

OUTCOME OF INTRAORAL AND EXTRAORAL APPROACHES FOR MANDIBULAR ANGLE FRACTURE REDUCTION AND FIXATION

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ABSTRACT

Objectives: To compare the outcome of intra oral and extra oral approaches for mandibular angle fracture reduction and fixation.

Materials and Methods: This Randomized Clinical Trial. was conducted at Oral and Maxillofacial surgery at Khyber College of Dentistry. Data of 110 diagnosed cases of fracture angle region of the mandible Presented at the Khyber college of Dentistry Peshawar KPK Pakistan, over a minimum of 6 months period were obtained.

Results: A total of 110 patients with 55 patients in group A (extra oral approach) and 55 in group B (intra oral approach) were included. The age of patients presented with Angle fracture ranged from 11-60 years with mean age 39 years and SD + 1.089. Comparison of malocclusion between extra oral and intra oral approach shows insignificant results, whereas post-operative infection was common in extra orally than intra orally. Also the post facial nerve damage was more extra orally than intra oral approach.

Conclusion: There is no significant difference in outcome of intra oral and extra oral approaches for mandibular angle fracture reduction and fixation. However facial nerve damaged was more in extraoral approach.

Key words: Fracture, Mandibular Angle, Intra oral approach, Extra oral approach, Malocclusion

INTRODUCTION

Mandibular angle fractures are known to be plagued with highest rates of complication among all mandibular fractures. Management of these fractures is associated with unpredictable results and difficulties compared to other fractures of mandible. Management of mandibular angle fractures (MAF) is often challenging, particularly in relation to the stability of the fixation system. Optimal treatment of angle fractures continues to be debatable. Mandibular fractures comprise almost two thirds of all the maxillofacial fractures and represent 26-35% of all

mandibular fractures¹. Fractures of the angle region are usually unfavorable owing to the anatomy of the region. Such is the local biomechanics that the actions of the medial pterygoid, masseter, temporalis muscles tend to pull the proximal mandibular segment supero medially. Mandibular angle fractures have a high complication rate (ranging from 0% to 32%)². Open reduction and internal fixation (ORIF) continues to be the treatment of choice for displaced, unfavorable fracture of mandibular angle.

There has been a gradual evolution in the manner in which mandibular fractures are managed. Research during the decades has brought many techniques for the repair of mandibular fractures. The advent of plate and screw fixation hardware has enormously changed the methods of open reduction and internal fixation in the last few years. Intraoral and extraoral approach are the different approaches used for the treatment of mandibular angle fractures³.

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Restoring the anatomical form and function is the foremost goal of the management of mandibular fracture, with a meticulous attention to achieving the pre-trauma occlusion. For the mandible to function optimally, it takes maintenance of normal anatomy, shape and stiffness (i.e., resistance to deforming load). It is very important to get the mandible in precise anatomical position and then let it rest in place undisturbed throughout the healing period. Inability to fulfill this precedent condition can result in post-operative malocclusion or nonunion, infection, etc⁴.

The intraoral approach is indicated in cases where fractures are either non displaced or slightly displaced, with the advantages of having no external scar, no risk to facial nerve branches, the comfort of having the occlusion in sight while fixing plates, lesser reported infection rates. However, for the placement of screws for plate fixation, mandibular base may require additional stab incisions. Intraoral lacerations may be exploited for access in fixation of mandible fractures. Local anesthesia alone may suffice for simple non displaced fractures where fixation of one plate is needed⁵. A study done nationally by Bukhari S.G.B et al⁷ in 2018 in Punjab has shown that the intra oral approach for mandibular angle fracture management is an effective and comparatively better technique as compare to the extra oral approach.

A meta analysis done internationally by Al-Morraissi¹⁷ showed that the transbuccally placed lateral miniplate was better at reducing the incidence of postoperative complications than one placed on the external oblique ridge using a trans oral approach. Fractures that are grossly displaced or comminuted fractures, edentulous, and avulsive fractures necessitate the use of extra oral approach, since it is difficult to place longer and stronger plates through intraoral approach. Since local anesthesia alone is not enough, general anesthesia is generally indicated with the extra oral approaches⁵. A multitude of studies has concluded that no single surgical approach has persistently been believed to be ideal. Very few local/national studies compare the results of these two approaches. It's prudent to have local/national data on the matter.

The rationale of this study is to compare the outcome of two techniques in our department and to determine which one is superior in terms of the

previously mentioned factors. This will help us give clear guidelines for decision about the choice of surgical approach and help minimize post-operative sequelae. Resultantly, number of patient's visits to hospital and financial burden on hospital and patient, will be reduced.

MATERIALS AND METHODS

This Randomized Clinical Trial Study was conducted on 110 patients in Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar in a period of one year (Oct 2020 to Oct 2021).

By using WHO sample size calculator, Total sample size was 110(Group A 55, GROUP B 55 patients), by taking P1 as 69% (Frequency of overall complications through intraoral approach) and 39 % as P2 (Frequency of overall complications through Extra oral approach),while Keeping 5 % level of precision and 80% power of the test.

Null hypothesis that there is no difference in the outcome of intraoral and extraoral approaches for mandibular angle fracture reduction and fixation.

Patients were divided into two similar groups. Group A underwent extra oral approach and group B underwent intra oral approach. Sampling technique was consecutive non probability sampling.

During patient selection, Inclusion and Exclusion criteria was strictly followed to control bias and confounders. Inclusion criteria was all the dentate patients of age 11 to 65 years and any gender, with unilateral displaced, not grossly contaminated, mandibular angle fractures and derranged occlusion, presenting within 2 weeks of fracture.

Exclusion criteria was fractures in edentulous patients, grossly contaminated, infected wound, malunited or treated elsewhere before, medically compromised patients who are not fit for general anaesthesia and pathological fractures.

Intraoral approach was taken as incision through the mucosa in the vestibular area, in the mucogingival junction, 5 mm apically from the attached gingiva extending till the external oblique ridge. For extra oral approach Risdon and submandibular approaches were used. Parameters used to establish an incision are: Incision was located 2cm below the inferior mandibular border. Different layers encoun-

tered during dissection are skin, subcutaneous tissue, platysma, deep cervical fascia, pterygo masseteric sling, bone.

Facial nerve damage was recorded as lack of symmetrical lower lip retraction with lagging of ipsilateral half of the lower lip /decreased ipsilateral incisor show on requesting the patient to show lower anterior teeth, as examined at 14 days postoperatively, after excluding infection and edema.

Malocclusion was checked subjectively, by asking the patient if he feels any change in his occlusion and objectively, through inspecting the occlusion, Angle’s classification for malocclusion was followed. Infection was recorded as swelling at/round surgical wound site with/without erythema, tenderness and temperature above 98F and/or pus discharge from the site as examined 7 through 14 days postoperatively.

Approval to carry out the study was taken from the Khyber College of Dentistry’s Ethical Review Committee. For the choice of surgical approach (extra oral or intraoral), randomization was done through lottery method. The patients were informed about the purpose, procedure and benefits of the study. An informed consent was taken for willingness and participation in this study. The patients were assured regarding the maintenance of the confidentiality of their personal and other data collected from their records.

Similar duration of postsurgical oral antibiotic therapy and similar duration of MMF was ensued for every patient in both groups. Every patient was followed during ward stay, one week post operatively, at the time of MMF removal and 6 months post operatively. During postoperative period, radiograph were taken for each patient when visit for follow up, whenever deemed necessary. During follow-up period every patient was meticulously checked for any postoperative complications present, which were recorded on the purpose built performa for the two

treatment approaches. All the data were collected under the supervision of Oral and Maxillofacial consultant.

The data analysis was performed using Statistical Package for social Sciences (SPSS) version 20.0. Frequency and percentage were calculated for qualitative variables (gender , infection , malocclusion, facial nerve damage). For numerical variables(age) mean and Standard Deviation were found out. Chi square test was applied to determine the difference of outcomes of both intraoral and extra oral groups, in terms of infection, malocclusion and facial nerve damage. Age and gender were stratified to see effect modifiers among two groups by using chi square test. P-value of 0.05 was considered significant. Tables and charts were used to present all the data.

RESULT

This comparative study included a total of 110 patients with 55 patients in group A (extra oral approach) and 55 in group B (intra oral approach). The age of patients presented with Angle fracture was ranging from 18-65 years with a mean of 34.67 years and SD + 9.48. Angle fracture was most common in age group 31-42 years (42.7%) followed by age group 18-30 years (34.5%), 43-54 years (20.9%) and 55 and above (1.8%). Details are in table 1. Age was stratified to see effect modifiers among two groups by using chi square test. 0.995 was seen to be the P value, demonstrating no significance. Details are in table 2.

Table 1. Frequencies of Angle fracture among different age group

Age group	Frequency	Percent
18-30	38	34.5
31-42	47	42.7
43-54	23	20.9
55 and above	2	1.8
Total	110	100.0

Table 2. Stratification of surgical approach with age group

		Age group				Total	P value
		18-30	31-42	43-54	55 and above		
surgical approach used	Intraoral	19 (50%)	23 49%	12 48.9%	1 (50%)	55	0.996
	extra oral	19 (50%)	24 51%	11 51.1%	1 (50%)	55	
Total		38	47	23	2	110	

Thirty eight (34.5%) females and 72 (65.5%) males were part of in this study. Ratio of male to female was 2:1. Details are in table 4.3. Gender was stratified to see effect modifiers among two groups by using chi square test. 0.045 was the P-value , showing significance. Details are in Table 3.

In 110 post-operative cases of angle fracture the malocclusion was noted amongst 7(6.36%) patients. In extra oral approach 3(5.45%) cases were having postop malocclusion and 52(94.5%) were having normal occlusion. In intra oral approach 4 (7.27%) cases were reported with post operative malocclusion and 51(92.7%) cases having normal occlusion. Malocclusion was cross tabulated with surgical approaches which showed a p value of 0.696 showing insignificance. Details are in tables 4.

In 110 post-operative cases of angle fracture, infection was noted amongst 18 (16%) patients. In extra oral approach cases, 13 (23.6%) cases were having post op infection while in intra oral approach, 5 (9.09%) cases were reported with post op infection. Infection was cross tabulated with surgical approaches which showed a p value of 0.071 demonstrating no significance. Details are in tables 5.

In 110 post-operative cases of angle fracture the facial nerve damage was noted in 2(1.8%) patients. In extra oral approach 2 (3..6%) cases were having post op facial nerve damage. In intra oral approach no cases were reported with post operative facial nerve damage. Facial nerve damage was cross tabulated with surgical approaches which showed a p value

of 0.495 demonstrating no significance. Details are in tables 6.

Stratification with respect to age and gender was done to see its effects on malocclusion, post operative infection and facial nerve damage which showed insignificant P values.

DISCUSSION

Research during the decades has brought a gradual evolution in the manner in which mandibular fractures are managed surgically. Many new techniques for the management of mandibular fractures have been introduced with time.

Extra oral approach has traditionally been preferred over the intraoral approach for the management of mandibular angle fracture because of the obvious advantages of good surgical site exposure and the comfort of direct application of plate. However due to the grave complications of extra oral scarring and risk of facial nerve injury, trans oral/ intraoral approach gradually overshadowed the extra oral approach and rightly so.

Intraoral approach has some obvious disadvantages as well, including the inability to optimally reduce and fix the posterior angle region fractures, hindrance offered by the surrounding soft tissues does not allow the perpendicular orientation of the drilling device , direct contamination of the operated site with saliva needing water tight closure⁶.

In this study , angle fractures were found to

Table 3. surgical approach used * gender Cross tabulation

surgical approach used	Gender		Total	P value
	Female	Male		
Intraoral	14	41	55	0.045
extra oral	24	31	55	
Total	38	72	110	

Table 4. Surgical approach used post-operative malocclusion Cross tabulation

surgical approach used	post-operative malocclusion		Total
	No	Yes	
Intraoral	51 (92.7%)	4 (7.27%)	55
extra oral	52 (94.5%)	3 (5.45%)	55
Total	103 (93.6%)	7 (6.4%)	110

P value= 0.696

Table 5. Surgical approach used * post-operative infection Cross tabulation

surgical approach used	post-operative infection		Total
	No	Yes	
Intraoral	42 (76.3%)	13 (23.6%)	55
extra oral	50 (90.9%)	5 (9.09%)	55
Total	92	18	110

P value= 0.071*

Table 6. Surgical approach used * post-operative facial nerve damage Cross tabulation

surgical approach used	post-operative facial nerve damage		Total
	No	Yes	
Intraoral	55 (100%)	0 (0%)	55
extra oral	53 (96.36%)	2 (3.6%)	55
Total	108 (98.18)	2 (1.8%)	110

P value= 0.495*

commonly occur in age range, from 11 to 60 years. Mean age was 39 years. The maximum incidence was seen in the fourth decades of life (n40, 35.7%). According to a similar study done by Bukhari S.G.B et al⁷ in 2018 in Punjab mean age was 29 with peak incidence in 3rd decade (40%), Purva Vijay et al⁸ conducted a study in India with the same clinical question, with 60 patients. The mandibular angle fractures' occurrence was seen in age ranges from 17 to 53 years, with 26.73 years as the mean age. The maximum incidence was found in the second and third decades of life (n=46, 76.7%). In our study a propensity towards older age was noted for extra oral approach, possibly reflecting surgeon's wish to not have scar in young patients with a hope to have improved healing in them. When all other factors are equalized, age may sometime govern the decision making regarding the choice of surgical approach.

In this study males outnumbered females with ratio 2:1 in which male patient were 72(67%) and females were 38 (33%). Rehman B et al⁹ in 2015 conducted a study in Peshawar with the same objective, with a definite incline towards males (n=58, 70%). Similar results presented in study conducted by Bukhari S.G.B et al⁷ where males outnumbered females. Purva Vijay et al⁸ and other studies have shown, majority of the cases of mandibular angle fractures were found in males. Gender may have a role in decision making regarding choice of surgical approach with consideration of aesthetic concern in females and possibly avoidance of extra oral approach due to scarring on face. Presence of facial hair might play a role in occurrence of infection in male patients with extra oral approach.

The universally accepted standard of management of mandibular fracture is to achieve the natural pre-trauma occlusion, with as low postoperative complications as possible. Post operative malocclusion was seen in total of 7(6%) patients with 3 in extra oral group and 4 in intraoral group. Cross tabulation of malocclusion with surgical approaches showed a p value of 0.696 showing insignificant relationship between surgical approach and incidence of malocclusion. According to study done by Hsueh et al² in 2015 in USA on 155 patients the rates of malocclusion were similar regardless of approach, supporting the results of our study. Our results when compared to a study carried out by Bukhari S.G.B⁷ et al, are in contradiction with the findings of this

study. Our study showed surgical approach has no effect on malocclusion. In their study, with regard to postoperative occlusion, extra oral approach group had significantly less malocclusion compared to intraoral approach group (P=0.027, significant). A meta-analysis carried out by Al-Moraissi¹⁷ and Edward Ellis¹¹ showed that the lateral miniplate which was extra orally placed, had less postoperative malocclusion than one placed on the external oblique ridge using intraoral approach. Another study by Laverick et al¹⁰ shows when postoperative occlusion was assessed, the intraoral approach resulted in significantly more occlusal discrepancy than the extra oral approach. This is not in concordance with our study. This dissimilarity could be because of the fact that we excluded the concomitant mandibular fracture (concomitant Para symphysis, body, angle, condyle fractures) from our study but above mentioned studies have no such exclusion criteria. Presence of concomitant mandibular fractures might have caused malocclusion, adding to instability at the mandibular angle fracture site, gap in healing due to misalignment or difficulty of placing fixation hardware.

According to study done by Ellis¹¹, Radiographic assessment of fracture reduction was done between extra oral and intraoral approaches by studying the OPG tracings done on the OPG and gap assessment done on different points. Comparison between extra oral and intraoral approach showed uniform reduction in the extra oral group as compared to intraoral group in which there was gradual increase between the fracture segments. This observation was similar to a study conducted on three-dimensional models by Kroon¹² et al. and Choi et al¹³, where bony gaps along the inferior mandibular border were observed and found that this fracture movement had contribution in subsequent complications, e.g infection. Some studies show considerable affect of surgical approach on post operative malocclusion, others deny the role of surgical approach^{14,15}.

In this study facial nerve damage was noted amongst 2(1.8%) patients. In extra oral approach 2 cases were having post-operative facial nerve damage. In intraoral approach no cases were reported with post operative facial nerve damage. Facial nerve damage was cross tabulated with surgical approaches which showed insignificant p value of 0.495. According to the majority of literature found,

extra oral approach has been incriminated for having increased incidence of facial nerve damage. According to a local study done by Ali S et al¹⁶, facial nerve complications in extra oral approach 8(16%)cases while no case of facial nerve damage was reported in intra oral approach with a P-value of 0.005. Result does not corroborate with our study. According to a similar study done by Hsueh et al² in 2015 in USA on 155 patients, neurosensory disturbance was noted in 50% of extra oral approach but only 27% with intraoral approach. A meta-analysis carried out by Al-Moraissi¹⁷ and Edward Ellis¹¹ concluded that the intraoral approach had reduced incidence of postoperative facial nerve damage than an extra oral approach. This complication can be predicted from anatomical knowledge of both the approaches. Extra oral approach involves dissection through submandibular tissue planes, where the course of marginal mandibular nerve lies in close vicinity to the classical Risdon incision, posing the extra oral approach at a greater risk for nerve damage.

In 110 post-operative cases of angle fracture the infection was noted amongst 18 (16%) patients. In extra oral approach 13 cases were having post op infection and 43 were having no infection while 5 cases were reported with post op infection with intra oral approach. Infection was cross tabulated with surgical approaches which showed a p value of 0.071 showing no significance. A study carried out by Laverick¹⁰ et al Postoperative infection occurred in 20% of extra oral and 7% of intraoral cases² Apart from the study by Moraissi et al¹⁷, several other studies in literature by Sugar et al¹⁸, Kumar et al¹⁹, Laverick et al¹⁰, Wan et al²⁰ have observed significantly increased post-operative infection, wound dehiscence in extra oral approach compared to intraoral approach. The proposed explanation for this increased infection rate in current literature is the anatomic position of the external oblique ridge plate, enveloped by thin overlying soft tissues. Moreover, a plate fixed intra orally will be lying closer to the dentition, with a risk of bacterial pathogens to trickle down from the periodontal sulcus to plate and screw, because of the shorter and easier transgress path. This assumption supports the fact that more infections are associated with intraoral approach. Results of our study are not in alignment with this assumption. A meta-analysis conducted by Al-Moraissi¹⁷ and Edward Ellis¹¹ showed that there was significantly reduced post-

operative infection with extra orally placed lateral miniplate, as compared to one placed on the external oblique ridge using an intraoral approach. Their findings vary from the findings of our study.

Looking at the majority of literature available and results of this study, we advocate the use of both intraoral and extra oral approaches in mandible angle fractures and have summarized the reasons that, with both approaches there are similar chances of infection, facial nerve damage and malocclusion, suggesting that no approach is superior to the other. Keeping in view the results of this study, we can not prioritize one approach over the other as far as the post operative infection rate, nerve damage and malocclusion are concerned.

CONCLUSION

This study concluded that statistically there is insignificant difference between internal and external approach for the management of angle fractures in terms of post-operative infection rate, facial nerve damage and malocclusion. The results only apply to non-pathological, isolated, non-comminuted angle fractures which are not infected. The common most affected age group was 4th decade, with male predominance. Both approaches are inherently associated with certain advantages and disadvantages.

Both the approaches could be used for mandibular angle fracture reduction wherever clinically possible. Surgical approach should be individualized to patients in order to have maximum advantages of each approach.

REFERENCES

1. Sudhakar GV, Rajasekhar G, Dhanala S, Vura N, Ramisetty S. Comparison of Management of Mandibular Angle Fractures by Three Approaches. *J Maxi fax Oral Surg.* 2015;14(4):979-85.
2. Hsueh WD, Schechter CB, Tien Shaw I, Stupak HD. Comparison of intraoral and extra oral approaches to mandibular angle fracture repair with cost implications. *Laryngoscope*, 2016,126:591–595
3. Khan A, Salam A, Khatab U, Khan MT. Pattern of mandibular fractures- a study. *Pak Oral and Dent J* 2009; 29: 221-24.
4. Pattar P, Shetty S, Degala S. A Prospective Study on Management of Mandibular Angle Fracture. *J Maxillofac Oral Surg* 2014;13(4):592-8.
5. Singh V, Khatana S, Bhagol A. Superior border versus inferior border fixation in displaced mandibular angle

- fractures: prospective randomized comparative study. *Int J Oral Maxillofac Surg*. 2014;43(7):834-40.
6. Sadiq A, Warraich RA, Bhatti MUD. Comparison of two surgical procedures in reduction of Mandibular angle fractures. *PODJ*, 2010;30(2):287-90.
 7. M.SBukhari, Afzal M, Sibghat Ullah*, Liaqat S,- Comparison between extra oral and intraoral surgical procedures for the management of mandibular angle fractures *Pak Armed Forces Med J* 2018; 68 (3): 623-26
 8. Purva Vijay Sinai Khandeparker, Vikas Dhupar, Rakshit Vijay Sinai Khandeparker, Hunny Jain, Kiran Savant, Vikas Berwal Transbuccal versus transoral approach for management of mandibular angle fractures: a prospective, clinical and radiographic study. *JOPJ*.2015;13(4):15-17
 9. Rehman B, Iqbal A, Afsar H, Din QU, Ansari SR. Comparative analysis of extra oral and intraoral approaches in mandibular angle fracture. *JKCD* 2015; 5(2): 16-19.
 10. Laverick S et al Intraoral external oblique ridge compared with trans buccal lateral cortical plate fixation for the treatment of fractures of the mandibular angle: prospective randomized trial. *Br J Oral Maxillofac Surg* (2012) 50:344–349
 11. Ellis E III Treatment methods for fractures of the mandibular angle. *Int J Oral Maxillofac Surg* 1999; 28:243–252
 12. Kroon FH, Mathisson M, Cordey JR, Rahn BA. The use of miniplates in mandibular fractures. An in vitro study. *J Craniomaxillofac Surg* 1991;19:199-204.
 13. Choi BH, Kim KN, Kang HS. Clinical and in vitro evaluation of mandibular angle fracture fixation with the two-miniplate system. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995;79:692- 5.
 14. Ajmal S, Khan MA, Jadoon H, Malik SA. Management protocol of Mandibular fractures at Pakistan Institute Of Medical Science Islamabad, Pakistan. *J Ayub Med Coll* 2007; 19(3): 51-5.
 15. Barrera JE, Arlen MD, Meyer D. Mandibular Angle Fractures.[document on internet]. Medscape. Update Aug 16, 2017. [AZ1] Available from: <https://emedicine.medscape.com>.
 16. Ali S, Warraich RA, Dastagir MU. Comparison of two surgical procedures in reduction of mandibular angle fractures. *Pak Oral & Dent J* 2010; 30(2): 287-90.
 17. Al-Moraissi EA, Ellis E, What method for management of unilateral mandibular angle fractures has the lowest rate of postoperative complications? A systematic review and metaanalysis. *J Oral Maxillofac Surg* 72(11):2197–2211
 18. Sugar AW, Gibbons AJ, Patton DW, Silvester KC, Hodder SC, Gray M, et al. A randomised controlled trial comparing fixation of mandibular angle fractures with a single miniplate placed either transbuccally and intra-orally, or intra-orally alone. *Int J Oral Maxillofac Surg* 2009;38:241-5.
 19. Kumar GB, Dhupar V, Akkara F, Kumar SP. Patterns of maxillofacial fractures in Goa. *J Maxillofac Oral Surg* 2015;14:138-41.
 20. 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? *J Oral Maxillofac Surg* 2012;70:2620-8.
 21. Gutta R, Tracy K, Johnson C, James LE, Krishnan DG, Marciani RD. outcomes of mandibular fracture treatment at an academic tertiary hospital: A 5 year analysis. *J Oral and Maxillofac Surg* 2014; 72(3): 550-8.
 22. Perez R, Oeltjen JC, Thaller SR. A review of mandibular angle fractures *Craniomaxillofac Trauma Reconstr* 2011; 4(2): 69–72.
 23. Barde D, Madhol A, Madan R. Prevalence and pattern of mandibular fracture in central india. *Natl J maxillofac Surg* 2014; 5(2): 153-56.7
 24. Subhashraj K, Ramkumar S, Ravindran C. Pattern of mandibular fractures in cheni, India. *Br J Oral Maxillofac Surg* 2008; 46(2): 126-7.
 25. Al Ahmed HE, Jaber MA, Abu Fanas SH, Karas M. The pattern of maxillofacial fractures in Sharjah, united arab emirates: A review of 230 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004; 98(2): 166-70.