Review Article

International Journal of Dental and Health Sciences
Volume 02,Issue 06

EVALUATION OF CRESTAL BONE LOSS:A REVIEW UPDATE

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ABSTRACT:
The first report in the literature to quantify early crestal bone loss was a 15-year retrospective study that evaluated implants placed in edentulous jaws.In this study, Adell *et al.* reported an average of 1.2 mm marginal bone loss from the first thread during healing and the first year after loading. 200 articles were collected from google.out of the 200 articles 160 were eligible for the review.Out of the 160,107 are original.Out of this 107,62 were easily available and reviewed
Keywords: crestal bone loss,evaluation,review

INTRODUCTION:

The first report in the literature to quantify early crestal bone loss was a 15-year retrospective study that evaluated implants placed in edentulous jaws.[1]In this study, Adell *et al.* reported an average of 1.2 mm marginal bone loss from the first thread during healing and the first year after loading. In contrast with the bone loss during the first year, there was an average of only 0.1 mm bone lost annually thereafter. Based on the findings on submerged implants,Albrektsson *et al.* and Smith and Zarb proposed criteria for implant success, including a vertical bone loss of less than 0.2 mm annually following the implant's first year of function. Non-submerged implants have also demonstrated early crestal bone loss, with greater bone loss in the maxilla than in the mandible, ranging from 0.6 to 1.1 mm, at the first year of function.

METHOD

200 articles were collected from google.out of the 200 articles 160 were eligible for the review.Out of the 160,107 are original.Out of this 107,62 were easily available and reviewed

FACTORS CAUSING CRESTAL BONE LOSS

TEMPERATURE[5]

1)Eriksson and Albrektsson reported that the critical temperature for implant site preparation was 47°C for one minute or 40°C for seven minutes.[1]

2)Matthews and Hirsch demonstrated that temperature elevation was influenced more by the force appliedthan drill speed.10 When both drill speed and applied force were increased, no significant increase in temperature was observed owing to efficient cutting.[2]

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3)Sharawy *et al.* compared the heat generated by the drills of four different implant systems run at speeds of 1,225, 1,667 and 2,500 rpm.[] All of the drill systems were able to prepare an 8 mm site without the temperature rising by more than 4°C(to 41°C). For all drill systems, the 1,225 rpm drill speed required a 30 to 40 % longer drilling time when compared with 2,500 rpm and a 20 to 40 % reduction in the time required for bone temperature to normalise. With greater depth of preparation and insufficient time between drill changes, a detrimental temperature rise to 47°C or greater may be reached. The authors recommend that surgeons interrupt the drilling cycle every five to ten seconds to allow irrigant time to cool the osteotomy.

PERIOSTEAL ELEVATION

4)The periosteal elevation has been suggested as one of the possible contributing factors to crestal implant bone loss. Wilderman *et al.* reported that the mean horizontal bone loss after osseous surgery with periosteal elevation is approximately 0.8 mm, and the reparative potential is highly dependent upon the amount of cancellous bone (not cortical bone) underneath the cortical bone.The bone loss at stage II implant surgery in successfully osseointegrated implants is generally vertical and noted only around the implant characterised by saucerisation, not the surrounding bone even though during surgery all the bone was exposed. Therefore, this hypothesis is not generally supported.

Other Factors associated with increased bending overload in dental implants:Prostheses supported by one or two implants in the posterior region (Rangert *et al.* 1995);Straight alignment of implants; Significant deviation of the implant axis from the line of action;High crown/implant ratio;Excessive cantilever length (>15 mm in the mandible, Shackleton *et al.* 1994; >10–12 mm in the maxilla, Rangert *et al.* 1989; Taylor 1991); Discrepancy in dimensions between the occlusal table and implant head;Para-functional habits, heavy bite force and excessive premature contacts (>180 μm in monkey studies, Miyata *et al.* 2000; >100 μm in human studies, Falk *et al.* 1990);Steep cusp inclination;Poor bone density/quality; and Inadequate number of implants.

Based on a study by Frost, five types of strain levels interrelated with different load levels in the bone were described:

1) Disuse, bone resorption;

2) Physiological load, bone homeostasis;

3) Mild overload, bone mass increase;

4) Pathological overload, irreversible bone damage;and

5) Fracture.

The concept of “microfracture” was proposed by Roberts et al., who concluded that crestal regions around dental implants are high-stress-bearing areas.[5]They explained that if the crestal region is overloaded during bone remodelling, “cervical cratering” is created around dental implants

Peri-implantitis is one of the two main causative factors of implant failure in later stages. A correlation between plaque accumulation and progressive bone loss around implants has been reported in experimental studies and clinical studies. Tonetti and Schmid reported that peri-implant mucositis is a reversible inflammatory lesion confined to peri-implant mucosal tissues without bone loss. Peri-implantitis however begins with bone loss around dental implants.

REVIEW OF LITERATURE

1950s, Benkow suggested for the first time the use of a beam-aiming device made up of a bite block connected to an indicator arm, which itself was attached to a beam-aiming ring. Thus, projection errors could be decreased to a significant extent[1]

Larheim and Eggen showed for the first time in implant dentistry that standardized periapical radiography can be significantly improved if a customized bite record is additionally used in combination with a bite block and a long-cone technique.[2]

Joachim S. Hermann et al placed Fifty-nine implants in edentulous mandibular areas of 5 foxhounds in a side-by-side comparison in both submerged and nonsubmerged techniques. Three months after implant placement, abutment connection was performed in the submerged implant sites. At 6 months, all animals were sacrificed, and evaluations of the first bone-to-implant contact (fBIC), determined on standardized periapical radiographs, were compared to similar analyses made from nondecalcified histology. It was shown that both techniques provide the same information (Pearson correlation coefficient = 0.993; P < .001). The precision of the radiographs was within 0.1 mm of the histometry in 73.4% of the evaluations, while the level of agreement fell to between 0.1 and 0.2 mm in 15.9% of the cases. These data demonstrate in an experimental study that standardized periapical radiography can evaluate crestal bone levels around implants clinically accurately(within 0.2 mm) in a high percentage (89%) of cases. These findings are significant because crestal bone levels can be determined using a noninvasive technique, and block sectioning or sacrifice of the animal subject is not required. In addition, longitudinal evaluations can be made accurately such that bone changes over various time periods can be assessed. Such analyses may prove beneficial when trying to distinguish physiologic changes from pathologic changes or when trying to determine causes and effects of bone changes around dental implants.[3]

Tomas Albrektsson et al found Ten different studies of three modern implant brands of moderately rough surfaces with 10-year or longer follow-up times through a PubMed and manual search.It was concluded that bleeding on probing or probing depths are weak indicators of crestal bone loss (CBL); that CBL occurs for many other reasons than infection; that implant-, clinician-, and patient-related factors contribute to CBL; and that modern oral implants outperform older devices. Based on a literature search, the frequency of implants with reported peri-implant infection and significant bone loss leading to implant removal or other surgical intervention was on average 2.7% during 7 to 16 years of function. The summed frequency of peri-implantitis and implant failure is commonly less than 5% over 10 years of follow-up for modern implants when using established protocols.[4]

Montaser n al-qutub evaluated the alveolar crestal bone loss around dental implants with various diameters. A total of 120 patients (70 male and 50 female) with 150 single Nobel Replace®Select Tapered of different width were included in this study. The implants of size 3.5mmX10mm, 4.3mmX10mm, 5mmX10mm were used in this study. For each implant, radiographic measurements of the marginal bone height and its change over time were made. Intraoral radiographic examinations of all implants were performed at baseline, using paralleling technique and was compared to those taken at various subsequent post-placement times at the end of 1st year, 2nd year and 3rd year follow-ups to evaluate crestal bone level changes. The regular neck and wide neck implants showed relatively higher crestal bone loss compared to the narrow neck implants. All the three groups showed a progressive increase in bone loss from first year to the 3rd year after implant placement. It can be concluded that implant dimension might be one of the factors influencing the long term success of the implant.[5]

Summer introduced the osteotome technique in 1994. It has been claimed that using bone condensing to prepare the implant site in soft maxillary bone avoids the risk of heat generation, and implants can be placed precisely with increased primary stability. The purpose of this clinical study was to evaluate the crestal bone loss exhibited by the bone around early nonfunctionally loaded implants placed with conventional implant placement technique and with Summer's osteotome technique and to evaluate whether the bone-compression technique provides better primary stability than the conventional technique. A total of 10 Uniti implants were placed in the maxillary anterior region of 5 patients. One implant site was prepared using the conventional technique with drills (controlgroup A), and second site was prepared using the osteotome technique (experimental group B) and anMIS bone compression kit. Resonance frequency measurements (RFMs) weremade on each implant at the time of fixture placement and on the 180th day after implant fixture placement. The peri-implant alveolar bone loss was evaluated radiographically. Differences between the alveolar crest and the implant shoulder in radiographs were obtained immediately after implant insertion and on the 180th day after implant placement. The RFMs demonstrated a significantly higher stability of implants in control group A than in experimental group B on the day of surgery (P 5 .026). However, no statistically significant difference in stability was found between both groups on 180th day after implant placement (P5.076). A significant difference was found in the crestal bone levels after 180 days of surgery between two groups (P50) with less crestal bone loss with group A. Within the limitations of this study we concluded that the osteotome technique is good for the purpose forwhich itwas introduced, that is, for knife-edge ridges, and it should not be considered a substitute for conventional procedures for implant placement.[6]

Emanuel A. Bratu et al conducted an intra-individual controlled clinical trial to evaluate and compare the amount of marginal bone loss (MBL) found around implants of a comparable design, with or without retention grooves (microthreads) or polished necks, during the early stages of healing.Materials and methods: Forty-eight (48) patients with missing mandibular posterior teeth were treated with two commercially available implants of the same brand (MIS): one with microthreads (S-model) and the other with a polished neck (L-model). MBL around each implant was measured on follow-up radiograms taken 4 months after placement (exposure and crown cementation), and 6 and 12 months after loading. Forty-six (46) patients completed the study, making 46 implant pairs available for statistical analysis. None of the implants failed to integrate. All the implants displayed some extent of bone loss throughout the follow-up period. At each time point (exposure, 6 and 12 months after loading), the S-model implants displayed statistically significant lower amounts of bone loss (0.22 vs. 0.76, 0.57 vs. 1.22 and 0.9 vs. 1.5mm, respectively). Other than the type of the implant, no correlation was found between MBL and the implant stability values (PerioTest), dimensions, site of insertion or any of the other collected variables.Implants with a roughened neck surface and microthreads are more resistant to MBL during the first phases of healing, as compared with implants with a polished neck.[7]

Records of 50 consecutive patients treated with subcrestally placed by Theofilos Koutouzis by dental implants grafted with a xenograft (Group A) and 50 consecutive patients with subcrestally placed dental implants without any grafting material (Group B) were reviewed. For each implant, the radiographs after placement were compared to images from the last follow-up visit and evaluated regarding the following: 1) degree of subcrestal positioning of the implant, 2) changes ofmarginal hard-tissue height over time, and 3) whether marginal hard-tissue could bedetected on the implant platform at the follow-up visit. The mean marginal loss of hard tissues was 0.11 –0.30 mm for Group A and 0.08 – 0.22 mm for Group B. Sixtynine percent of the implants in GroupAand 77% of the implants in Group B demonstrated hard tissue on the implant platform.There were no statistically significant differences between the groups regarding marginal peri-implant hard-tissue loss.

The present study fails to demonstrate that grafting of the remaining osseous wound defect between the bone crest and the coronal aspect of the implant has a positiveMeffect on marginal peri-implant hard-tissue changes.[8]

Following dental implant loading, marginal bone loss after one year must be evaluated AJ. Flichy-Fernández et al by to check correct maintenance of the bone levels.To assess implant treatment success and quantify marginal bone loss 6 and 12 months after loading. Sixty-one MIS® implants with a 1.8 mm machined neck were placed in 26 patients. Implant success was based on the criteria of Buser. Radiological controls were made 6 and 12 months after loading, measuring bone loss mesial and distal.Twenty-two patients with 56 implants were included: 32 in the maxilla and 24 in the mandible. Two implants failed in two patients during the osseointegration phase (both in the maxilla), yielding an implant success rate of 96.4%. After 6 months, bone loss was 0.80±1.04 mm mesial and 0.73±1.08 mm distal, while after 12 months bone loss was 0.92±1.02 mesial and 0.87±1.01 distal. Bone loss 6 and 12 months after machined neck implant placement was within the normal ranges described in the literature.[9]

The aim of Maj Guruprasada study is to evaluate andmcompare the effectiveness of immediate implant loading protocol over conventional implant loading protocol in partially edentulous mandible. Twenty patients were selected from out patients department who needed the replacement of one of the missing mandibular first molar. They were divided into two groups. In Group A patients implants were loaded with immediate implant loading protocol, whereas in Group B they were loaded with conventional loading protocol. Periimplant bone loss and soft tissue health were measured and compared using OPG and IOPA radiographs 06 and 12 months after implant placement. One implant failed in immediate loading group (Group A), whereas all implants survived in conventional loading group (Group B). The average periimplant bone loss after 6 months and 1 year for Group A were 0.69 mm and 1.09mm respectively, whereas it was 0.74 mm and 1.13mm respectively for Group B. The difference in the bone loss betweenGroup A and B was not statistically significant. Immediate implant loading protocol has a highly acceptable clinical success rate in partially edentulous lower jaw although implant survival rate is slightly inferior to conventional loading protocol.[10]

Ji-Hoon Park1 et a al conduacted this research to determine whether peri-implant crestal bone loss could be affected by systemic disease, primary ISQ value, implantation method (submerged vs. non-submerged), surface treatment, and bone density. Patients who underwent fixture installation from June 24, 2005 to October 23, 2008 at Seoul National University Bundang Hospital were evaluated. A total of 157 patients (male: 52, female: 85) had 346 fixtures installed. Among them, 49 patients had periapical radiographs taken 1 year after prostheses were first set. A total of 97 fixtures were implanted. In particular, 30 fixtures were installed in patients with systemic diseases such as diabetes mellitus, cardiovascular disease, hypertension, and liver disease. The immediate stability of implants was measured with Osstelltm. Implant surface treatment was classified into two groups (RBM, Cellnest (Anodized)), and bone density, into four groups (D1~D4). The bone resorption on the mesial and distal areas of fixtures was measured with periapical radiographs using the paralleling technique, and the mean value was calculated. The length determination program in IMPAX (AGFA, Belgium) was used.At least 332 out of 346 (96%) installed GS implants were successfully osseointegrated 1 year after prostheses were first set. The mean value of the bone resorption of the installed GS implants was 0.44mm. The minimum value was 0mm, and the maximum value, 2.85mm. There was a statistically significant difference between the implantation methods (submerged, non-submerged) with regard to the amount of alveolar bone loss 1 year after prostheses were first set ($p<0.05$). Non-submerged implants showed less crestal bone loss. Note, however, that other variables had no correlation with crestal bone loss ($p>0.05$).There was a statistically significant difference between the 1-stage method and 2-stage methodwith regard to the amount of alveolar bone loss 1 year after prostheses were first set. Systemic disease, primary ISQ value, surface treatment, and bone density were not associated with alveolar bone loss. Other variables were assumed to have a correlation with alveolar bone loss.[11]

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