Summary

INTRODUCTION

The three dimensional complexity of dento–skeletal problems depends on many factors, such as genetics, as well as osseous, dento–alveolar and soft tissue structures interactions during growth and development of the masticatory system.

AIMS

To define the influence of facial part of the skull's vertical dimension, represented by NLML skeletal base angle on teeth alveolar position. The main aim of the research was achieved by evaluation of specific goals: frontal skeletal base plane in vertical dimension of the facial part of the skull – NSLML angle; ANB angle role on dento–alveolar compensation; Angle class dental relations and the influence on dento–alveolar compensation overall.

MATERIAL AND METHODS

The research was conducted anonymously and retrospectively on the 152 cephalograms and on 152 high quality diagnostic casts of synthetic class IV dental plaster, collected from the medical data base of the patients with full permanent dentition, of both sexes, treated in the ward of Specialized Orthodontic Clinic at the Medical University of Białystok. The including criteria to the research for the lateral head cephalograms were: X-Rays made in habitual bite, application of the craniostat, images of high quality, with no artefacts. The including criteria for the plaster models were: full dental arches, teeth in good condition, models of high quality, with no evident artefacts. On contrary, the excluding criteria were as follows: missing teeth, prosthetic crowns, large fillings with no occlusal surface anatomy, or any accompanying other dental birth defects (such as clefts). The assessment of lateral cephalograms consisted of: maxillary and mandible position in relation to the skeletal base (SNA angle, SNB, n-s-ba, n-s-ar), the mutual position of the upper and lower jaws in the vertical plane (NLML angle, NSLML), skeletal classes (ANB angle) and mandibular morphology (beta angle, gonion). The measurements on the models were performed with the use of an electronic caliper, with the results accuracy up to 0,01 mm, and with the use of points WALA and FA acc. to Andrews and Andrews: WALA ridge WALA–WALA, the distance from point FA–FA maxillary and mandibular teeth projections: 6±6, 5±5, 4±4, 3±3; mathematical difference between measuring points WALA and FA in the projection of upper and lower teeth: 6±6, 5±5, 4±4, 3±3; the width of the lower dental arch between intercuspal central grooves the lower first molars (ICM); the

maxillary arch width was measured between intercuspal mesio-palatal tips of upper first molars (ICPB). Angle dental classes were assessed.

Statistical analysis

Statistical analysis was performed with the use of the IBM SPSS Statistics version 20.0 software. Nonparametric methods were used in the analysis due to the presence of statistically significant deviation from the norm of many variables (confirmed by Shapiro – Wilk test with Lilliefors correction). The comparison of quantitative variables between two groups was conducted with the help of Mann – Whitney tests. Kruskal – Wallis test with pos hoc test acc. to Dwass – Steele – Critchlow – Fligner were used to allow the comparison of more groups. To asses dependencies between pairs of quantitative variables nonparametric Spearmans correlations were used. Bayesian Network Analysis was helpful in modelling and visualization of relations between certain tested parameters.

RESULTS

Documentation of tested group consisted of 152 patients of both sexes (lateral head cephalograms and diagnostic plaster models). In the first stage the group was divided according to NLML, NSLML, ANB angle and Angle class. The average age of the patients was the highest in the average angle base NLML group (19,55 y.), younger age was observed in low angle group (18,99 y.) and the youngest group was seen in high angle skeletal base group (16,8 y.). Skeleto–dental parameters (such as measurement of the WALA–WALA distance, FA–FA, the mathematical difference between WALA and FA, or lower interarch width ICM and interpalatal width ICPB). The statistically significant WALA at the level of teeth 6+6 ($p=0,024$) for the width of the skeletal base, was observed in the NLML angle intervals, where the lowest result was noted in H group, and the highest in group A. The maxillary skeletal width at the level of second premolars, first premolars and canines, was statistically significant. In both measurements, the comparison of groups was relevant for the width WALA: 5+5, 4+4, 3+3. The dental arch width parameters FA–FA: 5+5, 4+4, 3+3 were significantly higher in low angle group, and smaller in high angle group. The parameter describing the mathematical difference between the WALA and FA points, was tested the lowest value at the level of teeth 3-3 in L group, and on contrary with the highest number in H group. The lower dental arch width (ICM) and upper dental arch width (ICPB) were found not statistically different. The variable NSLML categorizing into three angle groups, implied WALA parameter at the level 5+5, 4+4, 3+3, shown the highest values in low angle NSLML, and the lowest in high angle group. Similar

results were seen for dental arch width FA–FA: 5+5, 4+4, 3+3 with the highest numbers in low angle group, and the lowest in high angle group. The mathematical difference between WALA and FA width was marked the lowest at the level of teeth 3-3 with the angle value of NSLML<27°, and the highest with the angle values NSLML>39°. The mathematical difference WALA–FA was marked highest in low angle group, and lowest in the average angle group. The lower arch width (ICM) and upper arch width (ICPB) were not statistically different. Among ANB angle sections no differences between the mandibular and maxillary widths were noted according to the skeletal class. Analysis of the FA-FA variables shown the highest values of the lower arch span at the level of teeth 3-3 in skeletal class III, and the lowest in skeletal class I. The mathematical difference WALA–FA significantly the highest in skeletal class II at the level 3-3, and the smallest in class III. The maxillary smallest numbers were shown in ANB angle values ANB<1° for the difference WALA–FA: 5+5, 4+4, 3+3. In variable categorizing Angle classes, according to dento–skeletal parameters, the highest width of the mandibular base was found at the level of teeth 6-6 in dental class III, while the lowest was in Angle class I. The width of the dental arches FA–FA: 6-6, 5+5 was as well statistically higher in class III in comparison with group I or II. The width mathematical difference of the WALA skeletal base and FA in in analyzed Angle classes, was the highest at the level of teeth 6-6 in class II, and the lowest in class III. The biggest mathematical difference WALA–FA for teeth 6+6 was found in maxillary dental class II, the smallest on the other hand in Class III. The rest parameters examined in the maxilla in this category were meaningful, in which the shortest distance between WALA–FA was ANB angle values ANB<1°. The width of the lower dental arch (ICM) shown statistical differences between Angle classes. The biggest range of values of the central cuspal groove distance of teeth 6-6 was marked in Angle III class, and the smallest in dental class I.