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Original research article

To compare single miniplate fixation in three different anatomical site viz. external oblique ridge, inferior border or superior border plate fixation- a randomized prospective study

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ABSTRACT

Aim & Objectives: To compare single miniplate fixation in three different anatomical site viz. external oblique ridge fixation, inferior border fixation or superior border plate fixation- a randomised prospective study to further evaluate the preference in choosing anatomical site among the three different locations and to evaluate clinical outcome and complications in three groups.

Material & Methods: Patients divided in 3 groups randomly with minimum of 6 patients in each Group i.e. group A- External oblique ridge miniplate fixation through intraoral approach
Group B - Inferior border miniplate fixation through extra-oral approach.
Group C – lateral border miniplate fixation through trans-buccal approach.

Conclusion: Based on the findings of our study we can state that extra-oral approach may be preferred over the intra-oral & trans-buccal approach in displaced mandibular angle fracture, assessed on orthopantomograph. Minimal requirement of plate bending & facilitation of plate placement at inferior border of mandible, cleaner wound where factors favored this approach.

INTRODUCTION

Mandibular angle fractures have a high frequency of complications particularly in relation to the insufficient stability of the fixation systems[1,2]. Despite the advances in internal fixation used for the treatment of fractures of the mandibular angle, these fractures still present unpredictable results and difficulties in treatment compared to other mandibular fractures[3.]

In recent years, close consideration of the biomechanical principles of treatment of mandibular fractures has led to the use of operative as well as conservative methods. In most developed countries open reduction & internal fixation is the method of choice for the management of fractures of the mandibular angle[3]. There are numerous well established techniques of osteosynthesis but according to Champy et al. the placement of a single, four-hole monocortical osteosynthesis plate has been considered acceptable[2,11.] The plate is positioned in the region of tension band of the mandible, the upper border. It can be placed on – and often around- the external oblique ridge using an intra-oral approach, at the lower border through extraoral approach or flat against the outer lateral surface of the mandible using a transbuccal approach.

Of all the mandibular fractures encountered, the fractured angle has the highest rate of postoperative infection[14]. Various approaches are used for the fixation of fractures of the angle region of the mandible.

In the previous decades, increased availability of high quality and easy-to- use trocar instrumentation has made the trans-buccal approach prevalent, but research into its complication rate is greatly lacking. Presently, the choice of the approach relies on the surgeon's personal preference. In these regard new clinical and biomechanical studies have been used to evaluate and compare the benefits of different fixation techniques used in the reduction of mandibular angle fractures, showing different results[13]. However the ideal method for fixation of angle fractures remains controversial. purpose to present this study is to evaluate efficacy of anatomical site preference; whether to choose lateral border fixation, inferior border fixation or external oblique ridge fixation with corresponding trans-buccal approach, extra-oral approach & intra-oral approach respectively.

MATERIAL & METHODS

GROUP A- External oblique ridge miniplate fixation through intraoral approach

Group - A Intraoral Approach **Preoperative Photographs**

Frontal View

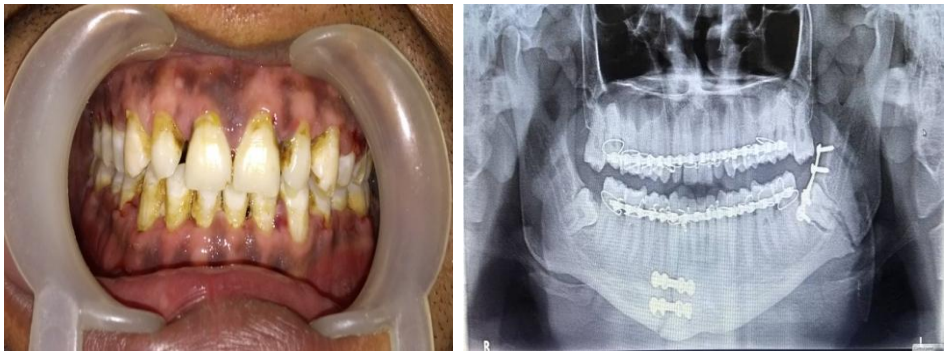
Lateral Profile View **Preoperative Photographs**

Preoperative Occlusion **Preoperative Radiograph**

Intraoperative Photographs

Fracture Segment Exposure

Plating Through Intraoral Approach



GROUP B - Inferior border miniplate fixation through extra-oral approach.

Group – B Extraoral Approach **Preoperative Photographs**

Frontal View Photograph

Lateral Profile View Photograph

Preoperative Occlusion **Preoperative Radiograph**

Intraoperative Photographs

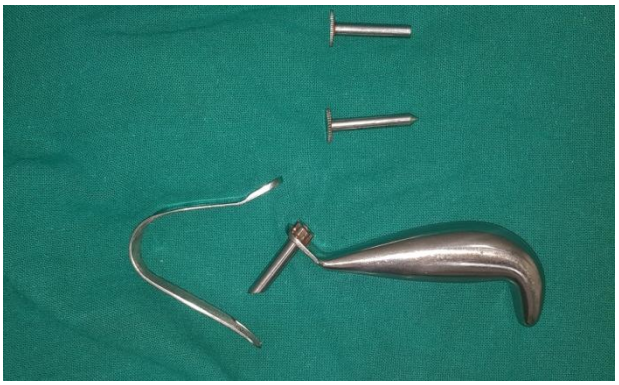
Submandibular Incision Marking **Fracture Segment Reduction** **Plating Through Extraoral Approach**

Postoperative Photographs

Postoperative Occlusion **Postoperative Radiograph**

GROUP C – lateral border miniplate fixation through trans-buccal approach.

Group C Transbuccal Approach

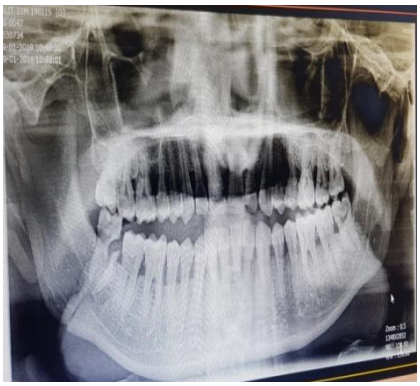


Armamentarium

Preoperative Photographs

Frontal View

Preoperative Occlusion



Preoperative Radiograph

Intraoperative Photographs

Marking For Transbuccal Approach

Drill Sleeve Placement

Intraoperative Photographs

Self Holding Retractor

Trocar Insertion Through Transoral Incison

Plating Through Transbuccal Approach

Closure of Stab Incision

Post Operative Occlusion

Post Operative Radiograph

SELECTION OF PATIENTS:
INCLUSION CRITERIA:

1. Angle fracture cases
2. Bilateral angle fracture cases.
3. Patients age > 18 years

4. Non smoker [if not then patients are strictly prohibited for smoking from pre-operative assessment]
5. Less/ acceptable co-morbidities.

EXCLUSION CRITERIA:

1. Angle fractures with multiple fracture site in mandible
2. Patients younger than 18 years

STUDY DESIGN

A prospective, randomised, single blinded study had been carried out & data collected at following points

1. Pre-operative assessment
2. Intra-operative assessment
3. 2nd day post-operative assessment
4. 1st week follow up
5. 4th week follow up
6. 12th week follow up

Procedure:

After examination & selection of patients, detailed case history recorded. Pre-operative Assessment & records were taken. Patient prepared on the day of surgical intervention. Decision Making & placement of single miniplate accordingly. Analysis and records of variables during Surgical procedure was done. And postoperative assessment after surgical procedure Follow up and evaluation of variables was done.

EVALUATION CRITERIA:

A. Pre-operative:

1. Displaced angle fracture segment assessed on OPG
2. Records of clinical positive findings

B. <u>Intra-operative</u>

1. Ease of surgery[simple-some difficulty-very difficult]
2. Time of plate fixation[min]
3. Time of surgical exposure of anatomical site [min]
4. Manipulation in reduction of fracture segment.
5. Total duration of surgery[min]

C. <u>Post-operative</u>

1. Post-operated occlusion assessment

By patients perception [satisfactory /unsatisfactory]
By surgeon's analysis [satisfactory/ unsatisfactory]

2. Pain[VAS]
   0-4: no pain
   5-44: mild pain
   45-74: moderate pain
   75-100: severe pain
3. Wound dehiscence.
4. Sinus formation.
5. Radiographic assessment
   Post-operative OPG displacement reduction [mm]
   (Lower border approximation of mandible)

DISCUSSION

The surgical approach in the management of mandibular fractures has been an ongoing point of debate. Contradictory outcomes & success rates with different surgical approaches and fixation schemes reported in studies by various authors have led to lack of unanimous opinion regarding best treatment method in Mandibular angle fractures. Decision regarding treatment approaches for ORIF of angle fractures of mandible is often dictated to type of fracture, location of fracture, amount of displacement, surgeon's experience and training[14]. Most of the confusion and debate exists about

the right approach for fractures of the mandibular angle. Treatment philosophies range from simple maxilla mandibular immobilization to rigid internal fixation of bone fragments[25]

Extra oral approach was once the most standard traditional and popular approach for management of mandibular angle fractures when compared to trans-oral approach which was first given by Kazanjian in 1933. Due to the increasing aesthetic demands of the patient and avoidance of extra-oral scar, trans-oral approach has become preferable to the extra-oral approach for the management of mandibular angle fractures.

The main aim of any approach is to promote rapid healing and restore the anatomical form and function with particular care to re-establish the functional occlusion and facial aesthetics with minimal disability and complications. A very few studies have been done by Raveh *et al*., Ellis and Karas, to discuss the differences between intra-oral, transoral and extraoral approaches

The studies in literature by Gear *et al*. and Sugar *et al*. have shown increased surgical time with the trans-buccal approach when compared to the trans-oral approach. According to Devireddy *et al*. who compared trans-oral and extra-oral approach for angle fracture osteosyn thesis, found that a mean time for plating was 49.7 min trans-orally and a mean of 73.4 min extra-oral approach[2]. They also found trans-oral approach had minimum difficulty level in the management of the fractures as compared to extra-oral approach. A recent study on comparison between trans-oral versus trans-buccal approach for the management of mandibular angle fractures by Khandeparker *et al*. showed that there is no significant difference between the two approaches for surgical time, ease of plate fixation, and no long-term occlusal discrepancy.

Our study found that access to fracture site during intra-operative procedure in group A(intra-oral approach) had high difficulty level 66.60% & some difficulty in group C(trans-buccal approach)16.60%. This comparison of intra-operative access of fracture site among three different approaches was compared using chi square test was found to be significant (p=0.001*) with “very difficulty” reported maximum in intra-oral approach.

In the present study, results were found to be significant for the anatomical exposure of fracture site with (p=0.001*) in group C followed by group A then group B. It was compared by using one way ANOVA test.

Time of reduction of fracture segment, was 15.40 for group A, for group B 5.33 & for group C 13.33.The results were found to be significant with maximum time taken in group A.

In this study, time of plate fixation was maximum for group A followed by group C then group B. This might be explained by the anatomic position of external oblique ridge plate adaptation. Difficulty level increases for adaptation of miniplate over external oblique ridge. On the other side transbuccal trocar instrumentation is a sensitive technique & surgeon has to be familiar with armamentarium and be skilled in the use of trocar cannula.

CONCLUSION

Mandibular angle fractures are the most common form of mandibular fractures attributed to high incidence of RSA & interpersonal violence. Currently the management of these fractures is one of the most debated issue and there is general lack of consensus among surgeons regarding best approach and method of fixation.

Results from biomechanical models seem to conflict with clinical studies. Obtained predictable result is a challenge for novice and expert surgeons alike. Variables like Fracture characteristics and preferences by surgeons based on their expertise and familiarity result in use of varying surgical approaches viz. Intraoral, Transbuccal, Extraoral.

Intraoral approach is performed through a mucosal incision, resulting in no external scar or nerve injury. Plating is done at superior border.

Extra oral approach involves a sub mandibular incision through which inferior border plating is done. Potential nerve injury and scar formation are shortcomings.

Transbuccal approach combines as intraoral mucosal incision with a stab incision through cheek for trocar placement. Lateral surface plating of MAF is done through this.

To conclude, all three approaches have their own inherent advantages and disadvantages. Within the limitation of this study(small sample size and short duration of follow-up) extra-oral approach was found to be superior to the trans-buccal & intra-oral approach in case of displaced mandibular angle fractures with regard to radiographic reduction in gap, inconspicuous external scarring, and few postoperative complications. We did not find increased operating time or damage to the facial nerve, which was observed by other authors. Extra-oral approach also allows direct visualization of both medial & lateral cortices to assist with proper reduction. Though a beginner might face challenges like increased likelihood of injury to the branches of facial nerve, inadvertent management of facial vessel during intra-operative procedures, these were not reported in our study. Based on the findings of our study we can state that extra-oral approach may be preferred over the intra-oral & trans-buccal approach in displaced mandibular angle fracture, assessed on orthopantomograph. Minimal requirement of plate bending & facilitation of plate placement at inferior border of mandible, cleaner wound where factors favored this approach.

Further prospective studies, with large sample size and long term follow up are necessary for consensus regarding ideal treatment approach for mandibular angle fractures.

BIBLIOGRAPHY

[1]. S. Laverick, P. Sidappa, H. Wong, P. Patel, D.C. Jones. Intraoral external oblique ridge compared with transbuccal lateral cortical plate fixation for the treatment of fractures of the mandibular angle: prospective randomised trial British Journal of Oral & Maxillofacial Surgery 50:2012:344-9

[2]. Sabah Ali Beza, Sayed Attia, Edward Ellis,III, Layala Omara. A Comparative study of transbuccal and Extra-oral Approaches in the Management of mandibular angle fractures: A systematic Review. Open Access Maced J Med Sci 2016;43:482-8.

[3]. Khandeparker PV, Dhupar V, Khandeparker RV, Jain H, Savant K, Berwal V. Transbuccal versus transoral approach for management of mandibular angle fractures: a prospective, clinical and radiographic study. Journal of the Korean Association of Oral and Maxillofacial Surgeons. 2016 Jun 1;42(3):144-50.

[4]. Erol B, Tanrikulu R, Go¨rgu¨n B. Maxillofacial fractures, analysis of demographic distribu- tion and treatment in 2901 patients (25-year experience). J Craniomaxillofac Surg 2004;32:308–13.

[5]. Martini MZ, Takahashi A, de Oliveira Neto HG, de Carvalho Ju´nior JP, Curcio R, Shinohara EH. Epidemiology of mandibular fractures treated in a Brazilian level I trauma public hospital in the city of Sa˜o Paulo, Brazil. Braz Dent J 2006;17:243–8.

[6]. Van Beek G, Merkx C. Changes in the pattern of fractures of the maxillofacial skeleton. Int J Oral Maxillofac Surg 1999;28:424–8.

[7]. Wald Jr RM, Abemayor E, Zempleny J, Mannai C, Lesavoy MA. The transoral treat-ment of mandibular fractures using noncom-pression miniplates: a prospective study. Ann Plast Surg 1988;20:409–13.

[8]. Iizuka T, Lindqvist C, Hallikainen D, Paukku P. Infection after rigid internal fixa-tion of mandibular fractures: a clinical and radiologic study. J Oral Maxillofac Surg 1991;49:585–93.

[9]. Danda A. Comparison of a single noncom-pression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial. J Oral Maxillofac Surg 2010;68: 1565–7.

[10]. Ellis III E. Treatment methods for fractures of the mandibular angle. Int J Oral Maxillofac Surg 1999;28: 243–52.

[11]. Champy M, Lodde JP, Jaeger JH, Wilk A. Biomechanical basis of mandibular osteosynthesis according to the F.X. Michelet method. Rev Stomatol Chir Maxillofac 1976;77:248–51.

[12]. Toma VS, Mathog RH, Toma RS, Meleca RJ. Transoral versus extraoral reduction of mandible fractures: a comparison of complication rates and other factors. Otolaryngol Head Neck Surg. 2003;128:215-219.

[13]. Kroon FH, Mathisson M, Cordey JR, Rahn BA. The use of miniplates in mandibular fractures, an in vitro study. J Craniomaxil- lofac Surg 1991;19: 199–204.

[14]. Wilson IF, Lokeh A, Benjamin CI, et al. Contribution of conventional axial computed tomography (nonhelical), in conjunction with panoramic tomography (zonography), in evaluating mandibular fractures. Ann Plast Surg. 2000;45:415-421.

[15]. Rudderman RH1, Mullen RL, Phillips JH. The biophysics of mandibular fractures: an evolution toward understanding. Plast Reconstr Surg 2008;121: 596–607.

[16]. Michelet F, Deymes J, Dessus B. Osteosynthesis with miniaturized screwed plates in maxillo-facial surgery. J Maxillofac Surg 1973;1: 79–84.

[17]. Kale TP, Baliga SD, Ahuja N, Kotrashetti SM. A comparative study between transbuccal and extra-oral approaches in treatment of mandibular fractures. Journal of maxillofacial and oral surgery. 2010 Mar 1;9(1):9-12.

[18]. Ellis E. Treatment of mandibular angle frac-tures using the AO reconstruction plate. J Oral Maxillofac Surg 1993;51: 250–4.
[19]. Dingman RO, Natvig P: Surgery of Facial Fractures. Philadelphia,PA, W.B. Saunders, 1964.
[20]. Rowe NL, Killey HC: Fractures of the facial skeleton, in Edinburgh, UK, E&S Livingstone Ltd, 1955.Elahi MM, Brar MS, Ahmed N, et al: Cervical spine injury in association with craniomaxillofacial fractures. Plast Reconstr Surg 2008; 121:201.
[21]. Devireddy SK, Kumar RK, Gali R, Kanubaddy SR, Dasari MR, Akheel M. Transoral versus extraoral approach for mandibular angle fractures: A comparative study. Indian journal of plastic surgery: official publication of the Association of Plastic Surgeons of India. 2014 Sep;47(3):354.
[22]. Shetty V, Atchison K, Der-Matirosian C, et al. The mandible injury severity score: development and validity. J Oral Maxillofac Surg 2007;65(4):663–70.
[23]. Spiessl B. AO classification of mandibular fractures. In: Spiessl B, ed. Internal Fixation of the Mandible-A Manual of AO/ASIF Principles. 2nd ed. Berlin, Heidelberg, New York, London, Paris, Tokyo: Springer Verlag; 1989.
[24]. Krüger E. Mandibular fractures, 1. Classification, diagnosis and fundamentals of treatment. In: Krüger E, Schilli W. eds. Oral and Maxillofacial Traumatology. Chicago: Quintessence Publishing Company; 1982:211–23.
[25]. Passeri L, Ellis III E, Sinn D. Complications of non-rigid fixation of mandibular angle fractures. J Oral Maxillofac Surg 1993;51: 382–4.
[26]. Spiessl B. Internal fixation of the mandible. New York, NY: Springer; 1989.
[27]. Niederdellmann H, Akuamoa-Boat-Eng E, Uhlig G. Lag screw osteosynthesis a new procedure for treating fractures of the man-dibular angle. J Oral Surg 1981;39:938–40.
[28]. Champy M, Lodde´ JP, Schmitt R, Jaeger JH, Muster D. Mandibular osteosynthesis by miniature screwed plates via a buccal approach. J Maxillofac Surg 1978;6:14–21.
[29]. Potter J, Ellis E. Treatment of mandibular angle fractures with a malleable noncompression plate. J Oral Maxillofac Surg.1999;57: 288-92.
[30]. Mehra P, Murad H. Internal fixation of mandibular angle fractures: a comparison of 2 techniques. J Oral Maxillofac Surg. 2008;66: 2254-60.
[31]. McNamara Z, Findlay G, O'Rourke P, et al: Removal vs retention of asymptomatic third molars in mandibular angle fractures: A randomized controlled trial. Int J Oral Maxillofac Surg 45:571, 2016.
[32]. Lee UK, Rojhani A, Herford A, et al: Immediate versus delayed treatment of mandibular fractures: A stratified analysis of complications. J Oral Maxillofac Surg 74:1186, 2016.
[33]. S. Antic, I. Saveljic, D. Nikolic, G. Jovicic, N. Filipovic, Z. Rakocevic, M. Djuric: Does the presence of an unerupted lower third molar influence the risk of mandibular angle and condylar fractures?. Int. J. Oral Maxillofac. Surg. 2016; 45:588-92.
[34]. Barker DA, Oo KK, Allak A, Park SS: Timing for repair of mandible fractures. Laryngoscope 121:1160, 2011
[35]. Rai S, Pradhan R. Tooth in the line of fracture: its prognosis and its effects on healing. Indian J Dent Res 2011;22:495–6.
[36]. John C. Koshy. Pearls of Mandibular Trauma Management. Semin Plast Surg. 2010 Nov; 24(4): 357–374.
[37]. Erdmann D, Follmar K E, Debruijn M, et al. A retrospective analysis of facial fracture etiologies. Ann Plast Surg. 2008;60:398–403
[38]. Barry C, Kearns G. Superior border plating technique in the management of isolated mandibular angle fractures: a retrospective study of 50 consecutive patients. J Oral Maxillofac Surg 2007;65:1544–9.
[39]. Furr A M, Schweinfurth J M, May W L. Factors associated with long-term complications after repair of mandibular fractures. Laryngoscope. 2006;116:427–30
[40]. Ellis E. Outcomes of patients with teeth in the line of mandibular angle fractures treated with stable internal fixation. J Oral Maxil-lofac Surg 2002;60:863–5.
[41]. Ellis E, Walker L. Treatment of mandibular angle fractures using one noncompression miniplate. J Oral Maxillofac Surg 1996; 54:864–71.
[42]. Gear AJ, Apasova E, Schmitz JP, Schubert W. Treatment modalities for mandibular angle fractures. Journal of oral and maxillofacial surgery. 2005 May 1;63(5):655-63.
[43]. Al-Moraissi EA, Ellis III E. What method for management of unilateral mandibular angle fractures has the lowest rate of postoperative complications? A systematic review and meta-analysis. Journal of Oral and Maxillofacial Surgery. 2014 Nov 1;72(11):2197-211.
[44]. Wan K, Williamson RA, Gebauer D, Hird K. Open reduction and internal fixation of mandibular angle fractures: does the transbuccal technique produce fewer complications after treatment than the transoral technique?. Journal of Oral and Maxillofacial Surgery. 2012 Nov 1;70(11):2620-8.
[45]. Rastogi S, Paul S, Kukreja S, Aggarwal K, Choudhury R, Bhugra A, Jawaid M.

[46]. Treatment of Mandibular Angle Fractures with Single Three-Dimensional Locking Miniplates without Maxillomandibular Fixation: How Much Fixation Is Required?. Craniomaxillofacial trauma & reconstruction. 2017 Sep;10(03):188-96.
[47]. Michelet FX, Deymes J, Dessus B. Osteosynthesis with miniaturized screwed plates in maxillo-facial surgery. Journal of maxillofacial surgery. 1973 Jan 1;1:79-84.
[48]. Laurentjoye M, Majoufre-Lefebvre C, Caix P, Siberchicot F, Ricard AS. Treatment of mandibular fractures with Michelet technique: manual fracture reduction without arch bars. Journal of Oral and Maxillofacial Surgery. 2009 Nov 1;67(11):2374-9.
[49]. Pattar P, Shetty S, Degala S. A prospective study on management of mandibular angle fracture. Journal of maxillofacial and oral surgery. 2014 Dec 1;13(4):592-8.
[50]. Yadav S, Mittal HC, Dhupar V, Akkara F, Sachdeva A. Transoral approach alone in single miniplate osteosynthesis of angle fracture-our experience. National journal of maxillofacial surgery. 2016 Jan;7(1):71.