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EVALUATION OF THE COMPATIBILITY OF HOWES ORTHODONTIC CAST ANALYSIS WITH TURKISH POPULATION

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ABSTRACT

The aim of this study is to evaluate the transverse arch dimensions and compatibility of Howes orthodontic cast analysis with Turkish Populaton. The material consisted of dental casts lateral cephalograms of 55 Class I patients (25 male, 30 female) aged between 18 – 26 years. No subject had any history of systemic disease and nor had undergone prior orthodontic treatment. Original Howes orthodontic cast analysis was applied on the study casrs and cephalograms. 4 milimetric and 3 proportional parameters were used for this analysis. Tooth material, left and right first bicuspid coronal arch width and the transversal basal width were measured on the dental casts in maxillary and mandibular arches. Maxillary and mandibular basal arch lengths were measured on the cephaligrams. The ratios of first bicuspid coronal arch width, basal arch width and basal arch length to tooth material were measured. Statistical analysis of the data was evaluated with student t test. No statistically significant differences were recorded in first bicuspid coronal arch widths and basal arch widths in both maxillary and mandibular arches. Maxillary and mandibular tooth materials were found significantly greater than Howes analysis standards, respectively $p < 0.05$, $p < 0.001$. The ratio of basal arch width to tooth material in maxillary arch was significantly lower

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than Howes standards ($p < 0.05$). The ratio of basal arch length to tooth material in maxillary arch significantly higher than Howes standards ($p < 0.001$). Maxillary basal arch length and the ratio of this parameter to tooth material were significantly higher than Howes standards ($p < 0.001$). Mandibular basal arch length and the ratio of this parameter to tooth material was significantly lower than Howes standards, respectively $p < 0.01$, $p < 0.001$. Howes orthodontic cast analysis was found applicable in Turkish population except for the tooth material and basal arch lengths.

INTRODUCTION

The relationship of tooth material to its supporting bone was briefly defined by Howes 50 years ago. The treatment procedures must be planned by cephalometric tracings, dental cast measurements and facial relations and we must decide if there is sufficient bone for the teeth in their proposed positions and must try to estimate the possibility of dental arch stability after treatment (1-5).

The expansion procedures and extraction decisions can be made by the dental cast analysis and radiographic examinations. If the tooth material with respect to its supporting basal arch is deficient then palatal expansion procedures can be held. Palatal expansion procedures can be held. Palatal expansion procedures can be held. Palatal expansion procedures can be held. Palatal expansion procedures can be held by rapid or semi rapid expansion devices. According to Hass(6), rapid maxillary expansion by opening of the midpalatal suture is extremely advantageous in the treatment of ; 1 – both surgical and nonsurgical Class III cases, especially the nonsurgical ones, 2- cases of real and relative maxillary deficiency, 3- cases of inadequate nasal capacity exhibiting chronic nasal respiratory problems, 4- the mature cleft palate patient, and 5- selected arch length problems to avoid the profile disturbances so frequently associated with removal of theeth. These are ordinarily cases with good morphogenetic patterns where just a slight amount of width in booth arches would give an excellent occlusion. Howes orthodontic cast analysis defines the size and form of the basal arches, the relationship of the teeth the those arches and interrelationship of those arches to each other (1.7). However reduction of the arch widths will be seen by the decision of extraction in the upper and lower arches whereas arch widths will widen with the expansion procedures (7,8). Bishara et al. (9) stated that, “after the eruption of the permanent dentition, the clinician should

either expect no changes or a minimal decrease in arch widths". So our earlier statement will slightly change; If the tooth material to its supporting basal arch is deficient then palatal expansion procedures can be hels in a "growing patient". Great changes can be made by our decisions for the patients so normal parameters for the patients must be studied for optimal treatment planning.

Howes's study is not a current study as it was done 50 years ago and it had a limited number of subjects. The population of Howes's study was not homogeneous and was done only with anglo saxon subjects so there is a question if Howe's findings is applicable for our population. However there is no alternative analysis to explain the horizontal skeletal discrepancy in the orthodontic study casts. The aim of this study is to evaluate the transverse arch dimensions and compatibility of Howes orthodontic cast analysis with Turkish population.

Materials and Methods

The material consisted of dental casts and lateral cephalograms of 55 patients (25 male, 30 female) aged between 18 – 26 years with Angle Class I occlusal relationship in the canines and molars, with normal overbite and overjet. All subjects were students of the faculty of dentistry of Istanbul University and they were from different cities of Turkey which can represent the Turkey which can represent the Turkish population. No subject had any history of systemic disease and nor had undergone prior orthodontic, prosthetic and surgical treatment.

The original Howes orthodontic cast analysis was applied on the study casts and cephalograms. 4 millimetric and 3 proportional measurements were used for this analysis (Figs. 1-2-3).

Millimetric measurements:

1- **Tooth material (TM)** for n arch was measured as the sum of the mesio-distal widths of each tooth from right to left first molar (including the first molars).

2- **Left and right first bicuspid coronal arch width (BCAW)** was measured from the left first bicuspid buccal cusp to the right bicuspid buccal cusp (Figure 1).

3- **Transversal basal arch width (TBAW)** was measured between the left and right canine fossa (Figure 2).

4- **Basal arch length (BAL)** was measured from point A on the maxilla and point B in on the mandible to the distal margin of the first molar on the lateral cephalometric radiogtaphies (Figure 3).

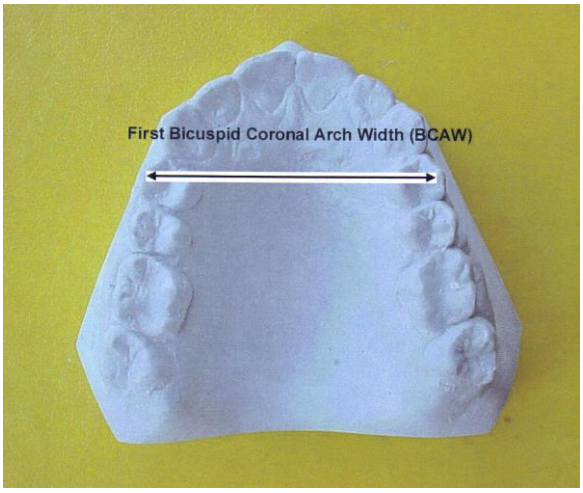

Figure 1: The measurement of First Bicuspid Coronal Arch Width (BCAW)

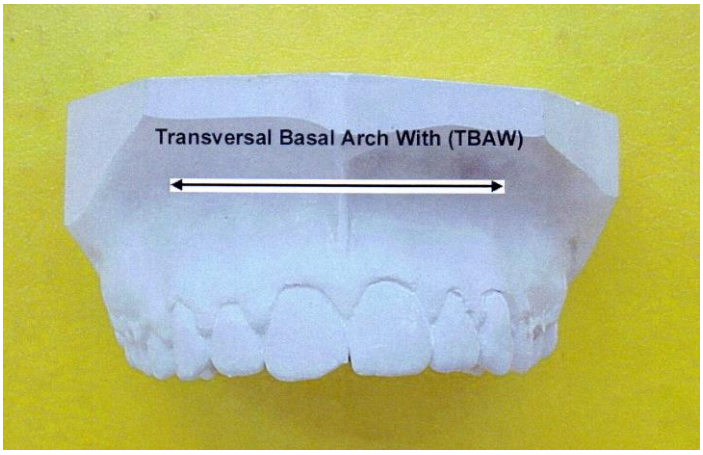

Figure 2: The measurement of Transversal Basal Arch Width (TBAW)

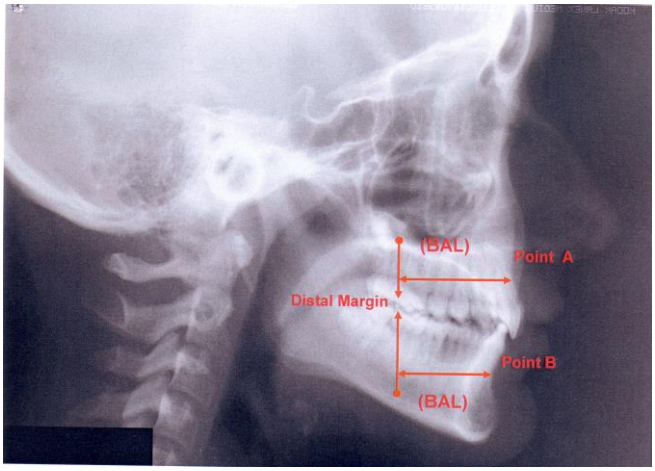

Figure 3: The measurement of Basal Arch Length (BAL)

Proportional measurements

1- The ratio of first bicuspid coronal arch width to tooth material (BCAW / TM).

2- The ratio of transversal basal arch width to tooth material (TBAW / TM).

3- The ratio of basal arch length to tooth material (BAL / TM).

All measurements were made by the same investigator with a measurement gauge (Dentaurum Germany). Randomly selected 20 models were remeasured 15 days later by the same investigator. Statistical analysis of the data was evaluated with t teat. The error of the method was evaluated with Dahlberg's formulae (10).

RESULTS

The results of this study are shown in Table 1.

No statistically significant differences were recorded in first bicuspid coronal arch widths (BCAW) and transversal basal arch widths (TBAW) in both maxillary and mandibular arches.

Maxillary and mandibular tooth material (TM) was found significantly greater than Howes analysis standards, $p < 0.05$, $p < 0.0001$, respectively.

The ratio of transversal basal arch width to tooth material (TBAW / TM) in maxillary arch was significantly lower than Howes standards, $p < 0.05$.

Maxillary basal arch length (BAL) was significantly higher than Howes standards, $p < 0.001$. The ratio of basal arch length to tooth materil (BAL/TM) in maxillary arch was significantly higher than Howes standards, $p < 0.001$.

Mandibular basal arch length (BAL) and the ratio of this parameter to tooth material (BAL/TM) was siginificantly lower that Howes standards, $p < 0.01$, $P < 0.001$, respectively.

Table I. Statistical data of the study.

	Maxilla (n = 55)				**Maxilla (n = 55)**			
Parameters	**Howes**	**Mean**	**SD**	**t-Test**	**Howes**	**Mean**	**SD**	**t-Test**
TM (mm)	91.70	92.69	3.77	*	84.10	85.66	3.32	***
BCAW (mm)	41.60	41.97	1.89	NS	33.90	34.25	1.67	NS
BCAW/TM (%)	46	45	2	NS	40	39.99	1.94	NS
TBAW (mm)	43.80	43.52	2.12	NS	39.90	40.23	1.86	NS
TBAW/TM (%)	48	47	2	*	47	46.68	1.87	NS
BAL (mm)	32.40	34.35	2.40	***	31.40	30.66	1.87	**
BAL/TM (%)	35	37	2	***	37	35.68	2.50	***

SD : Standard Deviation

NS : Not significant

*** p < 0.05 ; ** p < 0.01; *** p < 0.001**.

DISCUSSION

The original Howes cast analysis was done over a limited number of patients a non-homogeneous population. The data for the original Howes orthodontic cast analysis consisted of 14 untreated Class I patients. In our study, in our study, in order to get a more reliable result and to determine Howe's parameters for Turkish population, selected 55 Class I patients who were the students of faculty of dentistry of Istanbul University from different cities of Turkey with no need of orthodontic treatment were gathered.

No study was found regarding Howes orthodontic cast analysis in the orthodontic literature. However there is no alternative analysis to explain the horizontal skeletal discrepancy in the orthodontic study casts. Howes's study group was not compatible with Turkish population as the group consisted of Anglo-Saxon subjects. So we need to determine a norm for Turkish people.

The are a lot of factors affecting the arch dimensions such as; normal growth and development, treatment induced growth, crossbite correction, extraction of teeth, anteroposterior movements of the teeth and muscle function.

All these can have an effect on our treatment paln. In the growing patients we must be sure not to widen the intercanine width in the lower arches as we know that it will not be stable (9, 11).

If the tooth material to its supporting basal arch is deficient then palatal expansion procedures can be held. Especially with anteroposterior movement of the arches (upper arch distally, lower arch mesially) upper palatal expansion procedures also have affect on the lower dentition and lower arch expansion is seen in these cases (11, 12, 13).

Palatal expansion procedures can be considered applicable and more stable especially in the growing patients because in younger patients favorable skeletal, dental alveolar and muscular adaptations can occur (11). In order to expand arches normal parameters of the arch dimensions must be well known to the clinician.

Tooth size is the only parameter that can be changed by orthodontic treatment (1.14). In Turkish population, tooth sizes (TM) were found higher both in the maxilla and in the mandible than Howes standards. For this reason, basal arch lengths (BAL) and the ratio of this parameter to tooth material (BAL/TM) in the maxilla and in the mandible were also found higher than Howes standards.

In the maxilla, the ratio of trabsversal basal arch width to tooth material (TBAW/TM) was found to be lower than Howes standards. This difference was because of the tooth material (TM) which was higher than Howes analysis as there was no statistically significant difference in transversal basal arch width comparison.

CONCLUSIONS

- It was not found statistically difference in first bicuspid coronal arch widths (BCAW) and transversal basal arch width (TBAW) in both maxillary and mandibular arches between Turkish population and Howes standars.
- Maxillary and mandibular tooth material (TM) was found greater in Turkish population than Howes analysis standards.
- Maxillary basal arch length (BAL) was higher but mandibular basal arch length was lower in Turkish population than Howes standards.

As a conclusion in this study we can now claim that Howes orthodontic cast analysis was found applicable in Turkish population except for the tooth material and basal arch lengths.

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