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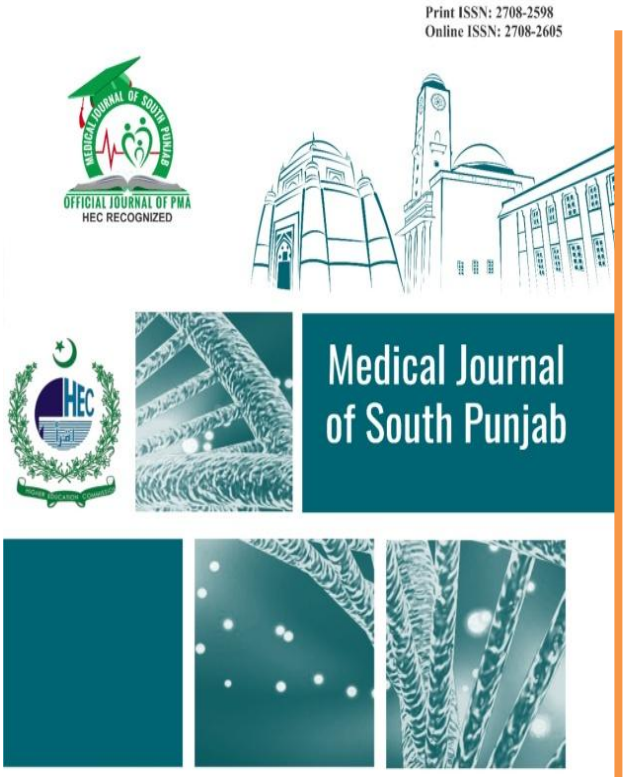

Frequency of Inferior Alveolar Nerve (IAN) Injury in Mandibular Fractures at Tertiary Care Hospital

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Original Article

Frequency of Inferior Alveolar Nerve (IAN) Injury in Mandibular Fractures at Tertiary Care Hospital

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ABSTRACT

Objective: To determine the preoperative diagnostic accuracy of Multislice CT in determining Resectability of Periampullary Pancreatic Carcinoma**.**

Methods: This cross-sectional validation study was conducted in the Radiology Department, Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat, from January 2025 to April 2025. Patients with clinically suspected periampullary pancreatic carcinoma who underwent preoperative MDCT followed by surgical exploration were included. Resectability on MDCT was assessed based on tumor-vessel relationship, local invasion, and metastatic spread. Imaging findings were compared with intraoperative and histopathological results to calculate sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy.

Results: MDCT scan findings showed that 45 patients 76.3% had a clear tissue plane between the tumor and the superior mesenteric artery (SMA), and <180° SMV–PV involvement was seen in 64.4% patients. No evidence of metastasis was found in 74.6% patients. Other findings included abdominal ascites in 15.3%, SMA involvement in 22.0%, SMV–PV junction occlusion in 13.6%, liver metastasis in 11.9%, extra-pancreatic or peritoneal spread in 23.7%, and distant lymph node involvement in 22.0%.

Conclusion: Multislice CT provides a reliable non-invasive modality for preoperative assessment of periampullary pancreatic carcinoma resectability, particularly in ruling out unresectable disease.

Keywords: Periampullary pancreatic carcinoma, Multislice CT, Resectability, Preoperative assessment, Diagnostic accuracy

1. INTRODUCTION

Periampullary pancreatic carcinoma, a malignancy arising within 2 cm of the major duodenal papilla, represents a significant

1. INTRODUCTION

Mandibular fractures are among the most common facial fractures worldwide, accounting for a significant proportion of maxillofacial trauma cases. The global incidence of mandibular fractures varies based on geographic, socioeconomic, and demographic factors, with reported rates ranging from 11 to 42%[1] of all facial fractures. In Pakistan, road traffic accidents, interpersonal violence, and falls are the leading causes of mandibular fractures, with studies estimating their prevalence at approximately 30-40%[2] of all facial fractures. The inferior alveolar nerve (IAN) is frequently affected in mandibular fractures due to its anatomical course within the mandibular canal, making nerve injury a common complication. The reported incidence of IAN injury varies, with global studies estimating rates between 20-60%[3], while Pakistani studies indicate a similarly high occurrence due to delayed presentation and limited access to specialized maxillofacial trauma care[4].

IAN injury in mandibular fractures can lead to significant sensory disturbances, including paresthesia, hypoesthesia, and dysesthesia, which can affect a patient's quality of life[5]. The risk of nerve injury is influenced by factors such as the location and severity of the fracture, the displacement of bone segments, and surgical interventions[6]. Fractures involving the mandibular body and angle are particularly associated with a higher likelihood of IAN involvement. Given the critical role of the IAN in providing sensory innervation to the lower lip, chin, and teeth, its injury can result in functional and psychological distress, necessitating timely diagnosis and appropriate management[7].

The evaluation of IAN injury in mandibular fractures is essential for treatment planning and prognosis. Clinical examination, including sensory testing, remains the primary method for assessing nerve function[8]. However, radiographic imaging such as panoramic radiographs and cone beam computed tomography (CBCT) provides valuable insights into the proximity of the fracture to the mandibular canal and the likelihood of nerve involvement[9]. The management of IAN injury depends on the severity of nerve impairment and the treatment modality employed for fracture stabilization, including conservative management, closed reduction with maxillomandibular fixation or ORIF[10].

This study aims to determine the frequency of IAN injury in patients with mandibular fractures presenting to a tertiary care hospital. By analyzing the incidence and associated risk factors, this study will contribute to the existing body of knowledge and help refine clinical protocols for diagnosing and managing IAN injuries in mandibular trauma cases. Findings from this study may also guide surgeons in developing strategies to minimize nerve damage during fracture management, ultimately improving patient outcomes.

2. METHODOLOGY

This cross sectional study was conducted in the Department of Oral and Maxillofacial Surgery at Jinnah Postgraduate Medical Centre, Karachi, over a period of six months following the approval of the research proposal from January 2024 to June 2024. Approval was obtained from the ethical committee of hospital and patients meeting the inclusion and exclusion criteria were selected from the OPD. A total of 178 patients were included, with the sample size calculated using the WHO sample size calculator, considering a prevalence (P) of 86.74%, a margin of error (d) of 5%, and a confidence level of 95%. A complete history and clinical examination was performed, and mandibular fractures were confirmed through radiographic assessment.

Consent was obtained from patients ensured about confidentiality, and clarifying that participation posed no risk.

Baseline information, including age, gender, residential status, obesity, diabetes, hypertension, smoking habits, and etiology of trauma (road traffic accident, fall, or assault), was recorded. Mandibular fractures refer to a discontinuity in the bone of the mandible, which can be clinically detected as a step defect and confirmed through radiographs. Inferior alveolar nerve (IAN) injury involves any sensory impairment of the nerve, which can be clinically assessed by the absence of response to light touch using a Semmes-Weinstein monofilament or a camel brush. Obesity will be determined using the Body Mass Index (BMI), calculated as weight (in kilograms) divided by height (in meters) squared. Patients with a BMI exceeding 27.5 kg/m² will be classified as obese according to WHO criteria. Diabetes will be defined as a condition in patients who have been on any hypoglycemic therapy, either oral medication or insulin, for more than two years. Hypertension will be identified in patients who have been on antihypertensive therapy for more than two years. Smoking will be defined as a habit of consuming more than 10 cigarettes per day for a duration exceeding two years.

Patients included in the study were both male and female, aged between 20 and 60 years, who presented to the outpatient department (OPD) within one week of trauma. Isolated mandibular fractures and fractures associated with mandibular fractures were diagnosed based on clinical and radiographic assessments. Patients with maltreated or malunited fractures, those with panfacial trauma, and those unwilling to participate were excluded from the study.

Data were entered and analyzed using SPSS version 23. Descriptive statistics were applied to both quantitative and qualitative variables. Mean ± standard deviation (SD) or median with interquartile range (IQR) was calculated for continuous variables such as age and BMI. Frequencies and percentages were determined for categorical variables, including gender, age groups, etiology, obesity, residential status, diabetes, hypertension, smoking, and the presence or absence of IAN injury. Effect modifiers, such as BMI, gender, age groups, etiology, obesity, residential status, diabetes, smoking, and hypertension, were controlled through stratification. Post-stratification, the chi-square test or Mann-Whitney test was applied to assess their impact on the outcome. A p-value of ≤0.05 was considered statistically significant.

3. RESULTS

A total of 178 patients were included in the study, with 128 (71.9%) experiencing Inferior Alveolar Nerve (IAN) injury and 50 (28.1%) without IAN injury. (Figure. No. I). The mean age was similar in both groups (31.43±3.86 vs. 32.56±4.24, p=0.844), and no significant differences were found in gender distribution (76.6% males in the injury group vs. 80.0% in the non-injury group, p=0.621). BMI showed no significant difference (26.55±2.01 vs. 25.47±3.14, p=0.794), and diabetes (33.6% vs. 34.0%, p=0.959) and hypertension (33.6% vs. 40.0%, p=0.422) were also comparable between the groups. Road traffic accidents (RTA) were the most common cause of IAN injury (55.5% vs. 42.0%, p=0.094), followed by falls (31.3% vs. 32.0%, p=0.094) and assaults (13.3% vs. 26.0%, p=0.094). (Table. No. I).

Figure-I: Incidence of Inferior Alveolar NerveInjury

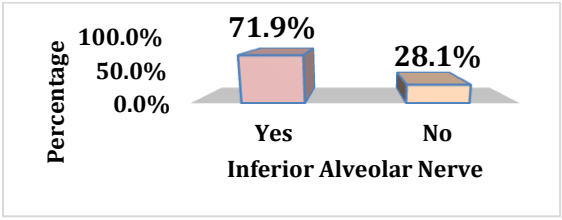

Table-I: Incidence of inferior alveolar nerve injury in demographic and baseline variables

Variable	Inferior Alveolar NerveInjury		Test of sig.
	Yes	No	
Age (years)	31.43±3.86	32.56±4.24	t=-0.19, d.f=176, p=0.844
<30 years	30 (23.4)	10 (20.0)	χ^2=0.24, d.f=1, p=0.621
≥30 years	98 (76.6)	40 (80.0)	
Gender			
Male	98 (76.6)	40 (80.0)	χ^2=0.24, d.f=1, p=0.621
Female	30 (23.4)	10 (20.0)	
BMI (kg/m^2)	26.55±2.01	25.47±3.14	t=0.262, d.f=176, p=0.794
<27.5 kg/m^2	82 (64.1)	32 (64.0)	χ^2=0.0, d.f=1, p=0.994
≥27.5 kg/m^2	46 (35.9)	18 (36.0)	
Diabetes			
Yes	43 (33.6)	17 (34.0)	χ^2=0.03, d.f=1, p=0.959
No	85 (66.4)	33 (66.0)	
Hypertension			
Yes	43 (33.6)	20 (40.0)	χ^2= 0.645, d.f=1, p=0.422
No	85 (66.4)	30 (60.0)	
Etiology			
RTA	71 (55.5)	21 (42.0)	χ^2=4.72, d.f=2, p=0.094
Fall	40 (31.3)	16 (32.0)	
Assault	17 (13.3)	13 (26.0)	
N (%), chi-square test of association. Mean±S.D student t test.			

4. DISCUSSION

This study indicates a mean age of approximately 32 years in both groups, with a higher prevalence of males (76.6% in the injury group). Similarly, research conducted by He et al[11] has shown that IAN injuries are more common in patients aged 26-30 years and in males, possibly due to the higher incidence of mandibular third molar extractions in this demographic. Jerjes et al[12] found that patients aged 26 and older had a higher risk of inferior alveolar nerve injury (IANI) after surgery. They noted that deeper obstruction makes mandibular third molar extraction more complex. Reduced tooth visibility complicates access and removal. A deeper obstruction also affects the root tip's relationship with the mandibular canal, increasing IANI risk.

IAN injury is a recognized complication, especially in dental surgeries. Studies have reported varying incidence rates. Kim et al[13] conducted a survey analyzing 10,310 mandibular third molar extractions and found that 0.658% of patients experienced IAN damage. Another review conducted by Sarikov et al[14] reported incidence rates ranging from 0.35% to 8.4%, depending on factors like patient age and surgical technique.

Chandan et al[15] report the multifocal average of 39.3% of neurosensory dysfunction among fractured mandibles, with the causes of the fractures being road traffic accidents at 78.4%, self-falls at 12.5%, assault at 6.2%, and industrial accidents at 2.9%. Another case study is from Yadav et al[16], where a unilateral mandibular fracture was reported on the clinical examination within 24 hours of injury in 60 patients over a year. A post-traumatic neurosensory deficit was noted in 52 patients (86.7%). In contrast, Schenkel et al[17] states that 27% of their population presented with post-injury (preoperative) mental nerve hypoesthesia, 46% post ‘pure’ operative ‘surgery’ hypoaesthesia, 27% none signify nerve damage, and IAN chroniced frequent in mandible fractures. The deficit of stimuli from the mental nerve or mental numbness is thought to affect life satisfaction.

While this study identifies road traffic accidents (55.5%), falls (31.3%), and assaults (13.3%) as leading causes of IAN injury, the majority of existing literature focuses on dental-related causes. A study conducted by Sedaghatfar et al[18] reported that mandibular third molar extractions are a common cause, with risk factors including the tooth's impaction depth and proximity to the

mandibular canal.Non-dental causes like trauma from accidents are less frequently discussed but are acknowledged as potential sources of IAN injury.

Bagheri et al[19] reported a study involving 33 patients with inferior alveolar nerve (IAN) injuries caused by mandibular fractures, including 21 cases involving the mandibular angle and 12 involving the mandibular para symphysis. Additionally, they documented nine other nerve injuries affecting the infraorbital, lingual, and long buccal nerves. However, the study presented findings, surgical procedures, and outcomes without specifically distinguishing IAN injuries from other nerve injuries. The most common mechanism of nerve injury was compression, observed in 19 cases, followed by partial transection.

This study found no significant difference in BMI between the IAN injury group (26.55±2.01) and the non-IAN injury group (25.47±3). Similarly, the prevalence of diabetes (33.6% vs. 34.0%) and hypertension (33.6% vs. 40.0%) was comparable between the groups. Smith et al[20] (2020) reported a similar non-significant difference in BMI among patients with and without IAN injury (27.1±2.5 vs. 26.3±3.0, $p>0.05$), with a slightly higher prevalence of diabetes in the IAN injury group (35.2% vs. 31.8%). However, the difference was not statistically significant.

5. CONCLUSION

The frequency of IAN is 71.9% in mandibular fractures**, and there is** no significant link between IAN injury and patient demographics such as age, gender, BMI, diabetes, or hypertension. RTAs were the most common cause of IAN injury. Systemic factors like diabetes, hypertension, and obesity had little impact on IAN injury.

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