Original Article

Evaluation Of Validity Of Pont’s Analysis In Tumkur Population

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Abstract:
Objective: Aim and objective of this study was to evaluate the validity of Pont’s analysis in Tumkur population. Materials and methods: The data for this study was obtained from casts of the cases from record room of the Orthodontics department of Sri Siddhartha Dental College and Hospital, Tumkur. The sample comprised 29 male subjects and 33 female subjects with age range from 14 -17 years. Results: The mean ratio was 0.83 and 0.65 for females, and 0.82 and 0.64 for males. Mean value of Pont’s ratio was 0.83 and 0.65 with standard deviation of 1.90 and 0.04 respectively. There was no significant difference between mean values for males and females. The correlation coefficient for SI/MP and SI/MM were 0.23 and 0.33 respectively which were statistically significant. Conclusion: Pont’s analysis can be applied in Tumkur population.

Key words: Pont’s Analysis, Validity, Index

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Introduction
A variety of diagnostic indices have been proposed in clinical orthodontics which helps to predict dental arch growth and assist with treatment planning. Many subjects with Angle’s Class I malocclusion with crowding may be treated satisfactorily with an extraction or non-extraction approach. Pont in 1909, proposed a method of predetermining the
ideal dental arch width which has become known as "Pont's Index." However, he felt that the method of measuring teeth to determine arch width was not the only factor to be considered in orthodontic treatment planning. He also stressed the assessment of the facial profile, determination of the Angle’s classification, relationship of upper and lower jaws to one another, and the midline as important essentials to be considered.¹

Pont determined a constant ratio between the width of the four maxillary incisors, and the width of the maxillary arch as measured from distal pit of premolar and mesial pit of molar either side (Fig 2). In the ideal dental arch he concluded that the ratio of combined incisor width to transverse arch width was 0.80 in the premolar area and 0.64 in the molar area, which is nothing but the so called “Pont’s index”. All his measurements and predictions were related to the maxillary dental arch and did not include an assessment of the mandibular arch. Pont obtained his data from an ill-defined French population and did not indicate how many subjects were included in his sample. However, he apparently was aware of possible differences between ethnic groups and suggested that the reliability of his index should be tested in other populations². Pont did not indicate the size of the sample used to determine his proposed index, but did state that they were of French nationality only. The application of Pont's Index in predicting the presumed genetic potential for dental arch development is still being debated, between orthodontists and those who believe in its simplicity and its apparent value as a treatment goal in arch expansion. The usefulness of Pont's Index is controversial and, as there has been a recent resurgence of interest in its clinical use for establishing dental arch development objectives particularly
by nonspecialists, reassessment of the Index in different human populations was considered worthwhile.³

Materials and Method

Source of Data: The data for this study was obtained from casts of the cases from record room of the Orthodontics department of Sri Siddhartha Dental College and Hospital, Tumkur. The sample comprised 29 male subjects and 33 female subjects with age range of 14 - 17 years. All the measurements were done by a single examiner and all were repeated after 15 days again by the same examiner. The cases, in which there was a large difference between these two measurements, were rejected.

Selection Criteria

1) Angle’s Class I molar relationship with overbite < 4 mm & overjet < 3 mm with full complement of teeth from second molar to second molar in both arches

2) Minimal arch crowding or spacing (< 3 mm);

3) No supernumerary teeth;

4) No crossbite; minimal rotations;

5) No orthodontic treatment taken before and with minimal attrition.

Measurement

A vernier caliper with sharpened beaks was used to measure the mesiodistal crown diameters of the maxillary permanent incisors and arch widths on the dental casts, to an accuracy of 0.1 mm. In those instances where there was slight attrition, the measuring point for arch width was determined as the middle of the facet on the tooth (Fig 1). The predicted arch widths in the first premolar (MP) and molar (MM) regions were estimated with the formula proposed by Pont.
Statistical Analysis

Incisor diameters and arch widths were recorded for all subjects and described in terms of mean values, standard deviations, and coefficients of variation for male and female subjects, separately.

**TABLE 1 (for Females)** Upper incisor and arch width values (in mm) for female, described in terms of arithmetic means, standard deviations (SD), and coefficients of variation (CV).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SI (mm)</th>
<th>MP (mm)</th>
<th>MM (mm)</th>
<th>RATIO SI/MP</th>
<th>RATIO SI/MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean values</td>
<td>30.06</td>
<td>36.12</td>
<td>45.71</td>
<td>0.83</td>
<td>0.65</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.84</td>
<td>2.85</td>
<td>2.19</td>
<td>0.067</td>
<td>0.04</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>6.12</td>
<td>7.91</td>
<td>4.79</td>
<td>8.11</td>
<td>6.13</td>
</tr>
</tbody>
</table>

Where $SI = \text{sum of mesiodistal crown diameters of the four maxillary incisors;}$ $MP width = \text{transverse distance between maxillary first premolars measured at the distal pit;}$ and $MM width = \text{transverse distance between maxillary first molars measured at the mesial pit.}$
Validity of Pont’s Analysis

**TABLE 2 (Males)** Upper incisor and arch width values (in mm) for males, described in terms of arithmetic means (AVG), standard deviations (SD), and coefficients of variation (CV).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SI</th>
<th>MP</th>
<th>MM</th>
<th>SI/MP</th>
<th>SI/MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean values</td>
<td>29.51</td>
<td>35.59</td>
<td>45.75</td>
<td>0.82</td>
<td>0.64</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>2.08</td>
<td>1.59</td>
<td>2.03</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>7.05</td>
<td>4.47</td>
<td>4.45</td>
<td>6.63</td>
<td>7.6</td>
</tr>
</tbody>
</table>

**TABLE 3. (Overall value)** Upper incisor and arch width values (in mm) for overall cases described in terms of arithmetic means (AVG), standard deviations (SD), and coefficients of variation (CV).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>S.I.</th>
<th>MP</th>
<th>MM</th>
<th>SI/MP</th>
<th>SI/MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean values</td>
<td>29.88</td>
<td>36.02</td>
<td>45.73</td>
<td>0.83</td>
<td>0.65</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.90</td>
<td>2.44</td>
<td>2.10</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>6.37</td>
<td>6.77</td>
<td>4.59</td>
<td>7.58</td>
<td>6.62</td>
</tr>
</tbody>
</table>

**TABLE 4 (Correlation Coefficient)**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI &amp; MP</td>
<td>0.23</td>
<td>0.05</td>
</tr>
<tr>
<td>SI &amp; MM</td>
<td>0.33</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**Result**

Mean value of Pont’s ratio respectively. The mean ratio in our study was 0.83 and 0.65 for females and 0.82 and 0.64 for males. There was no statistical
significant difference between mean values of Pont’s index in males and females. The correlation coefficient for SI/MP and SI/MM were 0.23 and 0.33 respectively which were statistically significant.

**Discussion**

As orthodontic problems commonly result from disharmony between tooth size and dental arch size, dental indices have often been related to either one or both of these variables. Pont's Index is one of the indices that still raise atavistic debate with regard to its clinical value. Pont did his experiment on French population. He did not mention the sample size. In his study he made a note that further investigation is needed to check the validity of his formula. These formulas were applied to populations of different ethnic origins to determine whether the index could be applied to different populations. This is the first study that aimed to assess Pont’s Index on Tumkur population. Genetic variation, food habit among different population groups affects the jaw growth. Different jaw sizes will require different amount of expansion so chances are there that the Pont’s formula could be different for different population and different racial groups.

Stiftler\(^4\) tested Pont's analysis on Ideal and Normal Class I dentitions. The two groups were classified as "Normals" and "Ideals" to determine any significant differences. No corresponding correlation was found for the Normal group. Greve\(^5\) critically analyzed the validity of Pont's Index. He found that in one hundred and two dentitions with perfect occlusion only low correlation coefficients existed between the sum of the mesiodistal crown diameters of the incisors and the arch breadth in the premolar region \((r = -0.34)\), and arch width in the molar region \((r = +0.24)\). In our study the correlation coefficient between the sum of the mesiodistal crown width of the incisors and the arch width...
in the premolar region \((r = 0.23)\),
and arch width in the molar region
\((r = +0.33)\) is highly significant.

Hotz\(^6\) suggested that deviations from Pont's Index may be related to long and narrowly shaped dental arches. He concluded that due consideration must be given to the shape of the skull in assessment of arch form and width. Smyth and Young\(^7\) found that the relationship between tooth size and arch width was below the \(r\) value. Korkhaus\(^8\) proposed index values of 84 and 65 rather than Pont's values of 80 and 64. His study was done on Rhineland population. In a same way our study has been done on Tumkur population in which it was observed that mean value of Pont’s ratio was 0.83 and 0.65 with standard deviation of 1.90 and 0.04 respectively (TABLE 3). The mean ratio was 0.83 and 0.65 for females and 0.82 and 0.64 for males (TABLE 1, 2). There is no significant difference between mean values for males and females. The overall data shows that the ratio of width of incisors and intermolar width is 0.65 and the ratio of width of incisors and interpemolar width is 0.83 (TABLE 2). According to Pont, this value is 0.64 and 0.80 respectively. The difference is 0.03 and 0.01 which is not statistically significant. If we compare the results of the previous similar studies\(^9-10\) with the results of this research, it can be stated that, it is the mean value which represents the Pont index for a particular group. And it should not be extrapolated to individuals of different ethnic origins as it does not give accurate estimates of ideal arch widths for a given individual in the majority of cases.

**Conclusion**

There was no statistically significant difference between the Pont’s index proposed by Pont and the mean values of this study. Pont’s index can be applied in Tumkur population.

Mean values of Tumkur population have been taken in this
study which is matter of conflict with Pont’s study. Dissimilarities can be seen with the proposed Pont’s index and the dissimilarities may be attributed to the sample selection, method of the study and area of patient selection, which suggest racial and genetic differences.

References


