Int. J. Oral Maxillofac. Surg. 2018; xxx: xxx–xxx
https://doi.org/10.1016/j.ijom.2018.05.018, available online at https://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Clinical Paper
Dental Implants

Are intraoral radiographs reliable in determining peri-implant marginal bone level changes? The correlation between open surgical measurements and peri-apical radiographs

M. Cassetta, R. Di Giorgio, E. Barbato
Department of Oral and Maxillofacial Sciences, School of Dentistry, "Sapienza" University of Rome, Rome, Italy

M. Cassetta, R. Di Giorgio, E. Barbato: Are intraoral radiographs reliable in determining peri-implant marginal bone level changes? The correlation between open surgical measurements and peri-apical radiographs. Int. J. Oral Maxillofac. Surg. 2018; xxx: xxx–xxx. © 2018 International Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

Abstract. This study was performed to evaluate the reliability of peri-apical radiographs in determining peri-implant marginal bone level changes. The STROBE guidelines were followed. Marginal bone levels were measured at the time of implant insertion using a straight periodontal probe and using peri-apical radiographs. These intraoperative and radiographic measurements were repeated at the time of second surgery. All radiographs were analysed by two examiners blinded to the intraoperative measurements. To standardize the radiographic images, the long-cone parallel technique and a film-holding system were used. Intra-observer agreement and inter-observer variability were assessed using the intra-class correlation coefficient (ICC). Descriptive statistics, the *t*-test, and the Pearson correlation coefficient were also used. A total of 268 implants were inserted in 142 patients. Inter-observer agreement was 0.950; intra-observer variability was 0.980 and 0.973. The mean difference between the radiographic and intraoperative measurements was 0.50 ± 1.55 mm (range 0–8 mm); the difference was statistically significant ($P = 0.000$). A significant linear correlation was found between the marginal bone level changes evaluated intraoperatively and

0901-5027/000001+07 © 2018 International Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

Please cite this article in press as: Cassetta M, et al. Are intraoral radiographs reliable in determining peri-implant marginal bone level changes? The correlation between . . . , *Int J Oral Maxillofac Surg* (2018), https://doi.org/10.1016/j.ijom.2018.05.018

radiographically ($P < 0.005$). Radiographic analysis significantly overestimated the level of peri-implant marginal bone compared to intraoperative measurements, but peri-apical radiographs are reliable in determining the bone level changes at different follow-ups.

Key words: dental radiography; dental implant; radiographic image interpretation; computer-assisted; alveolar bone loss.

Accepted for publication 23 May 2018

The long-term clinical survival of endosseous implants has been reported extensively[1–5], and many different success criteria for osseointegration have been used. A mean marginal bone loss ranging from 0.9 mm to 1.6 mm during the first year of function (i.e., after abutment connection) has been accepted as a radiographic criterion for implant success[4–6]. A further mean annual marginal bone loss of less than 0.2 mm in the following years is regarded as a radiographic criterion for a successful implant system[4–6]. These criteria of success are based on the radiograph taken at the second stage surgery or with the suprastructure in situ as the baseline, i.e. at 6 or more months after the surgical placement of the implants; therefore, the peri-implant bone remodelling that occurs within the first months of healing is neglected[7] .

The assessment of bone level changes over time requires methods with a high degree of precision, such that repeated measurements by one or several observers produce little variation[8]. Although the optical resolution of peri-apical radiography is too low to detect fibrous encapsulation or osseointegration[9], ongoing marginal bone loss over time can be an indication of biomechanical overload and/or peri-implant infection[10,11]. Radiographic assessments have some limitations: the marginal bone level measurements are limited to interproximal areas, and technical factors such as X-ray beam angulations, the strict parallelism between the implant and the film plane, and also the thickness of the ridge into which the implants are placed influence the reliability of marginal bone level radiographic assessment around oral implants[12,13].

The aim of this study was to determine whether there is a statistically significant difference between marginal bone level measurements obtained intraoperatively (direct bone measurements during surgical procedures) and marginal bone levels determined using peri-apical radiographs. The correlation between the marginal bone level changes at different follow-up points measured radiographically and intraoperatively was also determined in order to assess the degree to which the test scores were consistent given the variation in the methods/instruments used (inter-method reliability).

It was hypothesized that there would be a statistically significant difference between the intraoperative measurements and the marginal bone levels determined using peri-apical radiographs. Furthermore, it was hypothesized that there would be a correlation between the changes determined using the intraoperative and radiographic measurements and therefore inter-method reliability.

Materials and methods

This prospective cohort study was conducted at the Department of Oral and Maxillofacial Sciences of ''Sapienza'' University of Rome between February 2014 and February 2016. The STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for prospective cohort studies were followed. The inclusion and exclusion criteria as well as the preoperative radiographic examinations used were the same as those described in previous publications[1–3,7].

A two-piece, tapered implant was used (SM Torx Implant System; DIO Implant, Busan, Republic of Korea). This implant is characterized by a modified sand-blasted/acid-etched titanium surface (RBM, Resorbable Blast Media). The implant shoulder is machined and the coronal part of the implant body is characterized by microthreads. All patients were treated with a two-stage implant surgery procedure, with the second stage occurring 2 months after implant insertion. In no case was a temporary removable prosthesis used, in order to avoid hampering the healing process. The implants were inserted by raising a mucoperiosteal flap.

At the time of implant insertion and at the time of second surgery, the marginal bone levels were recorded using a straight periodontal probe (PCP UNC 15; Hu Friedy, Chicago, IL, USA) (Fig. 1). If the marginal bone level was coronal to the implant shoulder, the value recorded was a positive number. If the marginal bone level was located at the implant shoulder, the value recorded was zero. Finally, if the marginal bone level was located apical to the implant shoulder, the value recorded was a negative number. The marginal bone level value was rounded to the nearest millimetre. The observer was asked to measure the distance between the same reference point (implant shoulder) and the edge of the peri-implant marginal bone both mesially and distally ($n = 1072$ intraoperative measurements). All clinical measurements were performed by one examiner (MC).

At the time of implant insertion and at the time of second surgery, the marginal bone level was also recorded by taking peri-apical radiographs (Fig. 2). All radiographs were analysed independently by two examiners blinded to the intraoperative measurements. These examiners were not involved in the clinical part of the investigation. To standardize the radiographic images, the peri-apical radiographs were obtained using the long-cone parallel technique and the Super-Bite film-holding system (Kerr Corporation, Orange, CA, USA). Care was taken to parallel the alignment of the X-ray film in the film holder to the long axis of the implants. Images were taken with an intraoral radiation unit (Oralix AC; Gendex Dental Systems, Hatfield, PA, USA) using a cylindrical tube head, 2.5 mm aluminium filtration, and a focal spot distance of 200 mm. The exposure settings were 70 kV and 1.12 mAs. Digital radiographs were obtained (DenOptix QST Digital X-ray Phosphor Plate System; Gendex Dental Systems). The linear measurements ($n = 1072$ radiographic measurements) were obtained using dental imaging software (VixWin PRO; Gendex Dental Systems). The contrast and brightness of the digital images were adjusted freely by the examiners. The examiners did not evaluate more than 20 radiographs per day to avoid ocular fatigue. These measurements could be a positive number, zero, or a negative number, as described for the intraoperative measurements above. To reduce the symmetric imaging error in the vertical plane, the enlargement of each individual radiograph was determined, and the radiographic measurements were adjusted according to this enlargement for each individual radiograph. To obtain calibrated measurements,

Download English Version:

https://daneshyari.com/en/article/8963567

Download Persian Version:

https://daneshyari.com/article/8963567

Daneshyari.com