RETROSPECTIVE STUDY

Time lapse from the occurrence of trauma to the definitive management of mandibular fractures: a retrospective study

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Abstract The surgical management of maxillofacial trauma has come a long way in the last four millennia and without doubt will go further. The principles are not new but the interpretation constantly changes. A retrospective review of 52 in-patient records of mandibular fracture patients was done for the period 1 January 2003 to 30 June 2005.

Keywords Time lapse · Mandibular fractures

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Introduction

The objectives in treating mandibular fractures are to effect rapid healing by anatomic reduction and stabilization, with minimal disability and complications. Over the years, a number of techniques have been developed to achieve these results. Today the key question is not merely the incidence of post surgical complications, but more importantly, why a method or technique is successful in one case and not in another. Tateyuki et al. in 1991, have shown that the final outcome depends on the operator's skill and experience [1]. In another study Philip et al. has suggested that delay in treatment of a compound fracture is one of the main reason that increases the risk of developing bone infection or non union [2]. The delay is usually intertwined with the social history of the patient. A major percentage of the patients in the rural setting have social issues that increase both the likelihood of delay in initial treatment of fractures and the likelihood that these patients will be non compliant with the postoperative treatment protocol. In a study by Robert D. Marciani the mean initial time until treatment was six days after the injury [3]. There were six patients with complications in a total of 52 cases. The maximum delay was 34 days, for a patient with infection it was 19 days. It was argued that the time until initial treatment could be considered a measure or at least an indication of non compliance.

Aims and objectives

The aim of this retrospective study is
   1. To assess the time lapse between the onset of mandibular fracture and its definitive management.
   2. To assess the factors leading to time lapse in the definitive management of mandibular fractures.
   3. To evaluate the effects of time lapse, with special reference to infection, on the management of mandibular fractures and its ultimate outcome.

Table 1 Frequency of patients and the total time lapse

Total time lapse (days)	Number of patients	Number of patients with complications	Percentage
36	1	1	2%
30	1	1	2%
22	1	1	2%
19	1		2%
18	1		2%
17	2		4%
16	2	2	4%
15	4	2	8%
14	2		4%
13	7		13%
11	5		10%
10	3		6%
9	3		6%
8	4		8%
7	5		10%
6	2		4%
5	3		6%
4	2		4%
1	3		6%

Method

Inclusion criteria

The records of patients seen in the Department of Oral and Maxillofacial Surgery, with mandibular fracture were reviewed for this study. All the patients were considered irrespective of their age, sex, caste, creed, socio-economic status. All patients had panoramic radiographs and usually a mandibular radiographic series consisting of lateral oblique, postero anterior views.

Method of study

The variables that were considered responsible for the total time lapse are:
a. Time lost due to prior lack of treatment.
b. Time lost due to delayed reporting on part of the patient.
c. Time lost due to associated injuries or medical compromise.
d. Time required for the preoperative work up of the patient in the hospital.

The patient records were evaluated for the surgical procedure that was carried out, any intraoperative difficulty, and postoperative complications related to delayed treatment. It also involved assessment of patient compliance (that is keeping of appointments, obeying instructions, and other related factors). The review of surgical technique was similar to the one by Edward Ellis III [4]. All fractures were addressed by a team that consisted of a senior resident, a junior resident and an attending faculty member. Treatment included placement of arch bars and IMF preoperatively. This offered preoperative stabilization. All fractures were managed using monocortical miniplate osteosynthesis based on Champy's principles. Approach for open reduction was either intra-oral or extra-oral. The appropriateness of surgical procedure was analyzed by reviewing postoperative radiographs regarding adequacy of reduction and fixation.

Major health conditions such as diabetes, history of alcohol and drug abuse were recorded.

Statistical analysis

The variables considered for statistical analysis are:
a. Age
b. Time lost due to lack of treatment priority at some other center.

Table 2 Frequency of patients in the five age groups

Age group	Number of patients	Percentage	Cases with infection
up to 15 years	5	9.61%	0
15 to 25 years	10	19.23%	2
25 to 35 years	18	34.61%	2
35 to 45 years	11	21.15%	2
45 and above	8	15.38%	1

STATISTICAL ANALYSIS

Table 3 Descriptive statistics

Variable		No complications	Complications	Total
Age	Mean	30.68	30.14	30.61
	SD	13.76	8.93	13.14
	n	45	7	52
	Min	4	20	4
	Max	72	45	72
Total treatment time	Mean	9.91	21.57	11.48
	SD	4.56	8.34	6.50
	n	45	7	52
	Min	1	15	1
	Max	19	36	36
Patient neglicence	Mean	1.22	12.57	2.75
	SD	2.42	10.26	5.72
	n	45	7	52
	Min	0	0	0
	Max	9	30	30
Hospital delay	Mean	5.97	7.00	6.11
	SD	3.12	5.65	3.51
	n	45	7	52
	Min	1	0	0
	Max	15	15	15
Initial treatment time	Mean	2.71	2.00	2.61
	SD	3.32	4.12	3.40
	n	45	7	52
	Min	0	0	0
	Max	13	11	13

The analysis of variance of variables in Table 3 is:
F –Theoretical value for (1,50) degrees of freedom at 5% level of significance = 4.00. The multiple correlation with these variables by using multivariate analysis method was 0.010.

c. Time lost due to negligence on part of the patient.
d. Time required for the preoperative work up of the patient in the hospital.
e. Total treatment time.
The above variables were grouped into two:
a. Patients with complications
b. Patients without complications.

The analysis of variance table was prepared for each of the variables. Multivariate analysis was used to determine the multiple co-relation between the variables.

The 't' test is significant for total treatment time and patient negligence (i.e. patient non compliance) (Table 4). However no significant relation has been found between age, hospital delay and initial treatment time in this study. Table 5 gives the relationship between the time variables for patients with complications (Pearson correlation coefficient). It is seen that a significant correlation exists between total treatment time and patient negligence (i.e. patient non compliance).

Discussion

During the period 1 January 2003 to 30 June 2005, a total of 52 patients with mandibular fracture had reported. Of these, infection was seen in seven patients, an incidence of 13.6 %. All the seven patients with infection were male; four were cases of road traffic accident, one fall, and two assault. One patient developed infection post IMF, he was subjected to miniplate osteosynthesis after it was controlled. However infection recurred. Of the patients with infection, four were managed by intra-oral approach and three by extra-oral approach. In an evaluation of multiple fracture sites, twenty three patients (44.23%) had multiple fracture sites and three 5.76% of total and 13.04% of multiple fractures had infection.

It is seen that the total time lapse ranged from 1 to 36 days. Table 1 summarizes the findings of total time lapse from injury to the definitive management. The factors that can be cited as a cause of infection apart from time lapse are: Chronic smoker and non compliant – one patient with time lapse of 30 days, Poor oral hygiene and non compliant – one patient with time lapse of 16 days, Non-compliant patient – one patient with time lapse of 15 days, Contamination of the wound was seen in two patients with time lapse of 16 and 22 days, Loss of soft tissue was noticed in one patient with time lapse of 15 days, presence of other debilitating conditions was noted in one patient, the patient had a concomitant skin infection- verruca vulgaris and a time lapse of 36 days.

Similar to the studies of mandibular fractures of Moreno JC, James RB, the majority of the patients were young adult men, 18 patients in the age group of 25 to 35 (34.6%) [5,6]. A delay greater than two weeks was seen in all the patients with infection. Delay between injury and initial treatment must be considered, but there does seem to be a slight margin of safety.

Apart from delay there were five patients who did not receive any prophylactic antibiotics, preoperatively. This study seems to show that patients with compound mandibular fractures must receive prophylactic antibiotics. The protocol established by Philip L. Maloney et al. seems to hold good for the study [7]. The authors contend that a 4 day old intra medullary fracture with a potentially progressive impaired blood supply to the bone. Combination of an infection of the medullary bone adjacent to the fracture site, coupled with stripping of the periosteum and muscle while performing an open reduction, certainly compromises the blood flow to the fracture site and provides a local environment that is at an increased risk for a bone infection. In a preliminary study by Abubaker AO et al, has shown that the use of postoperative antibiotics in uncomplicated fractures of the mandible had no benefit in reducing the incidence of infection [8].

Non compliance on part of the patients is also another important factor highlighted by this study. The other statistically significant factor in the treatment outcome is time required in preoperative preparation of the patient. It is also largely related to co-operation offered by the patient. Compliance is not the exclusive domain of the patient, but should be viewed as a collaborative effort between the doctor and the patient. Non compliance can be the result of communication breakdown, interpersonal conflict, and unreasonable management protocols. Robert D. Marciani states that atleast a third of the patients who are prescribed a medical regimen do not do as they are told [3]. The socio economic status of the patient, nutritional status, oral hygiene, abusive habits, and other factors may all play a role in treatment outcome [9]. The presence of alcohol intoxication at the moment of the accident or at the moment of admission to the hospital is not reflected in the current study because of the difficulty of achieving accurate data in a retrospective study. However, the importance of this cannot be overlooked, inspite of the fact that most of the patients cannot be characterized as alcoholics. Jose Mareno has also expressed this view [5].

Additional investigations to identify the cause for these behaviors as well as the characteristics of these patients must be undertaken.

Table 4 Independent samples 't' test

Variable	t-value	Degrees of freedom	p-value	Significance
Age	0.10	50	0.92	Not-significant p>0.05
Total treatment time	5.53	50	0.00	Significant p<0.05
Patient negligence	6.61	50	0.00	Significant p<0.05
Hospital delay	0.71	50	0.47	Not-significant p>0.05
Initial treatment time	0.95	50	0.61	Not-significant p>0.05

Table 5 Relationship between the time variables for complications (Pearson correlation co-efficient)

Time variables	Statistics	Total treatment time	Patient negligence	Hospital delay	Initial treatment time
Total treatment time	Pearson correlation p-value	— —	0.75 0.04S, p<0.05	0.33 0.45NS, p>0.05	-0.32 0.47 NS, p>0.05
Patient negligence	Pearson correlation p-value	0.75 0.04 S, p<0.05	— —	0.24 0.59 NS, p>0.05	-0.62 0.13 NS, p>0.05
Hospital delay	Pearson correlation p-value	0.33 0.45 NS, p>0.05	-0.24 0.59 NS, p>0.05	— —	-0.07 0.86 NS, p>0.05
Initial treatment time	Pearson correlation p-value	-0.32 0.47 NS, p>0.05	-0.62 0.13 NS, p>0.05	-0.07 0.86 NS, p>0.05	— —

S: Significant, NS: Not Significant

Conclusion

The results of this study reinforce the need for early immobilization of compound fractures. Although an initial delay in treatment time (from the occurrence of trauma to admission) is not significant in this study, this factor is often intertwined with the social history of the patient. The patients with a history of substance abuse often delay seeking treatment of fractures.

The problem in the treatment of mandibular fractures is not only the incidence of postoperative infections, but also more importantly, why they occur. There are obviously multiple factors involved, which are intricately related to each other. However, the two most definitive factors that predispose the patient to post surgical infection are delay in immobilization of compound fractures and a lack of patient compliance.

Any recommended treatment protocol should best address both these issues as this will curtail the uncontrolled, confounding factors leading to complications.

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