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# Volumetric bone changes around dental implants – the use of 3D image superimposition

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### Volumetric bone changes around dental implants the use of 3D image superimposition

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**Abstract**

This research focus on a dental informatics protocol to measure volumetric changes in bone level around dental implants. CBCT & Digital Periapical Radiography were used after implantation. 12 and 24 months of functional loading and 3D reconstructions used to do a volumetric analysis. 2D/3D analyses estimated that an increase of bone of linear BIL was associated with a mean volumetric BIL of +142 mm<sup>3</sup> (p < 0.001).

**Background and Aim**

- Long term success of implant treatment depends on the integrity of bone-implant interface. Besides clinical features, imaging exams are used to monitor changes in this area.
- 3D images are commonly used but they have distortions and generate image superimposition between buccal and lingual bone.
- Development of CBCT in Dentistry provide a detailed volumetric reconstruction (3D) of a region of interest. Afterwards, superimposition techniques may be used to detect volume changes.

**Aim:** To present a dental informatics methodology to measure volumetric changes in the bone level around dental implants.

**Methods and Materials**

- Sample: 48 dental implants (buccal length = 4, 1 mm diameter) placed in posterior maxilla and mandible in 20 patients. All implants received custom-milled single crowns.
- CBCT & Digital Periapical Radiography after implantation (T0), 12 and 24 months.



Fig. 4 Image of different bones superimposition to superimposed. Showing increase in right image after the superimposition to body vertical bone.



Figure 5: 3D image of dental implant. Color map green images for the bone volumetric increase for the implant site partially placed reference bone (0.04 mm).



Figure 6: Image of color-coded dental implant showing volumetric changes in the bone level around dental implants.

**Results**

- Deviations in methodology: 3 patients dismissed / excluded.
- Volumetric changes 1<sup>st</sup> vs 2<sup>nd</sup> implants: 2<sup>nd</sup> vs 3<sup>rd</sup> implants: accumulated changes 1<sup>st</sup> & 2<sup>nd</sup> vs 2<sup>nd</sup> vs 3<sup>rd</sup> implants.
- Mean post-implant linear BIL.

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