

# Effects of interdental/intermaxillary wiring on teeth and periodontal tissues in the management of dentoalveolar and jaw fractures

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Received: 10/12/2015

Accepted: 05/03/2016

## ABSTRACT

**Objectives:** To evaluate immediate and late probable side effects of interdental/intermaxillary wiring used in treatment of jaw fractures on gingival and other deeper structures.

**Methods:** 30 patients undergoing wiring procedure as an aid for treatment of jaw fractures were selected. The immediate and late effects with a six month follow up were studied using various parameters that were Plaque index, Modified gingival index, Ramfjord's periodontal disease index, tooth mobility (graded as 'normal or pathological'), tooth vitality using gutta-percha hot stick and checking for ankylosis or root resorption clinically as well as radiographically.

**Results:** Immediate effects noticed after placement of wiring were increased accumulation of plaque, inflammatory gingival hyperplasia with bleeding on probing, deepening of gingival sulcus and increased tooth mobility. Most of the changes had totally reversed after 6 months follow up.

**Conclusions:** The late deleterious effects on teeth and periodontal tissues from interdental wiring in the treatment of jaw fractures are minimal and hardly of any significance.

**Key words:** Interdental/Intermaxillary Wiring, Jaw Fractures, Modified Gingival Index, Plaque Index, Ramford's Periodontal Index.

## INTRODUCTION

Maxillomandibular fixation (MMF), also called intermaxillary fixation (IMF) is the standard method of immobilization following fractures of jaws.<sup>1</sup> First of all used by Gilmer, IMF achieved by arch bars, eyelet wirings etc ligated to teeth, has revolutionized the treatment of jaws<sup>1</sup>. Modern techniques to fix the fractures or osteotomies by means of AO plates,<sup>2,3</sup> miniplates<sup>4</sup> or screws<sup>5</sup> have led to shorter duration or even avoidance of Intermaxillary fixation<sup>2</sup>. However, these techniques demand special skill and resources to achieve their required benefits.

Closed reduction using Maxillomandibular fixation (MMF) has been recommended as the most acceptable treatment in comminuted fractures and fractures associated with soft tissue loss where in surgical exposure of comminuted part and local contamination leads to infection. Also in cases with condylar fractures and children with developing dentition, closed reduction of fractures has proven to be the better modality of treatment.<sup>6</sup>

Furthermore short term IMF is also mandatory in cases treated with semi rigid mini plates and lag screws.<sup>7</sup>

The purpose of MMF is to immobilize the skeletal segments until osseous healing has occurred, usually with in a period of between 6 and 8 weeks.<sup>1</sup>

More often different types of splints are evaluated from technical point of view and biological aspect of splint application is not given the weight it deserves. The effect of splints on periodontal tissues especially has not been given sufficient consideration.

Beyond doubt in use splints act as plaque retentive ligatures and therefore have an effect on periodontal tissues. Previous studies have convincingly shown that wiring of teeth to splint jaw fractures causes no permanent changes in the teeth and surrounding structures.<sup>8,9,10</sup> The changes seen in the periodontium are temporary and disappear totally once the trauma of the fixation material to marginal area of the tooth is removed. However, the studies done were mostly on animals and ones on human beings are with a shorter follow up period. Therefore the aim of this study was to study short term and long term effects of wiring on teeth and periodontal tissues during treatment of dentoalveolar and jaw fractures.

## MATERIALS AND METHODS

This study was prospective analysis to evaluate the effects of interdental/ intermaxillary wiring on teeth and surrounding structures in management of dento-alveolar and jaw fractures. Thirty dentate patients who had been referred to the department of oral and maxillofacial surgery, GDC Bangalore, requiring interdental/ intermaxillary wiring for dentoalveolar and jaw fractures, were examined clinically and radiographically over a six-month period. Before the

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Quick Response Code:	Website: www.innovativepublication.com
	DOI: 10.5958/2393-9834.2016.00002.4

placement of Arch bar (interdental/ intermaxillary wiring) all patients underwent oral prophylaxis and were instructed standardized oral hygiene maintenance procedures during the course of study period to avoid any bias.

After this patients were assessed with respect to plaque accumulation (Plaque index by Silness and Loe)<sup>11</sup>; gingival changes (Modified gingival index [MGI])<sup>11</sup>; periodontal changes (Ramfjord's periodontal index)<sup>11</sup> and tooth mobility<sup>12</sup> (No, normal and pathologic). Effects on teeth involved in wiring were observed by checking their vitality status using hot gutta percha stick and electric pulp tester; and detecting presence of any dentoalveolar ankyloses,<sup>12</sup> clinically as well as radiographically.

Patients were evaluated four times during study period that is immediately after removal of splinting; at end of six weeks; and three and six months later to removal of wiring.

The results were then averaged (mean + standard deviation) for each parameter. Mann Whitney U test was applied to find out the significant difference between baseline values of various indices and values at 6 weeks, three and six months. In all above test P value

less than 0.05 was taken to be statistically significant. The data was analyzed using SPSS package.

## RESULTS

Comparison of mean plaque index score in patients between baseline to six weeks, three months and six months respectively (Table 1) showed the significant change has taken place within 6 weeks with mean value 2.42. After 3 months mean score approached 1.16. After 6 months, mean changes were closure to normal value (0.61).

Mean modified gingival index (Table 2) of patients showed significant rise with value of 2.64 at 6 weeks. After 3 months, mean value dropped to 1.41. Mean score at 6 months was 0.80, less than even baseline value.

With respect to periodontal status (Table 3), 80% of patients were found to have periodontal changes (Ramfjord's periodontal index  $\geq 4$ ). This number dropped significantly by the end of 6 months (13%). Similar trend was noticed with distribution of tooth mobility (Table 4) i.e. 26 patients at end of 6 weeks had abnormal mobility, which got reduced to 8 patients only, after 6 months period.

**Table 1: Comparison of Mean Plaque index score among patients at different visit**

Visit	N Obs	Mean	Std Dev	Mini	Max	Comparision	Z statistics	P value
Baseline	30	0.73	0.12	0.51	0.98			
6 Week	30	2.42	0.30	1.87	2.89	Baseline vs 6 week	120.0000	<.0001
3 Months	30	1.16	0.25	0.79	1.76	Baseline vs 3 month	131.0000	0.0002
6 Months	30	0.61	0.12	0.47	0.84	Baseline vs 6 month		

**Table 2: Comparison of Mean Modified gingival index among patients at different visit**

Visit	N Obs	Mean	Std Dev	Mini	Max	Comparision	Z statistics	P value
Baseline	30	0.85	0.21	0.56	1.26			
6 Week	30	2.64	0.22	2.24	2.95	Baseline vs 6 week	120.0000	<.0001
3 Months	30	1.41	0.27	1.02	1.97	Baseline vs 3 month	128.5000	0.0002
6 Months	30	0.80	0.29	0.45	1.53	Baseline vs 6 month	251.0000	0.4485

**Table 3: Distribution of Ramfjord's periodontal index among patients at different visit**

Visit	Ramfjord's	Component	Total
	<4	$\geq 4$	
Baseline	30	0	30
	100.00	0.00	
6 Week	6	24	30
	20.00	80.00	
3 Months	14	16	30
	46.67	53.33	
6 Months	26	4	30
	86.67	13.33	
Total	76	44	120

Statistic	DF	Value	Prob
Chi-Square	3	26.1244	<.0001

**Table 4: Distribution of Tooth mobility among patients at different visit**

Visit	Tooth Mobility		Total
	Normal	Abnormal	
Baseline	30 100.00	0 0.00	30
6 Week	4 13.33	26 86.67	30
3 Months	12 40.00	18 60.00	30
6 Months	22 73.33	8 26.67	30
Total	68	52	120

Statistic	DF	Value	Prob
Chi-Square	3	26.3348	<.0001

## DISCUSSION

The parameters used in this study have been widely accepted and documented extensively in studies of periodontal conditions.<sup>11,12,13,14,15</sup> The changes in marginal gingiva were calibrated by using plaque index and modified gingival index. Although their values rose significantly to peak values during the period of intermaxillary fixation but in later periods of study, values not only reversed to normal but settled to less than the baseline score. This can be attributed to increased patient's awareness as they were given instructions regarding standardized oral hygiene maintenance procedures before starting the study. Harle & Krekelar<sup>8</sup> and Frolich & Gabler<sup>10</sup> also reported total reversal of adverse marginal gingival changes as well as tooth mobility occurring as result of intermaxillary splinting.

Increased inflammatory response can be attributed to difficulty in maintaining oral hygiene and splints acting as plaque retentive factor. Ngassapa et al.<sup>15,16</sup> in their animal model study reported that degree of inflammation in gingiva did not depend only on the amount of plaque and suggested role of direct trauma to marginal gingiva by arch bars acting as a constant irritating factor causing inflammation. Also the mechanical effects in form of horizontal and vertical forces may be exerted on the teeth during splinting teeth using arch bar.

Formation of periodontal pockets during the course of the study was observed by evaluating scoring in Ramfjord's periodontal disease index. Although pockets were formed (scoring of more than 4) in 24 patients after six weeks, but in only four patients there was pathological deepening of gingival sulcus after six months of study period. Pockets formation during initial study periods may be due to inflammation and enlargement of gingiva which results in pseudo pockets as there is no loss of attachment in these cases and the

condition returns to normal few weeks after source of inflammation is removed.<sup>11</sup>

Evaluation of effects on teeth per se was done by checking their vitality status using gutta-percha hot stick and electric pulp tester. Negative response was observed in five patients in teeth that were adjacent to fracture line.

Teeth were also tested for changed percussion sounds, when percussed in horizontal and vertical directions by handle of mouth mirror for normal or altered high pitch sound indicating presence of dentoalveolar ankylosis and testing was supplemented by IOPA radiographs. No case of ankylosis and root resorption clinically and radiographically was reported in the study. In both the aspects, the results were in accordance with the study done by Thor & Anderson<sup>17</sup> where in, minimum one year follow up was recommended for the detection of root resorption or dento-alveolar ankylosis.

The study has highlighted some of the deleterious effects of wiring on teeth and periodontium during initial study periods. But considering the fact that fractures of the tooth bearing portion of the mandible, the restoration of occlusion is of prime concern and methods relying on IMF consistently achieve this objective. Moreover, the effects observed were transient in nature which disappeared after removal of splinting.

So the study supports the previous work done in this field emphasizing the harmless nature of arch bars and other wiring techniques.

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**How to cite this article:** Mediratta A. Effects of Interdental/Intermaxillary Wiring on Teeth and Periodontal Tissues in the Management of Dentoalveolar and Jaw Fractures. *J Dent Specialities* 2016;4(1):10-13.

**Source of Support:** NIL

**Conflict of Interest:** Author report no conflict of interest related to this study.