Assessment of Pocket Depth Changes in Treatment with Arch Bars: A Prospective Clinical Study

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Submitted: 2015-08-25; **Accepted:** 2015-11-28; **DOI:** *10.7508/rrr.2016.01.005*

Introduction: It is suggested that arch bars act as plaque-retentive ligatures and therefore exert effects on periodontal tissues health. The aim of the present study was to assess pocket probing depth prior to placing arch bars and following their removal. **Materials and Methods**: Pocket probing depths were studied in the subjects who had arch bars for one month due to condylar fracture. Pocket depths were measured before placing arch bars, one month and 12 months after removing them. The mean of pocket depth was measured for each tooth. Periodontal probing depth was measured in six sites of each tooth .The mean pocket depth was calculated by the division of the sum of the pocket depths by the number of teeth for anterior and the posterior teeth in all subjects. **Results:** Eleven males and nine females were included in this study. No significant pocket depth differences was 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. **Conclusion:** Arch bars can affect periodontium and pocket depths increased one month after releasing the arch bars. However, a significant improvement was detected following 12 months that suggested a partial reversible change in the pocket depths.

Keywords: Jaw fracture; Periodontium; Periodontal pocket; Dental plaque

Introduction

Arch bars are one of the common tools in treating maxillomandibular fractures (1). Arch bars are either used alone for closed reduction of maxillomandibular fractures or in along with open reduction of maxillomandibular fractures. In addition to treatment of fractures, arch bars are utilized as part of reconstructive treatments (2).

However, Use of wires may lead to deleterious effects on the teeth and surrounding tissues and several studies have been conducted on various aspects of this issue (3, 4). It is proved that arch bars act as plaque-retentive ligatures and therefore exert effects on periodontal tissues health (5, 6). On the other hand, it is not clear whether use of arch bars would affect the periodontal health for long term. It was previously demonstrated that orthodontic appliances such as fixed orthodontic treatment leads to dental plaque accumulation and gingival inflammation (7).

The present study aimed to assess pocket probing depth prior to placing arch bars and after removing them.

Materials and Methods

In the present prospective cohort study the samples were collected from the patients referred to the Department of Oral and Maxillofacial Surgery at Shiraz University of Medical Sciences. The research was approved by the medical ethics committee of Shiraz University of Medical Sciences. Subjects eligible for the study had condylar fractures, which were treated by closed reduction. Subjects were excluded if they had fractures other than condylar fractures, periodontitis prior to the trauma and trauma to the tooth. The time between trauma and arch bar placement was 2 to 7 days, and patients had arch bars for one month. Arch bars with 24 gauge wires were used for closed reduction of the condylar fractures in all samples. A dentist instructed the subjects on oral hygiene before arch bar placement.

Pocket depth was measured before arch bars placement, one and 12 months after removing them. A Michigan O round dental periodontal probe (Hu-Friedy, Chicago, IL) was used

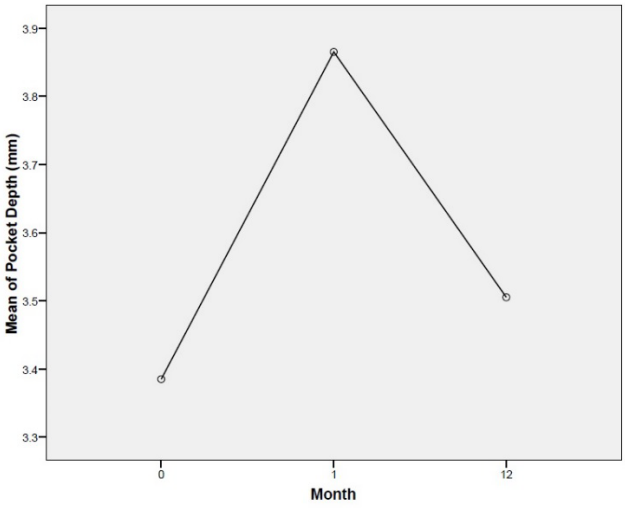

Figure 1. Pocket depths changes in different times in anterior of maxilla

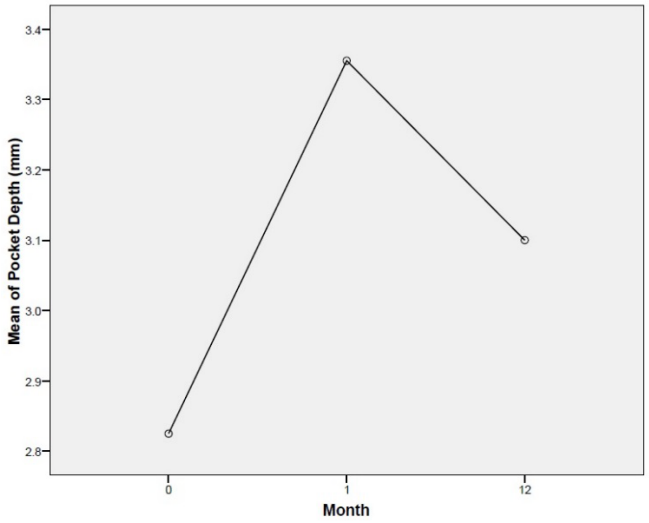

Figure 2. Pocket depths changes in different times in posterior of maxilla

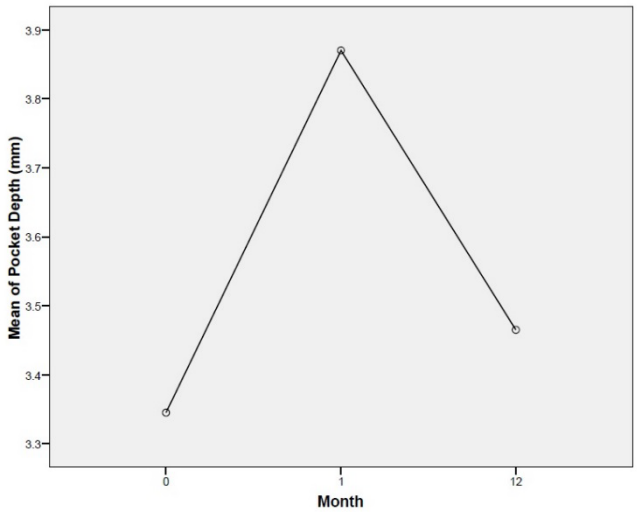

Figure 3. Pocket depths changes in different times in anterior of mandible

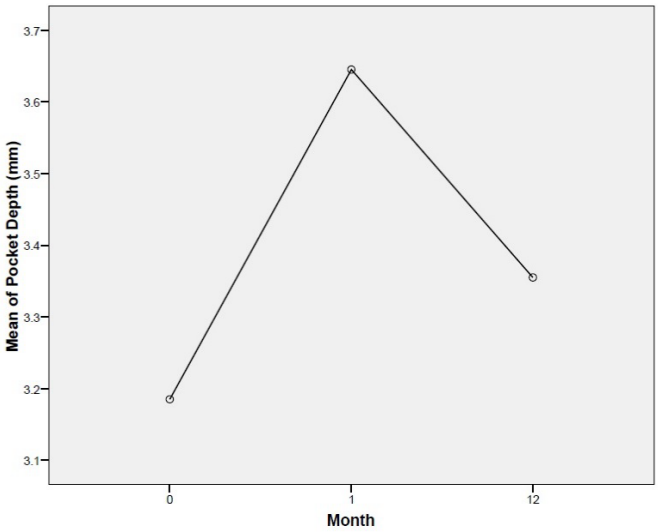

Figure 4. Pocket depths changes in different times in posterior of mandible

To measure pocket depth. The mean pocket depth was recorded for each tooth. Periodontal probing depth was measured in six areas of each tooth: distobuccal, mid-buccal, mesiobuccal, distolingual (distopalatal), mid-lingual (mid-palatal) and mesiolingual (mesiopalatal). The mean pocket depth was calculated by dividing sum of pocket depths (PDs) by the number of teeth for anterior (central, lateral, and canine in the Left and right) and posterior (two premolars and first molars on the left and right) teeth. None of the patients received periodontal treatment during the study time. Two examiners (a dentist and a resident of oral and maxillofacial surgery) performed all measurements in two s sessions.

Statistical Analysis

Data analysis was performed by Statistical Package for Social Sciences (SPSS 20.0.1 for windows; SPSS Inc, Chicago, IL). We used the repeated measure test (general liner model) for evaluating effect of time on pocket depths. The Pearson correlation was used to investigate correlation between age and pocket depths. The relationships between sex and pocked depths was assessed by a Chi-square test. Paired t- test was applied to detect differences between the anterior and the posterior of the jaws. An inter-examiner reliability analysis was performed using Kappa statistic to determine agreement between the examiners. Significance level was considered 0.05 or less.

Table 1. Comparison of pocket depths in various sites of jaws in time 1

Variable	Site	*P*-value
Pocket depths (mm)	Anterior of maxilla: 3.64± 0.32 Anterior of mandible: 3.35 ±0.43	*P*>0.05
	Anterior of maxilla: 3.64±0.32 Posterior of maxilla: 3.86±0.29	*P*>0.05
	Anterior of mandible: 3.35± 0.43 Posterior of mandible: 3.87± 0.32	*P*>0.05
	Posterior of mandible: 3.87± 0.32 Posterior of maxilla: 3.86± 0.29	*P*>0.05

Table 2*:* Comparison of pocket depths in various sites of jaws in time 12

Variable	Site	*P*-value
Pocket depths (mm)	Anterior of maxilla: 3.35±0.25 Anterior of mandible: 3.10±0.44	*P*>0.05
	Anterior of maxilla: 3.35±0.25 Posterior of maxilla: 3.50±0.26	*P*>0.05
	Anterior of mandible: 3.10± 0.44 Posterior of mandible: 3.46± 0.35	*P*>0.05
	Posterior of mandible: 3.46± 0.35 Posterior of maxilla: 3.50± 0.2	*P*>0.05

Table 3. General liner models (repeated measure test) demonstrate time effect on pocket depths measurement in various sites of jaws

Pocket depths (mm)	Time 0	Time 1	Time12	**P-value**
Anterior of maxilla	3.18± 0.19	3.64± 0.32	3.35±0.25	*P*<0.05
Posterior of maxilla	3.38±0.25	3.86±0.29	3.50±0.26	*P*<0.05
Anterior of mandible	2.28±0.30	3.35±0.43	3.10±0.44	*P*<0.05
Posterior of mandible	3.34±0.27	3.87±0.32	3.46 ±0.35	*P*<0.05

Results

Eleven males (55%) and nine females (45%) were enrolled in this study .The mean age was 26±4.2 years. The mean pocket depth was 3.18±0.19 mm prior to placing arch bars (time 0) , 3.64±0.32 mm at one month (time 1)and 3.35± 0.25 mm after 12 months (time 12) in the anterior of the maxilla. For the posterior of the maxilla, the mean pocket depth was 3.38±0.25 mm (time 0), 3.86±0.29 mm (time 1) and 3.50± 0.26 mm (time 12). In the anterior teeth of mandible, the mean pocket depth was 3.34±0.27 mm (time 0) , 3.87±0.32 (time 1) and 3.46± 0.35 mm (time 12) .The mean pocket depth was 3.34±0.27 mm (time 0) , 3.87±0.32 mm (time 1) and 3.46±0.35 mm (time 12) in the posterior of the mandible (Table 1, 2). Analysis of data did not demonstrate any statistically significant differences in pocket depth among the anterior and posterior of mandible and maxilla before and after placing the arch bars (P>0.05). Pearson correlation test did not reveal any correlation among age and pocket depths in the time 1 and time 12 (*P*>0.05). Evaluation of date did not demonstrate any correlation between sex and pocket depths in the time 1 and time 12. (*P*>0.05) Results demonstrated a significant pocket depths increase in the anterior and posterior of both jaws one month following removal of the arch bars (time 1) *P*<0.05) (Table 3). A significant improvement was detected at time 12 that suggested that suggested a relative improvement. Pocket depth changes in various time frames in various sites of the maxilla and mandible are demonstrated in Figures 1 to 4. The inter-examiner reliability (Kappa coefficient) was found to be 0.50 (*P*<0.001), which showed a moderate agreement between the examiners.

Discussion

It has been well established that arch bars increase plaque index, however, reaction of periodontium towards it remains controversial (8). There has not been any study evaluating pocket depths change following arch bar release in various sites of the jaws. Our study demonstrated a significant change in the pocket

depths one month following removal of arch bars but a considerable improvement was detected following 12 months without any periodontal treatment. No significant differences were detected between the anterior and posterior of the jaws. Furthermore, sex and age did not affect the pocket depth changes. The results of some similar studies did not demonstrate any effects on periodontium (3, 8). Increase in plaque index and pocket depth are reversible with meticulous oral hygiene care (8). The other factor that might influence the patient's ability in maintaining oral hygiene is severity of pain and limitation in mouth opening caused by fracture. Thore and Andersson studied the effect of interdental wiring on the periodontium in traumatized patients and. suggested that, late deleterious effects on teeth and periodontal tissues were uncommon one year following removal of the wires (9). Lello JL and Lello GE evaluated the influence of interdental loop-wiring splinting and intermaxillary fixation on the marginal gingival in 30 patients and demonstrated improvement in marginal gingiva changes two weeks following loop-wire splint removal (8). Periodontal healing was affected by intermaxillary fixation and periodontal tissues healed three months following treatment (10). Ngassapa *et al.,* studied reaction of periodontium to various types of splints and demonstrated significant increase in plaque retention following their application (5). Lello JL and Lello GE demonstrated no significant change in gingival inflammation despite the significant decrease in plaque index following removal of intermaxillary fixation Thus the arch bars encourage plaque accumulation, and subsequenly provoke gingival inflammation (8). Also oral hygiene care is an important factor in decreasing periodontium inflammation caused by arch bars placement (11). To avoid periodontal problems, other alternatives such as arch bars bonded to tooth (12) or transmucosal maxillomandibular fixation screws are suggested (13, 14). Furthermore, the results of studies conducted on plaque and gingivitis in orthodontically banded mouths can be utilized in resolving this issue. Intermaxillary fixation leads to restricted access to all surfaces of teeth, hence it is suggested to prioritize plaque control measurements (11). During the fixation phase, the patient must be followed up frequently to ensure good oral hygiene and to determine early onset of periodontal problems.

The results of the present study suggested that attachment level improves at 12 months following arch bar insertion, and this may highlight the reversible nature of damage from arch bars.

Conflict of Interest: 'None declared'.

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Please cite this paper as: Arabion H, Tabrizi R, Khorshidi H, Niroomand N. Assessment of Pocket Depth Changes in Treatment with Arch Bars: A Prospective Clinical Study. Regen Reconstr Restor. 2016; 1(1): 25-8. DOI: 10.7508/rrr.2016.01.005.