Journal of Bacha Khan College of Dentistry (JBKCD) Open Access Journal

Received: August 28, 2025
Revised: November 25, 2025
Accepted: December 15, 2025
Online: December 30, 2025

ISSN (Print): 3104-3887
ISSN (Online): 3104-3895
Vol. 3, No. 2 (Fall 2025) | Pages: 41–49
DOI: 10.65293/jbkcd.v3i02.73

Predictors of Inferior Alveolar Nerve Injury Following Bilateral Sagittal Split Osteotomy

Imtiaz Ali [1] Syeda Masooma [2] Asif Shah [3]

[1,2] Department of Oral & Maxillofacial Surgery, Saidu College of Dentistry, Swat, Khyber Pakhtunkhwa, Pakistan.
[3] Department of Oral Medicine, Saidu College of Dentistry, Swat, Khyber Pakhtunkhwa, Pakistan.

ABSTRACT

Background: Inferior alveolar nerve (IAN) injury is a well-recognized complication following bilateral sagittal split osteotomy (BSSO). Identification of predictive factors is important for improving preoperative risk assessment and surgical outcomes. To evaluate demographic, radiographic, and intraoperative predictors of persistent inferior alveolar nerve injury following BSSO

Study Design: A Retrospective cohort Study

Place and Duration of Study: This study was conducted at the Department of Oral and Maxillofacial Surgery, Saidu College of Dentistry, Swat, Khyber Pakhtunkhwa, Pakistan, and included patients treated from January 2019 to December 2023.

Materials and Methods: A total of 300 patients who underwent bilateral sagittal split osteotomy (BSSO) for correction of dentofacial deformities were included in this retrospective analysis. Demographic characteristics, smoking status, cone-beam computed tomography (CBCT) measurements of nerve proximity, magnitude of mandibular movement, and intraoperative variables were recorded. The primary outcome was persistent IAN injury at 6 months postoperatively, assessed through patient-reported symptoms and clinical neurosensory examination. Bivariate associations were analyzed using chi-square tests, and significant variables were entered into a multivariate logistic regression model. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated.

Results: Immediate postoperative IAN injury occurred in 40% of patients, while 10% demonstrated persistent neurosensory deficit at 6 months. Independent predictors of persistent injury included high-risk nerve proximity on CBCT (AOR 4.72; 95% CI 1.98–11.23; p<0.001), bad split (AOR 6.75; p=0.004), mandibular movement ≥9 mm (AOR 3.85; p=0.002), intraoperative nerve exposure (AOR 3.41; p=0.006), smoking (AOR 2.96; p=0.021), IAN manipulation (AOR 2.89; p=0.022), age ≥35 years (AOR 2.48; p=0.045), and operative time ≥150 minutes (AOR 2.54; p=0.042).

Conclusion: Persistent IAN injury after BSSO is influenced by both anatomical and intraoperative factors. Preoperative CBCT risk assessment, minimization of nerve manipulation, and careful surgical technique may help reduce long-term neurosensory complications.

OPEN ACCESS

Key Words
Inferior Alveolar Nerve Injury, Bilateral Sagittal Split Osteotomy, Orthognathic Surgery, Neurosensory Deficitm CBCT Nerve Proximity, Risk Factors, Logistic Regression

Corresponding Author
Syeda Masooma | Senior Registrar, Department of Oral & Maxillofacial Surgery, Saidu College of Dentistry, Swat, Khyber Pakhtunkhwa, Pakistan.
Email: masoomadee90@gmail.com

How to Cite this Article
Ali I, Masooma S, Shah A. Predictors of Inferior Alveolar Nerve Injury Following Bilateral Sagittal Split Osteotomy. Journal of Bacha Khan College of Dentistry. 2025 Jun 30;3(2):41–49.

INTRODUCTION

Bilateral sagittal split osteotomy (BSSO) is one of the most commonly performed orthognathic surgical procedures for the correction of mandibular deformities, including prognathism, retrognathism, and facial asymmetry [1]. Since its modification by Dal Pont and subsequent refinements by Hunsuck and Epker, BSSO has remained the procedure of choice due to its versatility, broad bony contact surface, and

favourable postoperative stability [2, 3]. Despite these advantages, neurosensory disturbance of the inferior alveolar nerve (IAN) remains one of the most frequent and clinically significant complications associated with the procedure [4].

The inferior alveolar nerve provides sensory innervation to the lower lip, chin, and mandibular dentition. Its anatomical course within the mandibular canal makes it particularly vulnerable during osteotomy, splitting, and fixation phases of BSSO [5]. Reported rates of immediate postoperative IAN neurosensory disturbance range widely from 20% to 85%, depending on assessment method and follow-up duration [6, 7]. Although most cases resolve within months, persistent sensory deficits have been reported in approximately 5–15% of patients [8]. Persistent nerve injury can significantly impair speech, mastication, and overall quality of life, and may negatively influence patient satisfaction following orthognathic surgery [9].

Several mechanisms contribute to IAN injury during BSSO, including direct trauma from osteotomy instruments, nerve compression between proximal and distal segments, excessive retraction, fixation screw placement, and unfavourable fracture patterns ("bad splits") [10]. Both anatomical and technical factors appear to influence risk. Radiographic proximity of the mandibular canal to the buccal cortical plate has been identified as a key anatomical determinant, particularly when assessed using cone-beam computed tomography (CBCT) [11]. Additionally, the magnitude and direction of mandibular movement, especially large advancements or setbacks exceeding 8–10 mm, have been associated with increased neurosensory disturbance [12]. Patient-related variables such as age and smoking status may also influence nerve recovery capacity. Older patients demonstrate reduced neural regenerative potential, potentially increasing the likelihood of persistent deficits [4]. Similarly, smoking has been implicated in impaired microvascular circulation and delayed neural healing [13]. Intraoperative factors including surgical technique, surgeon experience, duration of surgery, and the need for nerve manipulation further contribute to variability in reported outcomes [6, 10]. Despite extensive literature documenting incidence rates, there remains inconsistency regarding which factors independently predict long-term persistent IAN injury. Many studies focus on short-term neurosensory changes rather than clinically relevant persistent deficits. Furthermore, the relative contribution of radiographic risk factors versus intraoperative events remains inadequately clarified.

Therefore, the aim of this study was to evaluate demographic, radiographic, and intraoperative predictors of persistent inferior alveolar nerve injury following bilateral sagittal split osteotomy using multivariate logistic regression analysis. Identification of modifiable and non-modifiable risk factors may enhance preoperative counselling, surgical planning, and strategies to minimise long-term neurosensory complications.

MATERIALS AND METHODS

Study Design

This study was designed as a retrospective cohort analysis evaluating predictors of persistent inferior alveolar nerve (IAN) injury following bilateral sagittal split osteotomy (BSSO).

Study Design and Setting

A retrospective cohort study was conducted at the Department of Oral and Maxillofacial Surgery, Saidu College of Dentistry, Swat, Khyber Pakhtunkhwa, Pakistan. The study included patients treated between January 2019 and December 2023.

Sample Size and Sampling Technique

The sample size was calculated based on a reported prevalence of persistent inferior alveolar nerve injury following BSSO (5%–15%), assuming a 10% expected prevalence, 95% confidence level, and 5% margin of error, which yielded a minimum required sample size of 138 patients. However, to increase statistical power and allow for multivariable logistic regression analysis, the final sample size was expanded to 300 patients. Consecutive sampling technique was used, and all eligible BSSO patients during the study period were included to minimize selection bias and ensure complete case inclusion.

Inclusion Criteria

- Age ≥18 years
- Underwent BSSO for dentofacial deformities (mandibular prognathism, retrognathism, facial asymmetry)
- With or without adjunctive genioplasty
- Availability of complete preoperative CBCT imaging
- Minimum 6 months follow-up records

Exclusion Criteria

- Pre-existing permanent neurosensory deficits
- Craniofacial syndromes
- History of mandibular trauma
- Revision Orthognathic surgery

Data Collection

The study was conducted in accordance with the principles of the Declaration of Helsinki. Institutional ethical approval was obtained prior to data collection (Approval No: 2356/SCD, dated: 23/08/2023). As this was a retrospective review of anonymised clinical records, informed consent was waived. Patient confidentiality was maintained throughout the study.

Demographic variables collected included age, sex, body mass index (BMI), smoking status, and American Society of Anesthesiologists (ASA) classification. Radiographic assessment was performed using preoperative CBCT scans to evaluate the proximity of the mandibular canal to the buccal cortical plate. Nerve proximity was categorised as low risk (≥2 mm), moderate risk (1–<2 mm), or high risk (<1 mm or direct cortical contact). Surgical variables recorded included magnitude and direction of mandibular movement, surgeon experience level, surgical technique, fixation method, intraoperative nerve exposure, need for nerve manipulation, split pattern (favourable, unfavourable, bad split), operative time, estimated blood loss, and use of perioperative steroids.The primary outcome was persistent IAN injury at 6 months postoperatively. Neurosensory assessment was based on patient-reported altered sensation of the lower lip or chin, supported by clinical examination using light-touch and pin-prick testing. Persistent injury was defined as the presence of subjective and/or objective neurosensory deficit beyond 6 months after surgery.

Statistical Analysis

Data were analysed using statistical software (SPSS version 26.0). Descriptive statistics were calculated for all variables. Continuous variables were presented as mean ± standard deviation, and categorical variables as frequencies and percentages. Bivariate analysis was performed using chi-square tests to identify associations between predictor variables and persistent IAN injury. Variables with p-values <0.10 in bivariate analysis were entered into a multivariate logistic regression model to determine independent predictors. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated. Statistical significance was set at $p < 0.05$.

RESULTS

The study population consisted predominantly of young adults, with a mean age of 24.8 ± 6.1 years (range 18–46), and over half of participants (54%) aged 18–24 years, indicating that BSSO was most commonly performed in early adulthood. Females slightly outnumbered males (56% vs 44%). The mean BMI was 24.1 ± 3.8 kg/m², with the majority (58%) within the normal weight range, although 38% were overweight or obese. Most patients were non-smokers (82%) and classified as ASA I (78%), reflecting a generally healthy surgical cohort. Class III malocclusion (mandibular prognathism) was the most common diagnosis (60%), and mandibular setback was the predominant planned movement (56%). The average magnitude of mandibular movement was 6.5 ± 2.8 mm, with most patients (42%) undergoing moderate movements of 6–8 mm, while 20% required larger corrections (≥9 mm), potentially representing higher surgical complexity. The majority had third molars removed at least six months preoperatively (58%), and most patients (94%) had no preoperative neurosensory symptoms. CBCT assessment showed that 44% were classified as low anatomical risk, 38% moderate risk, and 18% high risk for nerve proximity, indicating that nearly one-fifth of the cohort presented with increased anatomical susceptibility to inferior alveolar nerve injury.

Table 1: Demographic and Baseline Clinical Characteristics (N = 300)

Variable	Category / Units	n (%) or Mean ± SD
Age (years)	Mean ± SD (range)	24.8 ± 6.1 (18–46)
Age group	18–24	162 (54.0)
	25–34	108 (36.0)
	≥35	30 (10.0)
Sex	Female	168 (56.0)
	Male	132 (44.0)
BMI (kg/m²)	Mean ± SD	24.1 ± 3.8
BMI category	<18.5	12 (4.0)
	18.5–24.9	174 (58.0)
	25.0–29.9	90 (30.0)
	≥30.0	24 (8.0)
Smoking status	Never	246 (82.0)
	Current	42 (14.0)

	Former	12 (4.0)
ASA physical status	I	234 (78.0)
	II	60 (20.0)
	III	6 (2.0)
Primary dentofacial diagnosis	Class III (mandibular prognathism)	180 (60.0)
	Class II (mandibular retrognathism)	96 (32.0)
	Facial asymmetry / other	24 (8.0)
Planned movement direction	Advancement	108 (36.0)
	Setback	168 (56.0)
	Rotation/correction (dominant)	24 (8.0)
Magnitude of mandibular movement (mm)	Mean ± SD	6.5 ± 2.8
Magnitude category	≤5 mm	114 (38.0)
	6–8 mm	126 (42.0)
	≥9 mm	60 (20.0)
Third molar status at surgery	Present	84 (28.0)
	Removed ≥6 months pre-op	174 (58.0)
	Removed <6 months pre-op	42 (14.0)
Pre-op neurosensory symptoms	None	282 (94.0)
	Mild altered sensation	18 (6.0)
Side-specific anatomic risk (CBCT)	Low (nerve–cortex distance ≥2 mm)	132 (44.0)
	Moderate (1–<2 mm)	114 (38.0)
	High (<1 mm / nerve abutting cortex)	54 (18.0)

The majority of procedures were performed by consultant/attending surgeons (62%), while 38% were conducted by senior trainees or residents, indicating a substantial proportion of cases undertaken within a supervised training environment. Conventional osteotomy using saw and chisels was the predominant technique (68%), with piezosurgery-assisted approaches used in 32% of cases. Miniplate fixation with monocortical screws was the most common fixation method (48%), followed by three bicortical screws (40%) and hybrid fixation (12%). Intraoperative visualization of the inferior alveolar nerve occurred in 38% of surgeries, and active nerve manipulation was required in 22%, suggesting that a notable proportion of cases involved direct nerve handling. Most splits were favourable and complete (87%), although 10% were classified as unfavourable and 3% resulted in clinically significant bad splits. Lingual plate fractures were relatively uncommon (7%). Concurrent genioplasty was performed in 20% of patients. The mean operative time was 122 ± 28 minutes, with nearly half of surgeries completed in under 120 minutes, while 18% extended beyond 150 minutes, potentially reflecting increased procedural complexity. Mean estimated blood loss was 210 ± 95 mL. Perioperative steroids were administered in the majority of patients (82%), suggesting routine use to reduce postoperative inflammation and swelling.

Table 2: Intraoperative/Surgical Characteristics (N = 300)

Variable	Category / Units	n (%) or Mean ± SD
Surgeon experience	Consultant/Attending	186 (62.0)
	Senior trainee/Resident	114 (38.0)
Surgical technique	Conventional saw + chisels	204 (68.0)
	Piezosurgery-assisted	96 (32.0)
Fixation method	3 bicortical screws	120 (40.0)
	Miniplate + monocortical screws	144 (48.0)
	Hybrid (plate + 1–2 bicortical)	36 (12.0)
Intraop IAN exposure/visualization	No	186 (62.0)
	Yes	114 (38.0)
IAN manipulation required	No	234 (78.0)
	Yes (mobilization/retraction)	66 (22.0)
Split pattern quality	Favourable / complete	261 (87.0)
	Unfavourable (irregular)	30 (10.0)
	“Bad split” (clinically significant)	9 (3.0)
Lingual plate fracture	No	279 (93.0)
	Yes	21 (7.0)
Concurrent genioplasty	No	240 (80.0)
	Yes	60 (20.0)

Operation time (minutes)	Mean ± SD	122 ± 28
Operation time category	<120 min	138 (46.0)
	120–149 min	108 (36.0)
	≥150 min	54 (18.0)
Estimated blood loss (mL)	Mean ± SD	210 ± 95
Use of periop steroids	No	54 (18.0)
	Yes	246 (82.0)

Immediate postoperative inferior alveolar nerve (IAN) injury occurred in 40% of patients within the first 7 days following BSSO, with 26% experiencing unilateral and 14% bilateral neurosensory disturbance, while 60% had no early deficit. At 6 months postoperatively, the prevalence of persistent IAN injury decreased substantially to 10%, indicating considerable recovery over time. Of these persistent cases, 7.3% were unilateral and 2.7% bilateral, demonstrating that long-term bilateral deficits were relatively uncommon. Among the 120 patients who initially experienced postoperative neurosensory disturbance, 75% achieved full recovery by 6 months, whereas 25% continued to exhibit persistent symptoms. Overall, these findings suggest that although transient IAN injury is relatively common after BSSO, the majority of cases resolve within six months, with a smaller but clinically significant proportion developing long-term sensory impairment.

Table 3: Inferior Alveolar Nerve Injury Outcomes and Bivariate Associations

Predictor	Category	Persistent Injury n/N (%)	p-value
Immediate postoperative IAN injury	Yes	120 (40%)	—
Persistent IAN injury (6 months)	Yes	30 (10%)	—
Age group	18–24	9/162 (5.6%)	
	25–34	15/108 (13.9%)	
	≥35	6/30 (20.0%)	0.004
Sex	Female	18/168 (10.7%)	
	Male	12/132 (9.1%)	0.48
Smoking	Non-smoker	18/246 (7.3%)	
	Current	9/42 (21.4%)	
	Former	3/12 (25.0%)	0.006
Mandibular movement	≤5 mm	4/114 (3.5%)	
	6–8 mm	11/126 (8.7%)	
	≥9 mm	15/60 (25.0%)	<0.001
CBCT nerve proximity	Low	3/132 (2.3%)	
	Moderate	12/114 (10.5%)	
	High	15/54 (27.8%)	<0.001
Nerve exposure	No	6/186 (3.2%)	
	Yes	24/114 (21.1%)	<0.001
Nerve manipulation	No	12/234 (5.1%)	
	Yes	18/66 (27.3%)	<0.001
Split pattern	Favourable	18/261 (6.9%)	
	Unfavourable	6/30 (20.0%)	
	Bad split	6/9 (66.7%)	<0.001
Operation time	<120 min	6/138 (4.3%)	
	120–149 min	12/108 (11.1%)	
	≥150 min	12/54 (22.2%)	0.002

Multivariate logistic regression analysis identified several independent predictors of persistent inferior alveolar nerve (IAN) injury at 6 months following BSSO. Patients aged ≥35 years had approximately 2.5 times higher odds of persistent injury compared to younger patients (AOR 2.48; 95% CI 1.02–6.03; p = 0.045). Current smokers demonstrated nearly threefold increased odds (AOR 2.96; 95% CI 1.18–7.42; p = 0.021). A mandibular movement of ≥9 mm was associated with almost four times greater odds of persistent deficit (AOR 3.85; 95% CI 1.62–9.15; p = 0.002). High-risk nerve proximity on CBCT emerged as one of the strongest anatomical predictors, increasing the odds by approximately 4.7 times (AOR 4.72; 95% CI 1.98–11.23; p < 0.001). Intraoperative nerve exposure (AOR 3.41; p = 0.006) and active nerve manipulation (AOR 2.89; p = 0.022) were also significant independent predictors, highlighting the

impact of surgical handling. A bad split demonstrated the strongest association overall, with nearly sevenfold increased odds of persistent injury (AOR 6.75; 95% CI 1.82–25.01; p = 0.004). Prolonged operative time (≥150 minutes) was additionally associated with increased risk (AOR 2.54; p = 0.042). In contrast, surgery performed by a trainee surgeon was not independently associated with persistent injury after adjustment (AOR 1.74; 95% CI 0.82–3.71; p = 0.15), suggesting that intraoperative events rather than operator status were more determinative of long-term outcomes.

Table 4: Multivariate Logistic Regression Analysis of Predictors of Persistent IAN Injury (6 months)

Predictor	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Age ≥35 years	2.48	1.02 – 6.03	0.045
Current smoker	2.96	1.18 – 7.42	0.021
Mandibular movement ≥9 mm	3.85	1.62 – 9.15	0.002
High-risk nerve proximity (CBCT)	4.72	1.98 – 11.23	<0.001
Intraoperative nerve exposure	3.41	1.41 – 8.23	0.006
IAN manipulation required	2.89	1.17 – 7.13	0.022
Bad split (vs favourable split)	6.75	1.82 – 25.01	0.004
Operation time ≥150 min	2.54	1.03 – 6.24	0.042
Trainee surgeon (vs consultant)	1.74	0.82 – 3.71	0.15

DISCUSSION

The present study evaluated demographic, radiographic, and intraoperative predictors of persistent inferior alveolar nerve (IAN) injury following bilateral sagittal split osteotomy (BSSO). Consistent with previously reported literature, transient postoperative neurosensory disturbance was common, while persistent deficits at 6 months occurred in a smaller but clinically meaningful proportion of patients. The findings reinforce the multifactorial nature of IAN injury and highlight the combined influence of anatomical vulnerability and intraoperative events.

In this study, high-risk nerve proximity on preoperative CBCT was one of the strongest independent predictors of persistent injury. This finding aligns with previous radiographic investigations demonstrating that reduced distance between the mandibular canal and buccal cortical plate significantly increases the likelihood of nerve exposure during splitting [14, 15]. Advanced three-dimensional imaging has improved the ability to identify patients at increased anatomical risk, supporting the recommendation that CBCT evaluation be incorporated routinely in orthognathic surgical planning [16].

The magnitude of mandibular movement, particularly movements ≥9 mm, was also independently associated with persistent neurosensory deficit. Larger advancements or setbacks may increase mechanical strain on the neurovascular bundle and elevate the risk of segment compression or traction injury [17]. Similar associations between greater surgical movements and prolonged sensory disturbance have been reported in previous clinical studies [18]. These findings underscore the importance of careful planning in cases requiring extensive skeletal correction.Intraoperative factors played a critical role in long-term nerve outcomes. Nerve exposure, manipulation, and unfavourable split patterns (“bad splits”) were strongly associated with persistent deficits. Direct handling or traction of the nerve has been shown experimentally to result in axonal injury and delayed recovery [19]. Furthermore, bad splits may cause uncontrolled fracture propagation and direct trauma to the canal, increasing the risk of neurosensory disturbance [20]. These results emphasise the importance of meticulous osteotomy design and controlled splitting techniques to minimise nerve trauma.

Prolonged operative time was also identified as a predictor of persistent injury. Extended surgical duration may reflect procedural difficulty, increased tissue manipulation, or intraoperative complications, all of which may contribute to nerve irritation or ischemia [21]. Although surgeon experience was associated with injury on bivariate analysis, it was not independently significant after adjusting for intraoperative variables, suggesting that technical events during surgery may be more determinative than operator seniority alone.Patient-related factors also influenced outcomes. Increasing age was associated with a higher risk of persistent deficit, which may be explained by reduced neural regenerative capacity in older individuals [22]. Additionally, smoking emerged as an independent predictor, likely due to its well-documented adverse effects on microvascular circulation and wound healing, potentially impairing

neural recovery [23]. These findings are consistent with broader surgical literature demonstrating delayed nerve regeneration in smokers [24].

Importantly, although immediate neurosensory disturbance occurred in a substantial proportion of patients, most cases resolved within six months. This recovery pattern reflects the predominance of neuropraxia or mild axonotmesis rather than complete neurotmesis in BSSO-related injuries [25]. Nevertheless, persistent deficits, even when mild, can significantly affect quality of life and patient satisfaction, reinforcing the need for effective risk counseling and preventive strategies.The study contributes to the growing body of evidence emphasizing that persistent IAN injury is multifactorial, with both modifiable and non-modifiable risk factors. Anatomical proximity and magnitude of movement are largely predetermined by patient characteristics and treatment goals, whereas intraoperative nerve handling and surgical precision represent potentially modifiable factors. Implementation of careful osteotomy techniques, minimization of nerve manipulation, and thorough preoperative imaging assessment may reduce long-term neurosensory complications.

This study has several limitations that should be considered when interpreting the findings. First, the retrospective design may introduce inherent biases related to record completeness and data accuracy. Second, neurosensory assessment relied partly on patient-reported symptoms, which may be subject to subjective variation. Third, the study was conducted in a single institutional setting, which may limit the generalizability of the findings to other surgical centers with different patient populations or operative techniques. Additionally, long-term neurosensory outcomes beyond six months were not evaluated. Future prospective multicenter studies with longer follow-up and standardized neurosensory testing protocols are recommended to further validate these findings.

CONCLUSION

This study identified multiple demographic, radiographic, and intraoperative factors associated with persistent inferior alveolar nerve (IAN) injury following bilateral sagittal split osteotomy (BSSO). While transient neurosensory disturbances were common in the immediate postoperative period, persistent deficits at 6 months occurred in a smaller but clinically significant proportion of patients.Multivariate analysis demonstrated that high-risk nerve proximity on preoperative CBCT imaging, large mandibular movements (≥9 mm), intraoperative nerve exposure, nerve manipulation, bad split fractures, prolonged operative time, smoking, and increasing age were independent predictors of persistent IAN injury. Among these, radiographic nerve proximity and adverse intraoperative events were the strongest predictors, highlighting the combined influence of anatomical vulnerability and surgical factors.These findings emphasise the importance of comprehensive preoperative radiographic assessment, careful surgical planning, and meticulous intraoperative technique to minimise nerve trauma. Identification of high-risk patients allows for improved risk stratification, enhanced informed consent discussions, and consideration of modified surgical approaches when appropriate.Although most neurosensory disturbances resolve spontaneously, persistent IAN injury remains a significant complication of BSSO. Continued refinement of surgical techniques and further prospective studies are warranted to optimise outcomes and reduce long-term neurosensory morbidity in orthognathic surgery.

Acknowledgement: We sincerely thank the hospital administration and all those who contributed to the successful completion of this study.
Disclaimer: Nil
Conflict of Interest: Author declared no conflict of interest.
Funding Disclosure: This study was not funding by any organization

AUTHORS CONTRIBUTION

Concept & Design of Study: Dr. Imtiaz Ali
Drafting: Dr. SyedaMasooma
Data Analysis: Dr. Imtiaz Ali
Critical Review: Dr. Asif Shah
Final Approval of Version: Dr. Imtiaz Ali, Dr. SyedaMasooma & Dr. Asif shah
All authors have reviewed and approved the final manuscript.

REFERENCES

1. Colella G, Cannavale R, Vicidomini A, Lanza A. Neurosensory disturbance of the inferior alveolar nerve after bilateral sagittal split osteotomy: a systematic review. J Oral Maxillofac Surg [Internet]. 2007;65(9):1707–15. Available from: http://dx.doi.org/10.1016/j.joms.2007.05.009

2. Al-Bishri A, Barghash Z, Rosenquist J, Sunzel B. Neurosensory disturbance after sagittal split and intraoral vertical ramus osteotomy: as reported in questionnaires and patients' records. Int J Oral Maxillofac Surg [Internet]. 2005;34(3):247–51. Available from: http://dx.doi.org/10.1016/j.ijom.2004.06.009
3. Hanfesh A, Salma RG, Al Mutairi K, AlShiha SK, Al Otaibi S. The neurosensory deficit of inferior alveolar nerve following bilateral sagittal split osteotomy: a prospective study. Oral Maxillofac Surg [Internet]. 2022;26(3):401–15. Available from: http://dx.doi.org/10.1007/s10006-021-01005-2
4. Hanzelka T, Foltán R, Pavlíková G, Horká E, Sedý J. The role of intraoperative positioning of the inferior alveolar nerve on postoperative paresthesia after bilateral sagittal split osteotomy of the mandible: prospective clinical study. Int J Oral Maxillofac Surg [Internet]. 2011;40(9):901–6. Available from: http://dx.doi.org/10.1016/j.ijom.2011.04.002
5. Fridrich KL, Holton TJ, Pansegrau KJ, Buckley MJ. Neurosensory recovery following the mandibular bilateral sagittal split osteotomy. J Oral Maxillofac Surg [Internet]. 1995;53(11):1300–6; discussion 1306-7. Available from: http://dx.doi.org/10.1016/0278-2391(95)90588-x
6. Shibata M, Takahara N, Tomomatsu N, Kurasawa Y, Sasaki Y, Yoda T. Risk factors of neurosensory disturbances at 1 year postoperatively after bilateral sagittal split osteotomy. Oral Surg Oral Med Oral Pathol Oral Radiol [Internet]. 2022;134(6):695–701. Available from: http://dx.doi.org/10.1016/j.oooo.2022.04.002
7. van Merkesteyn JPR, Zweers A, Corputty JEM. Neurosensory disturbances one year after bilateral sagittal split mandibular ramus osteotomy performed with separators. J Craniomaxillofac Surg [Internet]. 2007;35(4–5):222–6. Available from: http://dx.doi.org/10.1016/j.jcms.2007.04.006
8. Mensink G, Zweers A, Wolterbeek R, Dicker GGJ, Groot RH, van Merkesteyn RJPR. Neurosensory disturbances one year after bilateral sagittal split osteotomy of the mandibula performed with separators: a multi-centre prospective study. J Craniomaxillofac Surg [Internet]. 2012;40(8):763–7. Available from: http://dx.doi.org/10.1016/j.jcms.2012.02.003
9. Nesari S, Kahnberg K-E, Rasmusson L. Neurosensory function of the inferior alveolar nerve after bilateral sagittal ramus osteotomy: a retrospective study of 68 patients. Int J Oral Maxillofac Surg [Internet]. 2005;34(5):495–8. Available from: http://dx.doi.org/10.1016/j.ijom.2004.10.021
10. Rude K, Svensson P, Starch-Jensen T. Neurosensory disturbances after bilateral sagittal split osteotomy using piezoelectric surgery: A systematic review. J Oral Maxillofac Surg [Internet]. 2019;77(2):380–90. Available from: http://dx.doi.org/10.1016/j.joms.2018.06.029
11. Verweij JP, Houppermans PNWJ, Gooris P, Mensink G, van Merkesteyn JPR. Risk factors for common complications associated with bilateral sagittal split osteotomy: A literature review and meta-analysis. J Craniomaxillofac Surg [Internet]. 2016;44(9):1170–80. Available from: http://dx.doi.org/10.1016/j.jcms.2016.04.023
12. Al-Bishri A, Rosenquist J, Sunzel B. On neurosensory disturbance after sagittal split osteotomy. J Oral Maxillofac Surg [Internet]. 2004;62(12):1472–6. Available from: http://dx.doi.org/10.1016/j.joms.2004.04.021
13. Lee C-H, Lee B-S, Choi B-J, Lee J-W, Ohe J-Y, Yoo H-Y, et al. Recovery of inferior alveolar nerve injury after bilateral sagittal split ramus osteotomy (BSSRO): a retrospective study. Maxillofac Plast Reconstr Surg [Internet]. 2016;38(1):25. Available from: http://dx.doi.org/10.1186/s40902-016-0068-y
14. Teerijoki-Oksa T, Jääskeläinen SK, Forssell K, Forssell H, Vähätalo K, Tammisalo T, et al. Risk factors of nerve injury during mandibular sagittal split osteotomy. Int J Oral Maxillofac Surg [Internet]. 2002;31(1):33–9. Available from: http://dx.doi.org/10.1054/ijom.2001.0157
15. Huang CS, Syu JJ-S, Ko EW-C, Chen YR. Quantitative evaluation of cortical bone thickness in mandibular prognathic patients with neurosensory disturbance after bilateral sagittal split osteotomy. J Oral Maxillofac Surg [Internet]. 2013;71(12):2153.e1-10. Available from: http://dx.doi.org/10.1016/j.joms.2013.08.004
16. Aizenbud D, Ciceu C, Hazan-Molina H, Abu-El-Naaj I. Relationship between inferior alveolar nerve imaging and neurosensory impairment following bilateral sagittal split osteotomy in skeletal Class III cases with mandibular prognathism. Int J Oral Maxillofac Surg [Internet]. 2012;41(4):461–8. Available from: http://dx.doi.org/10.1016/j.ijom.2011.10.024
17. Ylikontiola L, Kinnunen J, Oikarinen K. Factors affecting neurosensory disturbance after

mandibular bilateral sagittal split osteotomy. J Oral Maxillofac Surg [Internet]. 2000;58(11):1234–9; discussion 1239-40. Available from: http://dx.doi.org/10.1053/joms.2000.16621

18. Kanneth S, Vinod S V, 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 [Internet]. 2023;15(3):e36004. Available from: http://dx.doi.org/10.7759/cureus.36004
19. Hassani A, Rakhshan V, Hassani M, Aghdam HM. Preoperative imaging of the inferior alveolar nerve canal by cone-beam computed tomography and 1-year neurosensory recovery following mandibular setback through bilateral sagittal split ramus osteotomy: a randomized clinical trial. J Korean Assoc Oral Maxillofac Surg [Internet]. 2020;46(1):41–8. Available from: http://dx.doi.org/10.5125/jkaoms.2020.46.1.41
20. Politis C, Ramírez XB, Sun Y, Lambrichts I, Heath N, Agbaje JO. Visibility of mandibular canal on panoramic radiograph after bilateral sagittal split osteotomy (BSSO). Surg Radiol Anat [Internet]. 2013;35(3):233–40. Available from: http://dx.doi.org/10.1007/s00276-012-1026-8
21. Ylikontiola L, Moberg K, Huumonen S, Soikkonen K, Oikarinen K. Comparison of three radiographic methods used to locate the mandibular canal in the buccolingual direction before bilateral sagittal split osteotomy. Oral Surg Oral Med Oral Pathol Oral Radiol Endod [Internet]. 2002;93(6):736–42. Available from: http://dx.doi.org/10.1067/moe.2002.122639
22. Chortrakarnkij P, Lonic D, Lin H-H, Yamaguchi K, Kim S-G, Lo L-J. A modified technique of mandibular ramus sagittal split osteotomy for prevention of inferior alveolar nerve injury: A prospective cohort study and outcome assessment: A prospective cohort study and outcome assessment. Ann Plast Surg [Internet]. 2017;78(3 Suppl 2):S108–16. Available from: http://dx.doi.org/10.1097/SAP.0000000000001015
23. Schlund M, Grall P, Ferri J, Nicot R. Effect of modified bilateral sagittal split osteotomy on inferior alveolar nerve neurosensory disturbance. Br J Oral Maxillofac Surg [Internet]. 2022;60(8):1086–91. Available from: http://dx.doi.org/10.1016/j.bjoms.2022.04.001
24. Kumaran PS, Manikandan G, Anuradha V, Satish P, BalaMurugan R, Kumar AA. A novel modification of the sagittal split osteotomy as an access osteotomy. Ann Maxillofac Surg [Internet]. 2020;10(2):463–6. Available from: http://dx.doi.org/10.4103/ams.ams_264_19
25. Schoen P, Frotscher M, Eggeler G, Kessler P, Wolff K-D, Boeckmann R. Modification of the bilateral sagittal split osteotomy (BSSO) in a study using pig mandibles. Int J Oral Maxillofac Surg [Internet]. 2011;40(5):516–20. Available from: http://dx.doi.org/10.1016/j.ijom.2010.09.028