



A comparative evaluation of maxillomandibular fracture management with and without arch bar fixation- an in vivo study.

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Date of Submission: 01-06-2023

Date of Acceptance: 10-06-2023

ABSTRACT

AIM:To evaluate and compare maxillo mandibular fracture management with and without arch bar fixation.

MATERIAL AND METHOD:An in vivo randomized clinical trial was carried in Department of oral and maxillofacial surgery on 40 patients having maxillomandibular fractures. The patients were equally distributed into two groups; in one group (group A), arch bar was placed and in other group (group B) arch bar was not placed. However, both the groups underwent open reduction and internal fixation of the fractures and evaluated preoperatively and post operatively on 1st day, 3rd month and 6th month for occlusal stability, oral hygiene index and comfort of the patient.

CONCLUSION:The present study concluded that maxillomandibular fracture management can be done without arch bar application and good anatomical reduction and occlusion can be obtained with manual reduction. Avoidance of the use of preoperative inter maxillary fixation is more economical in time and cost, is safer for the operator and more comfortable for the patient.

KEYWORDS: Maxillomandibular fracture, Arch bar, Intermaxillary fixation, Open reduction and internal fixation.

I. INTRODUCTION:

The face is an important structure in the body and trauma to the facial region causes injuries to skeletal components, dentition, as well as soft tissues of the face. Maxillomandibular fractures can have both functional and aesthetical long term consequences.¹ The etiological factors of maxillofacial injuries are road traffic accidents, interpersonal violence/ assault, trauma due to sport activities, fall from height and firearm injuries, bomb blasts, natural disasters and work related injuries and sometimes it may also be secondary to certain disease entities like cystic lesion, neoplasms, and metabolic diseases.

Facial area is one of the most frequently injured area of the body, accompanying 23–97% of

all facial fractures. Mandible being the most prominent part of face constitutes 36-59% of all maxillofacial fractures worldwide.⁴ When fractures occur, it causes pain, swelling, hematoma, dental malocclusion, facial contour deficit, restriction of masticatory function and mobility of bone fragments. To prevent these consequences, the treatment modalities for mandibular fractures proposed in the literature are non-surgical and surgical.⁵ Historically, mandibular fractures were treated with both closed reduction following a course of prolonged maxillomandibular fixation for long years. When fractured bone segments are placed in approximation and stabilized with allowance for some degree of micromotion, secondary bone healing occurs. This form of fixation can be performed with either intermaxillary fixation/ maxillomandibular fixation with or without arch bars, 4-point fixation, occlusal splints, or miniplates.⁶

Surgically treated maxillo mandibular fractures includes reduction of fracture site to its original anatomical position and osteosynthesis. Inter maxillary fixation has been a time honored as well as reliable method that allows for the reduction and stabilization of maxillary or mandibular fractures using arch bars, interdental wire ligatures or screws.⁸

Maxillo mandibular fixation (MMF) with arch bars is used as a traditional method of fracture reduction. Fixation with arch bars has some disadvantages: time-consuming, hard removal, blood-borne disease transmission, damage to dental papillae and oral mucosa, and speech and feeding difficulties.⁹ With the help of open reduction and internal fixation technique both the re-establishment of the normal dental occlusion and anatomical bony reduction of fracture fragment can be achieved. Use of IMF is doubtful as it does not often achieve anatomical reduction and fracture reduction can be achieved by other more accurate methods. Application of arch bars is preferable for the treatment of comminuted fractures and those

mandibular fractures along with concomitant midfacial fractures.

This present study is planned with the purpose to determine the necessity of arch bars is not always mandatory for successful clinical outcomes. The main goal of the current study is to evaluate and compare the clinical outcomes of surgically treated maxillo mandibular fractures with or without the use of arch bar fixation.

II. MATERIALS AND METHOD:

An in vivo randomized clinical trial was carried in Department of oral and maxillofacial surgery on 40 patients having maxillomandibular fractures. The patients were equally distributed into two groups; in one group (group A), arch bar was placed and in other group (group B) arch bar was not placed. However, both the groups underwent open reduction and internal fixation of the fractures and evaluated preoperatively and post operatively on 1st day, 3rd month and 6th month for occlusal stability, oral hygiene index and comfort of the patient. The patients included as per the following criteria -

1. Patient aged above 14 years.
2. Good physical and mental status.
3. Patients consenting for the study.

Patients with any uncontrolled systemic disease or any immunocompromised state, uncooperative patients, especially abled patients, patients not consenting for the study or cannot attend follow up visits, pediatric and geriatric (edentulous) fractures were excluded from the study.

Method of measurement includes clinical and radiographic evaluation of patients, the radiographs were taken preoperatively, one day, 3 months and 6 months postoperatively, proforma of each patient, informed written consent, preoperative and postoperative orthopantomograph / C.T. scan / P.N.S. view xray / P.A. mandible / Reverse Town's xray, preoperative and postoperative occlusion analysis, periodontal assessment including plaque index, bleeding on probing, probing depth, clinical attachment level, number of teeth present and comfort scale.

CLINICAL AND RADIOGRAPHIC FIGURES -

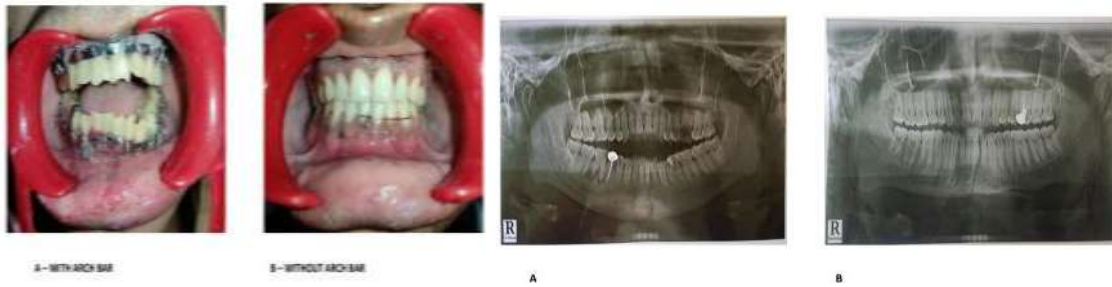


Figure 1

Figure 2

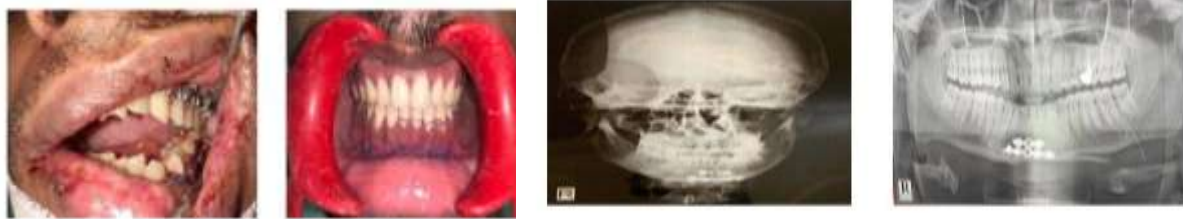


Figure 3

Figure 4

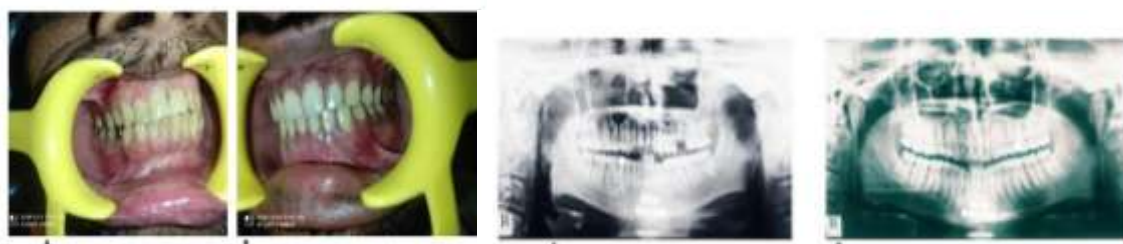


Figure 5

Figure 6



Figure 7



Figure 8

FIGURE LEGENDS WITH CAPTIONS-

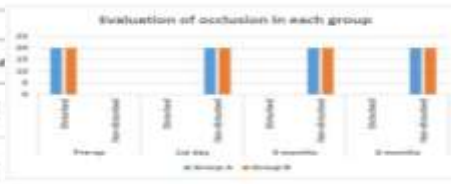
Figure 1-Preoperative clinical photograph (Group A-with arch bar & group B-without arch bar)
 Figure 2- Preoperative radiograph (Group A-with arch bar & group B-without arch bar)
 Figure 3- Postoperative clinical photograph day 1 (Group A-with arch bar & group B-without arch bar)
 Figure 4- Postoperative radiograph day 1 (Group A-with arch bar & group B-without arch bar)

Figure 5- Postoperative clinical photograph 3 month (Group A-with arch bar & group B-without arch bar)
 Figure 6- Postoperative radiograph 3 month (Group A-with arch bar & group B-without arch bar)
 Figure 7- Postoperative clinical photograph 6 month (Group A-with arch bar & group B-without arch bar)
 Figure 8- Postoperative radiograph 6 month (Group A-with arch bar & group B-without arch bar)

RESULTS:

Table- 1: Evaluation of occlusion in each group

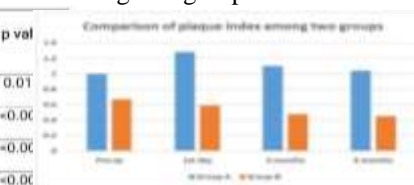
Group	Pre-op		1 st Day		3 months		6 months	
	Disturbed	Non-disturbed	Disturbed	Non-disturbed	Disturbed	Non-disturbed	Disturbed	Non-disturbed
Group A	20 (100)	0	0	20 (100)	0	20 (100)	0	20 (100)
Group B	20 (100)	0	0	20 (100)	0	20 (100)	0	20 (100)



Evaluation of occlusion showed that occlusion was not disturbed in any subjects of both the groups after 1st post-op day, 3 months and 6 months' post-op and change in occlusion in each group from pre-operative phase to 1st day, 3 months and 6 months was significant.

Table-2: Comparison of plaque index among two groups

Interval	Group A		Group B		p val
	Mean	SD	Mean	SD	
Pre-op	1.00	0.44	0.67	0.36	0.01
1 st day	1.28	0.37	0.59	0.34	<0.00
3 months	1.10	0.36	0.48	0.31	<0.00
6 months	1.04	0.38	0.45	0.32	<0.00

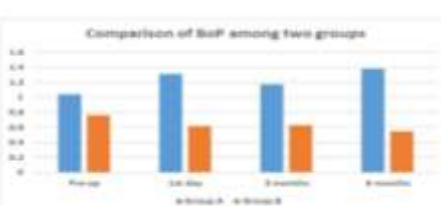


Independent t test; * indicates significant difference at $p \leq 0.05$

Comparison of plaque index among two groups at each interval showed that plaque index was significantly higher in Group A as compared to Group B at each interval.

Table-3: Comparison of BoP among two groups

Interval	Group A		Group B		p value
	Mean	SD	Mean	SD	
Pre-op	1.04	0.53	0.76	0.27	0.041*
1 st day	1.31	0.31	0.62	0.30	<0.001*
3 months	1.17	0.33	0.63	0.27	<0.001*
6 months	1.38	1.35	0.55	0.30	0.011*



Independent t test; * indicates significant difference at $p \leq 0.05$



Comparison of bleeding on probing among two groups at each interval showed that bleeding on probing was significantly higher in Group A as compared to Group B at each interval.

Table-4: Comparison of probing depth among two groups

Interval	Group A		Group B		p value
	Mean	SD	Mean	SD	
Pre-op	4.60	1.82	2.35	0.88	0.001*
1 st day	6.20	1.77	1.80	0.70	<0.001*
3 months	5.20	1.94	1.35	0.49	<0.001*
6 months	4.75	1.86	1.05	0.22	<0.001*

Independent t test; * indicates significant difference at $p \leq 0.05$

Comparison of probing depth among two groups at each interval showed that probing depth was significantly higher in Group A as compared to Group B at each interval.

Table-5: Comparison of CAL among two groups

Interval	Group A		Group B		p value
	Mean	SD	Mean	SD	
Pre-op	2.25	1.33	1.45	0.51	0.019
1 st day	3.80	1.32	1.30	0.47	<0.001
3 months	3.00	1.30	1.05	0.22	<0.001
6 months	2.65	1.27	1.00	0.00	<0.001

Independent t test; * indicates significant difference at $p \leq 0.05$

Comparison of CAL among two groups at each interval showed that CAL score was significantly higher in Group A as compared to Group B at each interval.

Table-6: Intergroup comparison of no of teeth present

Group	N	Mean	SD	p value
Group A	20	29.15	2.346	0
Group B	20	29.55	2.064	

Independent t test

Comparison of no of teeth present among two groups showed that n mean no of teeth present were almost similar in both the groups and there was a non-significant difference.

Table-7: Comparison of comfort scale among two groups

Interval	Group A		Group B		p value
	Mean	SD	Mean	SD	
Pre-op	3.30	0.73	2.85	0.87	0.009*
1st day	3.35	0.98	1.65	0.67	0.002*
3 months	1.45	0.91	1.10	0.31	0.014*
6 months	1.30	0.41	1.00	0.00	0.007*

Independent t test; * indicates significant difference at $p \leq 0.05$

Comparison of comfort scale scores among two groups at each interval showed that comfort scale score was significantly higher in Group A as compared to Group B at each interval.

Table-8: Evaluation of non-union

Group	1 st day		3 months		6 months	
	Union	Non-union	Union	Non-union	Union	Non-ur
Group A	0	20 (100)	20 (100)	0	20 (100)	0
Group B	0	20 (100)	20 (100)	0	20 (100)	0



Evaluation of union showed that there was non-union in all the subjects of both the groups after 1st post-op day, and union was seen after 3 months and 6 months post-op.

III. DISCUSSION:

The treatment of maxillo mandibular fractures, has undergone refinements over the period of time from the oldest technique of bandaging and splinting which are form of close reduction to the most recent method of open reduction and internal fixation. Maxillofacial trauma leads to injuries to skeleton components, dentitions as well as soft tissues of the face. Open reduction and internal fixation (ORIF) of the mandible with bone plates was first described by Schede in 1888. Management of mandibular fractures by open reduction and internal fixation (ORIF) is often assumed to be superior to treatment by close reduction and maxillomandibular fixation (MMF) because patients managed by ORIF seem to be rehabilitated earlier according to functional and social aspects.

The present study was a simple randomized clinical trial to evaluate and compare maxillo mandibular fracture management with and without using arch bars for inter maxillary fixation. We assessed 40 patients that were divided into group A and group B including 20 patients each. Both the groups were assessed preoperatively and post operatively on day 1, 3rd month and 6th month for occlusal stability, oral hygiene and comfort. Post-operative clinical analysis was done under the following parameters which involves stability of occlusion, comfort of the patient, oral hygiene index and non-union. Oral hygiene index was analysed by periodontal assessment which included plaque index, bleeding on probing, probing depth, clinical attachment level and total number of the teeth present. Post-operative radiographic analysis was done on post-operative day 1, post-operative 3rd month and post-operative 6th month with the help of OPG / C.T. scan/P.N.S. view x-ray/ P.A. mandible / Reverse Town's x-ray.

Restoration of occlusion is one of the most important goals of the management of fractures of dentofacial region. The effect of not restoring the occlusion to its original position can cause severe effects especially on the temporomandibular joint. In the present study, the occlusion of the patients was checked preoperatively and during the follow up period after surgery on post operative day 1, 3 month and 6-month post operatively. Evaluation of occlusion showed that occlusion was not disturbed in any subjects of both the groups after 1st post-operative day, 3 month and 6 months post

operatively. In group A, four patients showed severe occlusal disturbances preoperatively and required IMF with elastic traction for 4-6 weeks post operatively. One patient showed mild occlusal disturbance while rest 15 patients showed moderate occlusal discrepancies preoperatively which resolved without the requirement IMF and elastic traction post operatively. In Group B, two patients showed severe occlusal disturbances while one patient presented mild whereas 17 patients showed moderate occlusal discrepancies preoperatively which resolved and showed improvement from post operative day 1 to 6th month post operatively.

In the current study maintenance of oral hygiene and periodontal assessment was done by analyzing parameters including plaque index, bleeding on probing, probing depth, clinical attachment level and number of teeth present. Comparison of plaque index among two groups at each interval showed that plaque index was significantly higher in group A as compared to group B when assessed preoperatively, post-operative day 1, 3 month and 6 month post operatively. Statistical difference ($p < 0.05$) showed that change in plaque index in group A showed significant increase in PI from preop phase to 1st post-operative day, a significant decrease from 1st post-operative day to 3 months and 6 months and from 3 months to 6 months. In group B, change in plaque index showed significant decrease from preoperative phase to 6 months and from 1st post-operative day to 3 months and 6 months. D. V. Trupthi, Shouvik Chowdhury, Anjan Shah, Madhumati Singh in 2013 did a comparative study on the clinical efficacy of vacuum formed splints and arch bar in treating minimally displaced mandibular fractures. Forty patients were included in two groups. Group 1 was treated with splints and group 2 with arch bar. Patients were recalled on 3rd, 7th, 14th day and on the day of removal of the appliance for follow up and assessment of periodontal status, stability of appliance and chair side time. 8.3 % of patients with vacuum formed splints had poor oral hygiene in comparison with 25 % of patients with conventional arch bar.

Bleeding on probing was analyzed in two groups, on comparison group A showed significant increase in bleeding on probing from pre-operative phase to 1st post-operative day and a significant decrease from 1st post-operative day to 3 months. In group B, change in bleeding on probing showed significant decrease from pre-operative phase to 6 months and from 3 months to 6 months. Statistical difference ($p < 0.05$) suggested that bleeding on probing was significantly higher in group A as compared to group B at each interval.



According to few studies, even a 6-week course of arch bar fixation has been shown to worsen gingival inflammation and dental hygiene. Applying arch bars relies on dental anchorage and proximity to the periodontal structures; the use of arch bars can lead to increased plaque accumulation and reduce maintenance of oral hygiene. Sanjay Chandan, Shandilya Ramanojam (2010) did a Comparative study against conventional Erich arch bar fixation and evaluation concerning the oral hygiene, stability and safety of operator. A total of 20 patients were divided in two groups. In group A, patients were treated by intermaxillary fixation using Erich arch bar with the help of circumdental wiring. Group B patients were treated by intermaxillary fixation with the help of resin bonded arch bar. Preoperative oral hygiene was evaluated using plaque Index (Stillness and Loe) and gingival Index (Loe and Stillness). For each Group, after 6 weeks, oral hygiene was evaluated using Plaque Index (Stillness and Loe) and Gingival Index (Loe and Stillness) immediately after the removal of arch bar. Accumulation of plaque and gingival inflammation was more in patients of group A as compared to group B was. This study concluded that the gingival inflammation was recorded in both the groups during the treatment period and it increased in both the groups as the treatment period elapsed. Bleeding on probing was assessed in two groups, on comparison group A showed significant increase in bleeding on probing from pre-operative phase to 1st post-operative day and a significant decrease from 1st post-operative day to 3 months. In group B, change in bleeding on probing showed significant decrease from pre-operative phase to 6 months and from 3 months to 6 months. The bleeding on probing (BOP) is a widely used clinical sign as indicator of the periodontal condition and disease progression and is directly proportional to gingival inflammation.

Hamidreza Arabion, Reza Tabrizi, Hooman Khorshidi, Naghmeh Niroomand in 2015 carried out a study where pocket probing depths were studied in the patients who had arch bars for one month due to condylar fracture. Eleven males and nine females were included in this study. No significant pocket depth differences were detected among the anterior and posterior of the mandible and maxilla before and after placing the arch bars. Results demonstrated a significant pocket depth increase in the anterior and posterior of both jaws one month following removal of the arch bars. The pocket depths were decreased following 12 months which were indicative of relative improvement at the sites. In the current study, change in probing

depth in group A showed increase in probing depth from preoperative phase to 1st post-operative day and a significant decrease from 1st post-operative day to 6 months while in group B, change in probing depth showed significant decrease from pre-operative phase to 1st post-operative day, 3 months and 6 months post operatively.

Sites with periodontitis can exhibit clinical signs of gingival inflammation and experience a loss of connective tissue attachment. In patients with arch bars due to non compliance to maintain oral hygiene, periodontal health is compromised as compared to patients without arch bars leading to increased plaque induced periodontitis, gingivitis ultimately affecting pocket depth and clinical attachment levels. On comparison between both the groups, change in clinical attachment loss (CAL) in group A showed significant increase in CAL from preoperative phase to 1st post-operative day and significant decrease from 1st post-operative day to 6 months. While in group B, change in CAL showed significant decrease from preoperative phase to 1st post-operative day to 6 months. OHI index (Oral Hygiene Index) shows patient's oral hygiene and express the presence of plaque on the surface of the teeth. Different oral hygiene indices depend on number of presence of teeth in oral cavity. Arch bars can have effects like tooth root injury or may be even significant mobility of teeth if placed for prolonged duration with heavy elastic tractions. On comparison, no. of teeth presents among two groups showed that n mean no. of teeth present was almost similar in both the groups and there was no significant difference.

Kevin U. Omeje, Majeed Rana, Adetokunbo R. Adebola, Akinwale A. Efunkoya, Hector O. Olasoji, Nicolai Purcz, Nils-Claudius Gellrich, Madiha Rana in 2014 carried a study in which fifty-six patients with mandibular fractures within the tooth bearing areas of the mandible were prospectively studied in a randomized controlled pattern for postoperative Quality of Life (QoL) after ORIF versus MMF. Both groups were analyzed preoperatively, at 1st day, 6 and 8 weeks regarding their QoL using the General Oral Health Assessment Index questionnaire (GOHAI). No significant statistical difference was found between the groups regarding overall QoL. Patients managed by MMF were more affected by psychosocial and physical domains whereas patients managed by ORIF were more affected by the pain domain. In the present study, in group A and group B, change in comfort scale score showed significant decrease from preoperative phase to 1st post-operative day, 3 months and 6 months. On comparison between two groups, comfort scale



score was significantly higher in group A as compared to group B at each interval.

For the assessment of bone healing, OPG x-ray / C.T. scan / P.N.S. x-ray / P.A. mandible / Reverse Town's x-ray was taken at the interval of post op day 1,3 months and 6 months post operatively. On comparison, evaluation of union showed that there was nonunion in all the subjects of both the groups after 1st post-operative day, and union was seen after 3 months and 6 months post operatively.

IV. CONCLUSION:

Based on above findings it can be concluded that maxillomandibular fracture management can be done without arch bar application. Good reduction and occlusion can be obtained with manual reduction. Avoidance of the use of preoperative inter maxillary fixation is more economical in time and cost, is safer for the operator and more comfortable for the patient.

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