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Research Article

Evaluation of Position Changes and Tooth Movements Value during the Orthodontic Treatment Patients with the Vestibular Upper Canines

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Received: December 26, 2019; **Published:** January 30, 2020

Abstract

The article presents the biometric diagnosis and evaluation of maxilla canine position changing during braces orthodontic treatment by using computer program "Ortho-premier". This method helps to detect the exact position and its deviation before orthodontic treatment in comparison to normal. Based on this results doctor may choose and plan the direction and the amount of each tooth movement.

Keywords: *Canine Vestibulo-Position; Computer Program "Ortho-Premier"; Orthodontics; Diagnosis; Treatment Planning; Braces*

Introduction

For conducting effective orthodontic treatment and for obtaining stable results it should be chosen the right plan and tactics of treating, which are based on an informative diagnosis of dental-alveolar anomalies. It is necessary to conduct a comprehensive examination of the patient, which allows to accurately determine the cause of the occurred anomalies. Anthropometric methods for diagnosing models are simple, informative and allow orthodontists to make a diagnosis, differential diagnostics and treatment plan, but these methods are laborious, take a lot of time in orthodontic practice and errors due to inaccurate measurements. Unfortunately, nowadays most methods are not enough for all modern requirements. Computer technologies allow to conduct biometric diagnostics in full, more accurately, informatively and keep the received data [1,2,10].

Materials and Methods

27 patients (11 males and 16 females) were examined with a vestibular position of canines on the upper jaw at the age of 12 to 15 years, who applied to the orthodontics department of Moscow State University of Medicine and Dentistry named by A.I. Evdokimova. During the examination, each patient underwent a clinical examination and additional diagnostic methods, including: manufacturing and anthropometric study of diagnostic models of the jaw, analysis of X-rays (orthopantomograms and cefalograms before and after treat-

ment), followed by a statistical analysis of the data. Biometric diagnosis and assessment of position changes teeth of the upper jaw during the orthodontic treatment was carried out by using the computer programs “Ortho-Premier" and "Ortho 3D". Anthropometric diagnostics was performed using the Ortho3 computer software (the result of combined work the orthodontic department of the Moscow State University of Medicine and Dentistry named by A.I. Evdokimova and company ORTOLAB, Poland) [5], and computer program “ORTO-PREMIER” (developed by S.V. Chernenko, P.A. Zhelezny and O.S. Korchemnaya, 2012) to analyze the teeth position changes of the upper jaw during orthodontic treatment was assessed using the method of arcing for biometric. The program have standard “norm - arches”: the size, shape and volume of which depends on the sum of the mesiodistal sizes of the four upper incisors [6] (Figure 1 and 2).

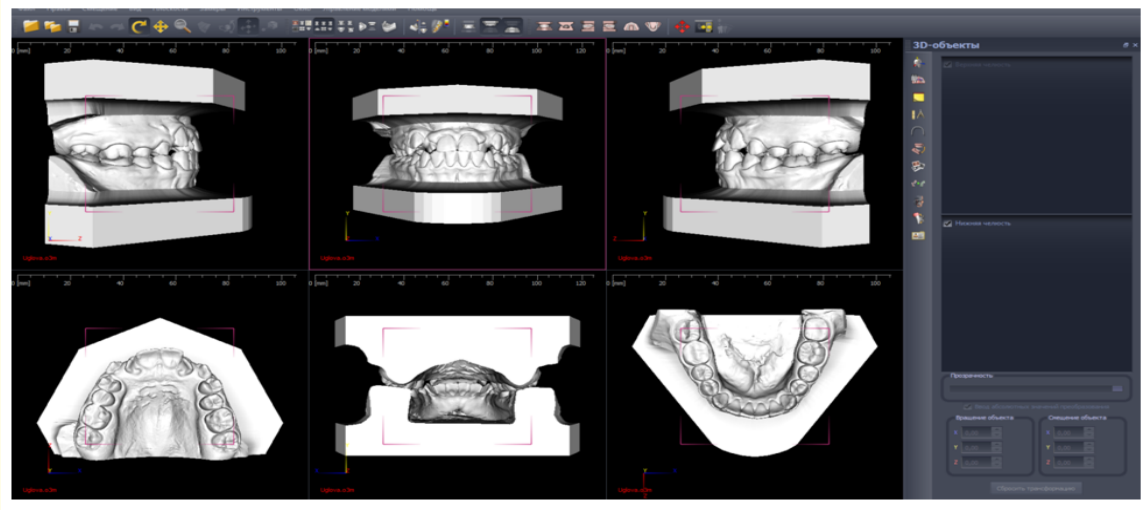

Figure 1: *Output form of models analyze patient 1 by using computer program “ORTO 3D”.*

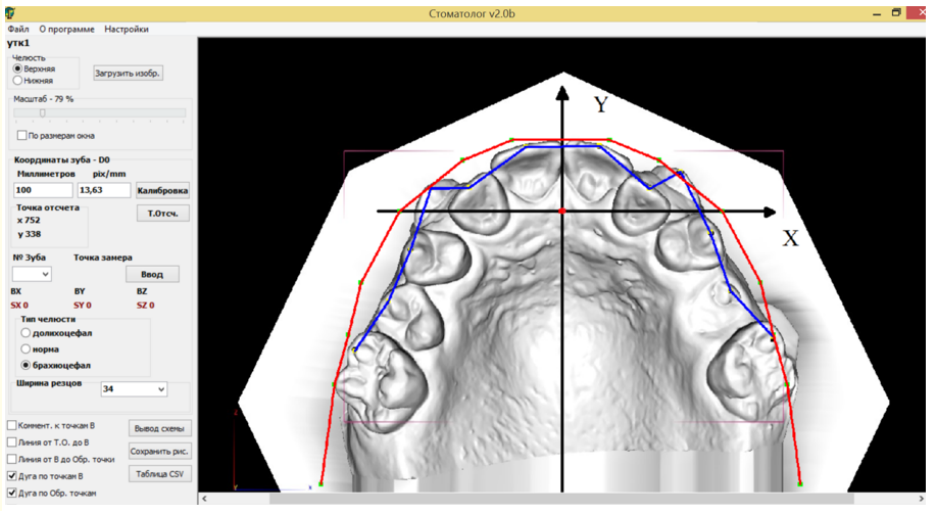

Figure 2: *Output form of tooth arch analyze (real arch and norm arch) by using computer program Ortho-premier.*

Orthodontic treatment was performed for all patients using fixed orthodontic appliance (passive self-ligation braces) without tooth extraction (first premolar). The average duration of treatment was 2.5 years [3,4].

Results and Discussion

It was found that patients with vestibular position of upper canines have the sum of the mesiodistal sizes of the frontal group of teeth (medial and lateral incisors) as averaged 34.50 ± 0.25 mm; there is a shortening of the length of the anterior segment of the upper dentition, the total projection length, shortening of the length of the lateral segments, narrowing of the dentition in the area of premolars and first molars.

It was found (based on the results of computer programs) the position of the teeth in the dentition, relative to the base points and reference lines - "norm - arches" (axis X and Y). The canines occupy the correct position independently of malocclusion regarding to the X axis (transverse direction); premolars and molars are displaced orally on average 3.73 ± 1.15 mm ($p < 0.001$), 1.83 ± 0.55 mm ($p < 0.001$), respectively, and lateral incisors are medially displaced on average 1.06 ± 0.55 mm ($p < 0.001$) before treatment. In relation to the Y axis (sagittal direction), the mesial displacement of canines is observed on average 1.26 ± 0.50 mm ($p < 0.001$), premolars - 1.68 ± 0.55 mm ($p < 0.001$) and molars - 2,01 ± 0.77 mm ($p < 0.001$), the lateral incisors of the upper jaw are displaced orally on average 2.16 ± 0.46 mm ($p < 0.001$) relative to this axis (Figure 3).

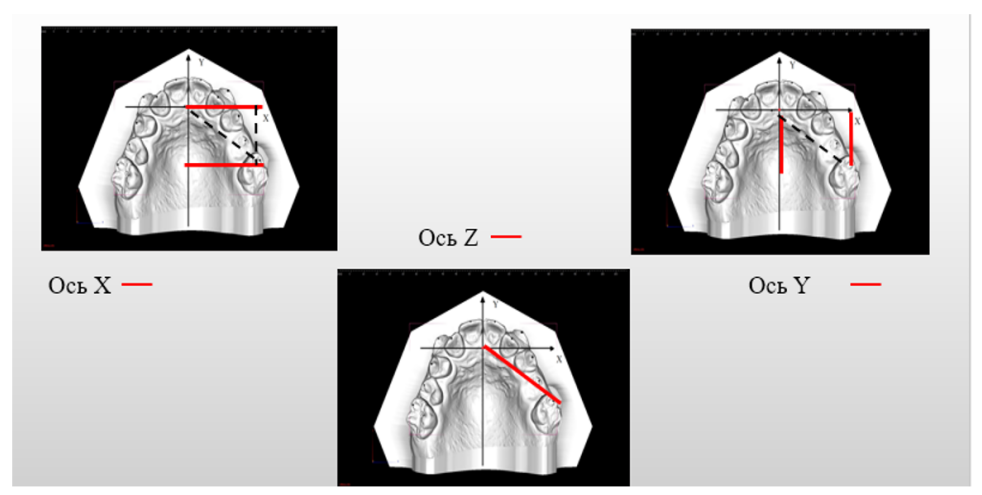

Figure 3: *The schema of tooth movement analyze (X-axis, Y-axis, Z-axis) by using computer program Ortho-premier.*

Analysis of position changes teeth during orthodontic treatment (using fixed appliances) had shown that the canines do not change their position in the transverse direction (relative to the X axis), but move distally relative to the Y axis on average 1.26 ± 0.50 mm ($p < 0.001$) due to their distal inclination by 3.21° ± 1.06 ($p < 0.001$), while vertically, relative to the occlusal plane, the canines went down on 3.23 ± 0.37 mm ($p < 0.001$); the lateral group of teeth moves in the vestibulo-distal direction on average 2.03 ± 0.40 mm ($p < 0.001$), while the frontal group of teeth always moves vestibular on average 2.16 ± 0.46 ($p < 0.001$), due to protrusion.

Conclusion

By using computer program Ortho-Premier is possible to follow with 99% accuracy the direction and degree of tooth movement during orthodontic treatment: determine the exact position of the tooth in the dentition and the degree of deviation from the norm, choo-

se the direction and volume of the planned movement and determine the timing of treatment based on these data. Using this method after treatment by analyzing models allows to ascertain the size and direction of the displaced segments of the dentition, individual teeth and their coincidence to the norm data, which can serve as an assessment of the quality of the treatment.

Disclosure

There is no any financial interest or any conflict of interest exists.

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Volume 19 Issue 2 February 2020