ORAL HYGIENE STATUS OF PATIENTS UNDERGOING ORTHODONTIC TREATMENT

**SAQIB NAEEM, FCPS (Orthodontics)

**M RAFIQUE CHATHA, BDS, MDS (Hons), FCPS

ABSTRACT

The aim of the present study was to evaluate oral hygiene status of patients receiving fixed orthodontic treatment and to monitor it longitudinally. Main sample consisted of one hundred patients with an age range of 12-25 years, having a full complement of permanent dentition, reporting to the orthodontic department of the Punjab Dental Hospital, Lahore. Patients having major medical problems, history of having antibiotics, orthodontic treatment and smoking were excluded. Community Periodontal Index was used to assess the periodontal status of these patients. From these 100 patients, 20 patients having good oral hygiene and in need of fixed orthodontic treatment were selected, and their periodontal status was assessed before and during fixed orthodontic treatment. Data was analyzed by using SPSS (Version 8.0) in personal computer. Results showed that periodontal status of patients receiving orthodontic treatment significantly worsened after the placement of fixed orthodontic appliances.

Key words: Periodontal status, patients undergoing fixed orthodontic treatment, Community Periodontal Index (CPI), longitudinal monitoring of periodontal status.

INTRODUCTION

Importance of good oral hygiene increases excessively during orthodontic treatment. The periodontal status of patients undergoing orthodontic treatment has been the focus of attention by orthodontists and periodontists.

Orthodontic appliances make adequate plaque removal difficult, resulting in poor oral hygiene, and accumulated food debris along the gingival margin leads to gingival and periodontal diseases. Active cooperation of orthodontic patients is essential over a prolonged treatment and involves keeping appointments, maintenance of an adequate level of oral hygiene and refrain from hard and sticky foods.

A number of studies have been done in different parts of the world to evaluate the oral hygiene status of the patients, especially those receiving orthodontic appliances.

MATERIALS AND METHODS

One hundred patients reporting to the orthodontic department, Punjab Dental Hospital Lahore were selected randomly, irrespective of sex. The age range of the patients was 12 to 25 years chronologically. All patients had a full complement of permanent dentition through first/second molars. Care was taken to exclude patients who were having: major medical problems like diabetes mellitus, antibiotic therapy during the past two months, abnormal para functional habits, abnormal hard and soft tissue morphology like cleft lip and cleft palate patients.
history of any active orthodontic treatment and smokers.

After obtaining consent of the patients, periodontal examination was done by the author using CPI index (Community Periodontal Index) formerly known as CPITN index (Community Periodontal Index of Treatment Need), with the help of WHO CPI periodontal probe. Individual patient’s CPI scores were recorded and assessed according to Annexure I.

From the main sample of these 100 patients, twenty patients having CPI scores of 0, 1 or 2 in each sextant, irrespective of sex and age were selected.

These patients received fixed orthodontic appliances and the level of their oral hygiene was scored with CPI index, immediately prior to placement of fixed orthodontic appliances (pretreatment) and at 1, 3 and 6 months after the appliance placement.

The mean, standard deviation and range for quantitative variables were computed using SPSS version 8.0 for Windows. For intra-examiner reliability, 20 cases were randomly selected from the main sample of 100 patients and their CPI scores were reevaluated two weeks after the first examination. For inter-examiner reliability, a senior faculty member evaluated the CPI status of the selected patients. Data for the examiner reliability was analyzed by kappa statistics using SPSS 8.0 software for the Windows.

COMMUNITY PERIODONTAL INDEX (CPI)

(Formerly called Community Periodontal Index of Treatment Needs or CPITN)

Indicators

Three indicators of periodontal status are used for this assessment:

1. Gingival bleeding
2. Calculus
3. Periodontal pockets

A specially designed lightweight CPI probe with a 0.5 mm ball tip is used, with a black band between 3.5 and 5.5 mm and rings at 8.5 and 11.5 mm from the ball tip (Figure I).

Sextants

The mouth is divided into sextants defined by tooth numbers: 18-14, 13-23, 24-28, 38-34, 33-43, and 44-48.

Distribution of the mouth into six sextants

<table>
<thead>
<tr>
<th><strong>S</strong></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-14</td>
<td>13-23</td>
<td>24-28</td>
<td></td>
</tr>
<tr>
<td>38-44</td>
<td>33-43</td>
<td>34-38</td>
<td></td>
</tr>
</tbody>
</table>

* Tooth numbering is according to the FDI system.

** S represents the six sextants and the numbers from 1-6 denotes the number of sextant.

Index teeth

For adults aged 20 years and over, the teeth to be examined are:

17/16 11 26/27

47/46 31 36/37

The two molars in each posterior sextant are paired for recording. For subjects under the age of 20 years, only six teeth; 16, 11, 26, 36, 31, and 46; are examined. This modification is made to avoid, scoring the deepened sulci associated with eruption as periodontal pockets. For the same reason, when examining children under the age of 15 years, pockets should not be recorded, i.e. only bleeding and calculus should be recorded.

RESULTS

The mean age of the 20 patients followed longitudinally was 17.65 ± 3.61 years with a range from 13 to 25 years. The gender distribution was 9 (45 %) males and 11 (55 %) female patients. The mean age of the male patients was 18.33 ± 4.09 years with a range from 13 to 25 years. The mean age of the females was 17.09 ± 3.26 years with a range of 13 to 22 years.

Table 1 shows the mean CPI score at baseline, first month, third month and at sixth month during the fixed
ANNEXURE I.
CPI – PERIODONTAL STATUS OF PATIENTS
CRITERIA FOR COMMUNITY PERIODONTAL INDEX

<table>
<thead>
<tr>
<th>0</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bleeding observed, directly or by using mouth mirror, after probing</td>
</tr>
<tr>
<td>2</td>
<td>Calculus detected during probing, but all the black band* on the probe visible</td>
</tr>
<tr>
<td>3</td>
<td>Pocket 4 - 5 mm (gingival margin within the black band on the probe)</td>
</tr>
<tr>
<td>4</td>
<td>Pocket 6 mm or more (black band on the probe not visible)</td>
</tr>
</tbody>
</table>

TABLE 1: MEAN CPI SCORE OF THE FOLLOW-UP GROUP AT BASELINE, FIRST MONTH, THIRD MONTH AND AT SIXTH MONTH

<table>
<thead>
<tr>
<th>Sextants</th>
<th>Baseline</th>
<th>First month</th>
<th>Third month</th>
<th>Sixth month</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>1.05 ± 0.39</td>
<td>1.10 ± 0.30</td>
<td>1.05 ± 0.22</td>
<td>1.15 ± 0.36</td>
</tr>
<tr>
<td>Second</td>
<td>0.60 ± 0.50</td>
<td>0.90 ± 0.30</td>
<td>0.95 ± 0.22</td>
<td>1.10 ± 0.30</td>
</tr>
<tr>
<td>Third</td>
<td>1.05 ± 0.39</td>
<td>1.10 ± 0.30</td>
<td>1.10 ± 0.44</td>
<td>1.25 ± 0.55</td>
</tr>
<tr>
<td>Fourth</td>
<td>1.00 ± 0.32</td>
<td>1.05 ± 0.39</td>
<td>1.25 ± 0.44</td>
<td>1.40 ± 0.50</td>
</tr>
<tr>
<td>Fifth</td>
<td>1.00 ± 0.64</td>
<td>1.25 ± 0.44</td>
<td>1.40 ± 0.50</td>
<td>1.75 ± 0.55</td>
</tr>
<tr>
<td>Sixth</td>
<td>1.00 ± 0.32</td>
<td>1.00 ± 0.32</td>
<td>1.05 ± 0.22</td>
<td>1.15 ± 0.48</td>
</tr>
<tr>
<td>Cumulative CPI score</td>
<td>5.70 ± 1.34</td>
<td>6.40 ± 0.99</td>
<td>6.80 ± 0.95</td>
<td>7.80 ± 1.54</td>
</tr>
</tbody>
</table>

TABLE 2: WITHIN-GROUP COMPARISON FOR STATISTICALLY SIGNIFICANT DIFFERENCES (FOLLOW-UP GROUP)

<table>
<thead>
<tr>
<th>Sextants</th>
<th>Baseline</th>
<th>Baseline</th>
<th>Baseline</th>
<th>First month</th>
<th>First month</th>
<th>Third month</th>
<th>Third month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>↓ First month</td>
<td>↓ Third month</td>
<td>↓ Sixth month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Second</td>
<td>p &lt; 0.05</td>
<td>p &lt; 0.01</td>
<td>p &lt; 0.01</td>
<td>NS</td>
<td>p &lt; 0.05</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Third</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Fourth</td>
<td>NS</td>
<td>p &lt; 0.05</td>
<td>p &lt; 0.01</td>
<td>p &lt; 0.05</td>
<td>p &lt; 0.01</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Fifth</td>
<td>p &lt; 0.05</td>
<td>p &lt; 0.05</td>
<td>p &lt; 0.01</td>
<td>NS</td>
<td>p &lt; 0.01</td>
<td>p &lt; 0.01</td>
<td></td>
</tr>
<tr>
<td>Sixth</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Cumulative CPI score</td>
<td>p &lt; 0.01</td>
<td>p &lt; 0.01</td>
<td>p &lt; 0.01</td>
<td>NS</td>
<td>p &lt; 0.01</td>
<td>p &lt; 0.01</td>
<td></td>
</tr>
</tbody>
</table>

Note: NS stands for “Not significant” p > 0.05
orthodontic treatment. Month wise comparison groups (Table 2) for the six sextants and their cumulative CPI score shows, that changes in the mean CPI score of the first, third, and sixth sextants from baseline to first month, baseline to third month and baseline to sixth month were statistically insignificant at p>0.05. However, for second sextant, statistically significant differences in mean CPI scores were found between baseline and first month (p<0.05), baseline and third month (p<0.01) and baseline and sixth month (p<0.01), showing that periodontal status significantly worsened after one month of start of fixed orthodontic treatment.

For fourth sextant, more significant changes (p<0.01) at sixth month were found as compared to the changes that occurred at third month (p<0.05) after the start of fixed orthodontic treatment. Similar findings were found for fifth sextant, showing significantly more changes in CPI score at sixth month (p<0.01) than the changes that occurred at first and third month (p<0.05) when compared with baseline CPI score.

This shows that changes in the individual sextants were more marked at sixth month during the orthodontic treatment. This was contrary to the cumulative CPI score, which was significantly more worse from the first month during the treatment, showing that as whole, the periodontal status worsened significantly after one month of the start of fixed orthodontic treatment (p<0.01).

DISCUSSION

The periodontal status of patients receiving fixed orthodontic appliances has been the focus of attention, both by the orthodontists and periodontists. It is believed that greater plaque retentive nature of orthodontic appliances aid in plaque accumulation at gingival margins, contributing to gingival inflammation. Monitoring of gingival and periodontal status by orthodontists throughout the treatment period has become an integral part of modern orthodontic treatment. The aims of the present study was to, longitudinally monitor the periodontal health of patients undergoing fixed orthodontic treatment.

Out of these 100 patients, 20 patients having good periodontal status, and in need of fixed orthodontic treatment were selected. The periodontal status of these 20 patients was evaluated before and during fixed orthodontic treatment.

It was observed that for the first, third and sixth sextants, there were no statistically significant differences (p>0.05) between the mean CPI scores before and during orthodontic treatment at different recordings (Table 2). But for the second, fourth and fifth sextants, statistically significant differences were noted, indicating deterioration of periodontal status of these three sextants during treatment. Similar findings were observed when CPI scores of these six sextants were added up to get the cumulative CPI score, which showed that periodontal status of these 20 patients, significantly worsened (p<0.01) at first, third and sixth month during fixed orthodontic treatment when compared with the mean CPI score at baseline.

These findings are in agreement with the following studies;

Bjorn U. Zachrisson and Sigrun Zachrisson in two separate studies monitored the periodontal status of patients during and after fixed orthodontic treatment. They found a deterioration of periodontal status of patients within one to two months after the start of fixed orthodontic treatment, this is in agreement with the findings of the present study. Other findings noted by Bjorn and Sigrun were that, proximal areas of teeth were more affected then the buccal areas and after 4-5 months of appliance removal, periodontal status improved significantly. In the present study, no comparisons were made between periodontal health of buccal and proximal surfaces of teeth. Similarly the present study does not give any idea about the periodontal status after the appliance removal, because no check of the periodontal status was made after six months of start of orthodontic treatment.

Fredrik Lundstrom and Sven-Erik Hamp in two separate studies found deterioration of periodontal health of children, three months after the start of orthodontic treatment. This again supports the findings of the present study. Another feature found in Fredrik’s study, similar to that in Zachrisson’s study, was that after the removal of fixed orthodontic appliances gingival health improved significantly.
In an another study, Sven-Erik Hamp, Fredrik Lundstrom and Sture Nyman found that orthodontic treatment led to a slight but significant loss of periodontal support. They found significantly increased pocket depth after three months of treatment. Diamanti-Kipioti, Gusberti and Niklaus P Lang in a four-month study found increased pocket probing depths, along with increases in amount and shifts in microbial composition of subgingival plaque. The above two studies show deterioration of periodontal health, right from the start of fixed orthodontic treatment, a finding which is in agreement with the present study. Boyd, Leggott and Zhao, Xie, Meng also noted somewhat similar findings.

Study conducted by Svein Alstad and Bjorn U. Zachrisson on 38 adolescents, 11-12 years old at the start of orthodontic treatment, however showed excellent oral hygiene throughout the treatment. This is opposite to the results of the present study and the studies discussed earlier. This difference could be due to the intensive oral hygiene program employed in the Alstad's study which included; 1) A four-minute fluoride gel treatment, after thorough tooth cleaning with pumice in a rotating brush and dental floss. 2) Instructions in toothbrushing with a horizontal scrub technique, using plaque disclosing agents. All patients were provided with soft, multitufted toothbrushes, and were asked to brush twice daily. 3) A written orientation regarding the danger of decalcification during treatment with fixed orthodontic appliances were also presented to the patients. 4) For patients who were unable to perform optimal oral hygiene on their own, professional tooth cleaning by dental assistant was done at each visit.

CONCLUSIONS

Patients undergoing fixed orthodontic treatment showed significant deterioration of the periodontal status from the first month after the start of treatment (p<0.01).

However, there is a need to conduct such studies, also to evaluate the periodontal status after the removal of orthodontic appliances; as studies have shown that although orthodontic treatment leads to deterioration of periodontal status, but after the appliance removal periodontal status improves significantly.


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