(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 5, Issue 3, Page No: 390-396
May-June 2022

IJMSCR

Radiographic Evaluation Of The Prevalence Of Vertical And Horizontal Bone Loss Around Implants Implanted One Year After Loading

[1] Saman Nasiri, [2] Sajad Ghorbanizadeh, [3] Hamid Badrian
[1-3] Assistant Professor
[1]Department of periodontics,[2] Department of Oral & Maxillofacial Rdiology, [3]Department of Operative Dentistry
School of Dentistry, Lorestan University of Medical Science, Khorramabad, Iran.

***Corresponding Author:**
Hamid Badrian
Department of Operative Dentistry, School of Dentistry, Lorestan University of Medical Science, Khorramabad, Iran.

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Background and Aim: Although today, implant treatment is recognized as a common dental treatment worldwide, due to the bone resorption that occurs around implants, success in this treatment is not always guaranteed. The aim of this study was to evaluate the radiographic prevalence of vertical and horizontal bone loss around implants implanted one year after loading.

Materials and Methods: This research is a type of Cross-Sectional Study. The study population included people who referred to specialized dental centers in Khorramabad, Iran for implants. In the present study, the pattern of bone loss around single-blade implants with Sand blast large acid etch (SLA) and implantable prosthesis was evaluated in 43 patients. After one year of prosthetic loading, it was prepared with the same technique and with the same standard, and then the extent and pattern of possible bone loss were examined horizontally and vertically from the edge of the fixture to the recognizable edge of the alveolar crest.

Results: The findings of this study showed that there was no significant difference between men and women in terms of both vertical loss (VELS) (P = 0.06) and horizontal analysis (HOLES) (P = 0.13). Based on the results of the study, it was found that there was no significant difference between the two age groups, both in terms of VELS (P = 0.98) and HOLES (P = 0.96). In addition, based on the results, it was found that there was no significant difference between the anterior and posterior teeth in terms of VELS (P = 0.23) while the HOLES of the anterior teeth was significantly higher than the posterior teeth. (P = 0.04).

Conclusion: Based on the results, it can be concluded that although gender and age group have no significant effect on the rate of VELS and HOSL of bone around implants, but the rate of HOLS of the anterior teeth is significantly higher than the posterior teeth. Therefore, it is suggested that the narrow width of the bone related to the anterior teeth be strengthened and transplanted to the bone around the implant to reduce its HOLS.

Keywords: Dentistry; Implant; Crestal bone loss; Vertical loss; Horizontal loss, Radiography

Introduction :

The marginal bone around the crystal area of the emerald is usually an important indicator of implant health. Sometimes surgical trauma causes a slight loss of bone, but in rare cases the bone loss may be several millimeters. The dentist can check for bone loss due to surgery before implanting the prosthesis. Crystal bone loss is an early sign of the need for preventative treatment. Premature loss of crestal bone more than 1 mm from abutment-fixture microgut after prosthesis delivery is usually due to additional

stress at the permucosal site or Crest module implant design [1].

Marginal bone loss beyond the abutment junction and the implant platform area after function is usually the result of additional stress on the implant-bone contact surface. Some factors, such as parafunctional habits, bacterial infection, cantilever length, and thin crystal bone, can increase the likelihood of losing crystal bone. This can be done by assessing the initial bone loss after loading. The cause of secondary bone loss around the implant is usually due to a number of factors, including excess bacteria and stress (as a result of parafunction or the formation of anaerobic bacteria that form when the salcus depth around the implant is greater than 5 to 6 mm) [2].

Clinical evaluations performed with probing measurements of 0.1 mm radiographs of annual bone loss require great care and are not very reliable. Probing changes of 0.5 mm or more are more realistic for recording; Therefore, an annual assessment of bone loss in sections of 0.5 mm or more is recommended to determine marginal bone loss step by step. Minor changes in interproximal bone loss can be detected by radiography. Screw (distance between two threads) in screw implants is a good criterion for any system. (E.g. 0.6 mm for classic brand design) and can be used as radiographic markers. Ideally, an implant should have at least some bone loss. However, it is not possible to determine exactly how much bone resorption around the implant is a sign of success or failure. In general, if the implant has lost more than half of its height, the crystal bone, regardless of the initial amount of implant-bone contact, the implant is at high risk of failure. In addition, the depth of soft tissue probing should be considered in relation to bone resorption [3].

Radiographic evaluation of natural teeth is helpful in diagnosing caries, endodontic lesions, and proximal bone resorption. Radiographic interpretation is one of the simplest clinical tools for determining crystal implant bone loss, but it has many limitations. Radiography show only the crystal surfaces of the mesial and distal bones well; While early bone loss, sometimes occurs at the facial surface of the implant [4]. The protocol for assessing the quality of tissue health around the implant depends on the clinical examination. A baseline radiograph is taken at the first stage of prosthesis delivery. At this time, the biological width and impact of the crest module implant design are consistent with the loss of the crest bone. Crystal bone changes sometimes occur during the first year of loading, so regular visits to the implant maintenance phase are scheduled every 3 to 4 months, and a periapical / vertical bite-wing radiograph at 6 or 8 months is compared to baseline radiography. In the first year, another vertical bite-wing radiograph is compared to the previous two images. If no change is observed, control radiographs are scheduled every three years, provided that other clinical signs are monitored at shorter intervals [5].

Radiographs are taken every 6 to 8 months and compared until bone crest status has been established for two consecutive periods. If the bone resorption is more than 2 mm (from the time the prosthesis is delivered until the next x-ray), the dentist should strongly suspect that there is an accelerator of bone resorption around the implant. In cases of parafunction habits, the use of night guards and stress reduction on problematic implants are recommended [6].

So far, various studies have been performed to evaluate the rate of bone loss around dental implants in different populations, which have also reported different results. Numerous studies have shown that bone loss after the first year of function is in the range of zero to 0.2 mm. In a study, researchers found that in successful implants, after the first year of loading, an average of 0.1 mm of bone is lost each year [7]. Results of the study by Hermann et al. (2000) showed that for a number of two-stage dental implant systems, the mean marginal bone resorption in the first year after onset of function was between 0.5-1 mm and in subsequent years between 0.05 and 0.1 mm. Research has shown that two weeks after the second stage surgery, there will be 0.5 mm of bone resorption [8]. In a study by Ricci et al. (2004) measured crystal bone loss after 60 months in two-stage implants of about 2.17±1.6 mm [9]. Due to the different results of previous studies, the present study was performed with the aim of radiographic evaluation of the prevalence of VELS and HOLS of bone around implants implanted one year after loading.

Material & Methods:

Volume 5, Issue 3; May-June 2022; Page No 491-497

This research is a type of Cross-Sectional Study. The study population included people who referred to specialized dental centers in Khorramabad for implants.

1.1.Sampling

The sampling method was unlikely to be available and continued until the desired sample size was reached. Individuals referring to the clinic entered the study with informed consent. The sample size in the present study, based on the study of Kadkhodazadeh et al. (2013) [10] and using the formula for determining the sample size and considering the probability of falling 10%, was determined to be equal to 43 people.

1.2.Inclusion criteria

Inclusion criteria included the following:

- Completing the consent form to participate in the study
- The patient's age is in the range of 20 to 70 years
- The width of keratinized tissue is at least 2 mm
- Each tooth has been extracted at least 3 months before implant placement.
- Do not have other diseases, including diseases that weaken the immune system, as well as systemic diseases that may prevent surgery.
- No guided bone regeneration (GBR) around the implant.

1.3.Exclusion criteria

Exclusion criteria also include the following: Patients with a history of head and neck disease, bruxism / cloning, complete or partial denture in the area opposite the implant, local inflammation or oral mucosal disease, implants for immediate implantation, and patient dissatisfaction with the study.

1.4.Pattern of bone loss

In the present study, the pattern of bone loss around single-blade implants with Sand blast large acid etch (SLA) and implantable prosthesis was evaluated. One year of prosthetic loading was performed using the same technique and with the same standard, then the extent and pattern of possible bone loss were examined horizontally and vertically from the edge of the fixture to the recognizable edge of the alveolar crest. The obtained results were analyzed by age, sex, implant diameter, jaw area variables.

1.5.Statistical analysis

Finally, using SPSS-Ver.22 software and using independent samples t-test at a significant level (α = 0.05) and 95% confidence interval, the average vertical loss and horizontal loss between the two sex groups (female and male), two age groups (less than 45 and 70-45 years) and two implantation areas (posterior and anterior) were compared.

Results:

In this cross-sectional study, which aimed to radiograph the prevalence of vertical and horizontal bone resorption around implants implanted one year after loading in 43 patients. The results showed that out of 43 patients, 16 (37.21%) were male and 27 (62.79%) were female (Table 1). The mean age of the patients was 42.77 ± 10.99 years. The mean of VELS and HOLS in the studied patients were 1.14 ± 0.61 mm and 0.89. 0.45 mm, respectively. The mean implant diameter was 4.04 ± 0.45 mm in the studied patients. In terms of implanting area, 15 patients (34.88%) belonged to the right maxilla, 15 patients (34.88%) related to the left maxilla, and 6 patients (13.95%) related to the maxilla lower-right and 7 patients (16.28%) belonged to the lower-left mandible (Table 1).

The results of statistical analysis showed that there was no significant difference between the two groups of men and women in terms of both VELS (P = 0.06) and HOLS (P = 0.13) (Table2). In addition, there was no significant difference between VELS and HOLS for both men (P = 0.27) and women (P = 0.075) (Table 2).

Based on the results of the study, it was found that there was no significant difference between the two age groups, both in terms of VELS (P = 0.98) and HOLS (P = 0.96) (Table3). In addition, no significant difference was observed between VELS and HOLS for both age group less than 45 years (P = 0.127) and age group 45-70 years (P = 0.109) (Table 3).

Based on the results, it was found that there was no significant difference between the anterior and

Volume 5, Issue 3; May-June 2022; Page No 491-497

posterior teeth in terms of VELS (P = 0.23), while the amount of HOLS in the anterior teeth was significantly higher than the posterior teeth (P = 0.04). (Table 4). It was also observed that there was no significant difference between the mean of VELS and HOLS in the anterior teeth (P = 0.07) but in the posterior teeth, this difference was significant (P = 0.02) (Table 4).

Table 1. Demographic variables and other characteristics of the studied population

Variables		N (%)	SD ± Mean
Gender	Man	16 (37.21)	-
	Woman	27 (62.79)	-
Half jaw	Top-right	15 (34.88)	-
	Top-left	15 (34.88)	-
	Bottom-right	6 (13.95)	-
	Bottom-left	7 (16.28)	-
Area	Anterior maxillary	15 (34.88)	-
	Anterior mandible	-	
	Posterior maxilla	15 (34.88)	-
	Posterior mandible	13 (30.23)	-
Age (year)		-	42.77±10.99
Vertical loss (mm)		-	1.14±0.61
Horizontal loss (mm)		-	0.89±0.45
Implant diameter (mm)		-	4.04±0.45

Table 2. Statistical comparison of the mean of vertical analysis and horizontal analysis by gender group

Gender	Mean ± SD		p-value
	Vertical loss (mm)	Horizontal loss (mm)	
Man	1.36±0.77	1.01±0.54	0.27
Woman	1.01±0.45	0.81±0.37	0.075
p-value	0.06	0.13	-

Table 3. Statistical comparison of the mean of vertical analysis and horizontal analysis by age group

Age (year)	Mean ± SD		p-value
	Vertical loss (mm)	Horizontal loss (mm)	
< 45 year	1.145±0.68	0.883±0.47	0.127
45-70	1.142±0.51	0.889±0.43	0.109

Volume 5, Issue 3; May-June 2022; Page No 491-497

p-value	0.98	0.96	-

Table 4. Statistical comparison of the mean of vertical analysis and horizontal analysis by implanting area

Implanting area	Mean ± SD		p-value
	Vertical loss (mm)	Horizontal loss (mm)	
Anterior	1.37±0.00	1.08±0.00	0.23
Posterior	1.02±0.00	0.77±0.00	0.04
P-value	0.07	0.02	-

Discussion:

Nowadays, preservation of the crystal bone around the implant has a special role and importance in its long-term stability. If the presence of HOLS or VELS around the implant is detected, appropriate intervention can be performed and its spread can be prevented.

The aim of this study was to radiograph the prevalence of VELS and HOLS of bone around implants implanted one year after loading. The results showed that there was no significant difference between HOLS and VELS of bone between the age groups of less than 45 years and more than 45 years and also the amount of VELS and HOLS of bone was the same in men and women. Therefore, based on the results, it can be said that gender and age variables have no effect on the rate of VELS and HOLS of bone around implants.

The results of the present study showed that there was no significant difference between the anterior and posterior teeth in terms of the amount of VELS, while the HOLS of the anterior teeth was significantly higher than the posterior teeth. Because the rate of bone loss around the implant in anterior implants is slightly higher than posterior implants, it can be stated that often in the anterior buccal region the bone thickness is less than the posterior and according to previous studies, after tooth extraction, labial thickness in CBCT varies from 0.9 to 1.1 mm, and this narrow bone width may be more susceptible to the bone loss process if the implant is not strengthened and grafted [11, 12]. In addition, the possibility of placing the buccal position of the implant and the wrong drilling path in the anterior jaw is more than the posterior areas and one of the reasons for the increase in bone loss around the implant can be the incorrect position and buccal position of the implants and consequently the thin bone remaining on the labial fixture. To date, various studies have been performed to evaluate the rate of bone loss around dental implants in different populations, which have reported different results. Ajanović et al. (2014) study aimed to evaluate the rate of bone loss around dental implants in the maxilla and mandible after one year in Bosnia and Herzegovina. The results of this study showed that there was no statistically significant difference between distal and mesial bone loss between maxilla (left and right) and mandible (left and right) at the implant location. The results of this study showed more bone loss related to anterior implants compared to posterior implants, while no significant difference was found between maxilla and mandible [17]. In this regard, in the present study, there was no significant difference between VELS in posterior anterior teeth, but HOLS of anterior teeth was more than posterior teeth.

Study by Amoian et al. (2014) was performed with the aim of comparing the rate of crystal bone loss in immediate and delayed implants in radiographic view. In this pilot study, a total of 12 implants (6 immediate implants and 6 delayed implants) were placed in male patients in the age range of 30-60 years, and one week later, periapical radiographs were taken using a parallel technique. Patients were re-examined over a period of 6 months and one year and periapical radiographs were taken from the implant site under the same conditions. The results of this study showed that the immediate implant had

Volume 5, Issue 3; May-June 2022; Page No 491-497

less crystal bone resorption compared to the delayed implant during the 6-month period (p value = 0.009). Also, for the one-year period of immediate implants, the amount of crystal bone loss was less compared to delayed implants (p = 0.002). Based on the results of the above study, it can be concluded that the rate of crystal bone loss in immediate implants is lower and in this regard, the use of immediate implants can be considered as a more successful method than the normal method [18].

Conclusion:

Based on the results of the present study, it can be concluded that the rate of vertical loss and horizontal bone loss around implants is not significantly different between men and women and also between different age groups. In addition, the results show that there is no significant difference between the anterior and posterior teeth in terms of vertical loss, while the horizontal loss of the anterior teeth is significantly higher than the posterior teeth. Therefore, it is suggested that the narrow width of the bone related to the anterior teeth be strengthened and transplanted to the bone around the implant to reduce its horizontal loss of bone around implants.

References:

1. Al Najjar MA, Al Adili SS. Evaluation of Crestal Bone Resorption around Dental Implants in Flapped and Flapless Surgical Techniques Depending on Cone Beam CT Scan (Comparative Study). Journal of Baghdad College of Dentistry. 2019 Dec 15; 31(4).
2. Sargolzaie N, Arab HR, Moghaddam MM. Evaluation of crestal bone resorption around cylindrical and conical implants following 6 months of loading: a randomized clinical trial. European Journal of Dentistry. 2017 Jul; 11(03):317-22.
3. Lozano-Carrascal N, Delgado-Ruiz RA, Gargallo-Albiol J, Maté-Sánchez JE, Hernandez Alfaro F, Calvo-Guirado JL. Xenografts Supplemented with Pamindronate placed in postextraction sockets to avoid crestal bone resorption. Experimental study in Fox hound dogs. Clinical Oral Implants Research. 2016 Feb;27(2):149-55.
4. Pan YH, Lin HK, Lin JC, Hsu YS, Wu YF, Salamanca E, Chang WJ. Evaluation of the peri-implant bone level around platform-switched dental implants: a retrospective 3-year radiographic study. International Journal of Environmental Research and Public Health. 2019 Jan;16(14):2570.
5. Tandan A, Upadhyaya V, Raghuvanshi M. Comparative evaluation of the influence of immediate versus delayed loading protocols of dental implants: A radiographic and clinical study. The Journal of Indian Prosthodontic Society. 2018 Apr 1;18(2):131.
6. Alkan EA, Mau LP, Schoolfield J, Guest GF, Cochran DL. Prevalence of Dental Implants and Evaluation of Peri-implant Bone Levels in Patients Presenting to a Dental School: A Radiographic Cross-Sectional 2-Year Study. International Journal of Oral & Maxillofacial Implants. 2018 Jan 1; 33(1).
7. Pisoni L, Ordesi P, Siervo P, Bianchi AE, Persia M, Siervo S. Flapless versus traditional dental implant surgery: long-term evaluation of crestal bone resorption. Journal of Oral and Maxillofacial Surgery. 2016 Jul 1;74(7):1354-9.
8. Hermann JS, Buser D, Schenk RK, Cochran DL. Crestal bone changes around titanium implants. A histometric evaluation of unloaded non-submerged and submerged implants in the canine mandible. Journal of periodontology. 2000 Sep;71(9):1412-24.
9. Ricci G, Aimetti M, Stablum W, Guasti A. Crestal bone resorption 5 years after implant loading: clinical and radiologic results with a 2-stage implant system. International Journal of Oral & Maxillofacial Implants. 2004 Jul 1;19(4).
10. Kadkhodazadeh M, Heidari B, Abdi Z, Mollaverdi F, Amid R. Radiographic evaluation of marginal bone levels around dental implants with different designs after 1 year. Acta Odontologica Scandinavica. 2013 Jan 1;71(1):92-5.
11. Panjnosh M, Siadat H, AliKhasi M. Comparison of crestal bone loss around submerged and Non-submerged replace implants. Journal of Dental Medicine. 2009 Sep 1; 22(2): 116-124.
12. Albrektsson T, Buser D, Sennerby L. Crestal bone loss and oral implants. Clinical implant

Volume 5, Issue 3; May-June 2022; Page No 491-497

dentistry and related research. 2012 Dec;14(6):783-91.
13. Cappiello M, Luongo R, Di Iorio D, Bugea C, Cocchetto R, Celletti R. Evaluation of peri-implant bone loss around platform-switched implants. International Journal of Periodontics & Restorative Dentistry. 2008 Aug 1;28(4).
14. Chou CT, Morris HF, Ochi S, Walker L, DesRosiers D. AICRG, Part II: Crestal bone loss associated with the Ankylos implant: loading to 36 months. Journal of Oral Implantology. 2004 Jun;30(3):134-43.
15. Shapoff CA, Lahey BJ. Crestal bone loss and the consequences of retained excess cement around dental implants. Compendium of continuing education in dentistry (Jamesburg, NJ: 1995). 2012 Feb 1;33(2):94-6.
16. Nagarajan B, Murthy V, Livingstone D, Surendra MP, Jayaraman S. Evaluation of crestal bone loss around implants placed at equicrestal and subcrestal levels before loading: a prospective clinical study. Journal of Clinical and Diagnostic Research: JCDR. 2015 Dec;9(12): ZC47.
17. Ajanović M, Hamzić A, Redžepagić S, Kamber-Ćesir A, Kazazić L, Tosum S. Radiographic Evaluation Cervical Crestal Bone Resorption around Dental Implants in Maxilla and Mandible: One Year Study. Pesquisa Brasileira em Odontopediatria e Clínica Integrada. 2014;14(3).
18. Amoian B, Haghanifar S, Kazemi HH, Aski MH. Comparison of crestal bone resorption in immediate and delayed implants on radiographic views: A preliminary study. Journal of Isfahan Dental School. 2014; 10(6): 457-467.

Volume 5, Issue 3; May-June 2022; Page No 491-497