

## Neurosensory Disturbance following Bilateral Sagittal Split Osteotomy Surgery for Mandibular Advancement

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**Abstract :** Bilateral Sagittal Split Osteotomy (BSSO) is one of the most common surgeries for the management of mandibular retrognathism. However, nerve damage and lip paresthesia is possible after the surgery. The aim of the present study was to evaluate the incidence of neurosensory disturbance after BSSO surgery. 42 patients in need of mandibular advancement participated in this study. The sensory status was evaluated by means of two point discrimination test (TPD) prior the surgery, 3 and 6 months after surgery. Data were analyzed in SPSS software using t-test and repeated measures tests. 41 patients with mean age of 22 years completed the study. TPD was significantly increased after 3 months ( $P$ -value  $< 0.05$ ). However, TPD was reached the level of preoperative value after 6 months ( $P$ -value  $> 0.05$ ). The main trigger annoyance in paresthesia was touching. Based on the results of the present study, neurosensory disturbance after mandibular advancement with BSSO technique was transitory and mostly resolved after 6 months.

**Keywords:** Bilateral Sagittal Split Osteotomy, Lip Paresthesia, Mandibular Advancement, Neurosensory Disturbance, Two Point Discrimination Test.

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### I. Introduction

During the recent decades the management of maxillofacial abnormalities has been improved significantly by introducing new surgical approaches and techniques. One of the most common techniques used for mandibular setback or advancement is bilateral sagittal split osteotomy (BSSO) [1].

BSSO was first introduced by Obwegeser in 1957 and from then it has been improved by various researchers [2]. This approach has numerous advantages including wide 3D flexibility, favorable healing rate, minimum alteration of muscles and TMJ position, short operation time, and also low complication rate. However, various complications following surgery have been reported for BSSO technique including temporomandibular joint dysfunctions, reduced masticatory force, and limitation in jaw opening [1-6]. Moreover, one of the disadvantages of BSSO in comparison to distraction osteogenesis (OD) and intraoral vertical ramus osteotomy (IVRO) is the higher rate of sensory disturbance and lip paresthesia [6, 7].

The aim of the present study was to evaluate the incidence of neurosensory disturbance following mandibular advancement with BSSO technique in patients with mandibular retrognathism.

### II. Materials And Methods

The current study was performed at the clinic of Oral and Maxillofacial Surgery in Mashhad Dental School. All patients signed a detailed informed consent and the study protocol was approved by Ethical Board of Mashhad University of Medical Sciences.

#### 2.1 Patient Population:

42 patients in need of surgical advancement of mandible using BSSO technique between September 2011 and January 20 were participated in this study. Patients had initiated their orthodontics treatment.

Exclusion criteria were previous trauma to the oral and maxillofacial region, TMJ disorder, neuromuscular diseases, taking medications affecting sensory or neuromuscular system, or previous orthognathic surgery, unexpected complications during surgery including fracture of pieces or incorrect occlusion after surgery

#### 2.2 Surgery Technique:

All surgeries were performed by single surgeon using the Epker modification of BSSO technique. Preoperative screening consisted lateral cephalography in Natural Head Position three weeks before the surgery, prediction tracing, and model casts mounting on semi adjustable articulator.

During the surgery osteotomy and repositioning of the jaw was performed to obtain favorable occlusion and then the pieces were fixed using bicortical titanium screws.

After the surgery patients were instructed to be on liquid diet for one week. In addition, during the first three postoperative days, packed bandage was used.

### **2.3 Neurosensory Sensory Evaluation**

To determine the incidence of neurosensory complications, two point discrimination-test (TPD) was performed on both lip sides to indicate the changes in lip sensation in three different time points; prior the surgery (baseline), 3 months, and 6 months after the surgery. TPD was performed by a compass with two sharp tips. The minimum distance between the two sharp tips in which patient could discriminate the presence of two sharp tips was recorded as the TPD value. The test was performed in a calm room and the patients were instructed to seat on a chair while their eyes were completely shut. In addition to TPD, the presence of lip paresthesia and also the triggers were also recorded.

### **2.4 Statistical Analysis:**

Data were reported descriptively using frequency, mean, and standard deviation. Data were collected in SPSS version 11.0 software and analyzed with t-test and repeated measures and the confidence interval was set at 95%.

## **III. Results**

41 patients including 27 (65.8%) females and 14 (34.2%) males participated in this study with the mean age of  $24.12 \pm 5.42$ . One patient did not participate in the 6 month follow up and excluded from the study population. The results of TPD test is presented in Table 1. Based on t-test, no significant difference was observed between the TPD values of left and right lips at baseline, 3 month, and 6 month measurements (P-value = 0.833 , 0.617 , and 0.389, respectively). The TPD value was significantly increased after 3 months of surgery (P-value = 0.008). However, no significant difference was observed between the total TPD value at 6 month follow up and baseline (P-value = 0.083).

Among the 41 patients (82 lip sides), 21 patients (51.2%) in 35 sides (42.7%) developed lip paresthesia after the surgery (evaluated at the 3 month follow up). After 6 months, the number of patients with lip paresthesia and number of affected sides reduced to 9 patient (21.9%) and 14 sides (17.1%), respectively.

The predominant trigger of annoyance in paresthesia was mostly touching followed by feeding/mastication (Table 2). After 6 months, all of the patients reported partial or complete resolution of lip paresthesia except three patients who reported no difference in the severity of lip paresthesia and had experienced continuous discomfort in either side of their lips.

## **IV. Discussion**

Based on the results of the present study, 51.2% of the patients experiences neurosensory disturbance 3 months after BSSO surgery. However, after 6 months the number of patients with lip paresthesia reduced to 21.9%. There is wide range of reported neurosensory deficit rate (9% to 85%) following orthognathic surgery in various studies [8]. Schultze-Mosgau et al [9] found 83% IAN injury. Hua et al [10] reported 78% temporary IAN impairment after BSSO surgery. Eshghpour et al [5] reported 56% lip paresthesia after mandibular setback surgery. Al-Bishri et al [8] indicated 40% sensory disturbances in patients undergoing setback surgery of mandible. Lip paresthesia is due to the injury to inferior alveolar nerve (IAN). In BSSO surgery, direct manipulation of IAN or trauma to the adjacent structures could lead to nerve damage [11]. IAN damage could be complete or partial transaction, crushing, compression, or ischaemia. According to the extent of injury, neuropraxia, neurotmesis, or axonotmesis of IAN [12]. Hence the healing rate would depend on the extent and type of injury to the nerves [11]. In the present study 51.2% of the patients with lip paresthesia at 3 month follow up, recovered after 6 months of surgery. In accordance with our findings, Becelli et al [13] reported that the highest rate of neurosensory disturbance after orthognathic surgery occurred 6 months after the surgery. Schultze-Mosgau et al [9] mentioned that the favorable period to observe healing of IAN injury would be 6 to 12 months after the surgery. Eshghpour et al [5] found significant healing of neurosensory deficits 6 months after surgery in patients undergoing mandibular setback surgery. In the present study two point discrimination test was used to assess the damage to IAN. In addition, subjective lip paresthesia and also the triggers were recorded. Similar to our study, Schultze-Mosgau et al [9] and also Hua et al used TPD to evaluate the IAN injury following BSSO surgery. One of the factors affecting the incidence of IAN injury is the surgeon's experience. Kobayashi et al [14] reported that the incidence neurosensory disturbances following orthognathic surgery performed by skilled surgeons was less than the rate of deficits observed with surgeons with little experience. In the present study, a single experienced surgeon performed all of the surgeries. Hence the surgeon experience was eliminated from study variables.

Present study had various limitations; one of which was the study population. In addition, it would be favorable to follow patients in longer periods in order to obtain a deeper understanding of the nerve damage resolution after BSSO surgery.

## V. Conclusion

In conclusion, BSSO surgery in patients with mandibular retrognathism lead to transient and temporary neurosensory disturbances which would be mostly resolved after 6 months of surgery. Hence BSSO technique is a relatively safe and reasonable approach for mandibular advancement.

## VI. Figures And Tables

**Table 1: Mean value of two point discrimination test (TPD) in both sides of lip in various sessions**

TPD test	Right side		Left side		Total	
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD
Baseline	41	3.17 ± 1.78	41	3.25 ± 1.92	82	3.20 ± 1.85
3 month	41	6.22 ± 3.05	41	6.06 ± 3.27	82	6.16 ± 3.13
6 month	41	4.03 ± 2.25	41	4.32 ± 2.02	82	4.19 ± 2.13

**Table 2: Distribution of predominant annoying triggers among study population**

Trigger	N sites (%)	
	3 month follow up	6 month follow up
None (continuous discomfort)	4 (4.9)	3 (3.7)
In touch	18 (21.9)	6 (7.4)
In Speech	3 (3.7)	0 (0)
In Feed/Mastication	10 (12.2)	5 (6.1)
No paresthesia	47 (57.3)	68 (82.8)

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