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Application of Pont's Index to Gujrati Population

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Abstract
Dental treatment for face corrections, teeth aligment, smile design, is advised as a part of cosmetic treatment. Dental casts of 100 Gujrati (50 males & 50 females), population with Angle's class I malocclusion were selected. The selection was done from the records of random stratified sample of children age 15 yrs to 20 yrs. The mesiodistal width of the maxillary permanent incisors and other parameters like interpremolar, intercanine, intermolar distances. They were measured directly by a digital caliper on dental casts.

To determine significant differences in teeth width and arch width values for males and females an independent "t" test was carried out.

The correlation coefficients determined between the measured arch width values and those calculated according to Pont's index. This value is low all over with 'r' value ranging from 0.21 to 0.32. It was concluded that Pont's index should be used to predetermine ideal arch width to consider Gujrati individuals for treatment modalities.

Keywords: *Arch width mesiodistal teeth width, correlation, coefficients, inter premolar, intermolar distances.*

Introduction

It is essential to obtain high quality, uncompromised, diagnostic records to evaluate the teeth, oral structures, occlusion, facial, jaw preparations. Record consists of study models, occlusal radiographs, panoramic and cephalometric X-rays to correlate the study models with it precisely. To apply the non-extraction and extraction treatment modality means expansion, stripping of teeth, extra oral headgear appliances. The ideal arch width necessary to accommodate the dentition and relieve the crowding. It can be determined by assuming a constant relationship between the sum of mesiodistal widths of permanent maxithory incisors (SI) and interpremolar and inter molar arch width. The study aimed to assess the application of this index to Gujrati population and compare the results with other international population.

Ideal model should display all the anatomical and dental landmarks. Perfect Impressions and dental casts should be made, bases prepeared for perfect measurement.

Hypothesis Tested

Pont's Index could used to predict the ideal arch with values in Gujrati Population.

Aim

To determine the space available for dental treatment with Angle's Class I maloculecon by using Pont's index to Gujrati population.

Objective

1) Pont's Index was established to predict ideal maxillary dental arch width from the sum of mesiodistal widths of four upper incisors.
2) To decide extraction or non-extraction mode of treatment.
3) To plan retention as orthodontic treatment completion to avoid selapse.
4) To decide the duration of treatment.
5) To decide implant treatment and dentoalveolar surgery to make the arch width useful.

Formula

- Anterior width

  (Inter premolar width) $= \frac{Incisor\ sum\ \times 100}{85}$

- Posterior width

  (Inter molar width) $= \frac{Incisor\ sum\ \times 100}{65}$

- Dental arch length $= \frac{Incisor\ sum}{160} \times 100$

Review of Literature

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- Ahmet Asif Celebi, Enes Tan and Ibrahim Erhan Gelgor in 2012 Showed the Pont's index should be used to predetermine the ideal arch width in Turkish individuals.[24]

Study Details

a) **Study Design:** This is a cross sectional study of 100 patients with both sexes age group 15-20 yrs. The study model impressions have fully erupted permanent set of teeth. The patients were part of orthodontic treatment in orthodontia department.

b) **Source of collection of data:** For study all Gujrati patients who were visiting to

Narsingbhai Patel Dental College, Visnagar, Meshana Gujrat, age 15-20 yrs.

c) **Related approval of study**
1. Sakalchand Patel University research unit.
2. Head of the department of Orthodontic department.
3. Written consent and approval from major patients self signed.
4. In minor patients their parents consent was taken.
5. Approval for photographs, radiographs, CT Scan, Pathological investigations.

d) **Sample Description of Study:** The target population is simply the group of individuals for research study, cluster sampling, probability sampling

e) **Time of study:** The study carried out within 30 days indental college.

f) **Selection Criteria for Study:** For every subject selected both the parents were Gujrati. The criteria for selection is angles Class I malocclusion with overjet, overbite, rotations, spacing and crowding. To align these malaligned teeth all the analysis has to be done to get arch width.

g) **Inclusion Criteria**
All the permanent teeth set erupted, no caries, no rotations, no missing or supernunerary teeth, no abnormally shaped and sized teeth means anomaly. No wear and tear of teeth.

h) **Exclusion criteria**
All the patient which are not fullfilling the condition of inclusion criteria. They were excluded from study.

Material and equipment Used
1. Living patients jaw and dental department.
2. Impression material alginate and perforated impression trays.
3. Water, bowl, spatula, Stone Plaster, Study cast, base former.
4. Digital Vernier calliper with 0.01 mm scale, compass, growth prediction software.
5. Model trimmer, plaster dispenser, vibrator stone plaster.
6. Miscellaneous.

Methods of Pont Index Application
Index study in reality is comparative, descriptive transverse. The variables taken into the consideration were upper incisor sum, posterior dental arch width, anterior dental arch width, dental length, the values for Pont's index are based on the mesiodistal width of the upper incisors combining them with the premolar and molar transverse width. The equation for calculating Pont's index is

- Anterior width
  (Inter premolar width) $= \frac{Incisor\ sum\ \times 100}{85}$
- Posterior width
  (Inter molar width) $= \frac{Incisor\ sum\ \times 100}{65}$
- Dental arch length $= \frac{Incisor\ sum}{160} \times 100$

The measurement were carried out using a digital vernier caliper with accuracy of 0.01 mm. The measurement were taken by only one researcher in all standard conditions. The Pont's index standardization for arch width measurements of incisors, premolars, molars and dental arch length taken in consideration.

For intercanine distance the cusptips of canines taken, interpremolar widths. The distance between the distal fossae of first premolars of maxillary and mandible arch. The intermolar distance in maxillary arch central fossae of maxillary first molars. The intermolor distance in mandibular arch the cusp tips of distobuccal cusps of mandibular first molars.

Error of the Method
For arch width measurements all 100 study models were selected randomly and the measurements were carried out twice by the same observer on two separate occasions with one week interval between measurements intra observer's error for each tooth measurements. Intra observers error for arch width measurements were assessed as per Dahilberg's formula ranged from 0.08 to

0.30 mm for tooth size measurements. Similarly for arch width measurements 0.25 to 0.38 mm.

The coefficient of reliability calculated as recommended by Hoston (1983) ranged from 92 to 98% for tooth width measurements.

The coefficient of reliability for arch width measurements is 96 to 99%. This shows the error are likely minimal and unlikely, to bias the results.

Statistical Analysis

Statistical tests were carried by statistical package for social Science SPSS

In the Pont's index analysis and formulae the sequined measurements has to be taken individual mesiodistal incisor width, arch width in promoter, canine & molar teeth upto the nearest 0.01 mm and average values, standard deviations and coefficients of variation for male and females.

All the values are calculated between the measured and the calculated arch width values. Correlations were also determined between individual and combined incisor widths and measured widths.

To determine whether there is a significant difference in tooth and / or arch width valued for males and females a t-test for independent samples.

Results

Arch width and individual incisor widths (Table 1)

Variable	Male (n-50)			Females (n-50)		
	AVG	SD	CV	AVG	SD	CV
Tooth widths						
12	6.86	0.47	6.98	6.74	0.51	7.69
11	8.82	0.60	6.90	8.68	0.50	5.86
21	8.86	0.59	6.75	8.69	0.49	5.74
22	6.81	0.48	7.17	6.73	0.52	7.87
Arch widths						
Maxilla						
3-3	35.27*	1.75	4.98	33.91*	1.70	5.03
4-4	37.86*	2.12	5.61	36.33*	1.83	5.05
6-6	48.17*	2.51	5.22	45.95*	2.16	4.71
Mandible						
3-3	26.89*	1.77	6.61	25.81*	1.36	5.30
4-4	32.16*	2.04	6.36	31.05*	1.79	5.79
6-6	49.10*	2.74	5.59	46.85*	2.17	4.64

*Significant differences between males and females at $p < 0.05$

There is significant difference between the incisor widths of males and females. Female has smaller incisor widths. Smaller values of maxillary and mandibular arch widths in females as compare to males.

Correlation coefficients (Table 2)

Arch widths		Male (n-50)	Females (n-50)
Interpremolar	r	0.24*	0.38*
	r^2	0.05	0.14
Intermolar	r	0.35**	0.25*
	r^2	0.12	0.06

*r value differ significantly from zero at $p < 0.05$
** r value differ significantly from zero at $p < 0.01$

The calculated arch width value according to point's index and the measured arch width values of corresponding teeth were considered for correlation coefficients.

This CCV were low in all cases for males and females width r values ranging from 0.28 to 0.38.

Combined mesiodistal widths of incisors and arch width correlations (Table 3)

	Intepremolar arch widths with					Intermolar arch widths with				
	12	11	21	22	SI	12	11	21	22	SI
Males (n=50)	0.159.	19	0.18	0.22	0.24	*0.21	0.30**	0.33**	0.24**	0.38**
Female (n=50)	0.38**	0.28*	0.28*	0.33**	0.35**	0.29**	0.10	0.14	0.29**	0.25*

*r value differ significantly from zero at $p < 0.05$

** r value differ significantly from zero at $p < 0.01$

The inter – relationship of the arch width of maxillary arch and masiodistal width of maxillary incisors in combination found to be low for males and females width r values ranging from 0.10 to 0.37.

The differences between calculation for individual subject Table 4

|	Under Pont's Prediction	Over Pont's Prediction	Pont's prediction $\pm$ 1 mm
Interpremolar			
Males (n=50)	68	30	18.2
Females (n=50)	84	14	27.3
Intermolar			
Males (n=50)	64	36	25.3
Females (n=50)	76	34	23.2

The differences between calculation for individual subject Table 5

	Largest difference under Pont's prediction	Largest difference over Pont's prediction
Interpremolar		
Males (n=50)	-6.62	4.94
Females (n=50)	-7.19	2.66
Intermolar		
Males (n=50)	-10.31	4.48
Females (n=50)	-9.48	3.40

The differences between measured and calculated arch width values were calculated for each individual subject and pre presented enables.

Fig. 1 also represents the above mention of facts.
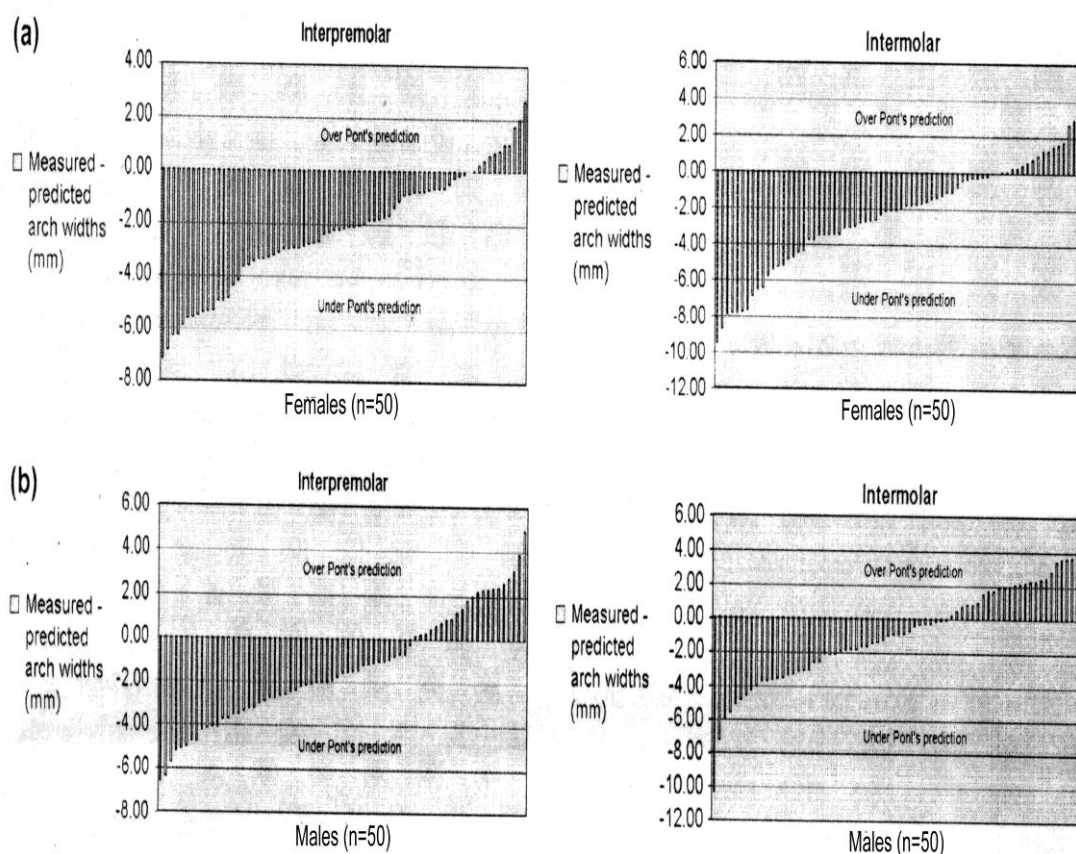
Figure 1: Differences between measured and predicted arch value for females (a) and males (b) in millimeters.

Discussion

This is the first study which is used to assess Pont's index in Gujrati population. The subject in the present study were of a single age group which represents a random satisfied sample from school of Visnagar, Mehsana.

Special attention was also given to the sample size hevgest sample of a single population compared with similar precious studies the power of calculation says the adequate sample size in the present study only one examiner measured arch width as error calculation has undertaken the results shown highly reliable measurements.

The findings of Hattab et. al. (1996), who found that there is significantly large teeth size of males than females.[6]

Bishava et.al. (1989), found the discussions of teeth in the three populations from Egespt, Mexico and USA found no significance difference between smabillran and mendhikhlan incisons in both genders.[2]

The correlations between measured arch widths and those calculated are to the point is formulae were low (Table 2) which slows Pont's index applicability to predetermine arch widths Dalidjan (1995).[4]

The actual and predicted arch width values of each subject and their difference were calculated. The inter molar widths which are ganged from -10.4 to 40.3 mm for males and from -9.2 to 3.9 mm far females (Table 5) Pont's index tender to overestimate the arch width to receive crowding (Fig.1)

Worms (1972) and Nimlearn (1995) came to conclusion that the index is same for Caucasians and Navojo. In this study the actual value of inter premolar and intermolor arch width is less than those predicted act to Pont's index. This shows Gujrati has nor over arches than the sample cased to formulate Pont's index.[20]

Pont's index represents mean values for groups that should be checked, evaluated and researched for every population group.

Conclusion

Pont's index should be used to predetermine ideal arch widths values for Gujarati individuals it should be applied clinically for patients undergoing orthodontic and other dental treatment.

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