ejpmr, 2025, 12(4), 1-13

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

COMPARATIVE STUDY OF CONVENTIONAL SAW VERSUS PIEZOSURGERY AT "LOW AND SHORT" MEDIAL CUT FOR BSSRO PROCEDURES (RANDOMIZED CONTROLLED CLINICAL TRIAL)

Mohammed Khaled Mansour[1]*, Ashraf Abdul-Fattah Mahmoud[2], Mohamed Alaa El-Din Mohamed El-Sayed[3] and Mohamed Ashraf Abdel Fattah Mahmoud[4]

[1]B.D.S (2018), Faculty of Dentistry, Modern Arts and Science University M.Sc (2025), Faculty of Dental Medicine, Al-Azhar University, Assiut Branch.

[2]Professor of Oral and Maxillofacial Surgery Faculty of Dental Medicine, Al-Azhar University, Assiut Branch.

[3]Lecturer of Oral Maxillofacial Surgery, Faculty of Dental Medicine, Al-Azhar University, Assiut Branch.

[4]Lecturer of Oral and Maxillofacial Surgery, Faculty of Oral and Dental Medicine, Ahram Canadian University.

***Corresponding Author: Dr. Mohammed Khaled Mansour**

B.D.S (2018), Faculty of Dentistry, Modern Arts and Science University M.Sc (2025), Faculty of Dental Medicine, Al-Azhar University, Assiut Branch.

Article Received on 30/01/2025 **Article Revised on 20/02/2025** **Article Accepted on 12/03/2025**

ABSTRACT

Statement of problem: One of common osteotomies to correct mandibular deformities is Bilateral sagittal split ramus osteotomy (BSSRO) for dentofacial deformities. The aim of this study was to compare Neurosensory Recovery and Operative time of Conventional Saw versus Piezosurgery at "Low and Short" Medial Cut at BSSRO procedures (clinically and radiographically). **Materials and Methods:** Twelve patients with skeletal class II or III deformity who seek orthognathic surgery were selected from outpatient clinic of Oral and Maxillofacial Surgery Department of Al-Azhar Dental University (Assiut Branch). Patients were allocated into 2 groups, each group contained 6 patients prepared for surgical mandibular advancement or setback for correction of skeletal Class II or Class III deformity. Group (I) (Control): Six patients of eligible sample were selected to proceed for Low and Short medial cut modification using conventional saw. Group (II): using piezosurgery. Assessment of Neurosensory Recovery was performed by objective and subjective examination on all patients post-operatively, on first and seventh day, then on first, third and sixth months after surgery. Reference points were determined over inferior lip and chin. The right and left sides were examined separately. As for operative time, it was assessed by stop watch from start of osteotomy till mobilization and fixation of segments. **Results:** Results showed that the duration of Piezo group (38.50 ± 4.42) was longer than that of the conventional saw (31.50 ± 3.27) with a statistically significant difference at p=0.016. As for IAN (inferior alveolar nerve) affection, it was only observed at one case of piezo group (16.7%, n=1) while saw group had showed no affection at all after the procedure (100%, n=6) with no statistical significance difference between groups at p= 1.00. **Conclusion:** It can be concluded that both techniques showed similar results regarding neurosensory recovery of IAN. However, conventional saw method showed less operative time than piezosurgery as usage of piezosurgery demands more experienced surgeon to minimize surgical time.

KEYWORD:- BSSRO, Conventional rotary saw, Orthognathic surgery, "Low and Short" Medial Cut, IAN, NSD, Piezosurgery, Operative time, TPD.

INTRODUCTION

Orthognathic surgery involves the surgical correction of facial skeleton components to restore appropriate anatomical and functional relationships in patients with dentofacial skeletal abnormalities. Bilateral sagittal split ramus osteotomy (BSSRO) is the most commonly employed orthognathic procedure for addressing asymmetric mandibular prognathism. This technique corrects mandibular protrusion and deviation by retracting and rotating distal bone segment along with proximal segment.[1]

The history of orthognathic surgery of mandible dates back to 1846, when Hullihen performed an osteotomy of mandibular body to correct prognathism. Significant advancements were minimal until Blair introduced a horizontal osteotomy of ramus at the early 1900s. During 1920s and 1930s, further modifications to external approaches for ramal osteotomies were made by Limberg, Wassmund, and Kazanjian, although these techniques were often associated with challenges related to relapse. The earliest description of what would evolve into modern bilateral sagittal split ramus osteotomy

(BSSRO) and first intraoral approach to a ramal osteotomy was provided by Schuchardt in 1942. In 1954, Caldwell and Letterman described a vertical ramus osteotomy technique, which was noted for preserving inferior alveolar neurovascular bundle. Subsequently, in 1957 innovation at mandibular surgery shifted, where Trauner and Obwegeser introduced BSSRO still known till today.[2]

Over decades, BSSRO technique underwent numerous improvements and modifications, focusing on reducing relapse, enhancing healing, and minimizing complications. Key contributors to these advancements included Dal Pont (1961), Hunsuck (1968), and Epker (1977).[2] In 1961, Dal Pont[3] modified lower horizontal cut to a vertical osteotomy on buccal cortex between first and second molars, increasing the contact surface area and requiring minimal muscular displacement. In 1968, Hunsuck[3] further refined the procedure by advocating for a shorter horizontal medial cut just past lingula to minimize soft tissue dissection, while retaining an anterior vertical cut similar to Dal Pont's modification. In 1977, Epker[2] introduced additional refinements, reducing stripping of masseter muscle and limiting medial dissection, which collectively contributed to decreased postoperative swelling, hemorrhage, and neurovascular bundle manipulation. Reduction of masticatory muscle stripping enhanced vascular supply to proximal segment, reduced bone resorption and loss of gonial angle. In 1976, Spiessel[4] introduced rigid internal fixation, which facilitated improved healing, early restoration of function, and reduced relapse. This replaced traditional 5- to 6-week intermaxillary fixation and was adopted from principles of orthopedic trauma surgery, providing enhanced convenience for patients.

There are various techniques for performing medial cut at BSSRO. Traditionally, a "high and short" medial cut was employed where the medial cut is positioned at a higher level on mandibular ramus, typically near lingula; extending for a shorter distance posteriorly, not reaching ramus. However, this technique has been shown to interfere with lingual plates used to stabilize jaw segments after repositioning. The low split osteotomy (Posnick's modification) positioned medial cut differently. The cut is placed closer to mandibular occlusal plane (chewing surface) and below lingula. It terminates anterior to and below lingula. This cut offers several benefits preventing osteotomy from extending towards condyle; lowering the risk of bad split which is defined as an unintended fracture pattern surgery. Furthermore, interferences with lingual plates are minimized as less lingual bone is attached to distal segment; reducing posterior interferences. Also, inferior alveolar nerve (IAN), which provides sensation to lower jaw, lip, and chin, stays at proximal segment thereby reducing the risk of nerve injury.[4]

Piezosurgery is proposed as an alternative method to osteotomy, expecting to cause minimal damage to soft tissues and nerves. Piezo effect is generated indirectly through piezoelectric crystal deformation can be used for osteotomies with high tactility and precise cutting; this technique utilizes microvibration (60 to 200 mm/second), making it highly selective for mineralized tissues. As a result, adjacent soft tissues, such as nerves, remain largely unaffected.[5]

However, current literature has not yet established a clear consensus on success of using piezosurgery for modified low and short medial cut compared to conventional saw technique. Abdel-Ghany et al., (2023)[6] assessed low medial cut osteotomy versus traditional sagittal split osteotomy in terms of surgical duration, bad split incidence and postoperative neurosensory disturbance. Higher BSSRO was associated with higher incidence of bad split and longer duration when it was compared to Posnick's low medial cut osteotomy, while incidence of Post-Operative Nerve Sensory Disturbance (NSD) was similar between both groups. While, Jenkins et al., (2019)[7] compared both techniques (piezosurgery and traditional saw method) in terms of neurosensory disturbance and surgical duration. 24 patients were treated during 15-month period followed by 24 consecutive patients with a piezoelectric cutter. Results showed that neurosensory recovery was better in piezoelectric group compared to conventional group while duration of operations were nearly identical. Abd-ELHady et al., (2022)[8] conducted a systemic review to compare incidence of neuro-sensory dysfunction between saws and piezotomes with patients undergoing BSSO. Meta-analysis revealed no significant difference in inferior alveolar neuro-sensory dysfunction between saws and piezotomes one week post-operatively. Review concluded that for patients undergoing BSSO, piezotomes do not offer any advantage over conventional saws in terms of reducing neurosensory disturbances. Longer follow-up beyond three months might had showed more rapid physiological recovery of sensations.

In this study, the aim was to compare Neurosensory Recovery and Operative time in Conventional Saw versus Piezosurgery at "Low and Short" Medial Cut at BSSRO procedures. The null hypothesis assumes that there will be no difference regarding neurosensory affection, yet conventional saw will be more efficient regarding operative time in comparison to piezosurgery.

PATIENTS AND METHODS

This study was designed as randomized, controlled clinical and radiographic study conducted on 12 patients,[17] aged from 20-45 with skeletal class II or III deformity who seek orthognathic surgery from outpatient clinic of Oral and Maxillofacial Surgery Department, Faculty of Al-Azhar Dental Medicine University (Assiut Branch).

Patients were classified into 2 groups prepared for surgical mandibular advancement or correction of skeletal Class II or Class III deformity.

Group (I) (Control): Six patients with Low and Short medial cut modification using conventional saw.
Group (II): Remaining six patients with Low and Short Medial cut modification using piezosurgery.

Eligibility criteria of population
Inclusion criteria

1. Adults from age from 20-45 (mean age 25.8 years).
2. Presence of Facial asymmetry including mandibular retrognathism.
3. Skeletal class II and class III dento-facial deformity, and open-bite.

Exclusion criteria

1. Patients with history of previous orthognathic surgery.
2. Reconstructive facial surgery.
3. Developmental disorders affecting jaws.
4. Craniofacial syndromes.
5. Patients with Pacemakers, Implanted Electronic Devices
6. Pregnant females
7. Patients with soft tissue lesions in surgical area.
8. Patients with history of IAN sensory impairment, mandibular fractures, degenerative joint disease or systemic/ bone disease, syndrome or those under any medication that might interfere with normal bone healing were excluded.

All patients were subjected to
Pre-Surgical preparation, which included: Personal history, History of present illness and chief complaint, Past medical history, Clinical examination, Radiographic examination analysis, Laboratory tests and Patient Investigations, so we can have a proper Diagnosis. Then Study casts were taken, and scan scanning was done Figure (1,2).

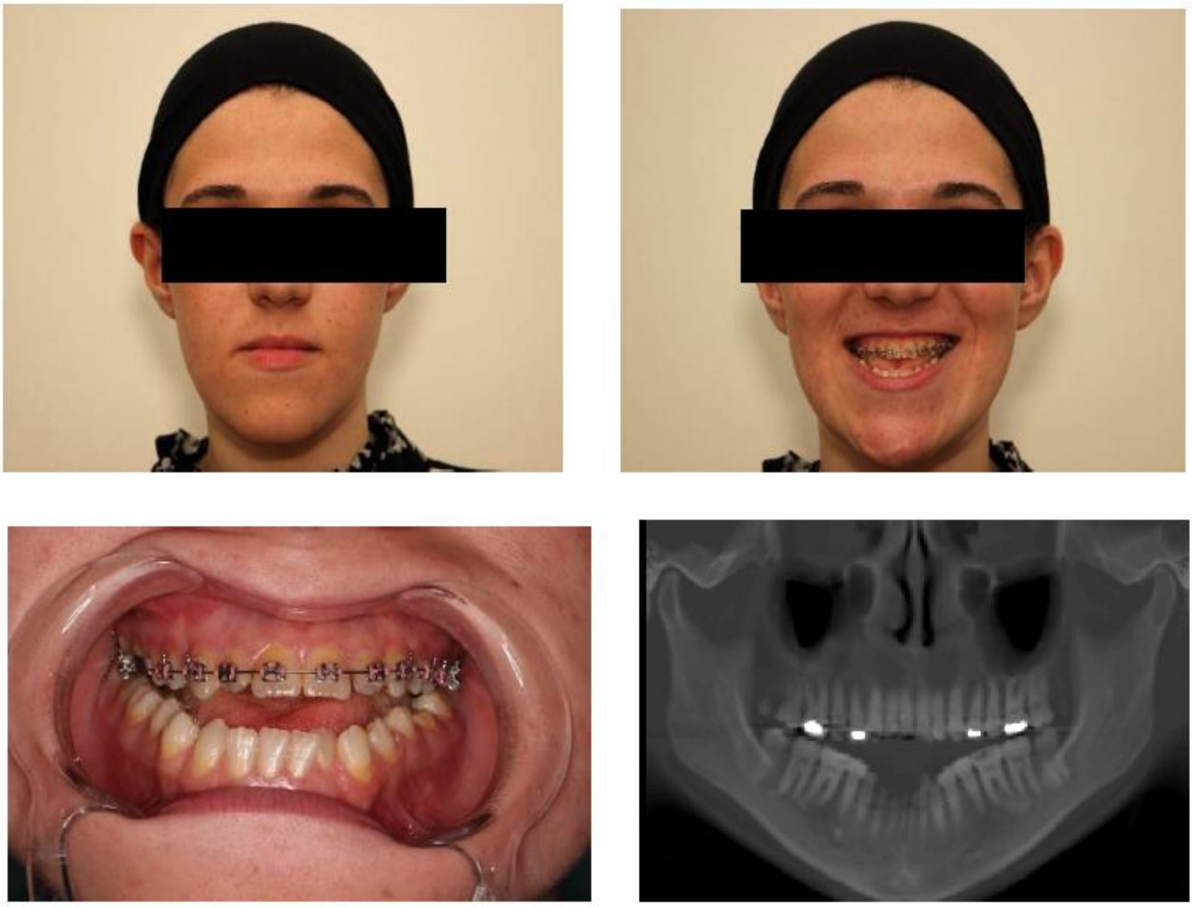

Figure (1): Group I: Preoperative 1) Frontal 2) smile 3) intraoral photo and 4) Panorama.

Figure (2): Group II: Preoperative 1) Frontal 2) smile 3) intraoral photo and 4) Panorama.

Preoperative patient preparation

1- Impression was taken for study cast formation and occlusal wafer fabrication was adjusted for correction of occlusion during surgery.
2- All patients were prepared for surgery by application of different technique of IMF after scaling and curettage of teeth.
3- All patients were instructed to fast from both food and drink for 8 hours preoperatively.
4- Male patients were asked to shave their beard 24 hours preoperatively.
5- All patients signed informed consent before the surgical procedure to be aware about nature and complications.
6- Impacted third molars were removed bilaterally in all patients before surgery by 4 months.

Surgical procedures

Mandibular surgery was performed under general anesthesia for all patients via nasoendotracheal intubation.

A dose of prophylactic antibiotic were given including:

(Unasyn 1.5gm): was given to patients 1-2 hours (Intravenous) before surgery after skin test to exclude allergy and continued for 5 days post-operatively every 12 hours.

(Dalacin C 600mg tab): was started before surgery and continued 5 days postoperatively every 8 hours.

(Dexamethosone 8mg): Ampoule was given intravenously, to decrease postoperative edema and continued for 3 days postoperative, one ampoule every 8 hours.

All patients were prepared for surgical intervention by the routine technique that includes scrubbing and drappin, and injection of local anesthetic solution in the mucobuccal fold for hemostasis and decrease pain, and IMF was done by wiring or IMF screws according to each case.

At Group (I), after performing an ideal mucoperiosteal flap reflection and retraction to expose lateral cortical plate and medial cortical plate. Using surgical saw, the horizontal medial osteotomy cut was performed just superior to the occlusal plane of the mandibular molars and immediately below the lingula (to limit excess ramal lingual plate attached to the distal segment).

The cut stopped short of the posterior aspect of ramus (just behind the lingula) to avoid inclusion of the condylar part with the distal segment. The lateral component of osteotomy extends anteriorly according to length of setback or advancement required (ideally between first and second molar).

From the end of the lateral osteotomy, the vertical osteotomy begins with a curved connection with the lateral osteotomy to avoid buccal plate fragmentation on splitting.

The vertical osteotomy ends at the inferior border of the mandible through the buccal cortex only to avoid propagation of a bad split. The splitting then begins with straight osteotomes beginning with the medial and inferior border splitting with the osteotome inserted (maximum 5 mm through the cortex) and directed away from the inferior alveolar canal to avoid nerve damage Figure(3).

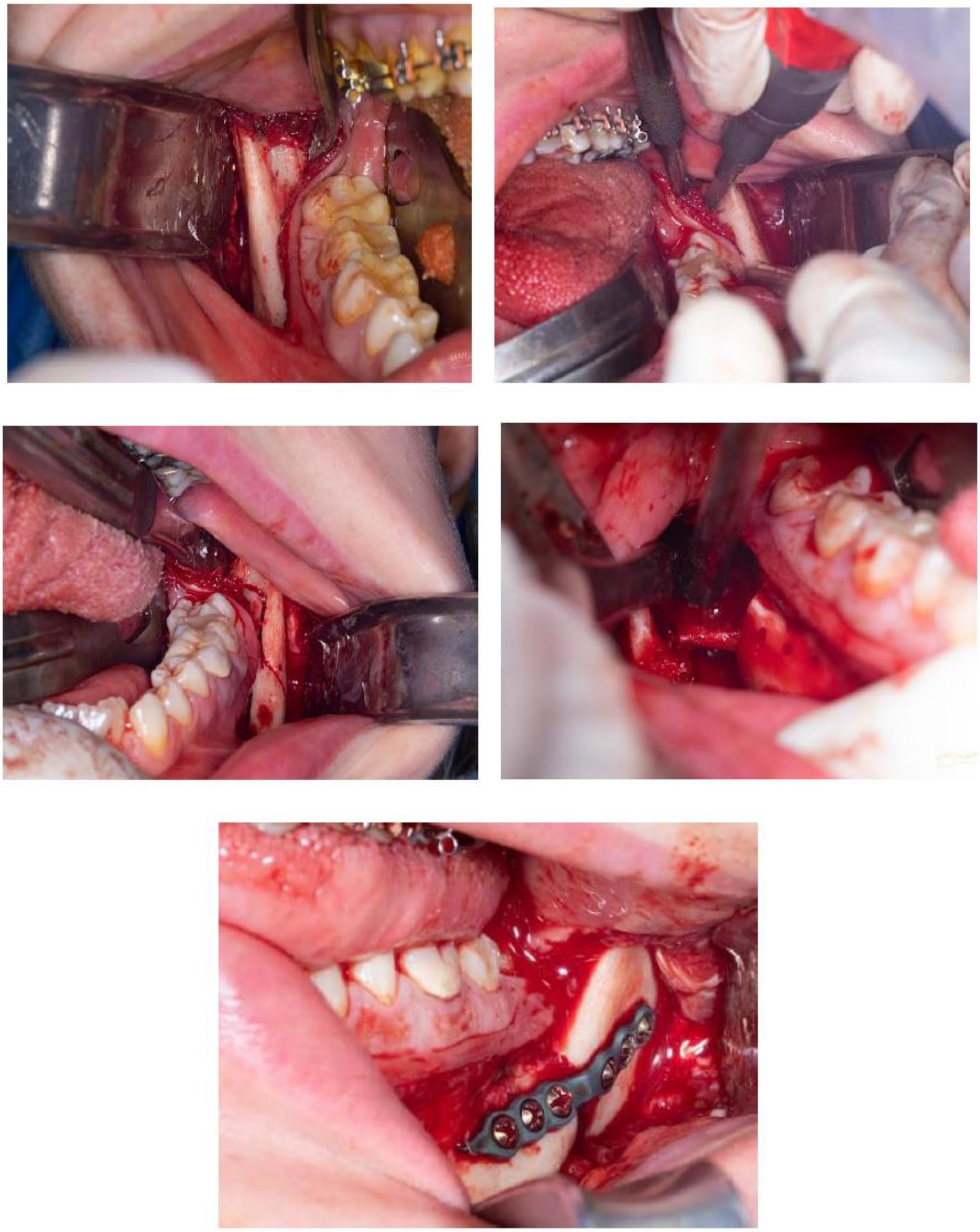

Figure (3): Group I: 1) Bone Exposure after subperiosteal reflection of flap, 2) BSSO by conventional saw, 3) "low and short" medial cut complete but segments not mobilized yet, 4) mobilization of segments and appearance of IAN, 5) Fixation by Miniplates and screws.

While in Group (II), Same as group (I) but osteotomies were performed using piezoelectric device. The scalpel's ultrasonic osteotome operated at a nominal, non-modulated frequency of 22.5 kHz, and the amplitude of the microvibrations ranged from 35 to 300mm/s Figure (4).

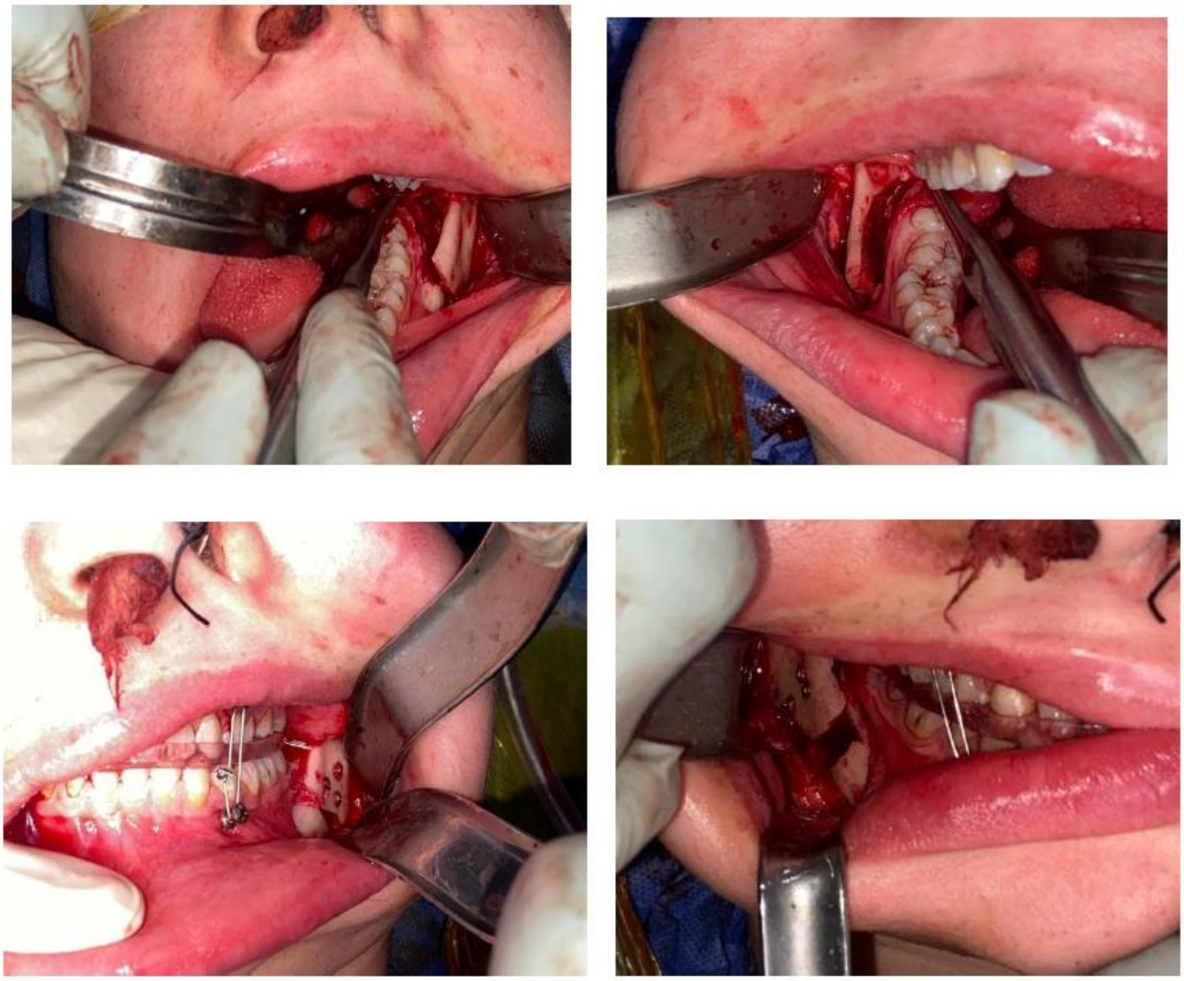

Figure (4): Group II: 1) Low and short medial cut, 2) Separation and mobilization of segments, 3) Fixation by 3 bi-cortical mini-screws on the left side, 4) Fixation by 3 bi-cortical mini-screws on the right side.

In each patient, after doing case study and preparing osteotomy design either for setback or advancement that was decided after examining cephalometric tracing, and preparing occlusal wafers (either intermediate and final) for bimaxillary cases or final only (for single jaw surgery). The desired centric occlusion was obtained and IMF was tightened to fix osteomatized segments in proper reduction and fixation. Fixation of segments following required advancement was attained. After completion of skeletal fixation, the MMF was released, and checking of occlusion and the position of condyles were performed. The wounds were closed with continuous resorbable sutures.

Postoperative care and follow up

Patients received antibiotic in the form of Unasyn (vials) 1.5 gm/12 hours by I.V injection for 5 days postoperatively.

Voltaren 75mg I.M every 12 hours for 3 days postoperatively.

Dexamethasone 8mg I.M every 8 hours for 3 days postoperatively.

Glucose 5% followed by ringer lactate in the same postoperative day to replace fluid loss.

Cold compresses 20 min/ hour for 1st 24 hours followed by hot fomentation next day.

Feeding was advised to be fluids and soft diet for 2 weeks postoperatively.

Patients were instructed to follow proper oral hygiene care through washing by normal saline and using soft brush after meals.

In early follow-up period clinical examination was carried out daily, up to the first week postoperatively to monitor any arising complication including pain, swelling, infection, restricted range of motion, deviation of mandible on opening, and nerve injury.

In delayed follow-up period, patients were examined clinically at every postoperative month for 6 months, for presence or absence of: neurosensory deficits, facial asymmetry and scar formation.

Accuracy of fixation was evaluated by examination of occlusion, Lateral excursion to contralateral side, maximum interincisal distance, mandibular deviation during mouth opening and facial symmetry Figure (5,6).

Figure (5): Group I: Postoperative 1) Frontal 2) Smile 3) Intraoral photo.

Figure (6): Group II: Postoperative 1) Frontal 2) Smile 3) Intraoral photo.

Measured outcomes

Assessment of Neurosensory Recovery was performed by objective and subjective examination on all patients post-operatively, on first and seventh day, then on first, third and sixth months after surgery. Reference points were determined over inferior lip and chin. Right and left sides were examined separately.

A- Subjective

Light touch done by Prolene 4(0) and by hand to evaluate sensory recovery[5] Figure (7).

Figure (7): Light touch done by Prolene 4(0).

Pin- Prick, using 2 static point scale, Patients were asked to close their eyes and a closed clipper was placed on a specific skin region and were asked about any area of hypoesthesia, numbness, tingling or pain[10] Figure (8).

Figure (8): Pin- Prick, using 2 static point scale.

B- Objective

TPD (Two POINT Dynamic) (Weber Test); Patients were asked to close their eyes and an opened clipper was placed on a specific skin region, discrimination of 2 different points on 2 different areas on lower inferior lip and chin[28] Figure (9).

Figure (9): TPD (Two POINT Dynamic) (Weber Test).

Patients were asked to evaluate sensory recovery, and grade of response as shown in **Table (1).**[17]

Table 1: Grade of response in nerve sensitivity evaluation on each side during subjective examination.

Grade	Response
1	Absent sensation, anaesthesia
2	Severely altered sensation, paraesthesias
3	Moderately altered or slightly reduced sensation
4	Mildly reduced or subnormal sensation
5	Normal sensation

Operative time was calculated using stopwatch from first cut to mobilization of segments and fixation in minutes.

RESULTS

Statistical methods

Data were statistically described in terms of mean ± standard deviation (± SD), median and range. Comparison of numerical variables between study groups was done using Mann Whitney U test for independent samples.

Duration

The results at **table (2)** had showed that the duration of Piezo group (38.50 ± 4.42) is longer than that of the conventional saw (31.50 ± 3.27) with a statistically significant difference at p=0.016.

Table 2: Duration of Conventional and Piezo Surgeries.

Duration	Conventional Saw Group (I) (n = 6)	Piezo Group (II) (n = 6)	P value
Mean ± SD.	31.50 ± 3.27	38.50 ± 4.42	p= 0.016*
Median (Range)	30 (29 - 37)	37.50 (34 - 46)	
Mean Rank	4.00	9.00	
Sum of Ranks	24.00	54.00	

Inferior alveolar nerve affection

The results at **table (3)** showed that inferior alveolar nerve affection was only observed at one case of piezo group (16.7%, n=1) while saw group had showed no affection at all after procedure (100%, n=6). No statistical significance difference present between groups at p= 1.00. This affection in Piezo group was may be due to the extra-oral incision and retraction done, and not related to the osteotomy itself, so it shaded the accuracy of results. So both techniques were comparable regarding neurosensory recovery of IAN at p≥0.05.

Table 3: Inferior alveolar nerve affection of Conventional and Piezo Surgeries.

Inferior Alveolar Nerve Affection	Conventional Saw Group (I) (n = 6)	Piezo Group (II) (n = 6)	P value
No	6 (100%)	5 (83.3 %)	1.000
Yes	0 (0%)	1 (16.7 %)	

Light touch test

The results showed that at the 1st day after surgery, there was a statistical significant difference between both groups at p= 0.455, where there was no response to the test by all patients at Group (I) (100%, n=6), while in Group (II) there were four cases that did not respond (66.7% n=4) and only two cases had showed grade 1 response (33.3%, n=2). While, 6th Month Postsurgical, results showed that there was no statistical significant difference between both groups where all patients at Group (I) and II had showed a Grade 1 response (100%, n=6).

There was a statistically significant change over time at response of patients at both groups to pin prick test at p≤0.05 Figure (10).

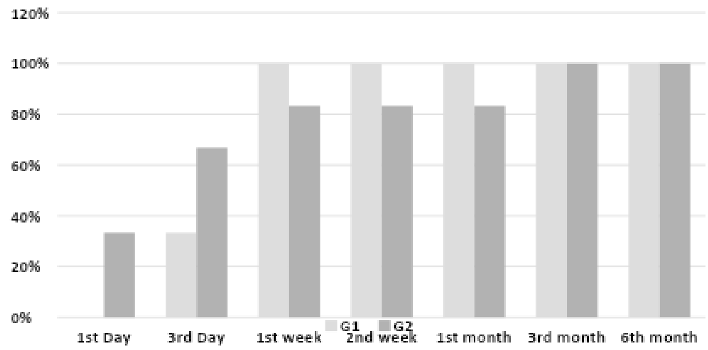

Figure 10: Percentage of positive light touch test at 2 study groups over study period.

Pin prick test

The results showed that there was a statistical significant difference between both groups regarding response of patients to pin prick test on postsurgical 1st day. In Group (I), all patients (100%, n=6) had showed no response to test. In Group (II), there were four cases (66.7%, n=4) with no response and two cases (33.3%, n=2) with a Grade 1 response at p = 0.455. While at 6th Postsurgical Month postoperative, the results showed that there was no statistical significant difference between both groups. Patients at both groups showed a Grade 1 response at all cases (100%, n=6).

There was a statistically significant change over time at response of patients at both gros to pin prick test at $p \leq 0.05$ Figure (11).

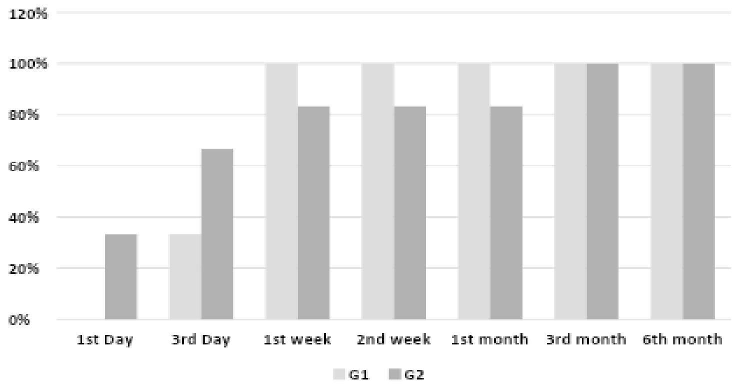

Figure 11: Percentage of positive pin prick test at both groups over study period.

DISCUSSION

Despite several prior modifications, high medial osteotomy still requires adequate marrow space within ramus to allow for a successful osteotomy and reduce risk of unfavorable splits. In cases of atypical ramus deformities with insufficient marrow space, a low medial osteotomy is recommended. The low split osteotomy, first introduced by Posnick, involves an infralingular horizontal osteotomy positioned just above occlusal plane, extending short of posterior ramal border and terminating just behind lingual.[9]

The osteotomy was performed at close proximity to delicate anatomical structures. Traditionally, saws, burs, and chisels have been used for bone cutting. While effective, these instruments carry the risk of damaging adjacent soft tissues and nerves. The high temperatures generated by rotating tools can hinder bone regeneration and even lead to bone necrosis.[5]

The demand for less invasive procedures and improved precision compared to conventional burs and saws led to development of piezosurgery. Invented by Tomasso Vercelloti, piezosurgery operates on principle of “pressure electrification,” where applying electric tension to certain materials, such as quartz and Rochelle salts, causes them to expand and contract, creating ultrasonic vibrations. This device generates ultrasonic vibrations with a specific frequency allowing for selective bone removal with minimal damage to surrounding soft tissues like blood vessels and nerves and it also offers enhanced visibility due to its cavitation effect. Due to these advantages, piezosurgery has emerged as an alternative tool and is increasingly utilized in orthognathic surgeries.[10]

Given the fact that the literature did not provide a clear data about success of piezosurgery compared to conventional saw in performing BSSRO utilizing Posnick’s modification, this randomized controlled clinical trial study was done to compare both methods in terms of neurosensory recovery of IAN subjectively and objectively, duration of operative time and bad split.

Twelve adult patients were recruited, starting from 20 years of age as a high percentage of relapse with BSSRO was found in patients younger than 18 years old, according to multiple studies. That was also in alignment with a study conducted by Kohnke et al. at 2017. Patients had a facial asymmetry, including cases of mandibular retrognathism or prognathism, skeletal Class II and Class III dentofacial deformities, with presence of an additional open bite were included. Agreeing with Liu's et al study 2022, patients with a history of previous orthognathic surgery, reconstructive facial surgery, or developmental disorders affecting jaws, as well as those with craniofacial syndromes were excluded.[11]

Additionally, individuals with a history of inferior alveolar nerve (IAN) sensory impairment, mandibular fractures, degenerative joint disease, systemic or bone diseases, syndromes, or those on medications that could interfere with normal bone healing were also excluded. Consequently, patient personal history was taken along with its past medical history followed by history of any present illness and chief complaint. Patients underwent a thorough clinical and radiographic evaluation (Panorama and Lateral cephalometry) which were done preoperatively. Lateral Cephalometry was employed due to its significance in simulating surgical outcomes based on patients' visible anatomical features as well as in conducting mock surgeries, making any necessary alterations before actual surgery.

In alignment with Spinelli et al.,[12] twelve patients were divided into 2 groups, each consisting of 6 patients, according to technique used for osteotomy, control group (Group (I)) using conventional saw and test group (Group 2) using piezosurgery. They were randomly assigned to avoid any bias, as done by Raj et al. in 2022. The choice of surgical technique was based on surgeon's personal expertise, by comparing surgical techniques which were reported in literature in studies of (Kahnberg, 1997; Landes et al., 2008; Nada et al., 2010; Gilles et al., 2013).[13-15]

In the present study, osteotomy design was done as described by Trauner and Obwegeser and modified by Dal Pont by moving lateral osteotomy to distal area of second molar to increase amount of cancellous bone contact to improve healing and provide easy access to fixation area.[16]

Regarding operative time, results of this study showed that there was a statistical significant difference between both groups. In Group (I), mean operative time for the six cases was 31.50 min (±3.27). In Group (II), mean operative time for the six cases was 38.50 min (±4.42) at p = (0.016). This was in agreement with Spinelli et al. and Rossi et al. who had observed that procedures performed using piezo-osteotomes take significantly longer time compared to conventional burs.[17,18] Specifically, it has been reported that piezo-osteotome extends surgical duration by 30%–50%, in order to allow cooling particularly when cutting through dense cortical bone, according to Silva et al.[19] According to Blus and Szmukler-Moncle, piezoelectric and conventional osteotomy techniques require different manual control approaches from surgeon. While incision with arotary bur can be expedited by applying greater pressure, excessive pressure on an ultrasonic tip can inhibit its vibration.[20] This may result in reduced cutting precision, increasing risk of bleeding and compromising quality of osteotomy outcome.Conversely, Kohnke et al. had concluded that using piezosurgery lessens operative time, explaining that extended durations reported in other studies may be attributed to limited experience with alternative technique or specific piezoelectric model used. In contrast, surgeons had at least one year of experience with piezoelectric osteotomy. This suggests that with adequate experience, piezoelectric osteotomy can potentially be performed in a shorter time. From Kohnke's perspective, consistent experience with piezoelectric osteotomy contributes to more stable and reproducible outcomes, particularly in terms of duration and precision of osteotomy lines.[5]

The second most common complication of a "bad split" in surgical procedures, after segment fracture, is injury to inferior alveolar neurovascular bundle. This often results in temporary or prolonged neurosensory disturbance (NSD) affecting lower lip and chin.[21]

Following Segmental Osteotomy (SSO) procedure, NSD occurs at 80-100% of cases.[22] Several factors influence incidence of NSD after SSO, including patient's age, severity of deformity, surgeon's experience, extent of medial dissection, and intraoperative nerve manipulation.[23] NSD is a significant concern to be evaluated postoperatively, and various tests are used to assess it. These include subjective reports of numbness at lower lip or chin, as well as objective tests such as two-point discrimination test, pinprick test and light touch test.[24]

The results showed that there was no statistical significant difference between both groups where there was no IAN affection at Group (I) (100%, n=6), while in Group (II) there was one case with IAN affection (83.3%, n=1) at p=1. This was in agreement with Campbell et al. and Lindorf[25] who explained that absence of a difference in neurosensory disturbance (ND) of inferior alveolar nerve (IAN) between two osteotomy techniques may be attributed to neurosensory function (NF) being influenced more by bone-separating procedures than by osteotomy itself. Factors such as IAN protection at foramen, degree of mobilization of distal fragment, nerve compression between proximal and distal segments during fixation, and direct trauma to IAN caused by screw contact are likely primary contributors to ND.[26]

At this study the light touch test, pinprick and dynamic two-point discrimination tests were used for evaluation of sensory function of IAN. While both groups had exhibited significant initial impairment in all tests, both groups had demonstrated substantial recovery over time. The piezo group consistently showed slightly better recovery at short term, particularly at TPD tests. However, by end of 6-month follow-up, both groups had achieved near-full recovery with no significant differences. These findings suggested that both techniques are effective in promoting neurosensory recovery, with piezo surgery potentially offering a slight advantage at early postoperative period. Our findings on neurosensory disturbances align with previous research. Beziat et al.[27] noted that ultrasound osteotomy yielded higher sensation recovery at earlier follow-ups. This was attributed to preservation of soft tissues, including perineurium.

CONCLUSION

Within the limitations of current study, the following conclusions were derived:

Both techniques showed similar results regarding neurosensory recovery of IAN.

However, conventional saw method showed less operative time than piezosurgery. Usage of piezosurgery demands more experienced surgeon to minimize surgical time.

REFERENCES

1. 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): 2344–53.
2. Monson LA. Bilateral sagittal split osteotomy. In: Seminars in plastic surgery. Thieme Medical Publishers, 2013; 145–8.
3. Pont D. Retromolar osteotomy for the correction of prognathism. J Oral Surg Anesth Hosp Dent Serv, 1961; 19: 42.
4. Neal TW, Rodrigo S, Carr BR, Gulko JA, Kolar NC, Shergill I, et al. Is the Low and Short Medial Horizontal Osteotomy a Predictive Factor for Bad Splits in Sagittal Split Osteotomies? J Oral Maxillofac Surg, 2021; 79(10): e47.
5. Köhnke R, Kolk A, Kluwe L, Ploder O. Piezosurgery for sagittal split osteotomy: Procedure duration and postoperative sensory perturbation. J Oral Maxillofac Surg, 2017; 75(9): 1941–7.
6. Abdel-Ghany H, Kadry W, A Aboalnaga A, El-Gengehi M. Low medial cut (Posnick modification) versus traditional bilateral sagittal split osteotomy on osteotomy split quality and complications. A comparative study. Egypt Dent J, 2023; 69(3): 1867–76.
7. Jenkins GW, Langford RJ. Comparison of the piezoelectric cutter with a conventional cutting technique in orthognathic surgery. Br J Oral Maxillofac Surg, 2019; 57(10): 1058–62.
8. Abd-ElHady MS, Abd-ElAziz OM, Hakam MM, Radi IAE. Post-surgical neurosensory dysfunction of inferior alveolar nerve in bilateral sagittal split osteotomy of the mandible using saw versus peizotome: A systematic review and meta-analysis. J Evid Based Dent Pract, 2022; 22(1): 101647.
9. Susarla SM, Cho DY, Ettinger RE, Dodson TB. The low medial horizontal osteotomy in patients with atypical ramus morphology undergoing sagittal split osteotomy. J Oral Maxillofac Surg, 2020; 78(10): 1813–9.
10. Raj H, Singh M, Shah AK. Piezo-osteotomy in orthognathic surgery: A comparative clinical study. Natl J Maxillofac Surg, 2022; 13(2): 276–82.
11. Freihofer Jr HPM. Results of osteotomies of the facial skeleton in adolescence. J Maxillofac Surg, 1977; 5: 267–97.
12. Landes CA, Stübinger S, Rieger J, Williger B, Ha TKL, Sader R. Critical evaluation of piezoelectric osteotomy in orthognathic surgery: operative technique, blood loss, time requirement, nerve and vessel integrity. J Oral Maxillofac Surg, 2008; 66(4): 657–74.
13. Kahnberg KE. Correction of maxillofacial asymmetry using orthognathic surgical methods. J Cranio-Maxillofacial Surg, 1997; 25(5): 254–60.
14. Nada RM, Sugar AW, Wijdeveld MGMM, Borstlap WA, Clauser L, Hoffmeister B, et al. Current practice of distraction osteogenesis for craniofacial anomalies in Europe: a web-based survey. J Cranio-Maxillofacial Surg, 2010; 38(2): 83–9.
15. Gilles R, Couvreur T, Dammous S. Ultrasonic orthognathic surgery: enhancements to established osteotomies. Int J Oral Maxillofac Surg, 2013; 42(8): 981–7.
16. Trauner R, Obwegeser H. The surgical correction of mandibular prognathism and retrognathia with consideration of genioplasty: Part I. Surgical procedures to correct mandibular prognathism and reshaping of the chin. Oral surgery, oral Med oral Pathol, 1957; 10(7): 677–89.
17. Spinelli G, Lazzeri D, Conti M, Agostini T, Mannelli G. Comparison of piezosurgery and traditional saw in bimaxillary orthognathic surgery. J Cranio-Maxillofacial Surg, 2014; 42(7): 1211–20.
18. Rossi D, Romano M, Karanxha L, Baserga C, Russillo A, Taschieri S, et al. Bimaxillary orthognathic surgery with a conventional saw compared with the piezoelectric technique: a longitudinal clinical study. Br J Oral Maxillofac Surg, 2018; 56(8): 698–704.
19. Silva LF, Carvalho-Reis ENR, Bonardi JP, De Lima VN, Momesso GAC, Garcia-Junior IR, et al. Comparison between piezoelectric surgery and conventional saw in sagittal split osteotomies: a systematic review. Int J Oral Maxillofac Surg, 2017; 46(8): 1000–6.
20. Blus C, Szmukler-Moncler S. Split-crest and immediate implant placement with ultra-sonic bone

surgery: a 3-year life-table analysis with 230 treated sites. Clin Oral Implants Res, 2006; 17(6): 700–7.
21. Kanneth S, Mani V, George A, Thomas A. Assessment of Mandibular Canal Using Cone-Beam Computed Tomography (CBCT) and Its Relevance in Post-Operative Neurosensory Disturbances Following Bilateral Sagittal Split Osteotomy Setback. Cureus, 2023; 15(3).
22. Ylikontiola L, Kinnunen J, Laukkanen P, Oikarinen K. Prediction of recovery from neurosensory deficit after bilateral sagittal split osteotomy. Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontology, 2000; 90(3): 275–81.
23. Zeynalzadeh F, Shooshtari Z, Eshghpour M, Zarch SHH, Tohidi E, Samieirad S. Dal Pont vs Hunsuck: which technique can lead to a lower incidence of bad split during bilateral sagittal split osteotomy? A triple-blind randomized clinical trial. World J Plast Surg, 2021; 10(3): 25.
24. Alolayan AB, Leung YY. Risk factors of neurosensory disturbance following orthognathic surgery. PLoS One, 2014; 9(3): e91055.
25. Lindorf HH. Sagittal ramus osteotomy with tandem screw fixation: Technique and results. J Maxillofac Surg, 1986; 14: 311–6.
26. Campbell RL, Shamaskin RG, Harkins SW. Assessment of recovery from injury to inferior alveolar and mental nerves. Oral Surgery, Oral Med Oral Pathol, 1987; 64(5): 519–26.
27. Beziat JL, Bera JC, Lavandier B, Gleizal A. Ultrasonic osteotomy as a new technique in craniomaxillofacial surgery. Int J Oral Maxillofac Surg, 2007; 36(6): 493–500.
28. Sadakah AA, Elshall MA. Incidence of inferior alveolar nerve affection with and without nerve exposure during bilateral sagittal split osteotomy. Egypt J Oral Maxillofac Surg, 2018; 9(1): 6–16.