Hard Palate Bone Density and Thickness Determination Using CT Scan and their Relationships with Body Compositions Measured by Bioelectrical Impedance Analysis for Iraqi Adult Sample

A thesis

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Abstract

The hard palate has been used as a host site for orthodontic implant anchorage. The bone density and thickness are two critical factors for success of mini-implant.

The aim of this study was to measure and compare bone density (cortical and cancellous) and thickness of the hard palate at different mid-sagittal and parasagittal plane points during 3rd and 4th decades of Iraqi sample from both gender by using a computed tomography scan to allow for better selection of palatal implant anchorage sites and to see if there is relationship for the hard palate bone density and bone thickness with body mass index (BMI) (calculated manually as body weight divided by squared height (kg/m²)), and diagnostic scale measurements which were body fat percentage, body water percentage, body muscle percentage, bone mass, basic metabolic rate and active metabolic rate which were measured by diagnostic scale, this scale operates according to the bioelectric impedance analysis principle.

Sixty subjects were selected and divided into two groups according to their age; group I (15 males, 15 females with age 20-29 years), and group II (15 males, 15 females with age 30-39 years). The measurements of hard palate bone density (HU) and thickness (mm) were made at 20 sites at the intersection of five anterioposterior reference lines with 6 mm interval from incisive foramen (anterior area at 0,6, middle area at 12 and posterior area at 18,24 mm) and four mediolateral reference lines with 3 mm interval from mid-palatal suture (mid-palatal area at 0, medial area at 3, middle area at 6 and lateral area at 9 mm) using Philips, Brilliancetm, 64-multislice computed tomography scanner software.

The results that were obtained showed that there was difference in bone density and thickness at different sites of hard palate. No significant difference in overall bone density and thickness of hard palate during 3rd and 4th decades. The gender should be considered only in regard to bone thickness. Significant differences between the most areas of hard palate in bone density and thickness were found. The

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cortical bone density and bone thickness showed a tendency to decrease posteriorly. While the cancellous bone density showed a tendency to increase posteriorly. In the mediolateral areas, mid-palatal area showed lowest cortical bone density and highest cancellous bone density and bone thickness. Medial area showed the highest cortical bone density and the lowest cancellous bone density. While middle area showed the lowest bone thickness. With increasing BMI, the cortical bone density was increased. No significant relationship of cancellous bone density and bone thickness with BMI was found. The relationship of bone density (cortical and cancellous) and bone thickness with diagnostic scale measurements was not significant, except the relationship of bone thickness with bone mass, basal metabolic rate and active metabolic rate were positively significant.

It was concluded that mini-implants for orthodontic anchorage can be effectively placed in most areas of hard palate regarding the bone density. While regarding bone thickness, care should be taken during the planning of mini-implants placement in hard palate.