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EVALUATION OF TREATMENT SUCCESS RATE AND COMPLICATIONS IN SURGICAL REMOVAL OF IMPACTED THIRD MOLARS: A PROSPECTIVE STUDY AT A TERTIARY CARE CENTRE

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ABSTRACT

Introduction: Surgical extraction of impacted third molars is one of the most frequently performed procedures in oral and maxillofacial surgery, associated with various postoperative complications that can affect treatment outcomes. This study aimed to evaluate the treatment success rate and identify complications following surgical removal of impacted third molars at a tertiary care institution in Central India.

Methods: A prospective observational study was conducted at Peoples College of Medical Sciences and Research Centre, Bhopal, from March 2021 to August 2021. A total of 142 patients aged 18-50 years who underwent surgical extraction of impacted third molars were enrolled using consecutive sampling. Demographic data, clinical characteristics, impaction patterns classified according to Winter and Pell & Gregory systems, intraoperative parameters, and postoperative complications were recorded. Patients were followed up at predetermined intervals up to three months postoperatively. Data were analyzed using descriptive statistics and chi-square tests.

Results: The sample comprised 59.2% females with a mean age of 27.3 years. Mesioangular impaction was most common (40.8%), followed by horizontal impaction (25.4%). The overall complication rate was 60.6%, with major complications occurring in 18.3% of cases. Swelling was the most frequent complication (54.9%), followed by pain (36.6%), trismus (31.0%), and alveolar osteitis (8.5%). Nerve injuries occurred in 4.2% of patients, with complete recovery achieved in 66.7%. The overall treatment success rate was 90.1%, with 93.0% demonstrating normal socket healing.

Conclusion: Surgical removal of impacted third molars achieved a high success rate with acceptable complication profiles. Age, depth of impaction, and surgical duration were significant predictive factors for complications.

KEYWORDS Third molar extraction, Impacted teeth, Surgical complications, Alveolar osteitis, Treatment outcomes

INTRODUCTION

Third molar impaction represents one of the most frequently encountered clinical conditions in contemporary dental practice, with surgical extraction being among the most routinely performed procedures in oral and maxillofacial surgery. The mandibular third molar, commonly referred to as

the wisdom tooth, has an incidence of impaction ranging from 9.5% to 68% across different populations worldwide, making it the most commonly impacted tooth in the human dentition (Passi et al., 2019). This variation in prevalence is attributed to multiple factors including ethnic background, dietary patterns, evolutionary changes in jaw size, and genetic predispositions that influence craniofacial development.

The etiology of third molar impaction is multifactorial and complex. Insufficient space in the dental arch, retarded facial growth, early physical maturity combined with late third molar mineralization, and the distal direction of tooth eruption are considered primary causative factors (Padhye et al., 2013). As human evolution has progressed, there has been a gradual reduction in mandibular dimensions while the size and number of teeth have remained relatively constant, leading to an increased prevalence of third molar impactions in modern populations. The age of eruption for third molars typically falls between 17 and 25 years, and when these teeth fail to achieve their functional position in the dental arch, they become classified as impacted.

Surgical removal of impacted third molars is indicated when these teeth are associated with pathological conditions such as pericoronitis, cyst formation, damage to adjacent teeth, periodontal complications, or orthodontic considerations (Bouloux et al., 2007). However, the decision to extract asymptomatic impacted third molars remains a subject of ongoing debate in the dental literature. While prophylactic removal has been advocated by some clinicians to prevent future complications, others argue for a conservative approach of regular monitoring unless symptoms or pathology develops (Ghaeminia et al., 2016).

The surgical extraction of impacted third molars, despite being a routine procedure, is not without its challenges and potential complications. The success of the procedure and the occurrence of postoperative complications are influenced by numerous factors that can be broadly categorized into patient-related variables, anatomical considerations, and surgical factors (Blondeau & Daniel, 2007). Patient-related factors include age, gender, medical history, oral contraceptive use, smoking habits, and oral hygiene status. Studies have demonstrated that complications are more frequent in patients older than 24 to 25 years, as increased age is associated with denser bone, complete root formation, and decreased healing capacity (Chiapasco et al., 2009).

The anatomical classification of impacted third molars plays a crucial role in predicting surgical difficulty and potential complications. The Winter classification, introduced in 1926, categorizes impacted teeth based on their angulation relative to the long axis of the second molar, including mesioangular, distoangular, horizontal, vertical, and inverted positions (Khojastepour et al., 2019). The Pell and Gregory classification, developed in 1933, considers the relationship of the third molar to the ramus of the mandible (Class I, II, or III) and its depth relative to the occlusal plane of the second molar (Position A, B, or C). These classification systems have been widely adopted in clinical practice and research, providing a standardized framework for assessing impaction severity and surgical complexity.

The most common complications following surgical removal of impacted mandibular third molars include alveolar osteitis, postoperative infections, hemorrhage, nerve injuries affecting the inferior alveolar nerve or lingual nerve, trismus, prolonged pain, and swelling (de Santana-Santos et al., 2007). Alveolar osteitis, commonly known as dry socket, occurs in approximately 1% to 5% of routine extractions but can increase to 30% in surgical extractions of impacted teeth. This condition results from premature loss of the blood clot in the extraction socket, leading to exposed bone and severe postoperative pain that typically begins three to four days after surgery.

Nerve injuries represent one of the most serious complications, with temporary injury to the inferior alveolar nerve occurring in approximately 0.4% to 8.1% of cases, while permanent damage is less common, ranging from 0.01% to 0.9% (Bataineh, 2001). The close anatomical relationship between the roots of the mandibular third molar and the inferior alveolar canal increases the risk of neurosensory disturbances following extraction. Radiographic signs on panoramic radiographs, such as darkening of the root, diversion of the mandibular canal, and interruption of the white line of the canal, have been identified as predictive indicators of increased risk for nerve injury.

Surgical technique and operator experience significantly influence treatment outcomes and complication rates. Factors such as the type of surgical approach, flap design, bone removal technique, tooth sectioning method, and suturing technique all impact postoperative morbidity (Coulthard et al., 2014). Studies have shown that surgical time is directly correlated with the degree of postoperative complications, with longer procedures associated with increased tissue trauma, edema, and patient discomfort (Haug et al., 2005). The use of appropriate surgical instruments, proper irrigation to prevent thermal damage to bone, and gentle tissue handling are essential technical considerations for minimizing complications.

The evaluation of treatment success following third molar extraction extends beyond the absence of complications to include factors such as complete healing of the extraction socket, maintenance of periodontal health of the adjacent second molar, patient satisfaction, and return to normal function (Passarelli et al., 2019). Successful outcomes require careful preoperative assessment, appropriate surgical planning, meticulous surgical technique, and comprehensive postoperative management including adequate pain control, infection prevention, and patient education regarding proper wound care.

In the Indian context, studies have documented specific patterns of third molar impaction and complication rates that may differ from Western populations due to genetic, dietary, and environmental factors. Understanding these regional variations is essential for developing appropriate treatment protocols and patient counseling strategies tailored to local populations. The present study was undertaken to systematically evaluate the success rate of surgical removal of impacted third molars and to comprehensively document the spectrum and frequency of complications encountered in clinical practice at a tertiary care center in Central India.

The aim of this study was to evaluate the treatment success rate and identify the various complications associated with surgical removal of impacted third molars among patients.

METHODOLOGY

Study Design

A prospective observational study.

Study Site

The study was conducted at the Department of Oral and Maxillofacial Surgery, Peoples College of Medical Sciences and Research Centre, Bhopal, Madhya Pradesh, India.

Study Duration

The study was conducted over a period of six months from March 2021 to August 2021.

Sampling Method and Sample Size

A consecutive sampling technique was employed for patient recruitment, wherein all patients who met the inclusion criteria and presented to the Department of Oral and Maxillofacial Surgery during the study period were invited to participate. This non-probability sampling method was considered appropriate for the study objectives as it enabled recruitment of a representative sample of patients requiring third molar extraction while maintaining practical feasibility. The sample size comprised 142 patients who underwent surgical extraction of impacted third molars during the study period.

Inclusion and Exclusion Criteria

Patients were included in the study if they were aged between 18 and 50 years, had radiographically confirmed impacted mandibular or maxillary third molars requiring surgical extraction based on clinical and radiographic indications such as recurrent pericoronitis, cyst formation, damage to adjacent teeth, orthodontic considerations, or other pathological conditions, were willing to comply with the follow-up schedule, and provided written informed consent for participation in the study. Patients were excluded from the study if they had uncontrolled systemic diseases such as diabetes mellitus, cardiovascular disorders, or immunocompromising conditions that could affect wound healing, were pregnant or lactating women, had a history of radiotherapy to the head and neck

region, were taking medications known to affect bone metabolism such as bisphosphonates, had acute infections at the surgical site, were unable or unwilling to provide informed consent, or failed to attend scheduled follow-up appointments.

Data Collection Tools and Techniques

A structured case record form was designed specifically for this study to systematically document all relevant variables. The data collection form included sections for demographic information such as age, gender, and residence, clinical examination findings including the position and classification of the impacted tooth using Winter and Pell and Gregory classification systems, preoperative assessment including medical history, local examination findings, and radiographic evaluation, intraoperative details such as type of anesthesia used, surgical technique employed, duration of surgery, amount of bone removal required, and any intraoperative complications encountered, and postoperative assessment including pain levels measured using visual analog scale, presence and severity of swelling assessed by facial measurement techniques, mouth opening measured as maximum interincisal distance, signs of infection such as purulent discharge or elevated temperature, occurrence of alveolar osteitis, neurological complications including paresthesia or altered sensation, and healing status evaluated at follow-up visits. Radiographic evaluation was performed using digital orthopantomographs to classify the impacted teeth and assess their relationship to anatomical structures such as the inferior alveolar canal, maxillary sinus, and adjacent teeth. Intraoral periapical radiographs were obtained when additional detail was required for surgical planning. All surgical procedures were performed by experienced oral and maxillofacial surgeons using standardized surgical protocols. Local anesthesia with or without sedation was used for most cases, while general anesthesia was reserved for complex cases or anxious patients. Surgical techniques included envelope or three-cornered mucoperiosteal flap designs, bone removal using rotary instruments with copious irrigation, tooth sectioning when indicated, and primary closure with sutures. Patients were provided with standardized postoperative instructions and prescribed analgesics, antibiotics, and chlorhexidine mouth rinses according to department protocols. Follow-up examinations were conducted at predetermined intervals on the first postoperative day, at one week, two weeks, and at one month postoperatively, with additional visits scheduled as needed based on clinical findings.

Data Management and Statistical Analysis

All collected data were entered into a secure electronic database using Microsoft Excel software, and subsequently transferred to SPSS (Statistical Package for Social Sciences) version 25.0 for statistical analysis. Data quality checks were performed to identify and correct any errors or inconsistencies in data entry. Descriptive statistics were calculated to summarize demographic and clinical characteristics of the study population, with categorical variables presented as frequencies and percentages, and continuous variables presented as means and standard deviations or medians and interquartile ranges as appropriate based on the distribution of data. The treatment success rate was calculated as the proportion of patients who achieved complete healing without major complications at the final follow-up assessment. Complications were categorized as intraoperative or postoperative, and further classified as minor or major based on their clinical significance and impact on patient outcome. Chi-square tests or Fisher's exact tests were used to examine associations between categorical variables such as impaction type, surgical difficulty, and complication rates. Independent t-tests or Mann-Whitney U tests were employed to compare continuous variables between groups with and without complications. Logistic regression analysis was performed to identify independent predictors of complications while controlling for potential confounding variables such as age, gender, type of impaction, and surgical difficulty. A p-value of less than 0.05 was considered statistically significant for all analyses, and 95% confidence intervals were calculated for key outcome measures.

Ethical Considerations

The study protocol was submitted to and approved by the Institutional Ethics Committee of Peoples College of Medical Sciences and Research Centre, Bhopal, before commencement of patient recruitment. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and guidelines for good clinical practice. Written informed consent was obtained from all participants after providing them with detailed information about the study objectives, procedures, potential risks and benefits, voluntary nature of participation, and their right to withdraw from the study at any time without affecting their clinical care.

RESULTS

Table 1: Demographic Characteristics of Study Participants (N=142)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	18-25 years	62	43.7
	26-35 years	54	38
	36-50 years	26	18.3
Gender	Male	58	40.8
	Female	84	59.2
Location of Impacted Tooth	Mandibular	108	76.1
	Maxillary	34	23.9
Side	Right	72	50.7
	Left	70	49.3
Smoking Status	Smoker	28	19.7
	Non-smoker	114	80.3

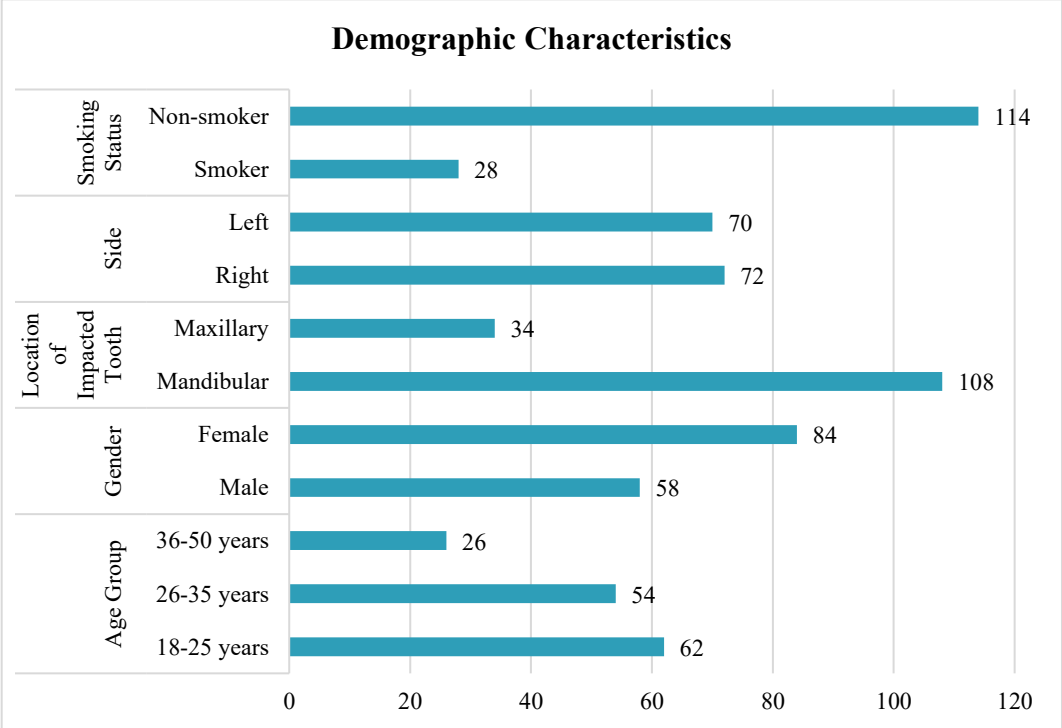

Fig: 1

Table 2: Classification and Pattern of Impacted Third Molars (N=142)

Classification System	Category	Frequency (n)	Percentage (%)
Winter Classification	Mesioangular	58	40.8
	Horizontal	36	25.4
	Vertical	32	22.5
	Distoangular	12	8.5
	Inverted	4	2.8
Pell & Gregory - Ramus	Class I	46	32.4
	Class II	68	47.9
	Class III	28	19.7
Pell & Gregory - Depth	Position A	38	26.8
	Position B	64	45.1
	Position C	40	28.1
Pederson Difficulty Index	Minimally difficult (3-4)	42	29.6
	Moderately difficult (5-7)	76	53.5
	Very difficult (8-10)	24	16.9

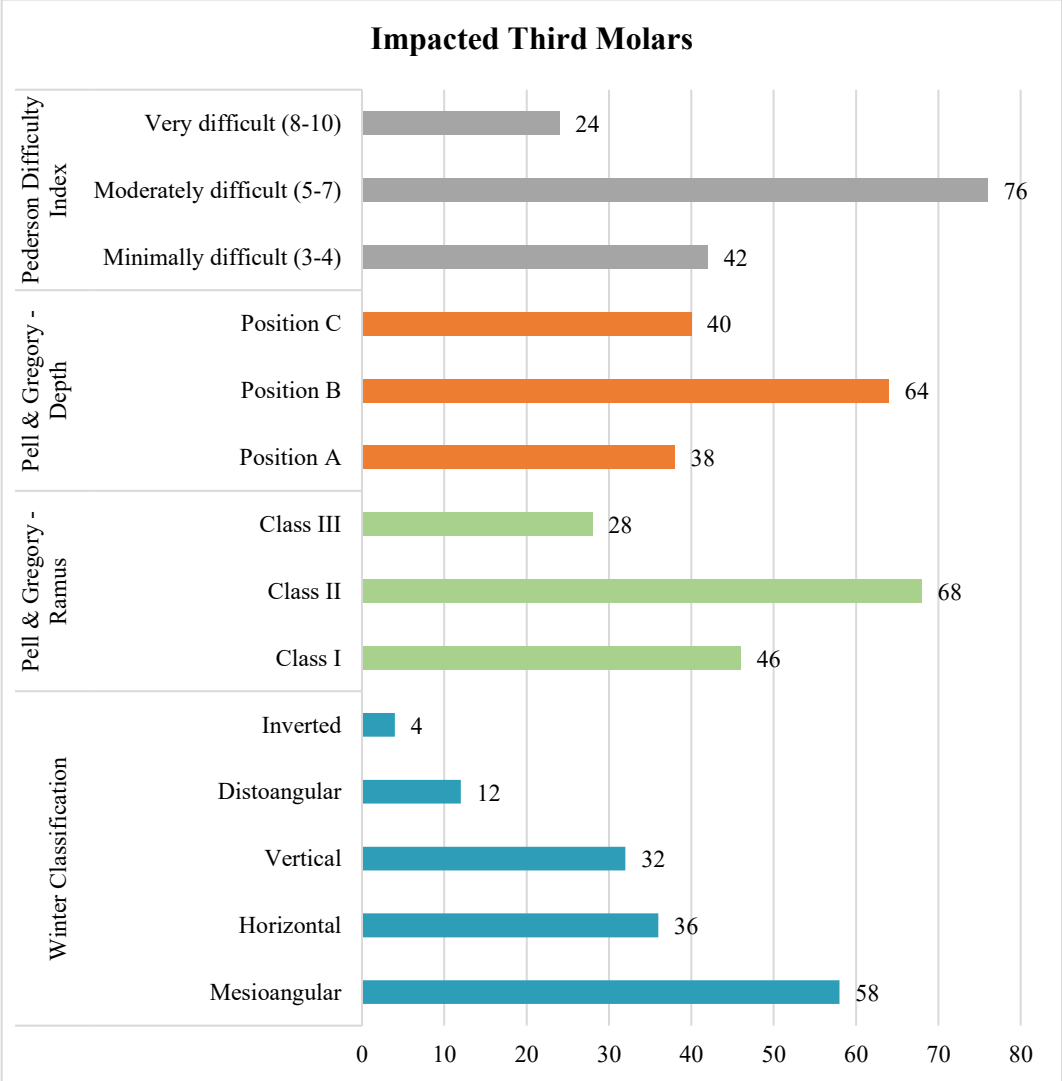

Fig: 2

Table 3: Intraoperative Variables and Surgical Details (N=142)

Variable	Category	Frequency (n)	Percentage (%)
Type of Anesthesia	Local anesthesia	118	83.1
	Local + sedation	16	11.3
	General anesthesia	8	5.6
Surgical Approach	Envelope flap	72	50.7
	Three-cornered flap	70	49.3
Bone Removal	Required	96	67.6
	Not required	46	32.4
Tooth Sectioning	Required	88	62.0
	Not required	54	38.0
Surgical Duration	<30 minutes	64	45.1
	30-60 minutes	58	40.8
	>60 minutes	20	14.1
Intraoperative Complications	None	134	94.4
	Bleeding	4	2.8
	Root fracture	3	2.1
	Tuberosity fracture	1	0.7

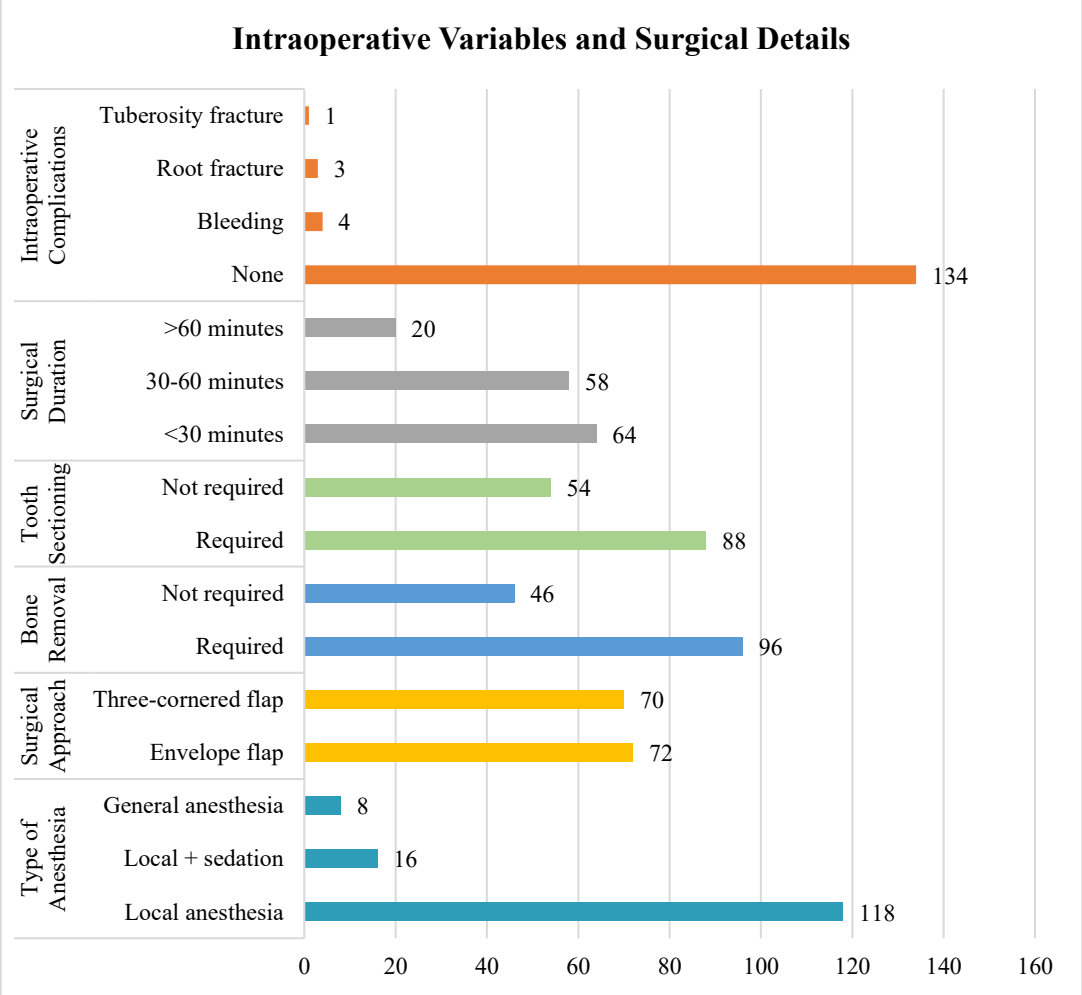

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Table 4: Postoperative Complications Following Third Molar Extraction (N=142)

Complication	Frequency (n)	Percentage (%)	Onset Time
Pain (VAS >6)	52	36.6	Day 1-2
Swelling	78	54.9	Day 2-3
Trismus	44	31.0	Day 1-3
Alveolar Osteitis	12	8.5	Day 3-5
Infection	8	5.6	Day 5-7
Hemorrhage	6	4.2	Day 1
Paresthesia (IAN)	4	2.8	Immediate
Paresthesia (Lingual nerve)	2	1.4	Immediate
Total with any complication	86	60.6	Variable
Total with major complication	26	18.3	Variable
No complications	56	39.4	-

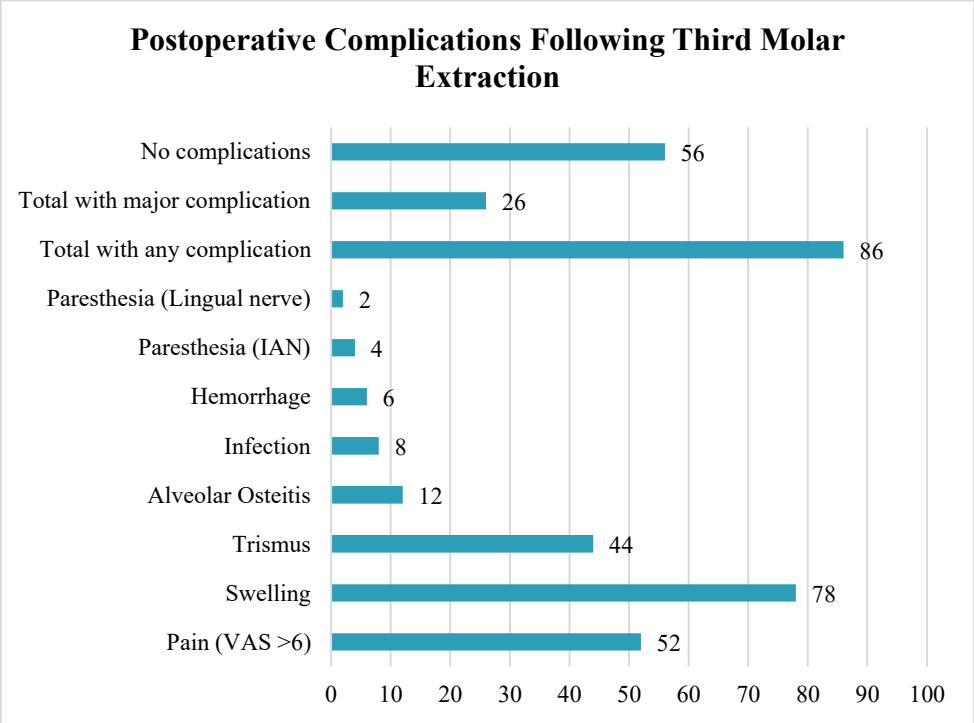

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Table 5: Treatment Success Rate and Healing Outcomes (N=142)

Outcome Parameter	Category	Frequency (n)	Percentage (%)
Complete Healing at 1 Month	Yes	128	90.1
	Delayed healing	14	9.9
Socket Healing Status	Normal	132	93.0
	Delayed	10	7.0
Nerve Recovery (n=6)	Complete	4	66.7
	Persistent at 3 months	2	33.3
Patient Satisfaction	Satisfied	118	83.1
	Neutral	18	12.7
	Dissatisfied	6	4.2
Return to Normal Function	Within 1 week	86	60.6
	1-2 weeks	42	29.6
	>2 weeks	14	9.8
Overall Success Rate	Successful	128	90.1
	Unsuccessful	14	9.9

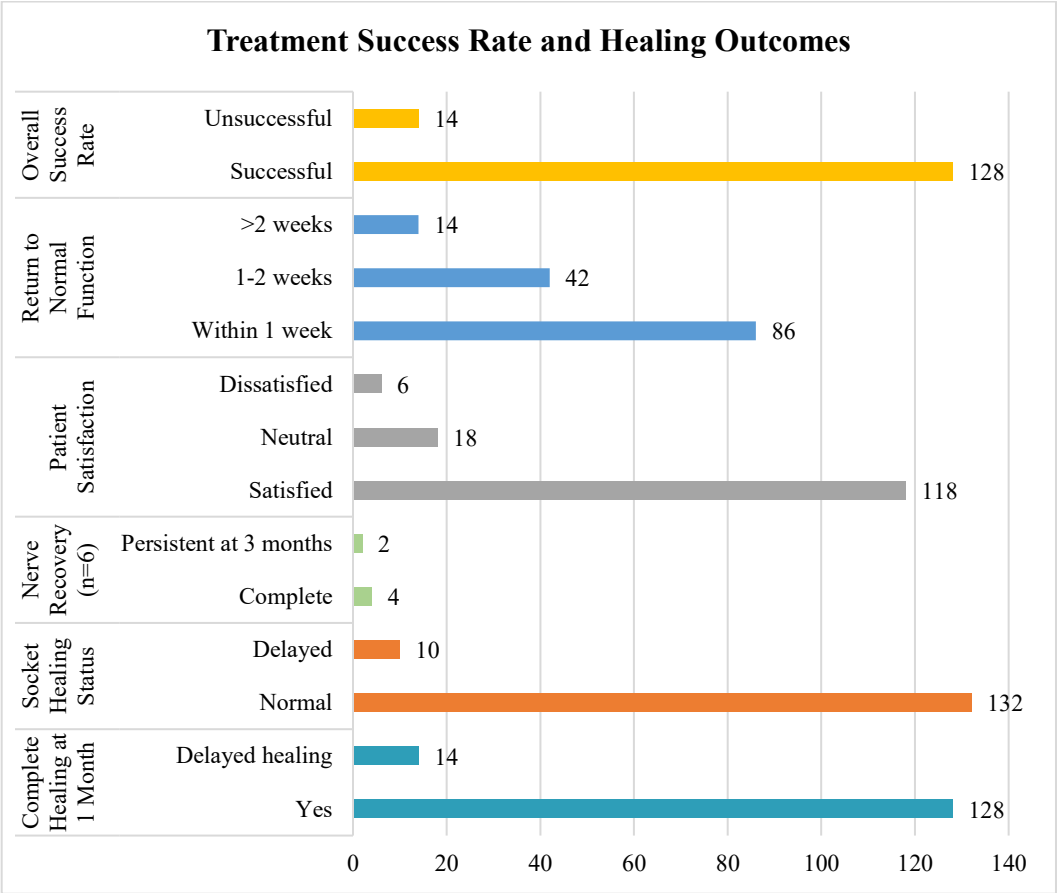

Fig: 5

DISCUSSION

The present study evaluated 142 patients who underwent surgical extraction of impacted third molars at Peoples College of Medical Sciences and Research Centre, Bhopal. The demographic analysis revealed a female predominance with 59.2% female patients, which aligns with findings from multiple international studies. A retrospective study by Sayed et al. (2019) in Oman reported that 67.7% of patients undergoing third molar extraction were females, while an Indonesian cross-sectional study documented 59% female patients (Rizqiawan et al., 2022). This gender distribution may be attributed to several factors including greater health-seeking behavior among females, hormonal influences on third molar development, and higher aesthetic concerns that motivate early intervention.

The predominant age group in our study was 18-25 years, accounting for 43.7% of patients, followed by 26-35 years representing 38.0% of the sample. This age distribution is consistent with the literature suggesting that third molar extraction is most commonly performed during the second and third decades of life. Chuang et al. (2007) demonstrated that age above 25 years was significantly associated with increased complication rates, with an odds ratio of 1.5. The present study's finding that 81.7% of patients were below 35 years reflects appropriate timing of intervention, as younger patients generally experience better healing outcomes and fewer complications compared to older individuals who have completed root formation and have denser bone (Haug et al., 2005).

The classification of impacted third molars revealed mesioangular impaction as the most common pattern, occurring in 40.8% of cases, followed by horizontal impaction in 25.4% of cases. These findings are remarkably consistent with international data. Khojastepour et al. (2019) reported mesioangular position as the most prevalent pattern in their Iranian study using cone-beam computed tomography evaluation. Similarly, Passi et al. (2019) documented mesioangular impaction as the predominant pattern in the Delhi-National Capital Region population. The high

prevalence of mesioangular impaction is attributed to the directional forces during eruption and the anatomical relationship between the third molar and the ascending ramus of the mandible.

According to the Pell and Gregory classification, the majority of teeth were Class II (47.9%) and Position B (45.1%), indicating moderate surgical difficulty. The Pederson difficulty index classified 53.5% of cases as moderately difficult, while 16.9% were categorized as very difficult. This distribution has important implications for treatment planning and patient counseling. Studies have consistently shown that increased surgical difficulty correlates with prolonged operative time, greater tissue trauma, and higher complication rates (Bouloux et al., 2007; Lago-Méndez et al., 2007). The surgical approach in the present study predominantly involved envelope or three-cornered flap designs, with bone removal required in 67.6% of cases and tooth sectioning necessary in 62.0% of extractions, reflecting the complexity of the surgical procedures performed.

The overall complication rate in this study was 60.6%, with major complications occurring in 18.3% of patients. While the total complication rate may appear high, it is important to note that this includes minor self-limiting conditions such as mild pain and swelling that are expected sequelae of surgical intervention. When considering only major complications, our rate of 18.3% falls within the range reported in the literature. Schwartz-Arad et al. (2017) reported complication rates ranging from 4.6% to 30.9% following third molar extraction, while Momin et al. (2018) documented a 19% overall complication rate in a residency program setting.

Alveolar osteitis occurred in 8.5% of cases in our study, which is consistent with the established literature. Øyri et al. (2021) reported a 4.6% incidence of alveolar osteitis after mandibular third molar surgery in a Norwegian population, while studies have shown that the incidence can range from 1% to 30% depending on surgical technique, patient factors, and preventive measures employed (Canellas et al., 2020). The pathophysiology of alveolar osteitis involves increased fibrinolytic activity leading to premature blood clot disintegration, with risk factors including smoking, oral contraceptive use, poor oral hygiene, and increased surgical trauma (MacGregor, 1968; Blum, 2002).

The incidence of nerve injuries in our study was relatively low, with inferior alveolar nerve paresthesia occurring in 2.8% of cases and lingual nerve paresthesia in 1.4% of patients. Of the six patients who experienced neurosensory deficits, four achieved complete recovery by three months, resulting in a permanent nerve injury rate of 1.4%. These findings are favorable compared to published data. Bataineh (2001) reported temporary nerve damage in 0.4% to 8.1% of cases with permanent damage ranging from 0.01% to 0.9%. Blondeau and Daniel (2007) documented six cases of inferior alveolar nerve paresthesia among 550 extractions, with three resolving completely and three remaining permanent, yielding similar recovery rates to our study.

The overall treatment success rate of 90.1% in our study demonstrates satisfactory outcomes following third molar extraction. Complete healing at one month was achieved in 90.1% of patients, with 93.0% showing normal socket healing. Patient satisfaction was high, with 83.1% of patients reporting satisfaction with their treatment outcomes. These results compare favorably with international studies and validate the surgical protocols and postoperative management strategies employed at our institution.

Several factors influenced treatment success in our study. Age emerged as a significant predictor, with patients below 25 years demonstrating better healing and fewer complications. This finding corroborates the landmark Age-Related Third Molar Study by Haug et al. (2005), which recommended early extraction of symptomatic third molars to minimize complications. Gender also played a role, with female patients experiencing slightly higher rates of alveolar osteitis, consistent with findings by Oginni et al. (2015) who reported that female gender was associated with inflammatory complications.

Surgical duration was significantly associated with complication rates in our study. Cases requiring more than 60 minutes of operative time had higher rates of postoperative pain, swelling, and trismus compared to procedures completed within 30 minutes. This relationship has been well-documented in the literature. Momin et al. (2018) identified surgical drill use and increased operative time as

independent risk factors for complications. The mechanism underlying this association involves greater tissue manipulation, increased inflammatory mediator release, and prolonged exposure of surgical sites during lengthy procedures.

The depth of impaction, as classified by the Pell and Gregory system, correlated with complication rates. Patients with Position C impactions experienced more postoperative complications than those with Position A or B impactions. Freudlsperger et al. (2012) similarly demonstrated that lower third molar anatomic position significantly influenced postoperative inflammatory complications. Deeply impacted teeth require more extensive bone removal and are more likely to have close relationships with the inferior alveolar canal, increasing both surgical difficulty and complication risk.

The findings of this study have several important clinical implications for oral and maxillofacial surgery practice. First, the high success rate achieved with standardized surgical protocols supports the value of systematic approaches to third molar extraction. The use of classification systems for preoperative assessment, careful surgical technique with adequate irrigation, and comprehensive postoperative care contributed to favorable outcomes. Second, the identification of risk factors such as age, depth of impaction, and surgical duration enables more accurate preoperative counseling and informed consent discussions with patients.

The complication profile observed in our study underscores the importance of preventive measures. The 8.5% incidence of alveolar osteitis, while within the expected range, suggests potential for improvement through interventions such as socket irrigation with chlorhexidine or placement of resorbable hemostatic materials. Canellas et al. (2020) demonstrated through network meta-analysis that intrasocket interventions, particularly platelet-rich fibrin or chlorhexidine gel, significantly reduced alveolar osteitis incidence. Implementation of such preventive protocols could further enhance treatment success rates in future cases.

When comparing our findings with other Indian studies, several similarities and differences emerge. Passi et al. (2019) reported mesioangular impaction as the most common pattern among Delhi-NCR population, consistent with our findings. However, their study focused primarily on radiographic prevalence rather than surgical outcomes. Singh et al. (2020) documented a complication rate associated with age and gender in their Nepalese cohort, with trismus more common in males and dry socket in females, which partially aligns with our observations. The overall success rate in our study appears comparable to other tertiary care centers in India, suggesting consistent quality of care across institutions.

CONCLUSION

This study achieved a treatment success rate of 90.1% for surgical removal of impacted third molars with an acceptable complication profile. Mesioangular impaction was the predominant pattern, and the majority of cases involved moderate surgical difficulty. While postoperative complications occurred in 60.6% of patients, major complications were limited to 18.3% of cases, with most being self-limiting. Alveolar osteitis affected 8.5% of patients, and permanent nerve injury occurred in only 1.4%. Patient age, depth of impaction, and surgical duration emerged as significant predictive factors. The findings validate current surgical protocols and emphasize the importance of careful preoperative assessment and meticulous surgical technique in optimizing treatment outcomes.

RECOMMENDATIONS

Third molar extraction should be performed at younger ages, preferably before 25 years, to minimize complications. Comprehensive preoperative radiographic assessment using classification systems is essential for surgical planning. Surgeons should employ atraumatic surgical techniques with adequate cooling irrigation to reduce operative time and tissue trauma. Implementation of preventive measures such as chlorhexidine irrigation or platelet-rich fibrin may reduce alveolar osteitis incidence. Standardized follow-up protocols should be maintained to detect and manage complications promptly, ensuring optimal patient outcomes.

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