

ORIGINAL RESEARCH

Assessment of efficacy of biodegradable plating system for fixation of maxillofacial fractures

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ABSTRACT

Background: Rigid internal fixation with metallic elements has been a routine procedure. The present study was conducted to assess efficacy of biodegradable plating system for fixation of maxillofacial fractures.

Materials & Methods: 56 cases of maxillofacial fractures of both genders were treated with Biodegradable Inion CPS (2.0 mm) plating system. Parameters such as location and type of fracture (displaced vs. nondisplaced), derangement of occlusion, paraesthesia along the distribution of infra-orbital nerve or mental nerve, presence or absence of diplopia, enophthalmos/exophthalmos in case of mid face fractures were recorded.

Results: Out of 56 patients, males were 30 and females were 26. Etiological factors were RTA in 38, violence in 12 and fall in 6 cases. Type of fracture was angle in 8, ZMC in 25, parasymphysis in 3, Lefort- I in 1, lefort-II in 15 and lefort- III in 4 patients. Clinical features were deranged occlusion in 23, paraesthesia in 5, diplopia in 2 and enophthalmos in 4 cases. Complications were infection in 2 and malunion in 1 case. The difference was significant ($P < 0.05$).

Conclusion: Biodegradable plates and screw system provided satisfactory stabilization when used as internal fixation for fractures of midface fractures in patients of all ages and mandibular fractures.

Key words: Biodegradable plates, mid face fractures, internal fixation

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Introduction

For the past 35 years, rigid internal fixation with metallic elements has been a routine procedure used to align bone parts while they heal. Sir William Lane described the first osteosynthesis plate more than a century ago.¹ Due to their high strength and adaptability to contours, metallic components have been the mainstay of rigid fixation techniques up until this point.² The inherent downsides of metallic devices include susceptibility to corrosion, the requirement to remove these plates or screws due to infection, stress shielding, the palpability of the plate, temperature sensitivity, interference with sophisticated imaging techniques, etc.³ The gradual transfer of physiological forces to the healing bone, the decreased need for a second operation to remove the material, the potential to deliver proteins that promote bone healing to fracture/osteotomy sites and the lack of growth restrictions or potential migration

in growing patients are benefits of biodegradable osteosynthesis devices.⁴ After the fracture has healed, the implant completely dissolves, stopping the stress shielding effect, while fibrous tissues or bone fill the empty space left by the implant.⁵ These materials should ideally be sufficiently stiff, biocompatible, and stable without negatively influencing bone healing and bone strength or interfering with radiotherapy or postoperative imaging procedures. The majority of currently available commercial materials have the best qualities for usage as a fixation method in craniofacial trauma.⁶ The present study was conducted to assess efficacy of biodegradable plating system for fixation of maxillofacial fractures.

Materials & Methods

The present study consisted of 56 cases of maxillofacial fractures of both genders. All gave their written consent to participate in the study. Data such

as name, age, gender etc. was recorded. Biodegradable Inion CPS (2.0 mm) plating system was used as a method of internal fixation. Parameters such as location and type of fracture (displaced vs. nondisplaced), derangement of occlusion, paraesthesia along the distribution of infra-orbital nerve or mental

nerve, presence or absence of diplopia, enophthalmos/exophthalmos in case of mid face fractures were recorded. CT scan was performed to the site, nature and displacement of fractures. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table : I Distribution of patients

Total- 56		
Gender	Male	Female
Number	30	26

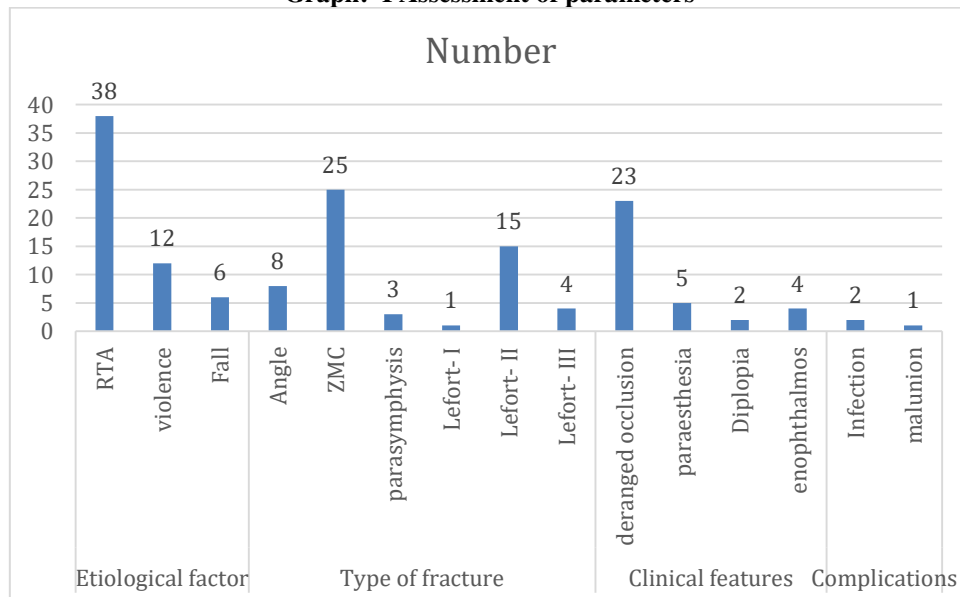
Table I shows that out of 56 patients, males were 30 and females were 26.

Table : II Assessment of parameters

Parameters	Variables	Number	P value
Etiological factor	RTA	38	0.01
	violence	12	
	Fall	6	
Type of fracture	Angle	8	0.02
	ZMC	25	
	parasymphysis	3	
	Lefort- I	1	
	Lefort- II	15	
Clinical features	Lefort- III	4	0.04
	deranged occlusion	23	
	paraesthesia	5	
	Diplopia	2	
Complications	enophthalmos	4	0.16
	Infection	2	
	malunion	1	

Table: II, graph I shows that etiological factors were RTA in 38, violence in 12 and fall in 6 cases. Type of fracture was angle in 8, ZMC in 25, parasymphysis in 3, Lefort- I in 1, lefort- II in 15 and lefort- III in 4 patients. Clinical features were deranged occlusion in 23, paraesthesia in 5, diplopia in 2 and enophthalmos in 4 cases. Complications were infection in 2 and malunion in 1 case. The difference was significant (P< 0.05).

Graph: I Assessment of parameters



Discussion

Biodegradable plating systems have been developed and used for the fixation of maxillofacial fractures as an alternative to traditional metal plates and screws. These systems offer several advantages, including reduced need for hardware removal, avoidance of long-term metal-related complications, and a more natural healing process.⁷ One of the significant advantages of biodegradable plates is that they naturally degrade over time, eliminating the need for a separate surgery to remove the hardware after the fracture has healed. This reduces the risk of complications associated with permanent metal implants.⁸ Metal implants can sometimes cause irritation, allergic reactions, or interfere with medical imaging. Biodegradable plates eliminate these concerns. Biodegradable materials promote bone healing by transferring load to the healing bone and gradually dissipating over time. This can lead to a more natural healing process and better long-term outcomes.⁹ We found that out of 56 patients, males were 30 and females were 26. Bali et al¹⁰ evaluated the efficacy of biodegradable plating system for fixation of maxillofacial fractures and to study the morbidity associated with the use of biodegradable plates and screws. All were plated with biodegradable system using standard plating principles and observed for a total period of 24 weeks. Characteristics of the fractures, ease of use of bioresorbable plate/screw system and post operative complications were assessed. Of total 10 patients, eight patients were of midface fracture and two pediatric patients with mandibular fracture, with nine male and one female. The mean age was 32.8 years. Out of 20 plates and 68 screws applied to the 10 fractures sites; there were three incidences of screw breakage with no other intraoperative difficulties. Paresthesia of the infraorbital nerve was present in two patients, and recovered completely in four weeks after surgery. Fracture reduction was considered to be satisfactory in all cases. One patient developed postsurgical infection and was managed with oral antibiotics and analgesics. We found that etiological factors were RTA in 38, violence in 12 and fall in 6 cases. Type of fracture was angle in 8, ZMC in 25, parasymphysis in 3, Lefort- I in 1, lefort- II in 15 and lefort- III in 4 patients. Clinical features were deranged occlusion in 23, paraesthesia in 5, diplopia in 2 and enophthalmos in 4 cases. Complications were infection in 2 and malunion in 1 case. Hassan et al¹¹ evaluated the efficacy of biodegradable plates as a treatment modality of rigid internal fixation for facial fractures and to assess the perioperative complications experienced with their utilization. The age of patients ranged from 9 to 65 years with an average of 26.1 years and a standard deviation of ± 12.9 . Regarding gender, males showed a higher percentage than female (80% versus 20%), respectively. There was a significant difference between the mean time of plate

application in midface and mandible (53 versus 32.9 minutes), respectively. All cases end up with complete screw holes ossification. Singh et al¹² in their study a total of 14 patients with isolated ZMC fractures were included. Fourteen patients with 34 fracture sites were included in the study. Intraoperatively, there were 2 incidences of screw head fracture. As observed clinically, there was complete stability of fracture segments, and no maxillomandibular fixation was required postoperatively. Paresthesia of the infraorbital nerve was present in 5 patients, but the sensation recovered completely in the first 3 months after surgery. The mean pain score was 3 on a visual analogue scale. In 1 case, ectropion developed, and dehiscence occurred in another patient in the early postoperative period. Postoperative radiographs were evaluated for the accuracy of fracture reduction and stability of fixation.

The limitation the study is small sample size.

Conclusion

Authors found that biodegradable plates and screw system provided satisfactory stabilization when used as internal fixation for fractures of midface fractures in patients of all ages and mandibular fractures.

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