

The Height of the Bonwill Triangle. A Cephalometric Study

Fotoula Nikolopoulou^{1*}, Isidora Crhistopoulou² and Apostolos I Tsolakis³

¹Assistant Professor of the Dental School, National and Kapodistrian University of Athens, Greece

²Dentist in Private Practice, Greece

³Associate Professor of Orthodontics, Dental School, National and Kapodistrian University of Athens, Greece

*Corresponding Author: Fotoula Nikolopoulou, Assistant Professor of the Dental School, National and Kapodistrian University of Athens, Greece.

Received: January 17, 2020; Published: February 11, 2020

Abstract

The Bonwill's triangle, the height of the triangle and Balkwill angle have used in attempts to construct dental articulators capable of reproducing mandibular movements.

This investigation pointed out the bandwidth of the height of Bonwill's triangle.

This study was carried out at the Department of Dentistry at the National and Kapodistrian University of Athens. We used for this investigation panoramic x-rays of patients with Class I and Class II malocclusion. The population of this study was twenty-five adolescents (10 - 19 years old).

The results showed that the mean value of the height for the patients with Class I was 73,68 mm. The mean value of the height for the population with Class II was 73,92 mm.

The data of our investigation showed that there was a difference of height of triangle between the two populations ($p < 0.001$).

Keywords: The Height of Bonwill's Triangle; Class I and Class II Malocclusion; Adolescents

Introduction

Bonwill's triangle is an equilateral triangle. This triangle is formed by lines drawn between mandibular mid-incisors tips, right and left mandibular condyles. The baseline is made up either by a line between points on the articulating surfaces of the condyle heads or by a line between points located centrally within the condylar head [1,2].

The height of the Bonwill's triangle was the vertical from the mandibular mid-incisor's tips to the baseline of the triangle [1].

The Bonwill's triangle, the height of the triangle and the Balkwill angle have used in attempts to construct dental articulators capable of reproducing mandibular movements [3,4].

Magetti, *et al.* presented the bandwidth of height of Bonwill's triangle was 34,3 mm with a range of 21.00mm to 47,2 mm [5].

Bonwill proposed that mandibular movements were guided by the condylar and incisal guidance; and the teeth moved in relation to each other as guided by this guidance [6]. Articulator based on Bonwill's triangle. CYSI permits a centric motion based on averages and

will not permit face-bow transfer. Bonwill theory for articulator is as theory of equilateral triangle. It allows lateral movement and permits movement in horizontal plane [2,7].

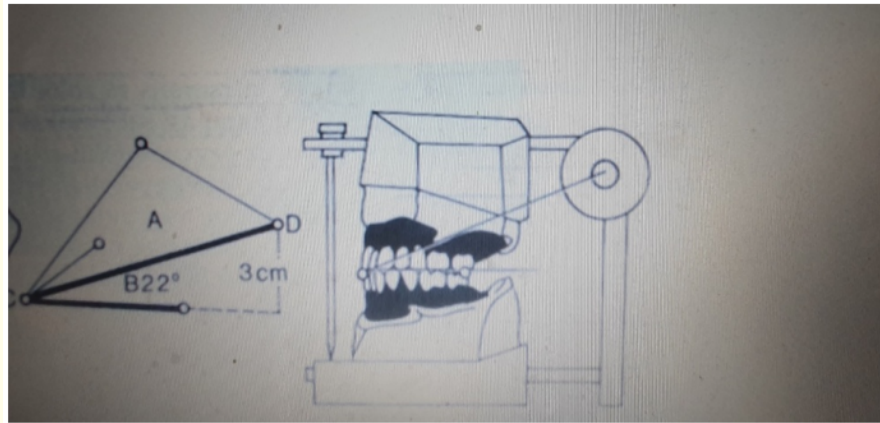


Figure 1: Shows the significant of the Bonwill's triangle for the mounting complete dentures (Balkwill angle and Bonwill's triangle).

Objective of the Study

The objective of our study was to point out the bandwidth of height of the Bonwill triangle. We used panoramic x-rays. These x-rays were taken in patients with Class I and Class II malocclusion.

Materials and Methods

This study was carried out at the Department of Dentistry at the National and Kapodistrian University of Athens. The panoramic x-rays were collected by the Department of Orthodontics of the Dental School of Athens.

The population of this study was adolescents (10-19 years old) Females were sixteen and nine males. Overall 25 panoramic x-rays of patients with Class I and 25 Class II were examined.

The Bonwill's triangle was formed by lines drawn between mandibular central incisors and the left and right mandibular condyles. The baseline was made up by a line between points located the most upper part of the mandibular condyle. The height of the triangle was an imaginary line from the incisal point to the baseline of the triangle [8]. To increase the objectivity of this study and as a result the reliability and validity, the measurements were taken by three examiners. The examiners did not have knowledge of the height as measured by the other examiners. Two of the examiners were orthodontists and one was a dentist. We measured the height for the patients with Class I and the patients with Class II [9].

Results

The statistics were computed from two independent samples. Since the population variances were unknown, we used sample variances in the calculation of the t- test statistic. It was a two-sided test.

The $n < 30$. We also assumed that the sampling distribution is normal. Hypothesis $H_0: \mu_0 \leq \mu_1$, $H_A: \mu_0 > \mu_1$. The 99 percent confidence interval, $\alpha = 0,01$, $\alpha/2 = 0,005$, degrees of freedom (df) = $50-2 = 48$. $t_{0,005,48} = 2,576$. Student's t distribution was $t = 2,33$. We used a two-tailed test. $x_1 - m_1 \pm t_{1-\alpha/2} \sqrt{s_p^2 / n_1} + \sqrt{s_p^2 / n_2} = 20,81, 16,15$.

N [n ₁ , n ₂]	Mean	Std Dev
n ₁ = 25	73,92	3,210
n ₂ = 25	73,68	3,20

Table 1: Distribution of height of Bonwill's triangle for population with class I and class II.

Since the interval does not include zero, we conclude that the mean height of Bonwill of two samples were not equal. We rejected the null hypothesis and $\mu_1 \leq \mu_2$. The height for Class I was different for the height of Class II. There was statistically significant different the mean value of height of Bonwill's triangle among the two populations ($p < 0,001$).

Discussion

Different lengths for different sizes of the Bonwill triangle have been reported by various studies. The Bonwill triangles, the height of the triangle and the Balkwill angle have been used in attempts to construct dental articulators. These tools stimulate the patient's jaw movements [10]. It has been reported by researchers that the height of Bonwill triangle was 87 - 98 mm [8]. They measured two alternative height of Bonwill triangle. It was related to choice of the condylar reference point. The choice of condylar references point from the articulating surface to the center of the condylar point did not influence significantly the size of the height, neither in women nor in men.

In women the alternative average sizes were 87 - 95 mm and 87 - 90 mm. In our study the mean value of the height for the patients with Class I was 73,68 mm and the patients with Class II was 73,92 mm. The sample was consisted of 128 adults. Our sample was consisted of 50 adolescents (10 - 19 years old). The size of the mandibles influenced the mean value of the height of Bonwill triangle. Other researchers proposed the height of Bonwill was 86,60 mm [6]. The height of Bonwill triangle was measured 87,99 mm by Ohm [8].

In our study the measurements of the triangle was related to the classification of jaw Class I and Class II. The results of the other studies were independent of the classification of the jaw.

The data of our investigation showed that there was a difference of height of triangle between the two populations. This difference was statistically significant ($p < 0,001$).

Conclusion

The following conclusion can be drawn:

1. The measurements of the height of Bonwill's triangle were related to the jaw classification Class I and Class II.
2. There were found differences of the bandwidth of the height of Bonwill's triangle between the two groups.
3. There was statistically significant different the mean value of the height of Bonwill's triangle among the two populations ($p < 0,001$).

Bibliography

1. Weinberg LA. "An evaluation of basic articulators and their concepts, Part II Arbitracy, Positional, Semiadjustable Articulator". *Journal of Prosthetic Dentistry* 13.4 (1963): 645-663.
2. Thomas CJ. "A classification of articulators". *Journal of Prosthetic Dentistry* 30.1 (1973): 11-14.
3. Nikolopoulou F, et al. "Bonwill's triangle in Greek human mandibles". *Advances in Dentistry and Oral Health* 11 (2019): 555816.
4. Derksen AAD and Van Haeringen W. "The Protrusive Movement in Articulators". *Journal of Dental Research* 37 (1958): 125-135.

5. Maggetti I, *et al.* "A three-dimensional morphometric study on the position of temporomandibular joints". *International Journal of Computerized Dentistry* 18 (2015): 19-31.
6. Dojun A. "A mathematical analysis of Monson's spherical theory and its clinical implication". *Journal of Craniomaxillofacial Research* 5.1 (2018): 8-18.
7. Rihani A. "Classification of articulators". *Journal of Prosthetic Dentistry* 43.3 (1980): 344-347.
8. Ohm E and Silness J. "The size of Balkwill angle and the height of the Bonwill triangle". *Journal of Oral Rehabilitation* 9.4 (1982): 301-306.
9. Gravely JF and Johnson BD. "Angle's classification of malocclusions: An Assessment of Reliability". *British Journal of Orthodontics* 1 (1974): 79-86.
10. Sönstebö RH. "Walker's improvements of Bonwill's system". *Journal of Prosthetic Dentistry* 11.6 (1961): 1074-1079.

Volume 19 Issue 3 March 2020

©All rights reserved by Fotoula Nikolopoulou., *et al.*