

Comparative Evaluation of Modified Erich's Arch Bar, Conventional Erich's Arch Bar and Intermaxillary Fixation Screws in Maxillo-Mandibular Fixation: A Prospective Clinical Study

Shahid Hassan^{1*}, Shahid Farooq², Muneet Kapoor², Ajaz Shah³

^{1*}Assistant Professor, ²Post-Graduates, ³Professor and Head,
Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Srinagar, J & K, India.

ABSTRACT

Background: Intermaxillary fixation is commonly employed in maxillofacial trauma to utilize functional occlusion as a tool to perform open reduction and internal fixation of maxillary and mandibular fractures. This new technique seems to be a simple, efficient and rapid modality to achieve intermaxillary fixation. Arch bars and intermaxillary fixation (IMF) screws are the most popular ways to achieve IMF in oral and maxillofacial surgery. Both techniques have their own advantages and limitations. The author proposes a simple modification of the conventional arch bar by fixing it to alveolar bone with 1.5 mm screws which is quicker, efficient and safer method of IMF compared to conventional methods.

Materials and Methods: Ninety patients of either gender with age group between 18-60 years who had reported to the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Srinagar (Jammu and Kashmir) for treatment of maxillofacial fractures requiring IMF under local or general anesthesia were included in the study.

Results: Results showed better oral hygiene in patients with modified arch bars and the results were statistically significant.

Conclusion: It can be concluded from the present study that modified arch bar is a quicker, safer and an efficient method of intermaxillary fixation when compared with the existing techniques.


Keywords: Erich Arch Bar, IMF, Modified Arch Bar.

*Correspondence to:

Dr. Shahid Hassan,
Assistant Professor,
Department of Oral and Maxillofacial Surgery,
Government Dental College and Hospital,
Srinagar, J & K, India.

Article History:

Received: 02-06-2018, **Revised:** 28-06-2018, **Accepted:** 12-07-2018

Access this article online	
Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.4.011	

INTRODUCTION

Intermaxillary fixation (IMF) has been used in oral and maxillofacial surgery as a method of immobilizing maxillofacial fractures, to help maxillo-mandibular positioning in orthognathic surgery, and the use of elastics in the postoperative period of fractures and orthognathic surgery. Different IMF techniques are described in the literature, using arch bars or bone screws. Basically, IMF has been performed with the use of wires applied directly on the teeth, or with arch bars wired to them.^{1,2} In general, these procedures are time consuming, and manipulation of the wires leads to the risk of glove puncture and needle stick injury to the surgeon or assistants.³⁻⁵ These problems have led to the development of alternative techniques, such as IMF screws, on which wires or elastics may be fixed for IMF.^{1,3,6}

Presently with the advent of open reduction and internal fixation IMF is predominantly used only as an intraoperative technique to aid reduction. The conventional Erich's arch bar fixation though a time tested technique, requires placement of many wires increasing total time consumption as well as risk of glove punctures, prick injuries. As a result other techniques such as IMF

screws, Leonard Buttons etc were evolved over time. However drawbacks are found in all these techniques such as lack of stability, root perforation etc. The present study was performed to compare the efficacies of modified Erich's arch bar, conventional Erich's arch bar and IMF screws in maxillomandibular/intermaxillary fixation and to record the duration of the procedure, stability of the fixation devices, iatrogenic injury to the patient and to compare the oral hygiene status of the patient.

MATERIALS AND METHODS

Ninety patients of either gender with age group between 18-60 years who had reported to the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Srinagar (Jammu and Kashmir) for treatment of maxillofacial fractures requiring IMF under local or general anesthesia were included in the study.

Written informed consent was taken from the subjects prior to treatment. A standard Proforma was used to collect the necessary information regarding each case after inclusion. The patients were

informed about the study and necessary consent was taken from concerned personnel. Ninety patients were divided into three groups of thirty patients in each group. Group A, B and C included the patients in which Modified Erich's arch bar, conventional arch bars and IMF screws were used respectively. The procedure was done under all aseptic precautions. All the patients were treated using 2% lignocaine hydrochloride with adrenaline in 1:80000 concentrations (Arcaine 2%) or intraoperatively during open reduction and internal fixation of the fractures under GA. Inter-radicular space was properly evaluated for drilling. Two perforations were made in the anterior region and two perforations were made in the posterior region using a 1.1x6.6 mm bur. Modified arch bar was placed in position and fixed by 1.5 mm screws in four areas where the perforation was made if necessary more screws were placed taking care that all the screws are placed in the inter radicular spaces. It was ensured that the Screws were not placed tightly in order to prevent ischemic necrosis of the mucosa. If the first hole was centered between the incisors a sufficient number of holes would coincide with inter radicular spaces required for fixation of bar⁶, then IMF was attained by elastics or wiring. Various preoperative, intraoperative and postoperative parameters were used to evaluate the study subjects which included, Preoperative assessment, where Patient

radiographic assessment of the fracture and treatment planning were done and Intraoperative assessment where time was recorded for each IMF devices from the beginning of the device fixation till the end of Intermaxillary fixation. Number of times the wire prick occurred for the operator as well as assistants was also evaluated. Post-operatively, the patient was evaluated for Post-removal periodontal health, oral hygiene status by Oral Hygiene Index-Simplified (OHI-S) described by Greene and Vermillion (1964)⁷. The patients between age group of 18-60 years with favorable and unfavorable, non-pathologic fracture of mandible were included in the study. Patients with any Pathologic fracture and edentulous patients were excluded. Data was entered in Microsoft Excel 2013 software and analysis was done using Minitab 16.1.1 version of statistical software. ANOVA test was utilized to find out any significant differences between various groups.

RESULTS

Oral hygiene status measured by using Oral Hygiene Index-Simplified (OHI-S). Teeth examined are 16, 11, 26 in the upper arch and 36, 31, 46 in the lower arch. All the results showed better oral hygiene in patients with modified arch bars and the results were statistically significant.

Table 1: Comparison of debris index (DI), calculus index (CI), Oral hygiene index (OHI)

	Group A (30)	Group B (30)	Group C (30)	P value
	Modified Erich's arch bar	Conventional arch bars	IMF screws	ANOVA
DI (S)	0.95±0.25	1.39±0.24	1.92±0.38	0.0000 (significant)
CI (S)	1.04±0.21	1.23±0.17	1.70±0.29	0.0000 (significant)
OHI (S)	2.0±0.28	2.63±0.31	3.62±0.46	0.0000 (significant)

*ANOVA test

Table 2: Debris Index (Simplified)

	Group A	Group B	Group C
S.NO	Modified Erich's arch bar	Conventional arch bar	IMF Screws
1	0.833333	1.333333	2
2	1	1.5	2.166667
3	0.666667	1.166667	1.833333
4	1.166667	1.333333	2.333333
5	1.333333	1.5	2
6	1	1.333333	1.333333
7	0.833333	1	2.333333
8	1.166667	1.166667	1.833333
9	0.666667	0.833333	1.666667
10	0.5	1.333333	1.5
11	1.333333	1.666667	1.333333
12	1	1.333333	1.833333
13	0.833333	1	1.666667
14	0.666667	1.333333	2.333333
15	0.833333	1.5	1.833333
16	1.166667	1.666667	1.666667
17	1.333333	1.833333	1.5
18	1.5	2	1.333333
19	1.166667	1.5	1.833333
20	1	1.333333	1.666667
21	0.666667	1.166667	2
22	1	1.333333	2.333333
23	1	1.666667	2

24	0.666667	1.5	1.833333
25	0.666667	1.333333	1.666667
26	1	1.333333	2.666667
27	0.833333	1.5	2.666667
28	1.166667	1.5	2.5
29	0.666667	1.333333	2.333333
30	1	1.5	1.666667
Mean±SD	0.95±0.25	1.39±0.24	1.92±0.38

Source	df	SS	MS	F	P-value
Treatments	2	14.056	7.028	79.0944	-0.0000
Error	87	7.731	0.089		
Total	89	21.787			

ANOVA

Table 3: Calculus Index (Simplified)

S.NO	Group A	Group B	Group C
	Modified Erich's arch bar	Conventional arch bar	IMF Screws
1	0.833333	1.5	1.666667
2	0.666667	1.166667	1.5
3	1	1	1
4	0.833333	1.166667	1.5
5	0.666667	1	1.833333
6	0.833333	1	2
7	0.833333	1	1.833333
8	1	1.166667	2.166667
9	1.166667	1.333333	2.333333
10	1.333333	1	1.833333
11	1	1.166667	1.5
12	1.166667	1	1.333333
13	1	1.166667	1.833333
14	0.833333	1.333333	1.666667
15	1	1.166667	1.833333
16	1.166667	1	2
17	1.333333	1.166667	1.5
18	1	1.333333	1.333333
19	1	1.5	1.666667
20	1	1.333333	1.5
21	1	1.5	1.833333
22	1.166667	1.333333	2
23	0.833333	1.166667	2.166667
24	1.333333	1.333333	2
25	1.5	1.166667	1.5
26	1.333333	1.333333	1.333333
27	1.166667	1.5	1.5
28	0.833333	1.5	1.666667
29	1.166667	1.333333	1.833333
30	1.333333	1.5	1.5
Mean±SD	1.04±0.21	1.23±0.17	1.70±0.29

Source	df	SS	MS	F	P-value
Treatments	2	6.927	3.463	62.8445	-0.0000
Error	87	4.794	0.055		
Total	89	11.721			

Table 4: Oral Hygiene Index (Simplified)

	Group A	Group B	Group C
S.NO	Modified Erich's arch bar	Conventional arch bar	IMF Screws
1	1.666666	2.833333	3.666667
2	1.666667	2.666667	3.666667
3	1.666667	2.166667	2.833333
4	2	2.5	3.833333
5	2	2.5	3.833333
6	1.833333	2.333333	3.333333
7	1.666666	2	4.166666
8	2.166667	2.333334	4
9	1.833334	2.166666	4
10	1.833333	2.333333	3.333333
11	2.333333	2.833334	2.833333
12	2.166667	2.333333	3.166666
13	1.833333	2.166667	3.5
14	1.5	2.666666	4
15	1.833333	2.666667	3.666666
16	2.333334	2.666667	3.666667
17	2.666666	3	3
18	2.5	3.333333	2.666666
19	2.166667	3	3.5
20	2	2.666666	3.166667
21	1.666667	2.666667	3.833333
22	2.166667	2.666666	4.333333
23	1.833333	2.833334	4.166667
24	2	2.833333	3.833333
25	2.166667	2.5	3.166667
26	2.333333	2.666666	4
27	2	3	4.166667
28	2	3	4.166667
29	1.833334	2.666666	4.166666
30	2.333333	3	3.166667
Mean ±SD	2.0±0.28	2.63±0.31	3.62±0.46

Source	df	SS	MS	F	P-value
Treatments	2	40.397	20.198	154.2338	-0.0000
Error	87	11.394	0.131		
Total	89	51.790			

DISCUSSION

IMF techniques are important tools in the treatment of facial fractures and in cases of orthognathic surgery. Among the diverse techniques, Erich or similar arch bars have been outstanding as the most popular devices among oral and maxillofacial surgeons, however, the time required to place them, the risks of needle stick injuries to the surgical team and the difficulty of cleaning⁸⁻¹⁰, has led to the development of alternative methods of IMF. Recently, the use of bone screws for IMF has gained preference among surgeons, although this method is not free of complications, such as loosening or loss of screws during the postoperative period and perforation of tooth roots.⁸ In the method presented here, the author tried to unite the three techniques, to find a method that would be easy and safe to apply, such as IMF screws, that can be used for a long time, such as conventional arch bars, since the loss of one screw does not compromise the stability and fixation of the bar as a whole. The modified arch bar may be fixed in

edentulous areas or in edentulous patients, which was not possible with conventional arch bars. There are still problems with oral cleaning, but they may be overcome with adequate guidance and periodic cleaning in the dental office. Other risks include necrosis of the attached gingiva due to excessive compression by the bar, and damage to the tooth roots, which may be prevented by avoiding excessive tightening of the screws used for bar fixation and careful location of the inter-radicular spaces during perforation and application of the screws. Another important issue is weakening of the arch bar due to the drilled perforations, which can lead to fracture of the bar. To avoid this, it is important to centralize the drill and hold the handpiece firmly while drilling the hole, thus minimizing the risk of fracture of the bar. Our results are in accordance with studies conducted by de Queiroz¹¹ who found better results with modified arch bar with some minor complications. Oral hygiene was maintained better in patients with modified arch bar as compared to conventional techniques of IMF.

This is only a minor study of the technique and controlled clinical trials should be conducted to determine the advantages and disadvantages of the modified arch bars compared to existing techniques.

LIMITATIONS

Fracture of the screws on insertion, iatrogenic damage to teeth causing loss and bony sequestra around the area of screw placement.

However, complications may occur occasionally and with careful thoughtful technique these should be minimized.

CONCLUSION

It can be concluded from the present study that modified arch bar is a quicker, safer and an efficient method of intermaxillary fixation when compared with the existing techniques.

REFERENCES

1. Hashemi HM, Parhiz A. Complications using Intermaxillary fixation screws. *J Oral Maxillofac Surg* 2011; 69: 1411-1414.
2. de Quelroz SBF. Modification of arch bars used for intermaxillary fixation in Oral and Maxillofacial surgery. *Int J Oral Maxillofac Surg*; 2013; 42: 481- 482.
3. Carlton JE, Dodson BT, Cleveland JL, Lockwood SA. Percutaneous injuries during oral and maxillofacial surgery procedures. *J Maxillofac Surg* 1997; 55: 553-556.
4. McCaul JA, DevlinMF, Lowe T. A new method for temporary maxillo-mandibular fixation. *Int J Oral Maxillofac Surg* 2004; 33: 502-503.
5. Nandini G.D, Balakrishna R, Rao J. Self tapping screws v/s Erich's arch bar for intermaxillary fixation. A comparative clinical study in the treatment of mandibular fractures. *J Maxillofac Oral Surg* 2011; 10(2): 127-131.
6. Rai A, Datarkar A, and Borle RM. Are maxillo-mandibular fixation screws a better option than Erich arch bar in achieving maxillo-mandibular fixation? A randomised clinical study. *J Oral Maxillofac Surg* 2011; 69: 3015-3018.
7. Hiremath SS. Preventive and Community Dentistry. 2nd ed. Chennai: Elsevier: 2011; 202-203.

8. Kharkar VR, Kini Y, Kannur J. A novel versatile technique for achieving buccolingualintermaxillary fixation. *Int J Oral Maxillofac Surg* 2011;40:543-4.

9. Nandini GD, Balakrishna R, Rao J. Self tapping screws v/s Erich arch bar for intermaxillary fixation: a comparative clinical study inthe treatment of mandibular fractures. *J Maxillofac Oral Surg* 2011;10:127-31

10. Avery CME, Johnson PA. Surgical glove perforation and maxillofacial trauma: to plate or wire? *Br J Oral Maxillofac Surg* 1992;30:31-5.

11. S. B. F. de Queiroz. Modification of arch bars usedfor intermaxillary fixation in oral and maxillofacial surgery; *Int. J. Oral Maxillofac. Surg.* 2013; 42: 481-482

12. Complications with intermaxillary fixation screws in the management of fractured mandibles. *British Journal of Oral and Maxillofacial Surgery* (2002) 40, 241-243

13. A novel versatile technique for achieving buccolingual intermaxillary fixation. *Int. J. Oral Maxillofac. Surg.* 2011; 40: 543-544.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Shahid Hassan, Shahid Farooq, Muneet Kapoor, Ajaz Shah. Comparative Evaluation of Modified Erich's Arch Bar, Conventional Erich's Arch Bar and Intermaxillary Fixation Screws in Maxillo-Mandibular Fixation: A Prospective Clinical Study. *Int J Med Res Prof.* 2018 July; 4(4):41-45. DOI:10.21276/ijmrp.2018.4.4.011