CAHIERS MAGELLANES-NS
Volume 07 Issue 1
2025

ISSN:1624-1940
http://magellanes.com/

REVIEW ON SAGITTAL SPLIT RAMUS OSTEOTOMY

Badr Mordi Alenazi[1]*, Abduljabbar Ali Alzahrani[2], Abdullah Ahmed Alzahrani[2], Abdulkarim Abdulrahman Almutairi[3], Bashayr Saud Alnawmasi[4], Rayan Mutiq Alrashidi[4], Elaf Mubarak Abdulla Algharbi[5], Ibrahim Saleh Alraddadi[6], Afnan Ahmad Abdullah Alhabardi[7], Salem Nasser Alawad[8], Faisal Jaber Alsiwat[9], Asim Abdullah Adhali[10], Deem Fahad Aljulaydan[11], Ibrahim Hattan M Hattan[12], Refdan Obeid Alqahtani[13]

[1]Periodontics Consultant, Faculty of Dentistry Medicine, Hail Health Cluster, Hail,Saudi Arabia
[2]Dentist , Albaha University , Albaha , Saudi Arabia
[3]Dentist , Durrat International Medical Services Company , Qassim , Saudi Arabia
[4]Dentist , Hail University , Hail , Saudi Arabia
[5]Dentist , King Saud bin Abdulaziz University for Health Sciences , Riyadh , Saudi Arabia
[6]Dentist , Medical Services King Khalid University , Abha , Saudi Arabia
[7]Dentist , Hospital Alrawabi PHC Qassim , Saudi Arabia
[8]Dentist , King Khalid University , Abha , Saudi Arabia
[9]Dentist , King Saud University , Riyadh , Saudi Arabia
[10]Dentist , Vision Colleges , Riyadh , Saudi Arabia
[11]Dentist , Qassim University , Qassim , Saudi Arabia ,
[12]Dentist , Public Security Health Center , Riyadh , Saudi Arabia
[12]Dentist , Prince Sattam Ibn Abdulaziz University, Alkharj, Saudi Arabia

Corresponding author*: drmsiyam@gmail.com

Abstract

Background: One of the most common surgical techniques in orthognathic surgery is sagittal split mandibular ramus osteotomy, which is used to twist, set back, and advance the distal (tooth-bearing) part of the mandible. The original method, as reported by Trauner and Obwegeser, has undergone several changes.
Methods: The Medline, Pubmed, Embase, NCBI, and Cochrane databases were searched for studies of Sagittal split ramus osteotomy.
Conclusion: Sagittal split ramus osteotomy (SSRO) and (BSSO) is a popular surgical treatment used in orthognathic surgery to address mandibular deformities such as malocclusion or mandibular asymmetry. By realigning the jaw and splitting the mandibular ramus, SSRO can improve both beauty and function.

Keywords: Orthognathic surgery, sagittal ramus osteotomy, bilateral sagittal split osteotomy, posterior facial height, idiopathic condylar resorption

ISSN:1624-1940
http://magellanes.com/

Introduction

Repositioning one, two, or all three bones may be necessary for the repair of facial asymmetry, a three-dimensional dentofacial malformation that can affect the chin, mandible, or maxilla. The evaluation of the cant of the maxillary occlusal plane, the anteroposterior, vertical, and transverse positions of the maxillary incisors, and other factors play critical roles in treatment planning and ultimately determine the position of the mandible, just as they do in the correction of other dentofacial deformities. Any chin asymmetry that persists after the maxilla and mandible are positioned symmetrically in the face can be fixed using genioplasty. Orthognathic surgery treats patients with dentofacial skeletal anomalies by surgically rearranging the constituent parts of the facial skeleton to reestablish the correct anatomical and functional relationship. Bilateral sagittal split osteotomy (BSSO), the most often performed jaw surgery, is a crucial part of orthognathic surgery and can be done with or without upper jaw surgery. In orthognathic surgery, the most common method for mandibular repositioning is the mandibular ramus sagittal split osteotomy. A bilateral sagittal split may be indicated by an excess, deficit, or asymmetry of the mandible horizontally. It is the most often used technique for mandibular advancement and can also be applied to mandibular setbacks ranging from mild to moderate in severity. It may be challenging to realign the mandible more than 7 to 8 mm posteriorly with a BSSO; instead, an intraoral vertical ramus osteotomy (IVRO) or an inverted "L" osteotomy should be considered (2). Cases of asymmetry can be readily handled with a BSSO, but they do require careful preparation and workup. The best treatment for cases requiring significant improvements, patients with inadequate soft tissue envelopes, and skeletally immature mandibles is mandibular distraction osteogenesis. An essential surgical method for the repair of mandibular abnormalities is the bilateral sagittal split osteotomy. It takes in-depth understanding of the sagittal split osteotomy's indications, procedure, and complications to attempt correcting these defects (3). Hullihen conducted an osteotomy of the mandibular body in 1846 to correct prognathism, marking the beginning of the history of orthognathic surgery of the mandible (4). Until Blair's horizontal ramus osteotomy in the early 1900s, there was not much additional innovation (5). Further alterations to external approaches to ramal osteotomies were made by Limberg, Wassmund, and Kazanjian in the 1920s and 1930s (6). Each of these struggled with relapse. The process would be refined and altered throughout the course of the following few decades with an eye on reducing problems, enhancing healing, and minimizing recurrence. These advancements were primarily made possible by Dal Pont (1961), Hunsuck (1968), and Epker (1977).

Surgical procedure:

When using this procedure, general anesthesia is used. After the patient is positioned supine, a nasotracheal tube is used to intubate them. Conventional sagittal split surgery involves making an incision across the front mandibular boundary. Both an electric and surgical scalpel are used to make incisions in the muscle, submucosa, and mucosa. Before the lingula is clearly visible, subperiosteal dissection is advanced basally to the angle of the jaw, the first molar, and the lingual cortex of the ramus. Piezotome tips or surgical reciprocating and oscillating saws can be used for the osteotomy. The first cut, which is similar to a conventional sagittal split, is made horizontally on the lingual cortex in the anterior two-thirds of the ramus using 702 burs. The osteotomy is then continued with an oblique cut down the anterior cortex of the ascending ramus, stopping distal to the first molar, where a vertical cut is made down the buccal cortex and stopped just below the IAN canal. Next, a new horizontal monocortical cut is made in the mandible's external cortex,

ISSN:1624-1940
http://magellanes.com/

parallel to the basilar border and right below the IAN canal towards the posterior border of the ramus (7). The IAN is avoided by the surgical saw's small downward and inward inclination, which ends exactly at the ante-gonial notch. In order to unify the osteotomies at the ante-gonial notch area where the previous cut was left, a bicortical horizontal osteotomy is then performed 5 to 8 mm above the basilar border of the mandible's angle, starting at the posterior border of the mandible and moving posteroanteriorly (8). As is customary, osteotomes are used to finish the split. Given that the osteotomy and conventional sagittal split share nearly the same contact bone area and exhibit similar behaviors, the surgeon can choose to provide rigid fixation using a variety of techniques, such as plates with monocortical screws, plates with bicortical screws, only bicortical screws, or a combination of plates and additional bicortical screws. To the best of our knowledge, a proper stiff fixation can be achieved with just three bicortical screws. The foundation of this osteotomy is the distal fragment's counterclockwise rotation, which creates a gap and raises the posterior ramus height. As a result, posterior open bite should exist following surgery to improve the mandibular angle's expression. The new temporary occlusion will be supported by occlusal contact points on the canine and incisor teeth, as well as on the first premolar in certain situations. In order to stimulate posterior tooth extrusion, the patients must begin orthodontic therapy with vertical elastics utilizing 3/16″ 3 Ounces as soon as surgery is completed. This requires the patients to have a light orthodontic arch wire, ideally no heavier than a stainless steel 0.016″ – 0.016″ wire.

Complications:

Sagittal split ramus osteotomy and (BSSO) complications include bleeding from damage to the masseteric or inferior alveolar arteries, avascular necrosis, condylar resorption, malposition of the proximal segment, and worsening of symptoms related to the temporomandibular joint (TMJ). When doing a BSSO, the possibility of harming the inferior alveolar nerve is a crucial factor to take into account. It is reported that between 2 and 3.5% of patients have transection, and between 10 and 30% of individuals, symptomatic or not, have some kind of long-term neurologic damage.Thirteen At one year, approximately 70% of individuals who receive a sagittal split osteotomy with an osseous genioplasty have some sort of neurosensory loss (9). Fixing the segments without properly seating the condyles can cause condylar malposition, which can increase TMJ symptoms, cause malocclusion, cause the proximal segment to rotate and eventually relapse, and remodel the condylar head. An open bite caused by malocclusion is frequently the outcome of insufficient initial fixation or hardware malfunction. Films should be obtained to evaluate hardware function when noted in the postoperative course; when noted intraoperatively, the fixation should be changed. Orthodontics can frequently be used to treat minor posterior open bites following surgery.

After surgery, all orthognathic patients should have a weekly checkup if any malocclusion symptoms appear. Elastics should then be properly adjusted to promote healing in the ideal occlusion. The most common cause of proximal segment fractures is incomplete cutting of the inferior border, which leaves a fracture line that extends along the inferior border's buccal side. The inferior border has to be recut because it is noted that the two portions are divided.

An further factor contributing to unfavorable fractures is impacted third molars, which are best treated six months to a year before mandibular surgery. When removing an impacted third tooth during surgery, caution should be used to avoid using too much power. Breaking the tooth into tiny pieces will make this easier. With a reported frequency of 20% to 25%, temporomandibular dysfunction (TMD) is a common finding in the general population (10). It is

ISSN:1624-1940
http://magellanes.com/

estimated that between 16 and 50% of orthognathic patients have preoperative TMD (1). The most commonly reported symptoms were TMJ clicking and discomfort. While there is considerable heterogeneity in the literature regarding the rates of symptom improvement, the majority of studies have demonstrated that most patients had improved symptoms, with just a tiny proportion of patients reporting increasing symptoms.

Recovery following surgical procedure:

Due to the intricacy and scope of orthognathic surgery, patients need to be more informed of everything that this kind of surgery involves, including the length of the procedure and after care, as well as the cosmetic, functional, and social ramifications. Following orthognathic surgery, the recuperation phase may last up to six months. The most commonly occurring objective and subjective indications during the recovery phase are edema, hematoma, mouth opening limits, discomfort, and anesthesia/hypoesthesia, with the maximum amount of edema occurring 48–72 hours after surgery (11). The patients had modest pain scores at the three-month postoperative follow-up, with the most common type of pain being a constant pressure sensation. Three months following surgery, the neurosensorial phenomena was still not fully resolved and was present in varying degrees in each patient. Soft-tissue alterations following bimaxillary orthognathic surgery have a direct impact on the appearance of the face. These discoveries offer insightful information about the profession that will aid practitioners in creating more effective intra- and postoperative plans to maximize outcomes and reduce patient discomfort (11).

Conclusion:

A common surgical procedure in orthognathic surgery to treat mandibular deformities including malocclusion or mandibular asymmetry is called a sagittal split ramus osteotomy (SSRO). SSRO can enhance appearance and function by dividing the mandibular ramus and realigning the jaw. It carries hazards like nerve damage or poor bone repair, but it also offers benefits like improved control over the bone segments and faster recovery durations. SSRO is a very effective way to improve patient quality of life, facial symmetry, and oral function when done by a skilled surgeon.

References:

1- Reyneke JP, Tsakiris P, Kienle F. A simple classification for surgicalplanning of maxillomandibular asymmetry. Br J Oral Maxillofac Surg1997;35:349–51.
2- Ow A, Cheung LK. Skeletal stability and complications of bilateral sagittal split osteotomies and mandibular distraction osteogenesis: an evidence-based review. J Oral Maxillofac Surg 2009;67(11): 2344–2353.
3- McCarthy JG, Katzen JT, Hopper R, Grayson BH. The first decade of mandibular distraction: lessons we have learned. Plast Reconstr Surg 2002;110(7):1704–1713.
4- Aziz SR. Simon P. Hullihen and the origin of orthognathic surgery. J Oral Maxillofac Surg 2004;62(10):1303–1307
5- Steinhäuser EW. Historical development of orthognathic surgery. J Craniomaxillofac Surg 1996;24(4):195–204
6- Obwegeser HL. Orthognathic surgery and a tale of how three procedures came to be: a letter to the next generations of surgeons. Clin Plast Surg 2007;34(3):331–355
7- Triaca A., Minoretti R., Saulacic N. Mandibular wing osteotomy for correction of the mandibular plane: a case report. Br J Oral Maxillofac Surg 2010;48:182–184.

ISSN:1624-1940
http://magellanes.com/

8- Mont'Alverne A.L.F., Xavier F.G., Meneses A.M., Santos E.S., Franco J.M.P.L. Is bilateral sagittal split osteotomy of the mandible with no step possible? A modification in the technique. J Craniofac Surg 2019;30:2275–2276.
9- Van Sickels JE, Hatch JP, Dolce C, Bays RA, Rugh JD. Effects of age, amount of advancement, and genioplasty on neurosensory disturbance after a bilateral sagittal split osteotomy. J Oral Maxillofac Surg 2002;60(9):1012–1017.
10- Thilander B, Rubio G, Pena L, de Mayorga C. Prevalence of temporomandibular dysfunction and its association with malocclusion in children and adolescents: an epidemiologic study related to specified stages of dental development. Angle Orthod 2002;72(2):146–154.