

Correlation between Mesiodistal Scale of the Teeth and Size of the Dental Arch

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Abstract:

Aims and Objectives: To determine if there is any deviation between agglomeration of the bone and the width of the teeth and its level.

Methodology: On the Clinic of Orthodontics, 68 studio models were analyzed with different malocclusion. For this purpose we used Bolton and Lundstrum analyses.

Results: According to the Bolton analysis of 12 teeth, in 38,2% from the analyzed models the reason for discrepancy was the bigger width of the teeth from the maxilla, while in 57.4% the result is reversed. In 4.4% the width of the teeth corresponds with the size of the dental arch.

Conclusion: According to the final results, we can still use the preceding analyses as diagnostic methods for determination of dental harmony.

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I. Introduction

One of the most important and essential criteria for diagnosing an orthodontic case is to know the mesiodistal width of the tooth. A proper balance should exist between the mesiodistal size of the teeth in both, maxillary and mandibular arches, in order to ensure adequate interdigitation, overbite, and overjet at the final complementation of the orthodontic treatment.^{2,3} It is believed that the size of the human teeth is determined by genetic factors.^{4,5} But, the environmental factors which involve also the neonatal factors, seem to be very important in the determination of the dimensions of the permanent teeth width. The differences in teeth size have been correlated with many different ethnic backgrounds and malocclusions.² As our working experience say, there isn't any patient without some or even minimal orthodontic anomaly. All the anomalies could be appeared as a result of an irregular development of any part of the composition of the orofacial system. The morphological analysis of the studio models, beside the clinical and radiology x-rays, is one of the crucial tools for the orthodontic diagnostic. It is performed on plaster models that reproduce the real condition of the area which is considered in the impression.¹ The deviation of the normal mesiodistal scale of the teeth in jaws could be one of the many reasons for the manifestation of malocclusions. Another possible cause is the deviation of the normal development of jaws which makes this topic interesting for examination.

It is estimated that irregular position of the teeth in the dental arch is a result of the lack of space. With a proper analysis of the studio models could be evaluated the size of the lack of space. When it comes to the permanent dentition, the required space could be determined by the measurement of the mesiodistal width of every permanent tooth. The sum of all mesiodistal widths determines the size of that space.¹ For completing this examination, the segmental analysis of Lundstrum and Bolton were utilized.

Aim of the study

The aim of this study is to determine if there is any deviation between agglomeration of the bone and the width of the teeth and also the percentage of its level.

II. Material and Methods

Exactly 68 pairs of study models of both jaws took part in the examination. The plaster models with different malocclusions were analyzed on the Clinique of Orthodontics. For the aim of the study the Bolton analysis for permanent dentition and the segmental analysis of Lundstrum were used.

The following criteria of accession were considered:

- All teeth on plaster models assessed to be morphologically normal
- Absence of any decay
- Absence of any interproximal restoration
- Absence of any attrition
- Absence of any erosion
- Absence of any abrasion
- Absence of any broken down crown
- Absence of any crack or fracture

The exclusion criteria involved persons undergoing orthodontic treatment, history of orthodontic treatment following extraction of permanent teeth, extraction history except the third molar, and also extensive direct restorations. Impressions were taken from all participants. They were taken with special prefabricated metal trays and irreversible hydrocolloid impression material. After this step, the impressions were disinfected with 2 % sodium hypochlorite solution for 10 minutes and later the plaster models were made. After 24 hours, mesiodistal width was measured directly on the studio models for all the teeth. For each studio model the following parameters were registered: the MD crown diameters of all the teeth except the second and third molars, and the inter-canine space between the six frontal teeth. The MD crown width was measured as the greatest distance between the contact points of the approximal surfaces of the dental crown. For obtaining credible results, the caliper should be placed parallel to the occlusal and buccal surfaces. All the measurements were done with manual method using special caliper. In order to evade eye exhaustion up to 10 pairs of dental studio models were examined. One week after the data collection the final results were obtained. Data were processed using the Computer program Statistika 6.0.

Table no1. The final parameter of the Bolton and Lundstrum equation of 68 models

MODEL	BOLTON 12	BOLTON 6	LUNDSTRUM LA	LUNDSTRUM UA
6625	95,1	82,3	5	3
6624	89,4	77,1	2	5
6616	96,7	88,4	-2	-3
6629	93,5	82,2	2	-1
6618	90,8	79,1	6	10
6647	89,7	79,1	0	-7
6611	93,7	83,3	-10	-2
6649	95,6	82,6	6	3
6613	92,1	77,3	-6	-2
6721	95,6	82,2	10	5
6650	98,9	95	-3	7
6648	98,9	95,1	-2	7
6724	88,6	89,4	-5	0
6240	88,2	84,7	-3	3
6710	91,7	69,2	-2	-1
6702	79,7	80	11	2
6706	94,1	86	-6	-5
6714	90,1	78,5	1	6
6818	92	76,1	5	5
6713	89,2	72,9	2	-5
6383	94,9	82,6	-1	3
6390	93,6	78,7	2	3
6405	92,7	80,4	3	1
6407	93,3	92,3	1	7
6450	92,8	77,5	-1	4
6449	88,1	76	1	-6
6485	101,3	80,4	14	-4
6473	114,6	76,4	-11	9
6471	92,5	84	-3	-1
6961	103,8	109,6	-2	12
6462	81,6	100	5	-1
6464	103,5	78,7	-2	4
6451	95,6	88,6	-2	0
6460	101,1	84,8	-3	9
6385	85,9	69,8	14	2
6395	82,5	69,6	8	-2
6401	91,2	76	2	3
6402	96,4	77,3	7	0
6447	107,2	88,4	-2	-2

6441	89,2	79,2	-3	0
6487	101,2	100	0	18
6483	94,3	82,5	3	9
6476	89,1	82,6	-2	0
6469	89,8	76,2	-2	-1
6474	91,1	72,7	6	2
6466	97,7	83,7	2	1
6464	96,8	82,6	0	6
6468	102,4	82,2	3	4
6459	91,4	82,2	-3	4
6225	91,1	80,9	4	8
6253	106,6	121	3	2
6310	91	76,7	7	-2
6302	106,8	95,1	-11	-1
6301	91,3	69,3	1	-5
6270	94,6	78,2	-1	3
6255	85,7	77,1	-2	-3
6271	89,5	78,2	2	-1
6254	101,1	90	3	1
6257	94,9	80,8	7	1
6283	91,3	81,3	0	-4
6305	91,3	81,3	10	5
6310	90	77,5	0	5
6298	109	89,4	6	12
6711	89,6	85,7	1	-1
6716	89,4	77,7	-2	-5
6261	82,7	78,1	3	3
6283	97,8	81,8	-5	-3
6271	89,4	76	-3	-3

III. Results

For obtaining the final result, 68 studio models from different genders, age 15-18 were analyzed. According to them 98% from the evaluated models there is incompatibility in the whole jaw, and in the frontal segment there is deviation of even 99.1%. In 38% of the examined models in which all twelve teeth from both jaws were measured, the reason for incompatibility was the bigger width of the teeth from the maxilla, while in 57.4% the result is reversed. In 4.4% the width of the teeth corresponds with the size of the dental arch.

When analyzing the teeth in the frontal segment, in 77.9% the reason for incompatibility is the bigger width of the teeth from the mandible, and in 19.1% the result is reverse.

Table no 2. Graphic presentation of the Bolton indicator for 6 teeth

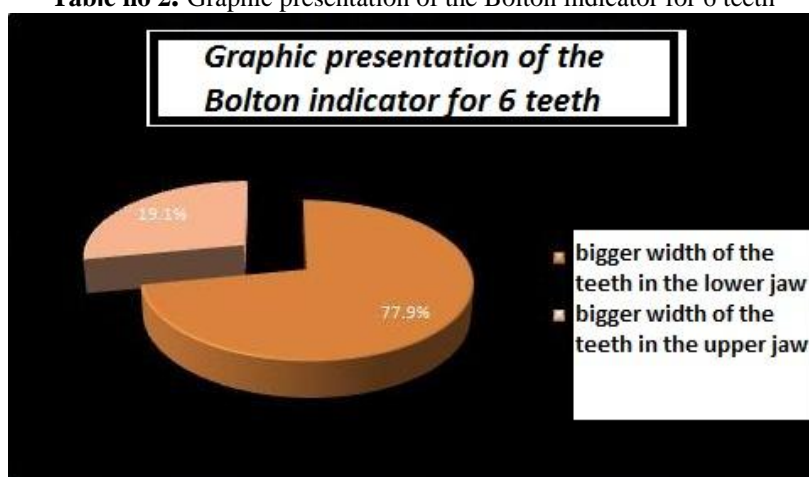


Table no 3. Graphic presentation of the Bolton indicator for 12 teeth

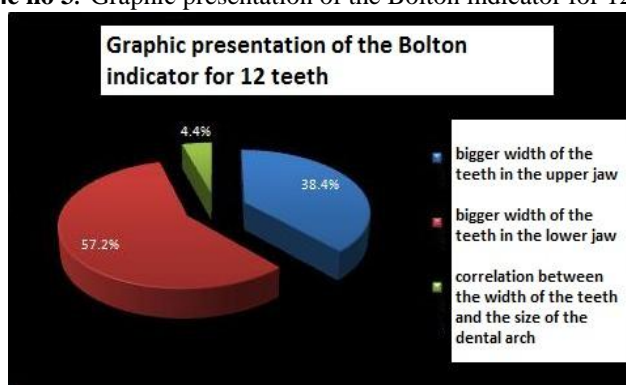
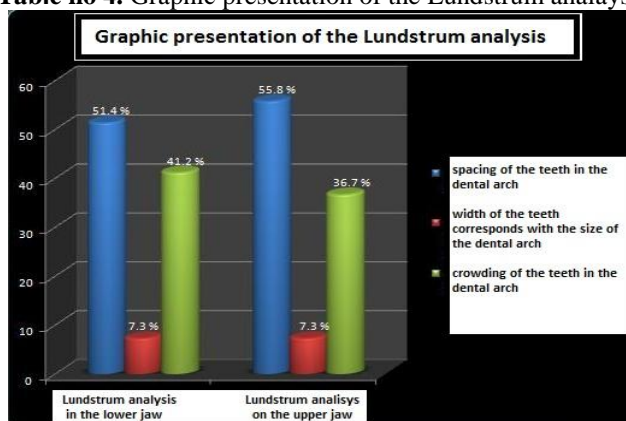


Table no 4. Graphic presentation of the Lundstrum analysis



IV. Discussion

Every orthodontist has to be aware of the tooth size discrepancies before the big start of the orthodontic treatment. The mesiodistal tooth scale of the maxillary and mandibular arches must correspond to each other in order to obtain an optimal occlusion at the completion of the orthodontic treatment. Many studies have been shown to measure tooth size.^{2,3,6,7} Keep in mind that the outcome of the odontometric studies is very useful not only in researches with anthropological character but also for the practicing dentist. Clinical studies favored the idea that heredity played a major role in tooth based malocclusions and also in craniofacial structure.⁸ Tooth size and dental arches are determined by genetic factors. Other factors that can influence the variability of the permanent teeth are sex, race, environment, etc. Environmental variables such as climate, nutrition, or disease can also affect the dentition during the prenatal period even though their influence is with very low significance.⁹

According to the obtained results from the segmental analysis of Lundstrum, the percent of spacing in the both jaws is bigger especially in the upper jaw. This means that there is more space between the teeth. The crowding phenomenon is also persistent with big percentage of the evaluated models and it is more oriented in the lower jaw. In a very small percentage there is a positive correlation between the width of the teeth and the size of the dental arches.

For the results of the Bolton analysis, the following equation was used:

$$\frac{\sum L12}{\sum U12} \times 100$$

This means that the sum of the width of the 12 mandibular teeth is divided with the sum of the width of the upper teeth and the obtained value is multiplied with 100. The average parameter is 91.3 that mean that there are ideal conditions. If the obtained index is bigger than 91,3, the reason for the incompatibility is the bigger width of the teeth in the lower jaw. If the obtained index is smaller than 91,3, the incompatibility is because of the bigger width of the teeth in the upper jaw.¹

The Bolton analysis is also used for estimating the value in the frontal area in both jaws. The following equation is used for this segment:

$$\frac{\sum L6}{\sum U6} \times 100$$

The final result is compared with the index of 77,2. ¹

According to the results from table 1. 77, 9% of the evaluated models show bigger width of the teeth in the upper jaw, and 19,1% in the lower jaw.

V. Conclusion

According to the final outcome, we concluded that these analyses are very important in the orthodontic treatment and they can still serve as good diagnostic methods for the determination of the dental harmony in patients.

Another great tip is that the Bolton analysis is significantly important during the final part of the orthodontic treatment because it may suggest a kind of separation or “stripping” of the interproximal surfaces of the teeth especially when the value of the index is smaller than 5% or extraction when the value of the index is bigger than 5%. ¹

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