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Original Research

# Complications of sagittal split ramus osteotomy

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ABSTRACT

*Purpose:* To determine intraoperative as well as post surgical complications of bilateral sagittal split ramus osteotomy.
*Patients and methods:* A retrospective evaluation of 44 case records of BSSRO, performed over a period of five years from January 2010 to Dec 2014, at a single center.
*Results:* Bad split was reported in 3 patients in the series, intraoperative bleeding was encountered in 5 cases, which was controlled by pressure packing. Postsurgical Neuro Sensory Deficit (NSD) was present in 22 patients, which resolved over a period of 6 months–1 year. Severe relapse and bone loss were reported in 1 patient each. Implant removal was done in 3 cases following peri-implantitis. Reoperation was done in 1 case to correct anterior open bite (AOB).
*Conclusion:* Neuro Sensory Deficit (NSD) was the most common immediate post surgical complication following BSSRO. Almost all the cases had neuropraxia of inferior alveolar nerve (IAN) secondary to stretch or compression. Additional care should be taken during incision placement, soft tissue retraction and fixation.


## 1. Introduction

Bilateral sagittal split ramus osteotomy (BSSRO) is a versatile intraoral surgical procedure to address various congenital and acquired mandibular and Bi-jaw deformities. Trauner and Obwegeser introduced it in 1957 [1]. Their technique was frequently associated with complications like aseptic necrosis, nonunion of segments, which subsequently led to modifications by Dal Pont [2], Hunsuck [3], and Epker [4]. Due to altered mandibular anatomy and its relation to important anatomical structures, the procedure still presents technical difficulties leading to both intra operative and post operative complications. The rate of complications also depends upon the experience of the orthognathic surgeon as the technique has a stiff learning curve. The purpose of this retrospective study is to evaluate the intra operative and postsurgical complications of BSSRO performed at a single centre over a period of 5 years.

## 2. Patients and methods

A total of 74 cases were operated for orthognathic surgery in our tertiary care centre between 01 Jan, 2010 to 31 Dec, 2014. 44 cases were selected for the study. Age profile of the selected patients from both the sexes ranged between 18 to 30 years. All the patients had under gone presurgical orthodontic treatment. On completion of the presurgical Dentofacial Orthopedics, they were taken up for isolated BSSRO surgery for symmetrical and asymmetrical advancement, setback and rotation of mandible. Post-surgical follow up period of the study was at least 1 year. The syndromic patients and cases having history of trauma, previous orthognathic surgery, bijaw surgery, incomplete records and inadequate follow up were excluded from study.

### 2.1. Procedure

The selected cases had undergone presurgical orthodontic treatment to established maxillary and mandibular teeth in optimal alignment, inclination and angulation. Cases were evaluated by cephalometrics for orthognathic surgery (COGS), prediction tracing, face bow transfer and model surgery was done. A surgical splint was fabricated. After pre-anaesthetic evaluation, the cases were operated under general anaesthesia by nasotracheal intubation. Single team having experience of orthognathic surgery of over 15 years operated all the cases. The surgical technique used was as

☆ AsianAOMS: Asian Association of Oral and Maxillofacial Surgeons; ASOMP: Asian Society of Oral and Maxillofacial Pathology; JSOP: Japanese Society of Oral Pathology; JSOMS: Japanese Society of Oral and Maxillofacial Surgeons; JSOM: Japanese Society of Oral Medicine; JAMI: Japanese Academy of Maxillofacial Implants.

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reported by Dal Pont [2] and Hunsuck [3]. For mandibular advancement the vertical cut was placed distal to 2nd molar and for setback medial to it. Controlled hypotensive anaesthesia was maintained during surgery.

### 2.2. Incision

In the absence of third molars, incision was given in the lateral crest of alveolus and extended up to the anterior border of ramus and anteriorly along external oblique ridge as far forward as distal surface of second molar. In cases, where third molars were planned to be removed, an extended Ward's incision was incorporated in the incision design and third molars were extracted intraoperatively.

### 2.3. Exposure

Mandibular ramus was exposed and the mandibular foramen was located. A periosteal elevator was placed just above the mandibular foramen and the horizontal bone cut was performed 5 mm above the mandibular foramen. Sagittal and vertical cuts were made. The inferior border was cut perpendicular through the inferior cortex, just reaching the medial side. Fine osteotome was used to confirm the corticotomy. Split is achieved with Smith splitter. Deroofing and split tooth technique was used to remove third molars. Intraoperative complications like bleeding and bad split were recorded and managed. Mandible was placed in new intermaxillary relationship using surgical splint and intermaxillary fixation (IMF) was done after confirming the position of the condyle manually.

The proximal segment was held with a Crocker forceps and guided posteriorly and superiorly thereby ensuring the position of condyle in glenoid fossa, which was confirmed by endaural and preauricular digital palpation. A reverse Langenback's retractor was engaged at the lower border of proximal segment to maintain the position while fixation of the segment was carried out using titanium mini bone plate and screws. On completion of bilateral fixation, IMF was released and mandibular movements were carried out to reconfirm the occlusion and condylar position thereby avoiding condylar sag.

The critical care team assessed intraoperative blood loss. Up to 1 unit blood loss was considered normal. All patients were prescribed Inj Cefotaxime 1 g 12 hourly, Inj Metronidazole 500 mg 8 hourly perioperatively, and the medication was continued for 3 days after the surgery. To reduce edema, 4 mg Dexamethasone was given at the time of the operation and 8 h postoperatively. After 48 h, splint was placed and training elastics were given for a period of 1 week.

Reports of sensory disturbances in the regions innervated by the inferior alveolar nerve (IAN) were recorded. The neurosensory function of the IAN was tested before the operation; immediately after the operation (within 1 or 2 days); and 1, 3, 6, months and 1 year after the operation. IAN function was tested by two-point discrimination test and subjectively by asking whether the sensation of the lower lip was changed or altered.

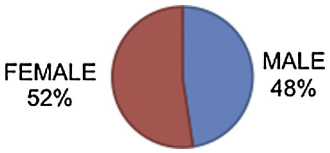
The patients were followed up for a period of 1–5 years with an average follow up of 28 months after surgery. Postoperative Orthopantomograph (OPG) and Lateral Cephalogram were recorded to evaluate the radiological parameters and healing.

## 3. Results

52% of patients included in the study were female (24) and 48% were male (20) (Table 1 & Graph 1). The age of the patients ranged from 18 to 26 years with a mean age of 20.65 years at the time of surgery (Table 2 & Graph 2). 31 patients (70.45%) underwent mandibular advancement and 13 patients (29.54%) underwent mandibular setback (Table 3).

**Table 1**
Patient gender distribution.

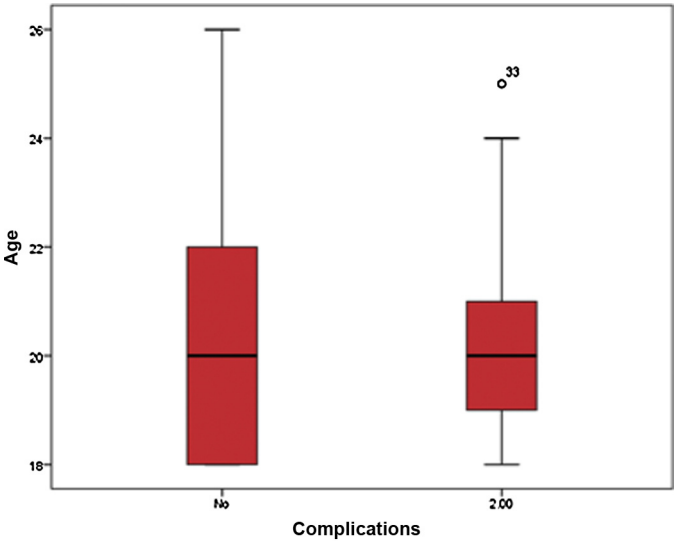
| | | Frequency | Percent | Valid percent | Cumulative percent |
|---|---|---|---|---|---|
| Valid | F | 24 | 52 | 52 | 52 |
| | M | 20 | 48 | 48 | 48 |
| | Total | 44 | 100.0 | 100.0 | 100.0 |




**Graph 1.** Distribution of patient as per gender.

**Table 2**
Patient age distribution.

| | N | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|---|
| Age | 44 | 18 | 26 | 20.65 | 2.253 |
| Valid N (list wise) | 44 | | | | |




**Graph 2.** Patient age distribution.

**Table 3**
Operative procedures.

| | | Frequency | Percent | Valid percent | Cumulative percent |
|---|---|---|---|---|---|
| Valid | Advancement | 31 | 70.45 | 70.45 | 70.45 |
| | Mandibular setback | 13 | 29.54 | 29.54 | 29.54 |
| | Total | 44 | 100.0 | 100.0 | 100.0 |

The complications encountered were divided into intraoperative and post surgery group. Complications such as hemorrhage, bad split were classified as intraoperative, while Neuro Sensory Deficit (NSD), implant/plate removal, relapse, bone loss as postsurgical complications (Table 3 & Graph 3).

### 3.1. Intraoperative complications

The most common complication encountered during surgery was excessive bleeding in 5 (11.36%) followed by bad split in 3 (6.81%). Bleeding was controlled with pressure pack. Blood loss was less than 1 unit and blood transfusion was not required. Bad split was unilateral and restricted to the proximal segment. In two cases

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