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Re–assessment of Pont's index in Class I normal occlusion

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ABSTRACT

Background: Since the introduction of modern orthodontics, several indices have been proposed to help prediction normal maxillary arch width that would relieve crowding, maintain occlusion stability and reduces future relapse. Among these indices Pont had proposed an index in 1909 to estimate maxillary arch width depending upon the sum of maxillary incisors mesiodistal dimensions. **Aims:** The present study tried to investigate the reliability of Pont's index in estimating dental arch width. **Materials and Methods:** The sample consisted of 22 boys and 22 girls aged 14–16 years. Measurements of all study models were done using a sliding caliper. The arch width was measured in first premolar region between distal pits, and in first permanent molar region between central fossae. **Results:** Statistical analysis, using correlation coefficient; revealed a poor correlations existed between Pont's estimation for the arch width and the actual arch width measured from the casts for both sexes. The arch widths were generally underestimated for all test groups. **Conclusion:** It was concluded that Pont's index is not a precise method for prediction of maxillary dental arch width.

Key Words: Pont's index, arch width, Class I occlusion

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INTRODUCTION

In orthodontic treatment, a wealth of information obtained from dental casts plays a significant role in diagnosis, treatment planning, and evaluation.[1]

Since the beginning of modern orthodontics the profession has continually tried to predict the success or failure of orthodontic treatment. While it must be supposed that variation from normal occlusion could be measured accurately and that orthodontic diagnosis could be based upon mathematical calculation, nevertheless, the ability predetermine arch size within limits is a useful diagnostic aid.[2]

Pont's index was established by Pont in 1909 to predict maxillary dental arch width (interpremolar and intermolar) from the sum of the mesiodistal dimensions of the four maxillary incisors. The usefulness of Pont's index is controversial.[3] However, the usefulness of Pont's index in its clinical use for establishing dental arch development, reassessment of this index is of great value.

In 1909, Pont presented to the profession a system whereby the mere measurement of the four maxillary incisors automatically established the width of the arches in the first premolar and first molar regions. Pont showed that, by using this method, the final result was no different from that of Hawley's for the predetermination arch width.[2]

When comparing orthodontic textbooks from various countries, Pont's index appears to have played a relatively important role in Germany. In the USA, marked shift treatment concept came up during the forties, in that the maintaining of pretreatment dental arch form especially in the lower jaw was considered to be important for reasons of stability. Later researches firmly supported this concept.[4]

According to Pont, in ideal dental arches, the value of the ratio of the combined

mesiodistal crown diameters of the maxillary incisors to the transverse dental arch width, multiplied by 100, should be 80 in the premolar region and 64 in the molar region. Pont obtained his data from ill–defined French population and did not indicated 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 populations.[3]

The present study tried to investigate the validity of Pont's index in estimating the dental arch width depending on the sum of mesiodistal dimensions of maxillary incisors.

MATERIALS AND METHODS

The sample consisted of 22 boys and 22 girls aged 14 – 16 years, all of Iraqi origin and live in the center of Mosul City. Some criteria were considered in selecting the sample including normal class I dental relationship.[5–7] No facial or skeletal deformities especially in horizontal plane. All permanent teeth were present (no extraction or congenitally missing teeth). Besides, all teeth were free from any fracture or badly carious lesions. Finally orthodontic–treated subjects were excluded.

Measurements of all study models were done using a sliding caliper gauge accurate up to 0.1 mm (Figure 1). Each incisor tooth was measured from anatomic contact point to another for it's mesiodistal dimension (Figure 2).[8] The sum of mesiodistal dimensions of the four upper incisor was calculated for each cast.

The arch width was measured in first premolar region between distal pits,[2, 9] and in first permanent molar region between central fossae (Figure 2).[10–14] The following equation was used to predict the arch width:[3] Premolar width = sum of mesiodistal dimensions of upper four incisors multiplied by 100/80. Molar width = sum of mesiodistal dimensions of upper four incisors multiplied by100/64.

Statistical Package for the Social Sciences (SPSS) program was used to analyze the data. The statistical analysis used include: Descriptive statistics (mean, standard deviation, minimum and maximum). Pearson's Correlation Coefficient analysis to explore the correlation between the true and estimated arch width.

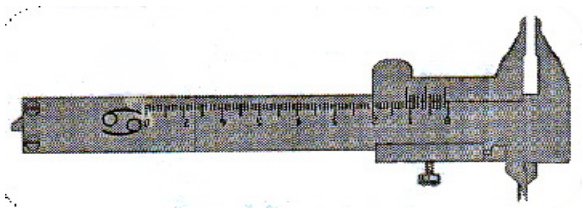

Figure (1): Sliding caliper gauge

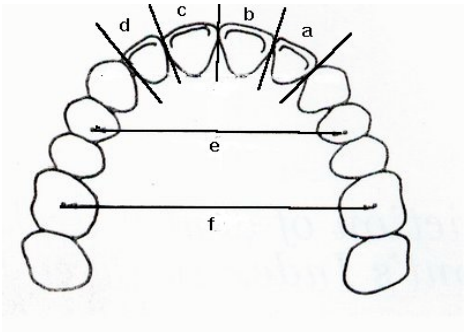

Figure (2): Cast measurements

a,b,c,d: Mesiodistal dimensions of upper incisors, e: Interpremolar width, f: Intermolar width.

RESULTS

Descriptive analysis of mesiodistal dimensions of the upper anterior teeth for males and females were shown in Table (1) and (2) respectively.

Description of the mean of interpremolar arch width for both sexes was shown in Table (3), and for the intermolar arch width was shown in Table (4).

The results showed that the interpremolar and intermolar arch widths estimated by Pont's formula were generally less than the true interpremolar and intermolar arch widths measured on the casts for both male and female groups.

Descriptive analysis for the interpremolar arch width (shown in Table 3) revealed that the underestimations of arch wid-

th, using Pont's index, were 6.58 mm for males and 4.12 mm for females. Whereas for the intermolar arch width, Table (4) revealed that Pont's index have underestimated arch width by 7.94 mm for males and 4.67 mm for females.

Table (1): Descriptive analysis for mesiodistal dimensions of upper incisors in males

	No.	Mean	± SD	Maximum	Minimum
Upper Right Central Incisor	22	8.23	0.38	9	7.6
Upper Left Central Incisor	22	8.29	0.44	8.9	7.4
Upper Right Lateral Incisor	22	6.3	0.29	6.7	5.9
Upper Left Lateral Incisor	22	6.3	0.33	6.9	5.7

SD: Standard Deviation.

Table (2): Descriptive analysis for mesiodistal dimensions of upper incisors in females

	No.	Mean	± SD	Maximum	Minimum
Upper Right Central Incisor	22	8.3	0.45	9	7.4
Upper Left Central Incisor	22	8.29	0.32	8.9	7.8
Upper Right Lateral Incisor	22	6.36	0.45	7	5.5
Upper Left Lateral Incisor	22	6.33	0.47	7	5.3

SD: Standard Deviation.

Table (3): Descriptive analysis for interpremolar width

	No.	Mean		± SD		Minimum		Maximum	
		Male	Female	Male	Female	Male	Female	Male	Female
IPW(t)	22	42.99	40.72	1.30	1.57	41.20	37.30	45.30	42.90
IPW(e)	22	36.41*	36.60**	1.65	1.76	33.25	32.50	38.87	38.50

SD: Standard Deviation, IPW(t): True interpremolar width as measured on the casts, IPW(e): Pont's estimation for interpremolar width.
*Underestimated by 6.58 mm, **Underestimated by 4.12 mm.

Table (4): Descriptive analysis for intermolar width

	No.	Mean		± SD		Minimum		Maximum	
		Male	Female	Male	Female	Male	Female	Male	Female
IMW(t)	22	53.43	50.42	1.96	2.66	49.30	45.20	56.80	54.70
IMW(e)	22	45.49*	45.75**	2.04	2.20	41.56	40.62	48.59	48.12

SD: Standard Deviation, IMW(t): True intermolar width as measured on the casts, IMW(e): Pont's estimation for intermolar width.
*Underestimated by 7.94 mm, **Underestimated by 4.76 mm.

DISCUSSION

From the results it could be observed that no person displayed the ideal arch dimensions predicted by Pont's index. Dental arch width was generally under–estimated by the index in both test groups (male and female). These findings were in agreement with those of Dalidjan *et al*[3] The present study disagreed with the findings of Nimkarn *et al*.,[9] who found an over–estimation of arch widths estimated by Pont's index relative to actual arch width measured on the dental casts.

Statistical analysis using Pearson's Correlation Coefficient (Table 5 and 6) revealed that positive but insignificant correlations existed between interpremolar and intermolar arch widths measured directly on the dental casts and those estimated by Pont's index.

These findings disagreed with the findings of Gupta *et al*.,[15] who found that a significant correlation existed between the combined maxillary incisor dimensions and the maxillary interpremolar and intermolar widths. On the contrary, the present study concluded that a poor correlation has been found between the predicted arch width estimated by Pont's index and the actual arch width measured directly from the casts, which corresponded to the findings of Dalidjan *et al*.,[3] and Nimkarn *et al*.,[9] who, respectively, underestimated and overestimated the arch widths using Pont's index.

Table (5): Correlation coefficient for interpremolar width

	Male		**Female**	
	IPW(t)	**IPW(e)**	**IPW(t)**	**IPW(e)**
IPW(t)		0.382		0.495
IPW(e)	0.382		0.495	

IPW(t): True interpremolar width as measured on the casts,
IPW(e): Pont's estimation for interpremolar width.

Table (6): Correlation coefficient for intermolar width

	Male		**Female**	
	IMW(t)	**IMW(e)**	**IMW(t)**	**IMW(e)**
IMW(t)		0.192		0.311
IMW(e)	192		0.311	

IMW(t) : True intermolar width as measured on the casts,
IMW(e):Pont's estimation for intermolar width.

CONCLUSION

The findings of the present study revealed that the use of Pont' s index for estimation of maxillary dental arch width is not so reliable and can not be considered to be of great clinical value in diagnosis and treatment planning considerations.

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