mandibular Plane Angle, U1: Maxillary upper incisor, L1: Mandibular lower incisor

Table 3.Soft Tissue Parameters

Soft Tissue Parameters	Values
Nasolabial angle	103 degrees
Ricketts aesthetic plane	2 mm
Cervico mental distance	39 mm

Table 4.Pharyngeal Parameters

Pharyngeal Parameters	Values (mm)
Nasopharyngeal limit	18
Oropharyngeal limit	9
Hypopharyngeal limit	15

Based on the clinical and radiographic presentation, the diagnosis of skeletal class III facial deformity with dental malocclusion was made. Pre-surgical fixed orthodontic treatment followed by bilateral sagittal split osteotomy with mandibular setback and post-surgical orthodontic treatment was finalised as the treatment plan. In the pre-surgical orthodontia phase, decompensation was achieved by the extraction of the upper first premolar (14,24) and lower second premolar (35,45). Ethical clearance was obtained from the Institutional Human Ethics Committee for Student Research (CARE IHEC-I) and the required patient consent was obtained from the patient.

The patient was operated under general anaesthesia. Using 2% lignocaine hydrochloride with adrenaline 1:2,00,000 dilution bilateral inferior alveolar nerve block and local infiltration was given intraorally along the surgical site. A retromolar incision was placed extending from the midway of the anterior body of ramus superiorly to the mesial aspect of (37,47) second molar inferiorly. The horizontal or lingual osteotomy cut was placed till the posterior surface of the lingula while the sagittal cut extended till the mesial aspect of the second molar. The vertical or buccal osteotomy cut was placed from the mesial aspect of the second molar to the inferior surface of the mandible involving the lingual cortex. The osteotomy cuts were deepened using osteotomes and a mallet while a Smith spreader was used to sagitally split the mandible. The mandibular distal segment was mobilised and set

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back in the desired position using a custom-made occlusal acrylic splint. Occlusion was secured using E-chains and the bone segments were fixed using two titanium plates (4 holes with a gap) and eight screws (2 x 8 mm). E-chains were removed. Condyle position and range of motion were checked. Primary haemostasis was achieved. Saline irrigation was done and a metrogyl wash was given. The closure was done using 3-0 vicryl. Ryle's tube was placed. The patient was extubated uneventfully with bag-mask ventilation and shifted to the post-operative intensive care unit. The patient recovered uneventfully and post-surgical orthodontic treatment resumed after 14 days. Post-operative care was given. Neurological changes resolved within a month, and the patient was kept on regular follow-up.

Discussion

Orthognathic surgery was rooted by Hullihen in the 19th century when he performed mandibular body osteotomy for the correction of mandibular prognathism in a burns victim.[7] The contributions of Blair, Limberg, Wassmund, Kazanjian, Caldwell, Lettermen and Schuchardt are all irreplaceable, but modern orthognathic surgery was revolutionised by the surgical innovations of Obwegeser and Trauner.[8]

Although oblique sagittal osteotomy in its preliminary stages was the brainchild of Schuchardt in the 1950s, bilateral sagittal split osteotomy, as we know today, was introduced in 1957 by the much controversial duo Trauner and Obwegeser.[9] Osteotomy consists of three osteotomy cuts: medial or lingual or horizontal cut, sagittal cut, and lateral or buccal or vertical cut. The lingual cut extends unicortically through the entire anteroposterior length of the ramus just above the lingula, the sagittal cut extends along the anterior border of the ramus to the retromolar area and it turns into a buccal cut which extends monocortically just above the angle of the mandible.[10] Since its introduction, it has seen numerous modifications and the prominent among them are that of Dalpont, Hunsuck and Epker. In 1961, the lower horizontal cut through the angle of the mandible was modified by Dalpont into a vertical cut through the buccal cortex between the first and second molars. This provided a greater area of contact and minimal muscle dissection.[11] The medial or lingual cut was modified in 1968 by Hunsuck whereby medial horizontal osteotomy was made shorter just past the lingula. This lessened the extent of muscle dissection in the lingual aspect.[12] Epker in 1977 made fine refinement changes to Dalpont and Hunsucks modification. He proposed less stripping of the masseter and medial pterygoid muscle which lessened post-operative haemorrhage, swelling and neurovascular bundle manipulation. The vascular pedicle to the proximal section increased due to the masticatory muscles' reduced stripping, which reduced bone resorption and loss of the gonial angle.[13]

Our case showed the improvement of facial aesthetics, i.e. establishment of positive ANB angle (the angle formed by point A, Nasion (N), and point B), reduction of mandibular plane angle and proclination of lower incisors, after treatment. Orthopantomography examination also revealed the same after pre-surgical orthodontics and surgery (BSSO). Gupta et al. described the combination of pre-surgical orthodontics followed by BSSO as an effective method for treating skeletal class III malocclusion with mandibular prognathism. Surgical orthodontic treatment can change skeletal and soft tissue dentofacial components.[14]

According to the current literature, persistent hypoesthesia of the inferior alveolar nerve (IAN) is the most common complication of BSSO of the mandible. Nerve fibres can be injured by surgical manipulation, such as stretching or crushing during the operation, or by compression of the nerve bundle within the mandibular canal; nerve damage can also result from the hypoxia and oedema caused by these manipulations. The type of nerve injury that results is most likely a combination of neuropraxia (bruising that damages the myelin sheath) and partial axonotmesis (nerve fibre damage caused by sectioning of the axon).[15]

Mensink et al. described that BSSO performed with splitters and separators will have a lower incidence of IAN hypoesthesia compared to other splitting techniques.[16] Our findings here indicate that the use of splitting forceps and elevators leads to a lower incidence of persistent post-operative hypoesthesia after BSSO of the mandible, without increasing the risk of a bad split.

Conclusion

The technique introduced by Obwegeser and Trauner, half a century ago, holds relevance even to this day.

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