CBCT Analysis of Vertical Soft Tissue Thickness Before Dental Implant Placement and Its Relationship with Cortical Bone Thickness

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Introduction

- The use of dental implants to support prosthesis is a widely accepted treatment modality with high success and predictability.
- The importance of peri-implant bone stability around implants for the success and longevity of treatment are always emphasized.
- There are many factors could affect alveolar bone stability around implants, one of them is soft tissue thickness.
- Soft tissue thickness which is measured at the occlusal aspect of the alveolar ridge could also be an important factor that affects the crestal bone level around implants.
- The recent development of radiological imaging in the form of cone-beam computed tomography (CBCT) provides a precise demonstration of anatomical structures.
- This research project will measure pre-implant CBCT images and collect epidemiological data to study if there is any correlation between cortical bone thickness and vertical soft tissue thickness.
- It would be helpful for clinicians to know the average range of vertical tissue thickness and if it is related to cortical bone thickness in order to generate knowledge that can improve treatment protocols and implant outcomes.

Methods

- Partially edentulous adult patients, who had a CBCT taken before implant placement and that were treated with single implant supported crown at the Comprehensive Care Clinic of ECU SoDM, were deidentified.
- Cross-section CBCT image at the center of each edentulous site was measured using Invivo 6.0.3 software.
- Factors were evaluated on CBCT as follows:
  - Thickness of vertical soft tissue at alveolar crest;
  - Thickness of cortical bone at alveolar crest;
  - Thickness of buccal and lingual cortical plate 5 mm apical of alveolar crest;
  - Width of alveolar ridge (from buccal cortical plate to lingual cortical plate) 5 mm of alveolar crest.

Results

- We identified 272 cases form our data pool.
- We measured 181 patients with 189 edentulous sites, of which 121 sites had a full set of data.
- We can only measure soft tissue, but not hard tissue, of the remaining 57 patients because they had a bone graft.

Discussion

- CBCT scans could be used to study vertical soft tissue thickness at crestal area of alveolar ridge although the measurement might not be as accurate as clinical measurement or digital scan superimposition.
- Patients whose CBCT scans were not clear enough to measure soft tissue were excluded, the contour of vertical soft tissue can be viewed in CBCT scans with a small field of view.
- Thick vertical soft tissue was defined as ≥ 3 mm in this CBCT research while in some clinical research the threshold was 2 mm.
- Healing time of the edentulous sites may affect results, the sites studied were considered mature sites (more than 3 months after extraction).
- Mean vertical soft tissue thickness of this study was 2.09 mm, median was 2.01 mm, and considered to be thin. However, more than 50% of sites measured had vertical soft tissue thickness > 2 mm.
- Mean thickness of cortical bone at alveolar crest was 0.94 mm and median was 0.88 mm. Results of this study did not show correlation between vertical soft tissue thickness and hard tissue measurements.
- Vertical soft tissue thickness compared by gender, age, and ethnic group did not show statistical significance. However, results indicated there was a higher chance of anterior sites presenting thicker vertical soft tissue than posterior sites.

Conclusions

- The vertical soft tissue of edentulous sites was found to be relatively thin (<3 mm) overall.
- There might be higher possibilities of anterior sites presenting thicker vertical soft tissue and cortical bone at alveolar crest than posterior sites.
- Gender, age groups or hard tissue measurements were not significantly correlated with vertical soft tissue thickness.

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