

## Accuracy of Cone Beam Computed Tomography for Dental Implant Treatment Planning

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### ABSTRACT

*This study evaluated the accuracy of cone beam computed tomography (CBCT) measurements using post-surgical, implant placement, CBCT images by measuring the length and width of implants on CBCT images and comparing these measurements to the actual sizes of the implants, as well as investigated critical anatomical structure injuries after using CBCT for planning. Ninety-six post-operative CBCT scans of 171 dental implants, placed between October 2012 and March 2015, were included in the study. Each implant was measured on the CBCT images for both diameter and length, using the measuring tool in the CBCT software. The measured values were compared with the actual implant diameters and lengths and calculated as a percentage of error. The mean percentage of error was 2.26%. There were no significant differences in percentage of error between implant size, implant diameters, implant positions, upper jaw, lower jaw, anterior area, or posterior area ( $p>0.05$ ). Anatomical structure injuries were not found post-operatively. The accuracy of CBCT used for measurement in this study was 97.74%, and comparable to that reported for other commercial CBCT machines. The use of CBCT for implant planning can avoid anatomical structure injuries.*

**Keywords:** 3D imaging, Implant measurement, CBCT accuracy

### INTRODUCTION

Dentistry is increasingly using cone beam computed tomography (CBCT), including in implant dentistry (Tyndall et al., 2012; Gupta and Ali, 2013; Bornstein et al., 2014), endodontics (Lofthag-Hansen et al., 2007; Patel, 2009; Janner et al., 2011), oral and maxillofacial surgery (Alamri et al., 2012), periodontics (Walter et al., 2009; De Faria Vasconcelos et al., 2012), orthodontics (Van Vlijmen et al., 2012; Machado, 2015), and temporomandibular joint disorders (Alamri et al., 2012).

One benefit of using CBCT is the ability to thoroughly inspect the hard tissues of interest in three dimensions. CBCT overcomes the limitations of 2-D