Pain and Discomfort Associated With Initial Alignment with Three Different Archwires-A Clinical Study

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I. Introduction:
Pain and discomfort are common place after insertion of an initial archwire during orthodontics and are reported at some stage during treatment by 91% of patients and following each appointment by 39%. The level of pain reported after archwire placement is believed to be greater and more prolonged than that following extraction of teeth. Discomfort peaks on the morning after placement of an archwire remained at this level for 2 to 3 days before abating at 5 to 6 days. The fear of potential pain related to treatment affects the uptake of orthodontic care. Furthermore, treatment discontinuation and poor compliance have been attributed to discomfort experienced in the early stages of appliance therapy.

Pain may be elicited by heavy pressure placed on the tooth with an instrument or by normal mastication, or it may arise spontaneously; pain is known to be influenced by psychological, sociocultural, and environmental factors, making objective evaluation difficult. The experience of pain is measured indirectly, and the visual analog scale (VAS) is the most reliable method of measuring pain perception. Nonlinear relationships have been shown between pain experienced after initial archwire placement and archwire material and age; social class; degree of force applied; dental arch relationships; and dental crowding. It is not surprising that the use of preemptive and postoperative analgesia has been shown to reduce pain scores.

The present study is intended to test whether any significant difference in the pain and discomfort experience could be found during initial alignment with three initial archwires, i.e. 0.0175 multisranded stainless steel archwire, 0.018 Cu-Niti and 0.018 Niti. Ideally, archwires are designed to move teeth with light and continuous forces. Such force reduces the potential for patient discomfort, tissue hyalinization and undermining resorption. When force is applied, the archwire should behave elastically over a period of weeks to months. Keeping these wire characteristics in mind, research work was pursued by orthodontists.

AIMS AND OBJECTIVES:
1 To investigate the amount of pain and discomfort experienced by the patient during the alignment phase of treatment.

II. Materials And Methods:
Nickel Titanium has made a revolution in the field of orthodontics. Utility of the elastic properties of Nickel Titanium arch wires has minimized the tedious job of wire bending.

The present study was conducted to further understand the clinical behavior of Nickel titanium, copper Nickel Titanium and multistranded stainless steel wires in the initial alignment.

Armamentarium used in the clinical study:
a. Bracket system – 0.022 x 0.028” MBT preadjusted bracket system (Ormco) (Victory series).
b. Arch wires (preformed, round)
   – 0.018” Nickel Titanium (Libral)
   – 0.018” copper Nickel Titanium 35° (Ormco)
   – 0.0175” multistranded stainless steel (Libral)

The wire samples under study were divided into three groups of 10 patients each.

METHOD OF STUDY:
Patients were randomly selected from the daily OPD of Department of Orthodontics and Dentofacial Orthopedics, P.M.N.M. Dental College and Hospital, Bagalkot. Pre-treatment records as mentioned earlier were taken. The patients were referred for oral prophylaxis, then patients were send for extraction of first premolars. After that bands were prepared on molars and 0.022” MBT preadjusted appliance was bonded according MBT prescription (Ormco).

The 3 arch wire types were randomly allocated to patients according to predetermined random allocation scheme. The records were taken at the interval of 1hr, 5th hr, 10th hr, 24th hr and 2nd day to 6th day.
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PATIENT NAME : 
OPD NO. : 
ARCH WIRE : 
QUESTIONNAIRE
1. Is the appliance painful? Yes/No
2. If yes
   a. On the day of commencement of treatment how much pain you felt after 1 hour:
      5 hour:
      10 hour:
      24 hour:
   b. 2nd day:
   c. 3rd day:
   d. 4th day:
   e. 5th day:
   f. 6th day:
   g. 7th day:
3. Are you comfortable with the appliance? Yes/No
4. Do you feel pressure on your teeth? Yes/No
5. Are you feeling sensation during orthodontic treatment? Yes/No
6. Any difficulty during mastication? Yes/No

GRADING
0 = Not at all
1 = Very little
2 = Much
3 = Very much
From, Hans Sergl (Am. J. Orthod., 1998)

STATISTICAL ANALYSIS
Various clinical parameters were graded in the form of scores. Mean crowding score and pain and discomfort score was determined and compared between three different types of wires by One-way ANOVA followed by Studentized Range Test for multiple comparison. Categorical data was analyzed by Chi-square test.

III. Results And Observations:
Three archwires of different materials are compared to test the hypotheses that (1) there is no difference in the pain experience during the week following initial placement of appliance. The changes at each interval were noted and statistical evaluation done.(table I).

Table 1: comparison of pain scores (mean) between three arch wires

<table>
<thead>
<tr>
<th>Group</th>
<th>I mean</th>
<th>II mean</th>
<th>III mean</th>
<th>F-value</th>
<th>P-value</th>
<th>Difference between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st hour</td>
<td>1.6+0.84</td>
<td>2.14+0.57</td>
<td>2.0+0.94</td>
<td>F=1.09</td>
<td>P=0.35</td>
<td>NS</td>
</tr>
<tr>
<td>5th hour</td>
<td>1.9+0.74</td>
<td>2.14+0.57</td>
<td>2.3+0.82</td>
<td>F=0.78</td>
<td>P=0.45</td>
<td>NS</td>
</tr>
<tr>
<td>10th hour</td>
<td>2.0+0.00</td>
<td>1.7+0.67</td>
<td>2.5+0.71</td>
<td>F=5.13</td>
<td>P=0.01</td>
<td>NS</td>
</tr>
<tr>
<td>24th hour</td>
<td>2.0+0.00</td>
<td>1.5+0.85</td>
<td>2.5+0.71</td>
<td>F=6.14</td>
<td>P=0.01</td>
<td>NS</td>
</tr>
<tr>
<td>2nd day</td>
<td>2.0+0.00</td>
<td>1.5+0.53</td>
<td>2.5+0.71</td>
<td>F=9.64</td>
<td>P=0.01</td>
<td>NS</td>
</tr>
<tr>
<td>3rd day</td>
<td>1.8+0.42</td>
<td>1.3+0.82</td>
<td>2.2+0.79</td>
<td>F=4.13</td>
<td>P=0.03</td>
<td>NS</td>
</tr>
<tr>
<td>4th day</td>
<td>1.4+0.52</td>
<td>1.0+0.67</td>
<td>1.2+0.52</td>
<td>F=2.86</td>
<td>P=0.07</td>
<td>NS</td>
</tr>
<tr>
<td>5th day</td>
<td>1.0+0.00</td>
<td>0.7+0.82</td>
<td>1.2+0.79</td>
<td>F=1.46</td>
<td>P=0.25</td>
<td>NS</td>
</tr>
<tr>
<td>6th day</td>
<td>0.8+0.42</td>
<td>0.6+0.70</td>
<td>0.8+0.42</td>
<td>F=0.47</td>
<td>P=0.62</td>
<td>NS</td>
</tr>
<tr>
<td>7th day</td>
<td>0.6+0.52</td>
<td>0.2+0.42</td>
<td>0.7+0.84</td>
<td>F=3.098</td>
<td>P=0.06</td>
<td>NS</td>
</tr>
</tbody>
</table>

GROUP I- 0.0175 MSS
Table I shows the pain scores between 3 wires at each time interval. The pain level at 1st hour and 5th hour was almost same with multistranded stainless steel, CuNiTi and NiTi wires and they are 1.9, 2.1 and 2.3 respectively (graph 1). There was no statistically significant difference found between them. But at 10th hour to 3rd day the pain levels were increased with multistranded stainless steel and NiTi wires. The pain levels were low with CuNiTi archwire. The pain levels were 2, 1.5 and 2.5 with MSS, CuNiTi and NiTi wires respectively. Statistically significant difference was found between CuNiTi and NiTi wires (P <0.05, 0.01). There was no statistically significant difference was found between MSS and CuNiTi archwires and MSS and NiTi wires (graph 2). From 4th day to 7th day the pain levels were decreased progressively for all wires and there was no statistically significant difference was found between them (graph 3)

Graph 1: Pain

Graph 2: Pressure
Pain and discomfort index demonstrated that, pain associated with copper NiTi was less as compared to multistranded stainless steel and NiTi archwire.

Bibliography