

ORIGINAL RESEARCH

Prognosis of teeth in the line of and adjacent to mandibular fracture treated by closed reduction - A clinical and radiographical follow up study

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ABSTRACT

Aim: The aim of this study was to assess the prognosis of teeth directly in the line of, and adjacent to fracture sites which are managed by closed reduction.

Methodology: A total of 59 Patients reporting to the outpatient wing, Department of oral and maxillofacial surgery, Government Dental College, Thiruvananthapuram with mandibular fractures in dentate region managed by closed reduction satisfying the inclusion and exclusion criteria, were selected for the study for a period of eighteen months. Information were collected using pre designed proforma and analysed using SPSS

Results: Teeth retained in fracture line pre-operatively out of 59 teeth, only 5 teeth (8.5%) responded to electric pulp testing and 54 teeth (91.5%) had clinically not responded. In teeth adjacent to fracture line preoperatively 45 teeth responded positively (76.3%) and 14 teeth were non responsive (23.7%). But after 6 months there is highly significant difference noted in sensitivity of teeth both groups. In Group A After 6 months 43 teeth showed positive sensitivity (72.9%) and only 16 teeth were non responsive (27.1%). Where in Group B 54 teeth showed positive response (91.5%) and only 5 teeth were non responsive (8.5%) with $p < 0.01$. There was no difference in post-operative complications pertaining to whether the tooth at the fracture site was extracted or retained.

Conclusion: There was an increasing proportion of positive response to pulp test of initially non-responsive teeth over time. The incidence of postoperative infection was not enhanced by retaining the teeth directly in the line of and adjacent to the fractures.

Keywords: Mandible fracture, Pulp sensitivity, Pocket depth, Tooth mobility, Fracture displacement, Marginal bone loss, Root resorption.

INTRODUCTION

Traumatic injuries have always been associated with human race. The unique position of the mandible makes it extremely vulnerable to injury. Incidence of mandibular fractures ranks first among all fractures of the bones of facial skeletal. Teeth in line of fractures of mandible

have always posed a dilemma to the Maxillofacial Surgeon. Such fractures are considered open and are always in communication with oral cavity because of presence of periodontal ligament. Teeth involved too may get devitalized as a result of traumatic severance of their vascular communications or thrombosis of feeding vessels. Such teeth have been considered foreign bodies and source of infection that might complicate satisfactory healing of the fracture.^{1,2,3} Historically in the pre antibiotic era, teeth in line of fractures generally were condemned for extraction because of the increased potential for untoward sequel such as osteomyelitis, non-union, delayed union. Since the advent of antibiotics, surgeons have been bolder with respect to retention. Indeed, some consider that retention is indicated if it helps in reduction by providing posterior stop, by permitting proper alignment of the arch or by preventing collapse or telescoping of segments. Apart from providing an accurate guide for reduction of the fracture, the teeth present in the line of fracture serve as a potential source of infection. These teeth may provide a route of ingress for oral microbes by way of the periodontal ligament or through the root canal particularly in cases of pulp infection or periapical pathology.⁴⁻⁸ The tooth in the fracture line may become necrosed due to traumatic severance of the neurovascular supply to the pulp as a result of the injury. Also there is an increased susceptibility to infection in the damaged region whenever absolute immobility is not maintained across the fracture line with wire osteosynthesis or intermaxillary fixation. This mechanical instability potentiates the irritation potential of the tooth in the line of fracture. Keeping these factors in view, in the pre-antibiotic era, it was recommended that all teeth present in the line of fracture be extracted.

Teeth lying within the fracture line and teeth lying adjacent to fracture line may be associated with certain complications, which include marginal bone loss, periodontal pocket formation, tooth mobility and pulp necrosis. Thus, there is a need to follow up these factors so that they can be treated optimally. Several studies have investigated the prognosis of teeth directly in the fracture line in mandibular fractures. Kamboozia and Punnia-Moorthy⁵ demonstrated the need to assess the fate of teeth in line of, as well as adjacent to, mandibular fracture sites.

AIM OF THE PRESENT STUDY

The aim of this study is to assess the prognosis of teeth directly in the line of and adjacent to fracture sites which are managed by closed reduction and evaluate the prognosis of retained teeth.

METHODOLOGY

A prospective observational study was conducted amongst patients who reported to the outpatient wing, Department of oral and maxillofacial surgery, Government Dental College, Thiruvananthapuram with mandibular fractures in dentate region managed by closed reduction satisfying the inclusion and exclusion criteria, were selected for the study for 18 months. Informed written consent was obtained from all patients. The procedure followed in the study was done in accordance with the ethical standards of the responsible Committee.

INCLUSION CRITERIA

- Patients with mandibular fracture in dentate region
- Fractures in the mandible included symphysis, parasymphysis, body, and angle regions
- Fracture reduction by intraoral traction method
- Absence of periapical pathology
- Presence of minimally displaced, <3mm of fracture segments.
- Exclusion criteria
- Patients with uncontrolled systemic condition such as diabetes, immunocompromised patients with periodontal diseases.

- Traumatic occlusion, presence of Para functional habits.
- Pulp exposed tooth and teeth with peri apical pathology, root fracture, fracture of crown ,pericoronitis to the teeth retained in fracture line are excluded

A standardized surgical protocol was followed for all the patients. Antibiotic prophylaxis includes intravenous administration of 1.2 g Augmentin twice daily from the day of hospitalization for a period of five days. In cases of infected fractures, will give intravenous Metrogyl 500 mg thrice daily for a period of 5 days along with augmentin IV. After exposure of the fracture site, the tooth present in the line of fracture was either extracted or retained as indicated. Fracture segments were reduced and treated with either eyelet ligatures or with Erich type arch bars attached by circumferential dental wiring and MMF. The average length of MMF is 4 weeks. The retained teeth will be categorized into two groups -

(1) Group A: - Teeth directly in the line of the fracture

(2) Group B: - Teeth adjacent to the fracture

The clinical and radiographic parameters of all teeth of Group A and Group B were evaluated pre-operatively and post-operatively at 7th day, 1-month, 3-months and 6 months. The clinical parameters included: (a) sensitivity of the tooth, (b) tooth mobility, and (c) pocket depth. Pocket depth is measured in millimetres in both the mesial and distal sulci of tooth in the line of the fracture using a WHO colour-coded probe. Pulp vitality checked by electric pulp tester. Position of the fracture line in relation to the apical foramen and lateral periodontium of the involved tooth was assessed pre-operatively from orthopantomograph (OPG) and intra-oral periapical radiographs (IOPAR). (Figure 1 & 2) All statistical analyses were performed using SPSS software. Association between qualitative variables analysed by Chi square test. Relationship between quantitative variables analysed by Pearson correlation. A p- values <0.05 will be considered statistically significant. Data analysis performed using SPSS ver 20.

RESULTS

Of the 59 patients, there were 38 male (64.4%) and 21 female (35.6%) patients. A total of 59 fracture sites were encountered, with the most frequent fracture site being in the mandibular parasymphysis and body region (n=20) followed by mandibular symphysis (n=15), dentoalveolar region (n=4).

Figure 1: a) Maxillary and Mandibular arch –bar with intermaxillary fixation, b) OPG showing closed reduction with erich arch bar

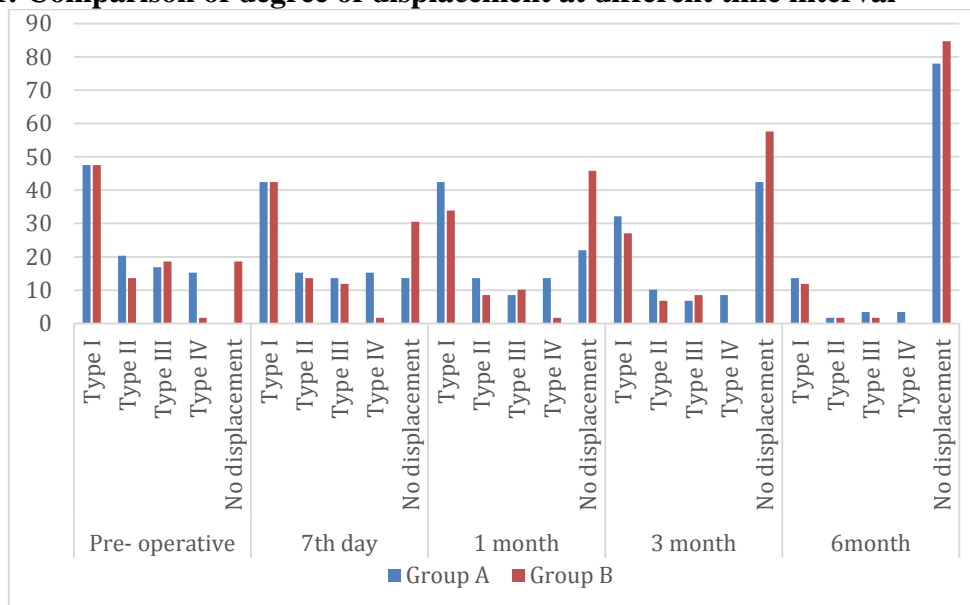


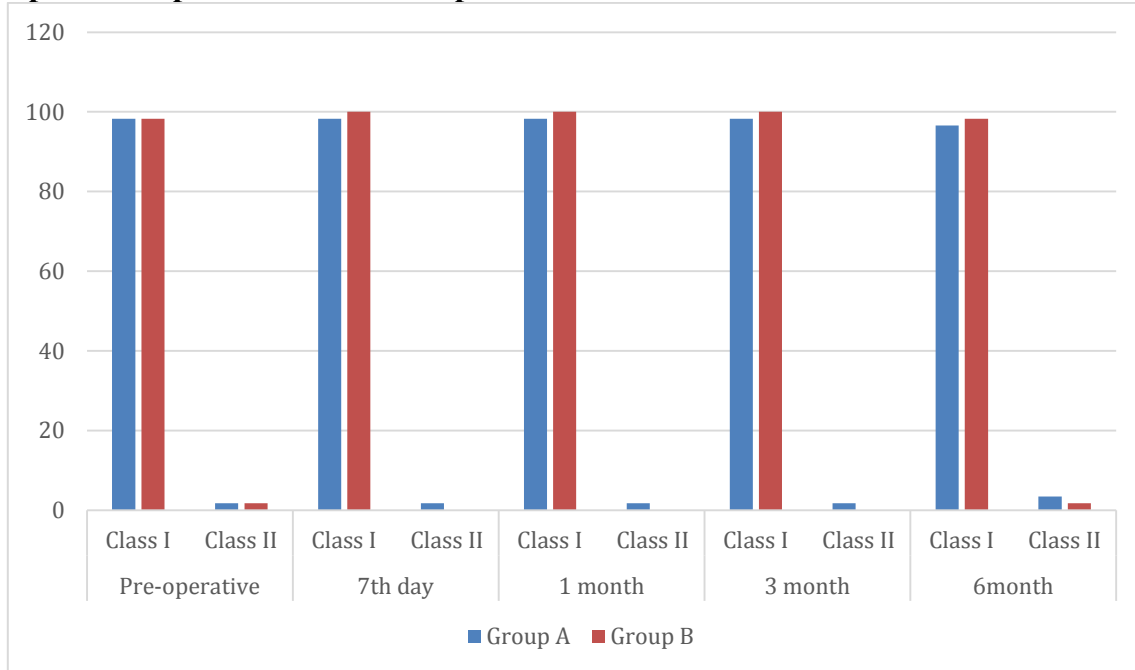
Figure 2- a) Checking mobility of teeth, b) Checking pocket depth



A total of 118 teeth were present in 59 fracture sites, of which 59 teeth were assigned to Group A and 59 teeth to Group B. Tooth mobility of Group A and Group B are pre-operatively showed varying degrees. However, post-operatively, it was only 5.1 % grade 1 mobility 3 months and 1.7% grade 2 mobility in 6months in Group A. group B shows 1.7% of grade 1 and grade 2 mobility in both 3 and 6 moths. Paired ‘t’ test revealed a highly significant difference in mobility at all post-operative intervals ($p < 0.01$). Pocket depth in Group A showed continuous significant reduction ($p < 0.01$) from pre- operative to post-operative 7 days, after one month, and after 6 months. In Group B, there was a significant reduction ($p < 0.01$) in pocket depth from post-operative 7 days to one month. The pulp sensitivity of teeth varied with different intervals. In Group A, pre- operatively out of 59 teeth, only 5 teeth (8.5%) responded to electric pulp testing. In Group B preoperatively 45 teeth responded positively (76.3%). In Group A after 6 months 43 teeth showed positive sensitivity (72.9%) whereas in Group B 54 teeth showed positive response (91.5%). Among the 59 fracture sites, Type I fracture (47.5%) was the most common type, followed by Type II (20.3%), Type III (16.3%), Type IV (15.3%). Radiographic assessment of root resorption revealed that 58teeth (98.3%) had Class I, only one tooth (1.7%) had Class II resorption in Group A. (Graph 1 & 2) Radiographic assessment of marginal bone loss in Group A preoperatively it was 39% then it reduced to 23.7% on post op 6month.

Graph 1: Comparison of degree of displacement at different time interval



Graph 2: Comparison of root resorption at different time interval

In Group B preoperatively it was 20.3% then it reduced to 11.5% on post operative 6-month period. (Table 1)

Table 1: Comparison of marginal bone loss at different time intervals

Marginal bone loss		Group A		Group B		Z#	p
		Count	Percent	Count	Percent		
Pre-operative	Present	23	39.0	12	20.3	2.21*	0.027
	Absent	36	61.0	47	79.7		
7th day	Present	21	35.6	8	13.6	2.77**	0.006
	Absent	38	64.4	51	86.4		
1 month	Present	19	32.2	6	10.2	2.92**	0.004
	Absent	40	67.8	53	89.8		
3 months	Present	17	28.8	5	8.5	2.82**	0.005
	Absent	42	71.2	54	91.5		
6 months	Present	14	23.7	7	11.9	1.68	0.093
	Absent	45	76.3	52	88.1		

Mann-Whitney U Test

** - Significant at 0.05 level, * - Significant at 0.05 level

DISCUSSION

In the present study, most of the teeth in both Group A and B showed varying grades of pre-operative mobility, periodontal pocket depths and pulp sensitivity, which subsequently changed at the post-operative periods. Disruption of the periodontium during trauma, different interdental splinting procedures and soft tissue manipulation during surgical intervention may affect the periodontal health and render teeth in the fracture line more prone to gingival detachment resulting in infrabony pockets²¹. Subsequent lodgement of food debris and calculus, and inadequate reduction of fracture segments, can lead to alveolar bone loss resulting in tooth mobility. These results imply that avoidance of incisions directly over already breached gingiva, adequate reduction of fracture segments, gentle handling and adequate repositioning of the soft tissues, decreased post-operative use of

wiring and meticulous oral hygiene minimize tooth mobility, periodontal pocket formation and marginal bone loss.⁶ In this study, the pulp sensitivity of initially non-responsive teeth of Group A and B continued to increase over time, and at the end of 6-months period 72.9% were responding to pulp tests, which confirms that recovery from inferior alveolar sensory disturbance usually starts between 6 weeks to 2 months post-injury and can proceed for 2-3 years. Thus it is strongly implied that teeth involved in jaw fractures should not be submitted to endodontic treatment or extracted during the initial stages and they should not be considered as having pulp necrosis until clinical and radiographic signs of infection are evident.⁹ In our study also age distribution among 20-29 years of age found more. Teeth in mandibular line fractures should be extracted when markedly distracted from fractures with extensive exposure of the root and when there is extensive periodontal damage resulting in deep pockets even after arch bar fixation. There was a significant difference in the incidence of dental problems among the teeth with bony displacement over 3 mm. One of the main objectives of treating bone fractures is to restrict or hinder the movement of fractured bone segments in order to prevent complications like inadequate healing, infection, or life-threatening abscesses. The mandible area is the most susceptible site for these complications, and this area is the only moving bone in the maxillofacial region. Therefore, fixing the fractured segments of this bone has a considerable importance.¹⁰ A long-term observation period of the teeth retained in fracture line is advisable regarding both clinical and radiographic complications.

CONCLUSION

The study reveals that teeth involved in jaw fractures undergo various long-term sequelae ranging from pulp necrosis, marginal bone loss, periodontal pocket formation, root resorption to periapical radiolucencies and that their prognosis affects the overall management of the fractures. There was an increasing proportion of positive response to pulp test of initially non-responsive teeth over time. The incidence of postoperative infection was not enhanced by retaining the teeth directly in the line of and adjacent to the fractures.

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