

Original Article:

Clinical evaluation of healing of mandibular parasymphysis fractures with teeth in the fracture line

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Abstract

Introduction: The aim of this study was to evaluate the postoperative results of mandibular parasymphysis fracture containing tooth in the fracture line. **Materials and methods:** The study was conducted at department of Oral & Maxillofacial Surgery, Dhaka Dental College and hospital. A total of 20 Patients included as study population, who were divided into two groups. Group I (retained group) consisted of 10 patients (50%) in which the teeth were retained in the fracture line. Group II (Extracted group) consisted of 10 patients (50%) in which teeth were extracted following specific criteria. All Patients were treated by open reduction and fixation with stainless steel miniplate and monocortical screw. Patients were followed up at 1st week, 8th week, 12th week and 24th week of postoperative period and evaluated for healing related complications of fracture like infection, delayed union, malunion, and nonunion. **Results:** Out of 20 cases 3 patients (15%) had developed complications. In the retained group only one complication developed which was malunion. Where as in the extracted group two complications developed, one was delayed union and another one was infection. Postoperative complications rate in retained group was 10% and in extracted group it was 20%. In the early postoperative period the frequency of infection was more in both group and was decreased gradually with passage of time. In the 1st week of postoperative period the infection rate in extracted group was 20%. On the other hand in retained group it was 10%. No case of infection was found at following 8th and 12th week. After 24th week, 10% infection rate was found in extracted group and it was 0% in retained group. 10% delayed union was found in extracted group but absent in retained group. No case of malunion was found in extracted group but it was 10% in retained group. The complications rates were lesser in retained group than extracted group. **Conclusion:** Teeth associated with mandibular parasymphysis fracture should not be removed on a prophylactic basis to reduce the risk of complications of fractures site without an absolute indication for removal.

Key words: Mandibular fracture, Parasymphysial region, Tooth in the fracture line, Effect of healing.

Introduction

The mandible is the area of the face with major incidence of fracture. Its prominence and position in the skeletal face predispose to frequent traumas¹. Reports have shown that on average more than 75% of the mandibular fractures are caused by motor vehicle accidents and interpersonal violence².

The most common facial fractures were in mandible (61%) followed by maxilla (46%), the zygoma (27%) and the nasal bones (19.5%)².

Almost 50% of the mandibular fractures occur in the teeth bearing region³. Ellis⁴ reported, a tooth was present in the fracture line 85% of the time. Parasymphysis fracture of mandible was 29.2%¹. The mandibular fracture line with involved teeth, because of presence of periodontal ligament, is always in communication with oral cavity and therefore may allow the spread of infection.

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Moreover, such tooth may lose blood supply due to damage of apical blood vessels and in case of pulp necrosis the tooth is the source of infection⁵.

The treatment plan for teeth in the line of fracture has evolved through the years because of development of new antibiotics and fixation techniques. Opinions differ regarding removal of teeth in the line of mandibular fractures.

Ellis reported a 19.5% infection rate when the tooth was present in the fracture line as compared to 9.0% when tooth was extracted⁴. Complications rate more when tooth is retained. Ellis found virtually no difference in incidence of infection when teeth were left in the line of fractures or extracted⁴.

A great variety of options has been observed relating to management, prognosis of these teeth and method of treatment¹. So which is the best procedure to follow when there are teeth involvement in the mandibular fracture line, taking into consideration the occurrence of post operative complication, should be find out.

The aim of this study is to evaluate the results of mandibular parasymphysis fracture complicated by the presence of teeth in the line of fracture and to undertake a clinical & radiological evaluation of complication of healing like delayed union, nonunion, malunion and infection, so as to indicate if they should be managed conservatively or extracted.

Materials and Method

Patients admitted in the Department of Oral and Maxillofacial Surgery of Dhaka Dental College and Hospital with parasymphysis fracture of mandible containing teeth in the fracture line willing to take part in the study, were included. Study was carried out from January 2013 to December 2014. A data collection sheet and check list were designed to obtain information about teeth present in the parasymphysis mandibular fracture line, treatment and evaluation of healing. All relevant information was recorded methodically and meticulously as far as possible in a pre-data sheet for each individual case. A total number of 20 patients of mandibular parasymphysis fracture containing teeth in the fracture line were included in the study by purposive sampling.

Among them in 10 patients, teeth were retained and in rest 10 patients, teeth were extracted.

Selection criteria of the Patient was Adult patients having only parasymphysis fracture and no fracture in other site of the mandible containing teeth in the fracture line, Those who had consent to be included in the study and co-operative patients. List of variables were age, sex, infection, malunion, delayed union and nonunion.

Management of the fracture done by open reduction and fixation with stainless steel miniplate and screw. Teeth in the line of fracture had not been extracted unless there was an absolute indication. Fracture site was exposed by an intraoral approach and intraoperative occlusion was achieved by means of IMF with an arch bar and 26 gauge wire. Two stainless steel 4 hole miniplate with gap were applied at the superior aspect of the fracture site subapically and in the lower border of the mandible and were fixed with monocortical screw of 2m.m diameter.

In the postoperative phase, patients were put on IMF for a period of 10 days and broad spectrum first generation cephalosporine antibiotics in syrup form were administered to all patients prophylactically for seven days. Oral hygiene was maintained by a 0.2% Chlorhexidine oral rinse. The patients were followed up at 1st week, 8th week, 12th week and 24th week of postoperative period and evaluated for healing related complications of fractures e.g infection malunion, delayed union and nonunion. Infection was detected clinically. Malunion, delayed union and nonunion was detected clinically and radiologically by OPG and occlusal view of mandible. Comparison of complications also done between above mentioned two groups.

Data were processed and analyzed using SPSS (Statistical Package for social science) version 22. The test statistics used to analyze the data were descriptive statistics, Chi-square (χ^2) Test and Unpaired t-Test. The level of significance was set at 5% and $p < 0.05$ was considered significant.

Figure 1: Age distribution of the respondents (n = 20)

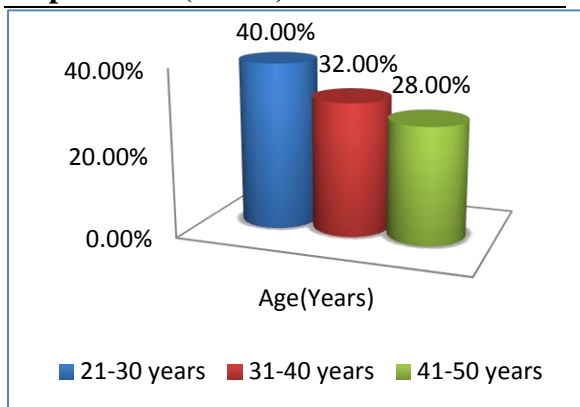


Figure shows 40% population in the age group of 21-30 years, which was the most common, 32% in the age group of 31-40 years and 28% in the age group of 41-50 years.

Figure 2: Sex distribution of the respondents (n=20)

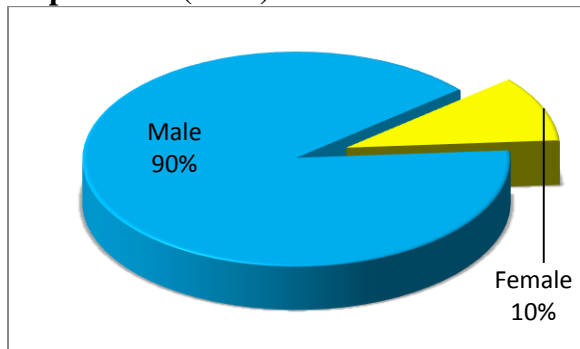


Figure illustrates the sex distribution of the respondents. Out of 20 patients 18 (90%) were male and 2 (10%) were female respondents. Males were predominant .

Figure 3: Distribution of retained and extracted group of participants (n=20)

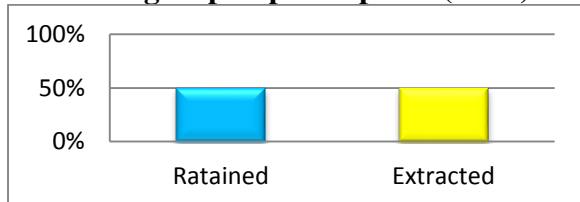


Figure shows 10 patients (50%) in whom tooth was retained in the fracture line and 10 patients (50%) in whom tooth was extracted.

Results

Out of 20 cases 3 patients (15%) had developed complications. In the retained group only one complication developed which was malunion. Where as in the extracted group two

complications developed, one was delayed union and another one was infection.

Age distribution of the respondents (n = 20) was 40% population in the age group of 21-30 years, which was the most common, 32% in the age group of 31-40 years and 28% in the age group of 41-50 years (Figure 1). Out of 20 patients 18 (90%) were male and 2 (10%) were female respondents. Males were predominant (Figure 2). Distribution of retained and extracted group of participants (n=20) was 10 patients (50%) in whom tooth was retained in the fracture line and 10 patients (50%) in whom tooth was extracted (Figure 3).

Status of Infection of (n=20) at 1st, 8th, 12th and 24th week of follow up period among the respondents was at 1st week, 1(10%) infection was found in retained group and 2(20%) infections were found in the extracted group, out of 10 patients. Total rate of infection was 3(15%) out of 20 patients. No infection was found at 8th and 12th week. At 24th week 1(10%) infection was noticed in extracted group and the total infection was 5% out of 20 patients. There was no significant association (p> 0.05) between infection and presence or absence of tooth in the fracture line (Table 1). Status of delayed union at 1st, 8th, 12th and 24th week of follow up period among the respondents was at 1st week delayed union was absent in both group. At 12th and 24th week 1(10%) delayed union out of 10 patients was found in extracted group. Delayed union was absent in retained group. The total delayed union was 1(5%) out of 20 patients. There was no significant association (p> 0.05) between delayed union and presence or absence of tooth in the fracture line (Table 2).

Status of malunion at 1st, 8th, 12th and 24th week of follow up period among the respondents was 1st week no malunion was found in both group. At 8th, 12th and 24th week only 1(10%) malunion out of 10 patients was found in retained group and was absent in extracted group. The total malunion was 1(5%) out of 20 patients. There was no significant association (p> 0.05) between malunion and presence or absence of tooth in the fracture line (Table 3).

Status of nonunion at 1st, 8th, 12th and 24th week of post operative period. No case of nonunion was found in both retained and extracted group (Table 4).

Table 1: Status of Infection of the respondents (n=20)

Teeth in the fracture line	Status of infection at 1 st , 8 th , 12 th & 24 th week								Total
	1 st Week		8 th Week		12 th Week		24 th Week		
	Present	Absent	Present	Absent	Present	Absent	Present	Absent	
Retained	1(10%)	9	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	10
Extracted	2(20%)	8	0(0.0%)	10	0(0.0%)	10	1(10%)	9	10
Total	3(15%)	17	0(0.0%)	20	0(0.0%)	20	1(5%)	19	20
Value	Chi-square = 0.392, p = 1.000						Chi square = 1.053, p = 1.000		

Table shows status of infection at 1st, 8th, 12th and 24th week of follow up period among the respondents. At 1st week, 1(10%) infection was found in retained group and 2(20%) infections were found in the extracted group, out of 10 patients. Total rate of infection was 3(15%) out of 20 patients. No infection was found at 8th and 12th week. At 24th week 1(10%) infection was noticed in extracted group, and the total infection was 5% out of 20 patients. There was no significant association ($p > 0.05$) between infection and presence or absence of tooth in the fracture line

Table 2 : Status of delayed union of respondents (n=20)

Teeth in the fracture line	Status of delayed union at 1 st , 8 th , 12 th & 24 th week								Total
	1 st Week		8 th Week		12 th Week		24 th Week		
	Present	Absent	Present	Absent	Present	Absent	Present	Absent	
Retained	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	10
Extracted	0(0.0%)	10	0(0.0%)	10	1(10%)	9	1(10%)	9	10
Total	0(0.0%)	20	0(0.0%)	20	1(5%)	19	1(5%)	19	20
Value					Chi-square = 1.053, p = 1.000		Chi-square = 1.053, p = 1.000		

Table shows status of delayed union at 1st, 8th, 12th and 24th week of follow up period among the respondents. At 1st week delayed union was absent in both group. At 12th and 24th week 1(10%) delayed union out of 10 patients was found in extracted group. Delayed union was absent in retained group. The total delayed union was 1(5%) out of 20 patients. There was no significant association ($p > 0.05$) between delayed union and presence or absence of tooth in the fracture line.

Table 3 : Status of malunion of respondents (n=20)

Teeth in the fracture line	Status of malunion at 1 st , 8 th , 12 th & 24 th week								Total
	1 st Week		8 th Week		12 th Week		24 th Week		
	Present	Absent	Present	Absent	Present	Absent	Present	Absent	
Retained	0(0.0%)	10	1(10%)	9	1(10%)	9	1(10%)	9	10
Extracted	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	10
Total	0(0.0%)	20	1(5%)	19	1(5%)	19	1(5%)	19	20
			Chi-square = 1.053, p = 1.000		Chi-square = 1.053, p = 1.000		Chi-square = 1.053, p = 1.000		

Table shows status of malunion at 1st, 8th, 12th and 24th week of follow up period among the respondents. At 1st week no malunion was found in both group. At 8th, 12th and 24th week only 1(10%) malunion out of 10 patients was found in retained group and was absent in extracted group. The total malunion was 1(5%) out of 20 patients. There was no significant association ($p > 0.05$) between malunion and presence or absence of tooth in the fracture line.

Table 4 : Status of nonunion of the respondents (n = 20)

Teeth in the fracture line	Status of nonunion at 1 st , 8 th , 12 th & 24 th week								Total
	1 st Week		8 th Week		12 th Week		24 th Week		
	Present	Absent	Present	Absent	Present	Absent	Present	Absent	
Retained	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	10
Extracted	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	0(0.0%)	10	10
Total	0(0.0%)	20	0(5%)	20	0(0.0%)	20	0(0.0%)	20	20

Table shows status of nonunion at 1st, 8th, 12th and 24th week of post-operative period. No case of nonunion was found in both retained and extracted group.

Discussion

The long standing concept that teeth in the fracture line must be removed seems to be changing and leading to a newer concept that such teeth can be preserved⁶.

Present study was conducted on 20 samples containing teeth in the parasymphysis mandibular fracture line which were divided into two groups. Teeth were retained in one group consisted of 10 patients and another group consisted of 10 patients in whom the teeth were extracted from the fracture line. No teeth were extracted in the fracture line unless absolutely indicated. In this study patients were followed up at 1st, 8th, 12th and 24th week for complications of healing. The parameters taken in this study were complications of healing like infection, delayed union, malunion and nonunion.

Majority of the patient were in the age group of 21 – 30 years (40%), which was the most common. Among them 90% were male and 10% were female. Yadavalli⁷ also found most common age group containing teeth in the fracture line between 21-30 years of age, which was 65% and 95% patients were male. So the mentioned study conform with the results of our study. The postoperative complications in retained group was 10% and in extracted group it was 20%. Total rate of complications were 15%. Complication rate was lesser in retained group.

In a study of 20 sample size, post operative complication rate in retained group (22.2%) were lesser when compared with extracted group (27.2%). Of the 20 cases, 5 (25%) had developed complications⁷. Overall complications were out of 20 sample (15%). Present study, overall complications were out of 20 sample (15%) which shows similar results with above mentioned study. Wagner⁸ had 37 cases of mandibular angle fractures with teeth in the line of fracture that were treated with an open reduction and found a complication rate of 11.8% in those fractures in which the teeth were retained and 35% when teeth were removed. The Complication rate was more in extracted group. Present study also supports the results of above mentioned study. In a study of Amartunga⁶, the frequency of complication was found to be 16.1% in retained group and 13.7% in extracted group. Complication was higher in retained group, but this difference is

statistically not significant⁶. Present study showed more complication rates in extracted group. This study do not supports the results of our study.

In early postoperative period the frequency of infection was more in both group and were disappeared with passage of time. In following 8th and 12th week no infection was present. At 24th week one infection was noticed in extracted group and broad spectrum antibiotic was administered for seven days but infection was not disappeared. After 24th week of follow up stainless steel miniplates were removed from the fracture site by second surgery and infection became cured within following one week.

In a study on 402 patients, postoperative infection was 15.8% in extraction group and 19.1% in retained group⁴. But in our study on 24th week of postoperative period infection present in retained group was 0% and in extracted group 5%. Ellis⁴ study showed more infection rate in retained group but statistically not significant. This study do not supports the results of our study.

In a study in India, out of 54 sample with teeth in the fracture line, infection was higher in retained group than extracted group initially but gradually the difference become less and statistically not significant⁹. The result of this study conforms with the results of present study.

A series of 1542 mandibular fractures with the presence of teeth in the fracture line was obtained. Of 788 cases where the tooth was removed, a postoperative infection occurred in 84 cases; of 754 cases where the tooth was retained, postoperative infection also occurred in 84 cases. Through this review it was observed that there was no significant statistical difference between removing or retaining the tooth in the line of fracture and the occurrence of postoperative infection by Borbrowski AN et al.¹⁰. The result of this study conform with the result of our study.

In a study on 82 patients with 100 fracture lines in mandible, 67 fracture lines were associated with teeth. In 32 cases teeth were removed from the fracture line and in 35 cases teeth were retained. Postoperative infection found in 13 cases. In retained group infection developed in 9 (25.7%) cases and in extracted group infection was found in 4 (12.5%) cases.

Infection was more in retained group found by Wagner et al⁸. The result of this study is not similar to the present study.

In present study delayed was found only in extracted group (10%) and was absent in retained group but Amartunga⁶ observed 6.86% cases of delayed healing in the extraction group compare to 8.06% in the retained group. The results of this study is not similar to our study, this variation may be due to different sample size. The sample size of above mentioned study was 226 which is much larger than our sample size.

Malunion was found only 1(5%) in retained group out of 20 cases, which produced malocclusion and it was corrected by increasing IMF time for additional one week in early postoperative period which resulting in an acceptable outcome.

In a study of 20 cases of mandibular fracture, teeth was extracted in 11 patients and retained in 9 patients. Patients were evaluated during post operative follow up for degree of healing of the fracture. No case malunion and nonunion were found. In present study 1(5%) case of malunion out of 20 patients were found but no cases of nonunion was identified by yadavalli et al.⁷. So this study contradict with our results regarding malunion.

In a study of 26 mandibular fractures, it was reported that complications developed in 8 patients. In these cases osteomyelitis, malunion were identified. A common features in all these cases was involvement of teeth in line of fracture by Chan et al¹¹.

Present study indicates the incidence of postoperative complications between retained and extracted cases. The overall complications were comparatively less in retained cases, but individual decision must be made in every case, whether to retain or extract the tooth involved in the line of mandibular fracture. In the present study, a sincere attempt have been made to clinically evaluate mandibular parasymphysis fracture with tooth in the fracture line and the result of this study were in accordance with the studies conducted by various authors.

Conclusion

It is generally accepted by most surgeons that antibiotic therapy should be administered when teeth are left in the line of fracture because of open nature and contamination of the oral cavity. Teeth associated with mandibular parasymphysis fracture should not

be removed on a prophylactic basis to reduce the risk of complication of fracture sites just if there is an absolute indication for removal. Each case must be evaluated individually, for maintaining or not the teeth in the parasymphysis fracture line, depending on the clinical and radiographic findings. As our sample size consisted of only 20 patients, a larger sample size can better evaluate the teeth in the line of fracture.

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