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Original Article

Comparison of Three Corner Flap with Vestibular Incision in the Management of Mandibular Body Fractures

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ABSTRACT

Objectives: To compare the three corner flap with vestibular incision in order to approach mandibular body fractures in terms of frequency of post-operative neurosensory disturbance in directional sense and mean post-operative mouth opening at 1st and 3rd post-operative day.

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi Pakistan from Aug 2020 to Jan 2021.

Methodology: A total of 72 patients, 36 in each group were enrolled in the study after getting consent. The patients were selected according to inclusion criteria and samples were assigned to two groups. All the procedures were performed by same classified oral and maxillofacial surgeon, and the patients were evaluated on 1st and 3rd postoperative day where postoperative mouth opening was measured as inter incisal distance in millimeters on asking patients to open mouth maximally.

Results: In Group-A (three corner flap group) mean inter-incisal mouth opening at day 1 was 42.10±1.85 mm and at day 3 it was 42.80 ± 1.14 mm. Whereas in Group-B (vestibular incision group) mean inter-incisal mouth opening at day 1 was 35.80± 1.44 mm and at day 3 it was 41.55 ±1.36 mm. The frequency of post-operative neurosensory disturbance in Group-A at day 1 was 16.7% and at day 3 it was 11.1%. Whereas in Group-B frequency of neurosensory disturbance at day 1 was 66.7% and at day 3 it was 55.6%.

Conclusion: Three corner flap is a preferred method to approach mandibular body fractures in terms of frequency of postoperative neurosensory disturbance and mean postoperative mouth opening at 1st and 3rd postoperative day as compared to vestibular incision.

Keywords: Mandibular body, Neuro sensory disturbance, Three Corner Flap, Vestibular incision,

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INTRODUCTION

Maxillofacial trauma incidence is on the rise due to rapid increase in social and economic activities in developed and developing countries. About 1/3rd of all trauma patients have maxillofacial injuries.[1] The etiology of maxillofacial trauma varies among geographic locations. Main causes are road traffic accidents, falls, interpersonal violence, sports injuries and occupational injuries.[2,3] However in our country bomb blasts have also been a significant cause of maxillofacial injuries.[3] 50% deaths from trauma can be attributed to maxillofacial trauma.[4] Mandible is at great risk of being fractured in maxillofacial trauma due to its unique anatomy and protuberant position. Among maxillofacial fractures, fracture mandible is second most common after nasal bone constituting approximately 38%.[2] Mandibular fractures are associated with loss of function, pain, esthetic disfigurement, decreased quality of life, psychological trauma and financial loss.[3-5] Out of all mandibular fractures, 16.8% fractures occur in body region.[6]

The management goal for jaw fractures is to restore preinjury occlusion. Treatment options for management of mandibular body fractures are either conservative or surgical.[5] Conservative or close treatment involves drawing fractured segments close to each other followed by maxillomandibular fixation for 4 to 6 weeks.1 However close treatment has many disadvantages like compromised nutrition, weight loss, difficulty in maintaining oral hygiene, late restoration of jaw function and loss of work hours.[7] Considering these limitations, most surgeons favor

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surgical or open reduction and internal fixation (ORIF). ORIF is usually performed by intraoral approach and involves semi rigid internal fixation after reduction of fracture segments.[2]

The traditional intraoral approach for ORIF is with vestibular incision followed by fixation with mini-plates, micro-plates or lag screws.[8] This is commonly associated with postoperative sequelae such as swelling, mouth opening limitation, pain, surgical site infection, hardware failure and injury to vital structures.[8,9] The most important vital structure in the body region is the mental nerve which is the main sensory supply to lip, chin and associated hard and soft tissues of this region and is prone to get injured during operation causing paresthesia. Major precipitating factors for these postoperative sequels are excessive manipulation of tissues and poor surgical approach during surgery.[8] Balasubramanian *et al.*,[9] found increased incidence of limited mouth opening and neurosensory disturbance with vestibular approach in comparison to sulcular approach for management of mandibular body fractures.

This stud aimed to compare the three corner flap with vestibular incision to approach the mandibular body fractures in terms of frequency of post-operative neurosensory disturbance in directional sense and mean post-operative mouth opening at 1st and 3rd post-operative day.

METHODOLOGY

This quasi experimental study was carried out at the Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi Pakistan. The participants were recruited through consecutive non-probability sampling technique. The study took place from August 2020 to January 2021 after approval from ERB of the institution (918/Trg Dated 13 May 2020).

A total of 72 patients (36 in each group) were enrolled in the study. The sample size was calculated with the help of WHO sample size calculator considering mean difference in mouth opening at 3rd post-op day of 1.6 mm, 9 standard deviations of 2.3 mm, 9 level of confidence of 95%, 80% study power and 10% precision. Two groups were made, Group-A in which three corner flap was made to approach mandibular body fractures. The incision extended from distil papilla of first molar till mesial papilla of canine where a releasing incision was given. Group-B in which vestibular incision was made which is 5-7 mm below mucogingival junction in lower buccal vestibule from mesial of mandibular canine till distal of 1st mandibular molar.

Inclusion Criteria: Patients with un-displaced or minimally displaced isolated mandibular body fractures of both genders, ranging from age 20-50 years with physical status 1 according to American Society of Anesthesiologists.

Exclusion Criteria: Patients with mental nerve paresthesia following trauma, compromised systemic status, comminuted fractures, and displacement of the fracture segments greater than 5mm.

The history, clinical and radiological examination of the patients with mandibular body fractures were carried out. An informed written consent of the patients was obtained. Demographic details (including name, age, gender, contact) were obtained and recorded on specific data collection form. The patients were selected according to inclusion criteria and samples were assigned to two groups such that patients having odd registration numbers were allocated to Group-A and those with even registration numbers were allocated to Group-B. All the procedures were performed by same classified oral and maxillofacial surgeon with more than 5 years of experience. All fractures were treated with ORIF under general anesthesia by standardized technique. All patients were administered injection Augmenting 1.2g IV preoperatively. Using 10% Pyodine Iodine solution fracture site was disinfected. Local anesthesia was administered at the site of surgical procedure using 2% Lignocaine with 1:100,000 Adrenaline (injection HD Caine plus 1.8ml). Injection I/V Decadron 4mg was given preop and in three postop doses according to institute guidelines.

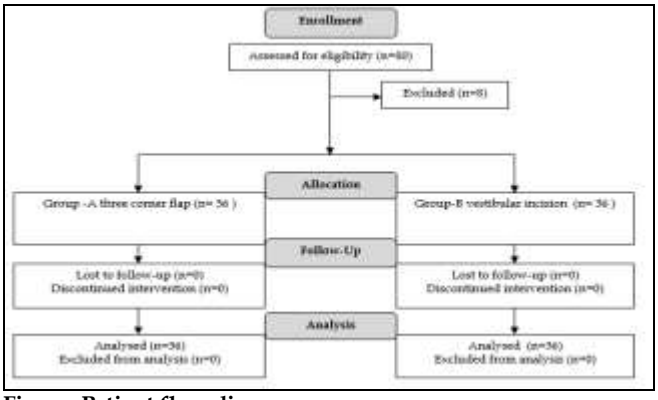

Figure: Patient flow diagram

Mandibular body fractures were approached in Group-B by using vestibular incision. While in Group-A three corner flap with full mucoperiosteal thickness

was raised. Maxillomandibular fixation (MMF) was done in best possible occlusion after which semi rigid fixation was done with two mini plates and screws and MMF was released. Wounds were closed with 3/0 vicryl sutures. The patients were evaluated on 1st and 3rd postoperative day where postoperative mouth opening was measured as inter incisal distance in millimeters on asking patients to open mouth maximally. Postoperative neurosensory impairment was assessed by stroking the test area 15 times with a soft brush then asking the patients to tell the direction of touch while keeping his/her eyes closed. Patient's responses were noted on data collection proforma in number of correct responses out of 15. Less than 90% correct response i.e., 13 or less correct responses were considered abnormal.[9] All patients were administered injection Augmentin 1.2 g IV and injection Flagyl 500mg IV, 12 hourly for 5 days postoperatively.

The Data obtained were entered in statistical software Statistical Package for Social Sciences (SPSS) version 17.1. Descriptive statistics were used to analyze Qualitative and Quantitative variables. Quantitative variables like age and mean postoperative mouth opening at 1st and 3rd postoperative days were measured as Mean±Sd deviation (SD). Qualitative variables like gender and neurosensory impairment at first and third postoperative days were measured as frequency and percentage. Independent sample t-test was applied to compare quantitative variables like mean postoperative mouth opening at 1st and 3rd postoperative days between two groups. Chi-square test was applied to compare qualitative variable like neurosensory impairment at first and third postoperative days. The *p*-value ≤ 0.05 was considered statistically significant.

RESULTS

There were 72 patients enrolled and analyzed in this study, with 36 patients each group. Age distribution among two groups was analyzed as in Group-A, 19(52.8%) patients were between ages 20-35 years, 17(47.2%) were in age ranged 36-50 years. Mean age was 33.8±8.6 years. Whereas in Group-B, 23(63.9%) patients were between ages 20-35 years, 13(36.1%) were in age ranged 36-50 years. Mean age was 31.4±10 years. In Group-A, 19(52.8%) patients were male, and 17(47.2%) patients were female. Whereas in Group-B, 23(63.9%) patients were male, and 13(36.1%) patients were female. Demographic characteristics are given in Table-I.

Frequency of neurosensory disturbance at first post-operative day between two groups was analyzed after 24 hours post-operatively. There were 6(16.7%) patients in Group-A who experienced neurosensory disturbance whereas in Group-B, 24(66.7%) patients experienced neurosensory disturbance as given in Table-II.

Frequency of neurosensory disturbance at third post-operative day among groups was analyzed after 72 hours post-operatively. 4(11.1%) patients in Group-A experienced neurosensory disturbance whereas in Group-B, 20(55.6%) patients experienced neurosensory disturbance as given in Table-III.

Mean inter incisal mouth opening in millimeters at first postoperative day among two groups was analyzed after 24 hours. In Group-A mean inter incisal mouth opening was 42.10±1.85 mm at day one. Whereas in Group-B mean inter incisal mouth opening was 35.80±1.44 mm at day one. Mean inter incisal mouth opening in millimeters at third postoperative day among two groups was analyzed after 72 hours. In Group-A mean inter incisal mouth opening was 42.80±1.14 mm at day three. Whereas in Group-B mean inter incisal mouth opening was 41.50±1.36 mm at day three as given in Table-IV.

Table-I: Demographic Characteristics of Study Participants (n=72)

Characteristics	Overall (n=72)	Group-A (n=36)	Group-B (n=36)	*p* value
Mean age in years (mean± SD)	32.6±9.37	33.8±8.6	31.4±10	0.283
Age groups 20-35 years 36-50 years	 44(61.1%) 28(38.9%)	 19(52.8%) 17(47.2%)	 23(63.9%) 13(36.1%)	0.474
Gender Males Females	 42(58.3%) 13(36.1%)	 19(52.8%) 17(47.2%)	 23(63.9%) 13(36.1%)	0.339

Table-II: Comparison of Neurosensory Disturbance on First Postoperative Day (n=72)

Neurosensory disturbance	Overall (n=72)	Group-A (n=36)	Group-B (n=36)	*p*-value
Present	30 (41.7%)	6(16.7%)	24(66.7%)	<0.001
Absent	42(58.3%)	30(83.3%)	12(33.3%)	
Total	72(100.0%)	36(100.0%)	36(100.0%)	

Table-III: Comparison of Neurosensory Disturbance on Third Postoperative Day (n=72)

Neurosensory disturbance	Overall (n=72)	Group-A (n=36)	Group-B (n=36)	*p*-value
Present	24(33.3%)	4(11.1%)	20(55.6%)	<0.001
Absent	48(66.7%)	32(88.9%)	16(44.4%)	
Total	72(100.0%)	36(100.0%)	36(100.0%)	

Table-IV: Mean Interincisal Mouth Opening on First and Third Postoperative Day (n=72)

Mean Inter incisal Mouth opening in mm (± SD)	Group-A (n=36)	Group-B (n=36)	*p*-value
At first postoperative day	42.10±1.85mm	35.80±1.44 mm	<0.001
At third postoperative day	42.80±1.14 mm	41.50±1.36 mm	<0.001

DISCUSSION

Our study shows that three corner flap is a preferred method to approach the mandibular body fractures in terms of frequency of postoperative neurosensory disturbance in directional sense and mean postoperative mouth opening at 1st and 3rd post-operative day as compared to vestibular incision. By making three corner flap modification to approach mandibular body fractures reduces complications,. This provides greater access and less tissue trauma per-operatively, hence reducing post-operative complications. It also provides greater access and visibility to mental foramen during reflection of tissue flap which reduces the chances of mental nerve injury.[9,10] Our study shows that mean age in Group-A was 33.8±8.6 years. Whereas mean age in Group-B was 31.4±10 years. In both groups majority of patients were male.

In our study, frequency of neurosensory disturbance at first postoperative day was noted among two groups. 6(16.7%) patients in Group-A experienced neurosensory disturbance whereas in Group-B, 24(66.7%) patients experienced neurosensory disturbance. Frequency of neurosensory disturbance at third post-operative day was evaluated. 4(11.1%) patients in Group-A experienced neurosensory disturbance whereas in Group-B, 20(55.6%) patients experienced neurosensory disturbance. Findings of our study are consistent with the findings of randomized controlled trial by Balasubramanian *et al*.[9] which found that postoperative frequency of neurosensory disturbance at both first and third post-operative day were significantly high in patients where body fractures were approached by vestibular incision as compared to those in which fractures were approached by sulcular approach. The difference in neurosensory disturbance between both Groups at day 1 and day 3 were statistically significant (p<0.05). They found that on day 1, neurosensory disturbance was present in 13.3% of patients in study group (three corner flap group) as compared to 63.3% of patients in control group (vestibular incision group). On day 3 in study group neurosensory disturbance was present in 3.3% of patients as compared to 53.3% of patients in control group.

Song *et al,*[12] reported that during treatment via conventional vestibular approach, there is increased frequency (58%) of trauma to inferior alveolar and mental nerve due to retraction and manipulation of fracture segments and limited access to fracture segment. In our study, with treatment of fractures via sulcular approach, the frequency of neurosensory disturbance of mental nerve was significantly lower at both first and third post-operative day (16.66% and 11.12% respectively).

In our study mean inter incisal mouth opening in millimeters at first postoperative day among two groups was analyzed after 24 hours. In Group-A mean inter incisal mouth opening was 42.1±1.85 mm. Whereas in Group-B, mean inter incisal mouth opening was 35.9±1.44 mm. Mean inter incisal mouth opening in millimeters at third post-operative day among two groups was analyzed after 72 hours. In Group-A mean inter incisal mouth opening was 42.8±1.14 mm. Whereas in Group-B mean inter incisal mouth opening was 41.5±1.36 mm. Findings of our study are consistent with findings of randomized controlled trial by Balasubramanian S *et al*.[9] who found that postoperative mean inter incisal mouth opening at both first and third postoperative day were significantly high in patients where body fractures were approached via three corner flap. The difference in mean inter-incisal mouth opening between both groups at both day 1 and day 3 were statistically significant (p<0.05). He found that on day 1 mean inter incisal mouth opening in study group was 42.03±2.75 mm as compared to 35.47±2.94 mm of patients in control group. On day 3 in study group mean inter incisal mouth opening was 43.33±2.84 mm as compared to 41.77±2.79 mm of patients in control group.

After ORIF of mandibular body fractures through vestibular approach, patients complain of post-operative paresthesia and limited mouth opening. These post-operative complications are a source of apprehension, anxiety and compromised oral function in patients with mandibular body fractures.[10,13] Mandibular fractures are second most common fractures in maxillofacial region, and they occur twice as often as midface fracturs.[14] The incidence of mandibular fractures rises as children are allowed more unsupervised physical and supports activity and it peaks in early teen years.[15]

In a study by Anyanechi CE *et al.*[10] it was reported that frequency of impaired mouth opening (< 35mm) post operatively after treatment of mandibular body fractures via conventional (vestibular) approach to be 12.2 %. Similarly, incidence of post-operative trismus is low with three corner flap. In three corner flap there is less need of dissection and retraction of tissues surrounding surgical site because three corner flap provides better access by raising mucoperiosteal flap. Clean incision on alveolar bone and keratinized mucosa leads to less chances of edema and postoperative swelling. Results of various studies are in alignment with our study that indicate prevalence of neurosensory disturbance after ORIF of body fractures via conventional approach ranges from 0.4% to 91.3 %.[16] Significantly higher frequency of neurosensory disturbance with vestibular approach can be attributed to limited approach to mental foramen, excessive traction of soft tissues around the nerve and nerve trauma during surgery. Aggressive retraction of mental nerve in this area may produce traction injury, resulting in neuropraxia or axonotmesis.[17,18] It can be avoided by three corner flap approach as mental nerve can be easily visualized and skeletonized in this approach by raising full thickness mucoperiosteal flap.

CONCLUSION

Our study concludes that three corner flap is a preferred method to approach the mandibular body fractures in terms of frequency of postoperative neurosensory disturbance in directional sense and mean postoperative mouth opening at 1st and 3rd post-operative day as compared to vestibular incision.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MRA & SM: Data acquisition, data analysis, critical review, approval of the final version to be published.

MA & NAK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

N & ZSS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Moradi A, Hosseini SM. Evaluation of correlation between lower jaw and lip rate of paresthesia and inferior alveolar canal diameter changes after mandibular fracture. Biosci Biotech Res Comm.2017; 2: 39-45.
2. Burns B, Fields JM, Farinas A, Pollins A, Perdikis G, Thayer W. Comparing maximal forces in resorbable poly-L-lactic acid and titanium plates for mandibular fracture fixation. Heliyon. 2020; 6(4): e03705. https://doi.org/10.1016/j.heliyon.2020.e03705
3. Abosadegh MM, Saddki N, Al-Tayar B, Rahman SA. Epidemiology of Maxillofacial Fractures at a Teaching Hospital in Malaysia: A Retrospective Study. Biomed Res Int 2019 Feb; 2019: 9024763 https://doi.org/10.1155/2019/9024763
4. Miguens-Jr SA, Borges TS, Dietrich LA, Oliveira MC, Hernandez PA, Kramer PF. A retrospective study of oral and maxillofacial injuries in an emergency hospital in Southern Brazil. Pesquisa Brasileira em Odontopediatria e Clínica Integrada. 2016 30; 16(1): 339-350.
5. Rashid S, Kundi JA, Sarfraz A, Qureshi AU, Khan A. Patterns of mandibular fractures and associated comorbidities in Peshawar, Khyber Pakhtunkhwa. Cureus 2019; 11: e5753. https://doi.org/10.7759/cureus.5753
6. Ahmed S, Usmani RV, Shaikh AH, Iqbal N, Hassan SMU, Ali A. Patterns and presentation of mandibular fractures in Dow International Dental College: Five-year review. Professional Med J 2018; 25: 1596-1599. https://doi.org/10.29309/TPMJ/18.4574
7. Zaky MM, Fayed NA, Shehab MF. Comparison of biting force when using a combination of one microplate and one miniplate versus two miniplates for fixation of parasymphyseal mandibular fracture: the use of microplates for parasymphyseal mandibular fracture. Oral Maxillofac Surg 2019; 24: 19-24. https://doi.org/10.1007/s10006-019-00810-0
8. Datarkar A, Tayal S, Thote A, Galie M. An in-vitro evaluation of a novel design of miniplate for fixation of fracture segments in the transition zone of parasymphysis-body region of mandible using finite element analysis. J Craniomaxillofac Surg 2019; 47: 99-105. https://doi.org/10.1016/j.jcms.2018.11.004
9. Balasubramanian S, Paneerselvam E, Gopi G, Nakkeeran KP, Sharma AR, Raja VBK. Comparison of two incisions for open reduction and internal fixation of mandibular body fractures: A randomized controlled clinical trial evaluating surgical outcome. Chines J Traumatol 2019; 22: 34-40. https://doi.org/10.1016/j.cjtee.2018.11.002
10. Anyanechi CE, Saheeb BD. Inflammatory morbidity due to compound mandibular body fractures: does it have a relationship with treatment outcome? Med Princ Pract 2015; 24: 238–243. https://doi.org/10.1159/000376581
11. Jiménez-Martínez E, Gasco-García C, Arrieta-Blanco JJ, Gomez del Torno J, Bartolome Villar B. Study of the analgesic efficacy of Dexketoprofen Trometamol 25mg vs. Ibuprofen 600mg after their administration in patients subjected to oral surgery. Med Oral 2004; 9: 143e148.
12. Song Q, Li S, Patil PM. Inferior alveolar and mental nerve injuries associated with open reduction and internal fixation of mandibular fractures: A Seven Year retrospective study. J Cranio-MaxilloFac Surg. 2014; 1-4. https://doi.org/10.1016/j.jcms.2014.03.029

13. Tay ABG, Lai JB, Lye KW, Wong WY, Nadkarni NV, Li W, Bautista D, Inferior alveolar nerve injury in trauma-induced mandible fractures. J Oral Maxillofac Surg 2015; 10: 1016-1022. https://doi.org/10.1016/j.joms.2015.02.003
14. Buch, K, Mottalib, A, Nadgir, R.N, et al. Unifocal versus multifocal mandibular fractures and injury location. Emerg Radio 2016; 23: 161–167. https://doi.org/10.1007/s10140-015-1375-9
15. Gadicherla S, Sasikumar P, Gill SS, Bhagania M, Kamath AT, Pentapati KC. Mandibular fractures and associated factors at a tertiary care hospital. Arch Trauma Res 2016 ; 5(4): e30574. https://doi.org/10.5812/atr.30574
16. Goodday RH. Management of fractures of the mandibular body and symphysis. Oral Maxillofac Surg Clin North Am 2013; 25(4): 601-616. https://doi.org/10.1016/j.coms.2013.07.002
17. N CS, Shetty SK, Shetty SK, Shah AK. Inferior alveolar nerve dysfunction in mandibular fractures: a prospective cohort study. J Korean Assoc Oral Maxillofac Surg 2021 ; 47(3): 183-189. https://doi.org/10.5125/jkaoms.2021.47.3.183
18. Cillo JE Jr, Godwin S, Becker E, Schorr R. Neurosensory recovery following mental nerve skeletonization in intraoral open reduction and internal fixation of mandible fractures. J Oral Maxillofac Surg 2021; 79(1): 183-191. https://doi.org/10.1016/j.joms.2020.08.027