



Retrospective evaluation of clinical efficacy of low-profile locking mandibular reconstruction plate system in surgical management of mandibular fractures: A 9 months follow up study

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Abstract

Background & Aim: As we all are aware that open reduction and internal fixation is the frequently performed in the surgical management of comminuted fractures where the jaw bone is broken into more than two pieces. Rational usages of reconstruction plate have also been shown as a reliable modality for managing such clinical situations. They usually exhibit excellent clinical result with least complications. This follow up study aimed to evaluate the clinical efficacy of low-profile locking mandibular reconstruction plate system in the surgical management of comminuted mandibular fractures. The study was completed on a follow up model of 9 months.

Materials & Methods: The present retrospective study was conducted in the department of general surgery of the hospital. It included 10 patients for whom open reduction internal fixations was done for managing mandibular fractures using a low-profile locking mandibular reconstruction plate system. Out of 10 patients, 5 were male and 5 were female patients of age range 31-50 years. On the basis of related post-operative signs, symptoms and other associated parameters, the clinical efficacy of the above mentioned methodology was evaluated in 9 month follow up period.

Results: Total 7 patients were reported after Road Traffic Accidents, 2 were injured following Sports activities and last patients injured due to falls. Symphysis Region fracture was reported as the most common site of fracture wherein 7 patients total were observed. Patients were not complaining about extra-oral sensibility and discomfort of low-profile plating systems.

Conclusion: The responses were very imperative as they reflected the overall effectiveness of low-profile locking mandibular reconstruction plate system in surgical management of comminuted mandibular fractures. Results clearly showed that open reduction with internal fixation using low-profile locking mandibular reconstruction plate system yielded outstanding results with fast recovery and minimum complications. Therefore, low-profile locking mandibular reconstruction plate system can be reliably and judiciously used for surgical management of such clinical condition.

Keywords: surgical reconstruction, open reduction, mandibular fracture, trauma

Introduction

By medical definition, a comminuted fracture is a fracture in which a bone is broken, splintered, or crushed into a number of pieces. Whereas the comminuted mandibular fracture is defined as the presence of multiple fracture lines resulting in many small pieces within the same area of the mandible (angle, body, ramus, symphysis) [1]. The common etiologies include high impact sports, road traffic accidents [RTA] and falls. When reviewing the past management practices, it revealed that common comminuted mandibular fractures were managed solely by closed reduction technique so as to avoid periosteal stripping and de-vascularization of fractured fragments [2-4]. However trends has changed now from closed to open reduction modality with some advanced rigid fixation techniques. Literature has well evidenced that open reduction with internal fixation is a superior treatment option as it causes less complications as compared to closed reduction method [5-6]. Still some of the researchers worked on these

dilemmas and stated that it is still controversial whether closed reduction is the most favorable treatment for comminuted fractures as compared to open reduction with internal fixation. Hence most of the clinician believe that the clinical decision making (as to what to do) must be based on the clinical findings and related investigations. Or in other words it must be purely evidence based. Theoretically, the mandibular bone reconstruction plate system should be strong enough to withstand the massive functional and occlusal forces. As seen in many of the studies, typically it must be more than 2.5-2.8 mm in thickness [7]. However, traditionally used screw systems require sound and sufficient bone for their placement. They also cause many complaints regarding sensation, palpability and altered skeletal profile particularly in females and geriatric patients. Klotch *et al.* in their retrospective study on mandibular reconstruction plate had showed that plate exposure can be reduced using low profile mandibular reconstruction plate [8]. In this study, we have followed 10

cases of comminuted mandibular fracture those were surgically managed by low-profile locking mandibular reconstruction plate system. This study was conducted to evaluate the clinical efficacy of mandibular reconstruction plate system in surgical management of mandibular fractures. Here authors have genuinely attempted to investigate the existing outcomes by processing patient's post operative responses.

Materials & methods

The present study was conducted in the department of general surgery of GS Medical College, Pilkhuwa (Hapur), UP, India. All patients were informed about the study and written consents were obtained. Ethical clearance was also obtained from the institutional ethical committee. Out of 10 patients, 5 were male and 5 were female patients of age range 31-50 years. Patients were screened out from the outpatient department of the hospital for last 1.5 years. The importance of this study was revealed to all participating patients. The privacy of the respondents and their freedom of expression were completely ensured. On the basis of strict inclusion and exclusion criterion, we finally selected 10 patients for whom open reduction internal fixations was done for managing their mandibular fractures using a low-profile locking mandibular reconstruction plate system. The sole inclusion criterion was cases with comminuted mandibular fracture those ready for follow up visits after 9 months of treatment completion. The exclusion criterion was 1) any past history of radiotherapy in mandibular region 2) pathological mandibular fracture as related to underlying *osteomyelitis*, cysts and malignancies. In due course, all 10 selected and thereafter admitted patients undergone open reduction with internal fixations using a low-profile locking mandibular reconstruction plate system. Basic demographic details and other relevant finding were recorded for data analysis. First and foremost, rigid fixation of the dentition and jaw fragments was achieved using metal arch. The maxillomandibular jaw relation was ensured to be in centric occlusion. In most of the studied cases, some of the teeth were exfoliated due to miscellaneous reasons. We tried to conserve the remaining teeth in either of jaws. This was to ensure complete occlusion and post-operative masticatory efficiency. An extra oral approach was used wherein all fracture sites were exposed prior to reduction and fixation. The mandibular fractured small fragments were then reduced and fixed using lag screws, miniplates, Approximately 2.0 mm thick low profile locking reconstruction plates were finally used to surgically repair comminuted mandibular fractures (Figure 1). After final discharges, patients were recalled periodically for the critical assessment of developing symptoms or complications related to surgery. Essential radiographic investigations (X-Ray, CT Scans) were also performed in post-operative phases to evaluate the status of bony calcification and dental occlusion. We have decided to conduct this study on retrospective and follow-up model since they are extremely useful to obtain detailed information about personal and or group perceptions and opinions. They are also competent of saving time and money while analyzing the subjects at individual levels. In addition, they also give a broader viewpoint with better clarification and understanding. Results thus obtained was tabulated and subjected to basic

statistical analysis to estimate relevant inferences. P value less than 0.05 was considered significant ($p < 0.05$).

Statistical analysis and results

All the studied parameters and records were gathered and sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, USA). The resultant data was subjected to relevant statistical tests to obtain p values, and other relevant statistical outcomes. Table 1 and Fig 2 showed that out of 10 patients, males were 5 and females were 5. Total 5 patients were belonging to age group 41-45 years. Only 1 patient was falling in the age range of 31-35 years thus we can assume that most of the studied patients (50 %) were belonging to age group of 41-45 years. P value less than 0.05 was considered significant ($p < 0.05$) hence P value was significant for this age group. Total 7 patients were reported after Road Traffic Accidents, 2 were injured following Sports activities and last patient injured due to falls (Table 2 & Fig 3). P value was significant for this parameter. We have also attempted to categorize the patients according to their sites of comminuted mandibular fractures. Symphysis Region fracture was reported as the most common site of fracture wherein 7 patients total were observed. Symphysis region fractures coupled with right and left mandibular fractures were seen in 2 patients. Only one patient was having only right mandibular body comminuted fracture (Table 3). Soon after the admission of the patients, basic life support systems were ensured with commencement of primary treatment like managing hemostasis, edema etc. Surgery was performed only after achieving all the vital parameters in their acceptable ranges. In post-operative follow up phases (9 months) we have not detected any gross facial anomalies and deformities in all 10 studied patients. The restoration of altered dental occlusion was also optimal and acceptable. Patients were not complaining about extra-oral sensibility and discomfort of these plating systems. Moreover we did not notice any significant post-operative signs of supper-added infections and related complications. All patients were mentally stable and have a positive outlook regarding their fast recovery and healing. Remarkable improvement of overall esthetic and function was reported in all studied patients.

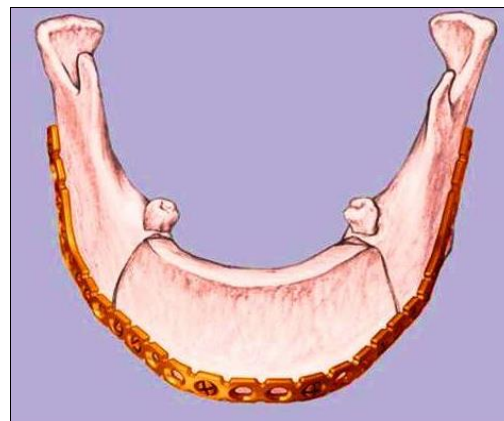


Fig 1: Schematic representation of low profile plating system

Table 1: Age & gender wise distribution of patients

Age Group (Yrs)	Male	Female	Total	P value
31-35	1	0	1 [10 %]	0.10
36-40	1	1	2 [20 %]	1.00
41-45	2	3	5 [50 %]	0.01*
45-50	1	1	2 [20 %]	0.30
Total	5	5	100 %	*Significant

*p<0.05 significant

Table 2: Distribution of patients according to etiology of mandibular fracture

S. No	Variables	No. of Patients	p value
1	Road Traffic Accidents [RTA]	7	0.010*
2	Sports Activities	2	
3	Falls	1	
4	Gunshot Injuries	0	

*p<0.05 significant

Table 3: Distribution of patients according to site of comminuted mandibular fracture

S. No	Region	No. of Patients	p value
1	Symphysis Region	7	0.080#
2	Symphysis + Rt Mandibular Body	1	
3	Symphysis + Lt Mandibular Body	1	
4	Rt Mandibular Body only	1	
5	Lt. Mandibular Body only	0	

#p>0.05 insignificant

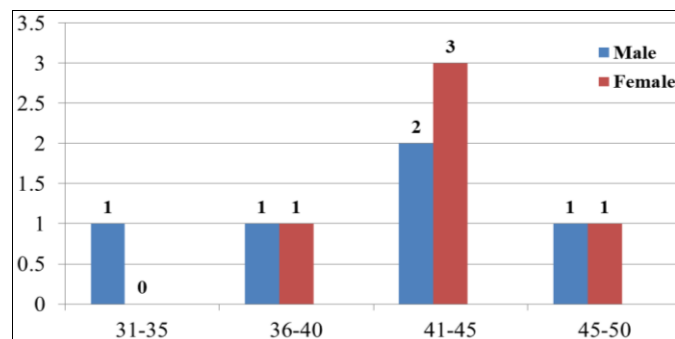


Fig 2: Age & gender wise distribution of patients

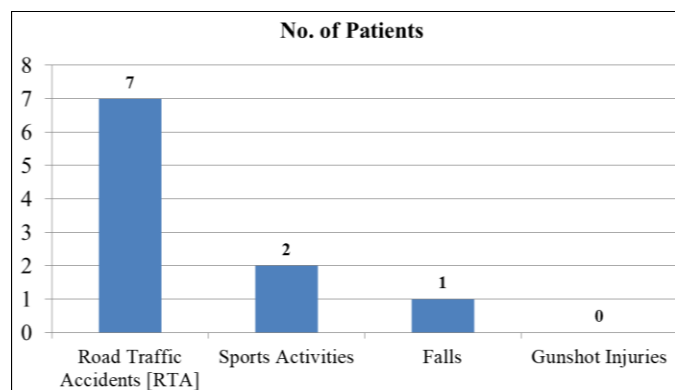


Fig 3: Graphical representation of patients according to etiology of mandibular fracture

Discussion

As we all are aware that mandibular reconstruction has always been challenging and demanding task in the field of surgery. It

is like that since the mandible is actively involved in phonation, chewing, swallowing, and facial esthetics [9-10]. Therefore, even slight mandibular disfigurement can cause serious discomfort and problem to the patient [11]. However with the advent of modern reconstruction plating systems, mandibular form and function can be received effectively and efficiently. Thus, majority of mandibular reconstruction surgeries are chiefly aimed to restoring and rehabilitating form, phonation, function and esthetics. Literature has shown many of the pioneer researchers those who significantly worked and drawn few concrete norms (Futran *et al.*, Alpert *et al.*, Kazanjian *et al.*) [12-15]. Blackwell and associated were among then who evaluated the response of patients who are undergoing reconstruction of mandible by using mandibular low-profile reconstruction plates [16]. They studied total 15 patients wherein they showed that plate exposure and its sensibility can be reduced by using low profile mandibular reconstruction plate. In the present study we also evaluated the clinical efficacy of low profile mandibular reconstruction plate system in surgical management of mandibular fractures. Our study results were quite comparable to the study results of Blackwell and coworkers. First time in the year 2010, a low-profile, 2.0 mm-thick mandibular reconstruction plate system was commercially made available by a USA based firm. (Matrix MANDIBLE Reconstruction plate; USA) This plate is extremely rigid and has adequate mechanical strength for use of reconstruction in comminuted mandibular fractures. In our study we also observed the clinical outcomes and inferences of this system. The results were very much positive and favorable in terms of patient’s acceptance and comfort.

Conclusion

Our study results clearly showed the present outcomes of low-profile locking mandibular reconstruction plate system in surgical management of comminuted mandibular fractures. Authors have concluded that that open reduction with internal fixation using low-profile locking mandibular reconstruction plate system yielded outstanding results with fast recovery and minimum complications. The restoration of altered dental occlusion was also optimal and acceptable. Hence, low-profile locking mandibular reconstruction plate system can be reliably and judiciously used for surgical management of such clinical circumstance. Nevertheless, we expect some other large scale studies to be conducted that could further establish certain standard norms in these prospects.

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Statement of conflict of interest

In the opinion of the author, there was no conflict of interests.

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