

How Accurate are Intraoral Radiographs for Measuring Peri-implant Crestal Bone Loss?

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The search term “dental implant crestal bone loss” in the PubMed MEDLINE database has shown over 1100 articles in the last 30 years. The evaluation of crestal bone loss to assess implant success rate with radiographs and/or computerized tomography scans has been well described.¹⁻⁴ The standardized intraoral periapical (PA) radiographs have been popularly used.^{1,2} Conventionally, the level of the first screw thread or the shoulder of the implant to the top of the alveolar crest is typically measured to assess crestal bone changes.¹⁻⁴ The intraoral film must be in the same precise position, angulation, and distance during each time-point of recall appointments to maintain uniformity in crestal bone level changes.³ To maintain the X-ray film in the position, the researchers have used various film holders or paralleling devices to ensure the same film position during each recall time-point.^{3,4} However, it is a challenging task to maintain the same precise position with or without film holding devices due to time-dependent and patient-related intraoral changes. Moreover, a completely edentulous arch is an additional challenge while taking the PA radiograph, as the X-ray film is difficult to place and stabilize. In such situations, it is advised to place the X-ray film with the complete denture in place, if available. Alternately, some clinicians have used orthopantomographs in edentulous patients.³ In the PA radiographs, the distance measured between two points is sometimes so small that accurate measurement is difficult.⁵ Patil and Nimbalkar-Patil⁵ described the measurement of the crestal bone level from the tip of the implant and calculated the effective changes by normalizing the values using actual implant length and radiographic implant length.⁵ This technique minimizes the measurement errors and is successfully used in clinical research⁶ and can be recommended in addition to use of the paralleling device or the film holder technique. Walton and Layton⁷ evaluated intra- and inter-examiner agreement of radiographic crestal bone level assessment around implants related to radiograph brightness, discrimination level (accuracy), participant demographics, or implant characteristics using 100 normal radiographs. They concluded that the agreement within and between examiners when assessing the crestal bone loss was poor. Disagreement occurred around 25% of the time, potentially affecting consistent disease assessments, and observed that the changes below 1 mm are likely due to human, not biological variations.⁷ The use of Cone Beam Computerized Tomography and novel Photoacoustic Ultrasound Imaging techniques have been described in the literature however not very popular yet.^{2,8}

Peri-implant health parameters could be influenced by other confounding factors such as implant system, implant surface treatment, loading protocols, method of bone level measurement,

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