Complications Associated with Surgical Removal of Mandibular Third Molar: A Prospective Study

Dr. Ashutosh Kumar Singh

Department of Oral and Maxillofacial Surgery, College of Medical Sciences, Bharatpur, Nepal

Correspondence:

Dr. Ashutosh Kumar Singh. Email: drashutoshkumarsingh@gmail.com

ABSTRACT

Introduction: Mandibular third molars are commonly impacted and surgical removal is indicated if associated with pathologic process causing discomfort. Patient variables like age, sex, angulation, depth and position of impaction affects the complications associated with surgical removal.

Objective: To describe complications associated with surgical removal of impacted mandibular third molars.

Materials and Method: A single center prospective study was planned in which patients presented for surgical removal of mandibular third molar were included in the study and their variables were recorded from clinical record and OPG. Complications were recorded during followup which was upto 3 months and descriptive analysis and chi squared test was done to correlate the patient variables with outcome variables.

Result: Complication rate was generally higher with increasing age, Trismus was associated with male gender and dry socket was seen more often in females. Nerve injuries were very uncommon and always temporary usually resolving within 3 months of followup.

Conclusion: There was association of complication rate with increasing age, male sex had higher incidence of trismus whereas dry socket was commonly seen in females. Increasing depth level and position C was associated with higher rate of complications. Nerve injuries are very uncommon and preventable with good surgical technique and even if they occur are most of the times temporary and not significant.

Keywords: Complications; impaction; third molar.

INTRODUCTION

Mandibular third molars are the most common teeth to be impacted and routinely require surgical exposure for removal. Impacted mandibular third molars (M3) are associated with pericoronitis which might lead to facial space infections, periodontal pocket in second molar, fibrosis and trismus.[1] There is controversy, as the American association of oral and maxillofacial surgeons (AAOMS) white paper recommends prophylactic removal of M3 as beneficial in prevention of periodontal pocket, mandibular angle fractures, recurrent pericoronitis and orthodontic crowding,[2] whereas National health trust UK guidelines suggest that removal of M3 has no added benefits and should only be removed surgically if symptomatic.[3] The complications associated with surgical removal of M3 are swelling, trismus, dry socket, infection, inferior alveolar nerve damage (IAND) and lingual nerve damage (LND). Overall complication rate of third molar surgery range from 4.6% to 30.9% [4] and has been correlated with age, gender, classification of impaction, oral contraceptive use, smoking, difficulty level and morphology of roots.[5, 6]

Studies have shown relationship between post-operative complications with sex, age and difficulty level of impactions.[7,8] Our study would describe data in our patient population and compare the data with similar national and international studies.

MATERIALS AND METHOD

A single center prospective cohort study was designed. All patient presenting for and indicated for surgical removal of M3 were included in the study meeting the inclusion criteria. The study was conducted at department of oral and maxillofacial surgery, College of medical sciences, Bharatpur from January 2016 to August 2017.

Inclusion criteria: Patient aged 16 to 50 presenting with impacted M3 and for whom surgical removal was planned.

Exclusion criteria: Patient younger than 16 years and older than 50 years were excluded as their age variable would skew the data and affect the correlation between age and complications. Patient undergoing chemotherapy and radiotherapy, Type I diabetes, renal failure and chronic liver disease were excluded as immunocompromised state would have affected the post operative complications. Ethical approval was obtained from Institutional review board and informed consent was taken from patients after explaining the study and collection of their data for study purpose. No additional cost was borne by the patients and the study was self-funded by the department of oral and maxillofacial surgery. All consecutive patients fulfilling inclusion criteria were selected by convenience sampling. Sample size was assumed from similar study with variables and outcomes which had similar number of participants.[7] Demographic data was collected by principal author during first visit when the surgery was done. Outcome measures were collected by second investigator who was not involved in the surgery to reduce bias. Primary surgeon was not involved in assessment and collection of complication related data.

All surgery was performed by the principal author under aseptic conditions and local anaesthesia. Triangular mucoperiosteal flap was elevated and bone removal was done using rotary instruments to a level just below cervical margin of crown of M3 where the surgeon felt a bur drop. Horizontal impactions were removed with division of crown and roots and elevation of root horizontally towards the crown space. Flap was closed with first suture around the second molar to prevent periodontal pocket formation and root exposure leading to sensitivity. Few more sutures were placed to obtain a primary closure. No preoperative antibiotics were used. Post operative regimen consisted of antibiotics for 5 days and analgesics for 3 days along with oral hygiene instructions and chlorhexidine mouthwash for 14 days.

Baseline data of age and sex were recorded from the patients file. All patients were advised OPG and Winter's classification (mesioangular, horizontal, vertical and distoangular)[9] was done after angulation was determined from the OPG. Pell and Gregory depth (Level I, II and III) and space classification (Position A, B and C)[10] was done from the OPG with Orthoralix Vixwin software and recorded.

Complications were classified as Trismus, dry socket, Lingual nerve damage (LND), Inferior alveolar nerve damage (IAND) and infection. Trismus was defined as mouth opening less than 10 mm measured at incisal edges of upper and lower central incisors with a stainless-steel scale. Dry socket was defined as severe pain not controlled by analgesics occurring after 3 days of surgery and with empty and foul-smelling socket with loss of primary sutures.

Lingual nerve and inferior alveolar nerve damage were defined as any neurosensory changes observed subjectively (hypo, hyper, para and dysesthesia as experienced and reported by the patient) and objectively by light touch and pin prick performed by investigators.

Infection was defined as localised tender swelling in the operated area with discharge occurring 5 days after surgery. These outcomes are measured in similar ways by previous studies as well and are reproducible, valid and reliable methods to collect data on these complications.[6,7] Patients were recalled on third post operative day for evaluation and data collection, on 7th post-operative day for suture removal, evaluation and data collection and one-month post operation for any neurosensory related complications. Patients with neurosensory

changes were followed up further for two months for a total of three months to evaluate if the changes were temporary or permanent. SPSS version 20 software was used to analyse the data. Descriptive analysis was done for baseline variables (age, sex, angulation, depth and position). Chi square test was done to find relation between baseline variables and complications.

RESULT

Out of 401 patients enrolled in the study, all completed the followup and there were no dropouts. Out of 401 participants, 178 (44.4%) were female and 223 (55.6%) were male. Mesioangular impaction was most common angulation (62.3%) followed by distoangular (24.9%). Depth I and II were equally common (47.6%) and (46.4%) respectively. Position 2 was very common with (91.0%). Age ranged from 18 to 43 years with average of 27 years. Most patients were in 26-35 years age group (55.4%) followed by 15-25 years age group (37.9%).

Overall complication rate was 37.4%, with dry socket (15%) and trismus (14.5%) most commonly observed complications. Inferior alveolar neurosensory change was not seen in any cases and temporary lingual nerve neurosensory changes were seen in nine cases which resolved spontaneously. No permanent nerve injury was observed after three months follow up. Infection was seen in 32 cases (8%) which resolved after some suture were removed for drainage and local irrigation and tablet metronidazole 400 mg thrice daily regimen was added for 5 days (Table 1).

Results showed significant association between trismus and gender (P value =0.027) with 40 cases of trismus observed in males compared to just 18 in females (Table 2). Horizontal impaction (42.9%), level III depth (79.2%) and position C (100%) was most commonly associated with trismus, which was statistically significant (P<0.001) (Table 3,4,5). Dry socket was observed significantly more with female sex (20.2%) compared to male (10.8%), P=0.008 (Table 2). Vertical impaction was commonly associated with dry socket (24.3%) which was not statistically significant (Table 3). Depth and position didn't seem to affect the incidence of dry socket with statistically insignificant association. Out of 9 cases of lingual nerve neurosensory disturbances, 8 were seen in males and 1 in females which was temporary in all cases and in 3 months follow up hypoesthesia and paresthesia was not observed in any cases. There was a significant association between mesioangular angulation and incidence of temporary lingual nerve damage (14.3%), P=0.013 (Table 3). There was no incidence of inferior alveolar nerve related neurosensory disturbance. There was significant association between depth level II (29.2%), P=0.000 and position C (100%), P=0.000 and incidence of temporary lingual nerve damage (Table 4,5).

There was significant association between horizontal impaction and incidence of infection (28.6%), P=0.020 (Table 3). Gender, depth, position and age had no effect on incidence of infection. There was no statistically significant association between age of patients and any other complications other than dry socket which showed significant association with chi square test, (P=0.021) and Spearman correlation (P=0.009) in the age group 26-35.

Table 1: Incidence and percentage of complications.

Complication	Incidence n (%)
Swelling	303 (75.6)
Trismus	58 (14.5)
Dry Socket	60 (15)
IAND	0
LND	9 (2.2)
Infection	32 (8)

Table 2: Association of complications with gender.

Complication	Male n (%)	Female n (%)
Swelling	155 (69.5)	148 (83.1)
Trismus	40 (17.9)	18 (10.1)
Dry Socket	36 (10.8)	24 (20.2)
IAND	0	0
LND	8 (3.6)	1 (6)
Infection	10 (9.9)	22 (5.6)

Table 3: Association of complications with angulation of impaction.

Complication	Mesioangular n (%)	Horizontal n (%)	Vertical n (%)	Distoangular n (%)
Swelling	195 (78.0)	14 (100.0)	19 (51.4)	75 (75.0)
Trismus	48 (19.2)	6 (42.9)	1 (2.7)	3 (3.0)
Dry Socket	36 (14.4)	1 (7.1)	9 (24.3)	14 (14.0)
IAND	0	0	0	0
LND	6 (2.4)	2 (14.3)	0 (0.0)	1 (1.0)
Infection	18 (7.2)	4 (28.6)	1 (2.7)	9 (9.0)

Table 4: Association of complications with depth of impaction.

Complication	Depth I n (%)	Depth II n (%)	Depth III n (%)
Swelling	113 (59.2)	168 (90.3)	22 (91.7)
Trismus	6 (3.1)	33 (17.7)	19 (79.2)
Dry Socket	26 (13.6)	32 (17.2)	2 (8.3)
IAND	0	0	0
LND	2 (1.0)	0 (0.0)	7 (29.2)
Infection	15 (7.9)	13 (7.0)	4 (16.7)

Table 5: Association of complications with position of impaction.

Complication	Position A n (%)	Position B n (%)	Position C n (%)
Swelling	5 (14.7)	296 (81.1)	2 (100.0)
Trismus	3 (8.8)	53 (14.5)	2 (100.0)
Dry Socket	8 (23.5)	52 (14.2)	0 (0.0)
IAND	0	0	0
LND	0 (0.0)	7 (1.9)	2 (100.0)
Infection	2 (5.9)	30 (8.2)	0 (0.0)

DISCUSSION

Majority of studies show that more and more impacted mandibular third molars are being removed at an early age, and our study sample also consisted of patients below 30 years of age.[11,12] Mesioangular impaction was the most common followed by horizontal and distoangular which is similar to other studies.[13,14] Level II depth and position B was most common in our study which is similar to finings in other studies, and probably is because this position and depth has increased probability of developing pericoronitis and patient seeking treatment.[15]

Our combined complication rate is on higher side compared to similar studies probably due to way complications are defined and also due to less patient compliance with post surgery instructions. compared to international standards.

We had very low nerve injury related complications with no inferior alveolar nerve injury and only temporary lingual nerve injury which resolved during three months follow up. Our surgical technique was to create a wider trough on buccal and distal side of M3 to allow more space for removal of M3 which allowed us to not drill deep towards the root of M3 and less manipulation required for removal. We always place a simple periosteal retractor under lingual flap to protect the lingual nerve. Mesioangular angulation showed significant association with temporary lingual nerve injury similar to other studies. Temporary lingual nerve injury was significantly associated with Depth level II and position B because of wider flap elevation required to expose the M3 in these cases. We advocate the use of periosteal elevator as simple retractor to be placed under lingual flap if distal and lingual bone removal is required to protect the superficially located lingual nerve.

Dry socket and trismus were seen as the most common complication in our study. Trismus occurred significantly more in males compared to females probably because of smaller tooth size in females and less exposure required distal to M3 for removal which led to less manipulation of anterior fibers of temporalis muscle attachment at anterior border of ramus. Depth level III and position C both require a larger flap elevation with injury to temporalis muscle fibers as well as longer time and more bone removal leading to trismus.[16] There is evidence that steroids, particularly dexamethasone intraoperative and post operative regimen leads to less edema, pain and trismus.[17]

Dry socket was seen significantly more in females and compared to males and with vertical impactions. Oral contraceptive use has been attributed to dry socket incidence[18] but we didn't record any oral contraceptive use from our patients so definitive association cannot be derived from our study. Cohen et al. didn't find enough data to associate oral contraceptive use with increased incidence of drysocket.[19] Dry socket incidence can be reduced with copious irrigation after removal of M3, clot stabilisation with biodegradable socket implants like gelatin sponge or micro fibrillar collagen, approximating sutures that reduce the clot fibrinolysis and local placement of intrasocket medicaments like tetracycline.[20,21] There was significant association of age with incidence of dry socket. This might be due to reduced immunity of the patient as well as longer surgical process in older patients due to dense brittle bone, reduced periodontal ligament space and long fully formed roots which increases susceptibility to bacterial contamination.[22] Vertical impactions was significantly associated with dry socket because it requires removal of a large portion of buccal bone leading to loss of socket wall to support the clot.

Infections were not seen commonly in our study probably because of antibiotic regimen advised post surgery. We advise the use of broad-spectrum antibiotics targeted to oral microorganism for established infections. Horizontal impaction was found to be associated significantly with incidence of infections and the reason could be because these impactions are usually associated with pericoronitis as these provide uncleanable soft tissue pocket distal to second molar where food debris lodgment occurs harboring bacterial process. Seeding of these bacteria might occur during surgery and we end up with higher incidence of infection.[23] Infection can be reduced by prophylactic antibiotic regimen and chlorhexidine mouthwash started 2 days before surgery.[24]

Limitation of the study was that it was not a randomized study and standardization of assessment methods was difficult as clinical outcomes are assessed subjectively, though the primary surgeon was blinded to the outcome assessment to reduce bias. Potential confounders like OCP use among females, lack of strict international level of sterilization, blunt instruments might have affected the outcomes as much as primary variables which were not accounted for. These findings can help understand the relationship between age, sex, angulation, depth and position of impaction and its effect on clinical outcomes. Surgical planning should include all these factors and steps should be taken as per evidence to minimize the complications and higher patient satisfaction.

CONCLUSION

Our study found that there was association of complication rate with increasing age, male sex had higher incidence of trismus whereas dry socket was commonly seen in females. Mesioangular impaction was the most common type of impaction. Increasing depth level and position C was associated with higher rate of complications. Nerve injuries are very uncommon and preventable with good surgical technique and even if they occur, they are most of the times temporary and not significant.

ACKNOWLEDGEMENT

We acknowledge the interns posted in department of oral and maxillofacial surgery for assisting in collection and tabulation of data.

Conflict of Interest: None

JNDA

REFERENCES

1. Yilmaz S, Adisen MZ, Misirlioglu M, Yorubulut S. Assessment of third molar impaction pattern and associated clinical symptoms in a central Anatolian turkish population. Med Princ Pract. 2015 Nov 13;25(2):169-75.
2. White RP, Proffit WR. Evaluation and management of asymptomatic third molars: Lack of symptoms does not equate to lack of pathology. Am J Orthod Dentofac Orthop. 2011 Jul;140(1):10-6.
3. McArdle LW, Renton T. The effects of NICE guidelines on the management of third molar teeth. Br Dent J. 2012 Sep;213(5):E8-8.
4. Kim J-Y, Jee H-G, Song HC, Kim S-J, Kim M-R. Clinical and pathologic features related to the impacted third molars in patients of different ages: A retrospective study in the Korean population. J Dent Sci. 2017 Dec;12(4):354-9.
5. Akadiri OA, Obiechina AE. Assessment of difficulty in third molar surgery - a systematic review. J Oral Maxillofac Surg. 2009 Apr;67(4):771-4.
6. Bouloux GF, Steed MB, Perciaccante VJ. Complications of third molar surgery. Oral Maxillofac Surg Clin North Am. 2007 Feb;19(1):117–28.
7. Khanal P, Dixit S, Singh R, Dixit P. Difficulty index in extraction of impacted mandibular third molars and their post-operative complications. J Kathmandu Med Coll. 2014 Aug 12;3(1):14-20.
8. Patel S, Mansuri S, Shaikh F, Shah T. Impacted mandibular third molars: a retrospective study of 1198 cases to assess indications for surgical removal, and correlation with age, sex and type of impaction—a single institutional experience. J Maxillofac Oral Surg. 2017 Mar;16(1):79-84.
9. G. B. Winter. The Principles of Exodontia as Applied to the Impacted Third Molar. St. Loius: American Medical Book co, 1926.
10. G. J. Pell and B. T. Gregory. Impacted mandibular third molars: classification and modified techniques for removal. Dent Digest, 1933.
11. Padhye MN, Dabir AV, Girotra CS, Pandhi VH. Pattern of mandibular third molar impaction in the Indian population: a retrospective clinico-radiographic survey. Oral Surg, Oral Med, Oral Pathol Oral Radiol. 2013 Sep;116(3):e161-6.
12. Nejat A, Shamsabadi Rm, Rezaei N, Eshghpour M, Nezadi A, Moradi A. Pattern of mandibular third molar impaction: A cross-sectional study in northeast of Iran. Niger J Clin Pract. 2014;17(6):673-7.
13. Upadhyaya C, Chaurasia NK, Neupane I, Srivastava S. Incidence and Pattern of Impaction of Mandibular Third Molar: A Single Institutional Experience in Nepal. Kathmandu Univ Med J 2017;57(1):66-9.
14. Alsadat-Hashemipour M, Tahmasbi-Arashlow M, Fahimi-Hanzaei F. Incidence of impacted mandibular and maxillary third molars-a radiographic study in a Southeast Iran population. Med Oral. 2013;e140-5.
15. Yamalık K, Bozkaya S. The predictivity of mandibular third molar position as a risk indicator for pericoronitis. Clin Oral Invest. 2008 Mar;12(1):9-14.
16. Balakrishnan G, Narendar R, Kavin T, Venkataraman S, Gokulanathan S. Incidence of trismus in transalveolar extraction of lower third molar. J Pharm Bioallied Sci. 2017;9(Suppl 1):S222-7.
17. O'Hare PE, Wilson BJ, Loga MG, Ariyawardana A. Effect of submucosal dexamethasone injections in the prevention of postoperative pain, trismus, and oedema associated with mandibular third molar surgery: a systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2019 May; S0901502719311075.
18. Tarakji B, Saleh LA, Umair A, Azzeghaiby SN, Hanouneh S. Systemic review of dry socket: aetiology, treatment, and prevention. J Clin Diagn Res. 2015 Apr;9(4):ZE10-3.
19. Cohen ME, Simecek JW. Effects of gender-related factors on the incidence of localised alveolar osteitis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1995 Apr;79(4):416-22.
20. Mamoun J. Dry socket aetiology, diagnosis, and clinical treatment techniques. J Korean Assoc Oral Maxillofac Surg. 2018;44(2):52.
21. Houston JP, Mccollum J, Pietz D, Schneck D. Alveolar osteitis: a review of its aetiology, prevention, and treatment modalities. Gen Dent. 2002;50(5):457-63
22. Kolokythas A, Olech E, Miloro M. Alveolar osteitis: a comprehensive review of concepts and controversies. Int J Dent. 2010;2010:249073.
23. Sigron GR, Pourmand PP, Mache B, Stadlinger B, Locher MC. The most common complications after wisdom-tooth removal: part 1: a retrospective study of 1,199 cases in the mandible. Swiss Dent J. 2014;124(10):1042-6, 1052-6.
24. Susarla SM, Sharaf B, Dodson TB. Do antibiotics reduce the frequency of surgical site infections after impacted mandibular third molar surgery? Oral Maxillofac Surg Clin North Am. 2011;23(4):541-6.