

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service Available Online at: www.ijdsir.com

Volume – 4, Issue – 1, February - 2021, Page No. : 700 - 705

Assessment of high insertion torque versus low insertion torque on implant survival and maintenance of marginal

bone levels- a clinico-radiographic study

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Citation of this Article: Kaur M, Singh P, Dev Y, Chouhan H, "Assessment of high insertion torque versus low insertion torque on implant survival and maintenance of marginal bone levels- a clinico-radiographic study", IJDSIR- February - 2021, Vol. – 4, Issue - 1, P. No. 700 – 705.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To document the clinical and radiographic outcomes involving the, probing depth, crestal bone levels around implants and Implant mobility following implant placement in edentulous sites with high insertion torque versus low insertion torque.

Materials and Methods: 40 subjects were selected and were divided into two groups (Group A and Group B). The surgical procedure was carried and implant using high insertion torque was placed in case of Group A and implant placement using low insertion torque was done in case of Group B and sutures were placed.

Observations and results: The observation and results on following criteria: Crestal bone levels around implants, Probing Depth and Implant mobility and concluded that there was statistically significant difference between Group A and Group B.

Keywords: Dental Implants, High and low insertion Torque, Primary Stability

Introduction

Dental implants are accepted as a standard of care with long term success rates as high as 97% after 10 years of implant function.1 To be successful, the inserted implant must achieve primary stability by achieving compression around it. The force used to insert a dental implant is

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called insertion torque (IT). The biologic ramifications of high compressive forces on the healing response of bone have been highlighted through histomorphometric evaluation, in which there was a significantly lower percentage of bone-to implant contact for implants placed in sites where bone was overly compressed. Implant insertion torque can be assessed by electronic devices incorporated with physiodispenser or with torque gauge incorporated with manual ratchets.2

High compression caused by insertion torque higher than 40 to 45 Ncm has been leading to necrosis of the osteocytes and to bone resorption. Using peak insertion torque to place an implant creates high interfacial stress and strain that is associated with damage to peri-implant bone, viability of peri-implant bone tissue. These findings are supported by a study in which marginal bone loss was much higher for implants placed using the osteotome technique. In contrast to the above, an experiment showed that, the bone compression produced by high insertion torque did not induce deleterious bone resorption, but it did produce bone microcracks, which accelerated bone remodeling as compared to the low-insertion-torque implants.3

So, this study was aimed out to compare between low and high implant insertion torque and thereby investigating their effects on crestal bone, probing depth, implant mobility which overall measures the implant survival.

Materials and Methods:

For this proposed study, total 40 subjects were selected from the Out Patient Department of Periodontics and Oral Implantology. An ethical approval for the study was obtained from the ethical committee of the institution. Each subject was given a detailed verbal and written description of the study and all the selected subjects were required to sign an informed consent form prior to commencement of the study. Subjects were randomly divided into two groups: GROUP-A and GROUP-B on the basis of inclusion and exclusion criteria. In **Group A** standard implant treatment (SIT) was performed using high insertion torque that is \geq 50 Ncm in 20 patients and in **Group B**- standard implant treatment (SIT) was performed using low insertion torque that is \leq 30 Ncm in 20 patients.

Selected subjects had undergone routine blood and radiographical (IOPA and OPG) examination prior to surgery. The diagnostic casts were made and OHI-S was recorded. After then, subjects were undergone with complete oral prophylaxis and restoration of carious teeth. Under local anesthesia with 2% lidocaine (1:2,00,000 epinephrine) in Group A patients, a standard full thickness mucoperiosteal flap was elevated following sulcular incision at both teeth facing the single edentulous space(*figure 1*). Thereupon, all patients received a commercially available implant that was placed using high insertion torque that is \geq 50 Ncm(figure 2,3). Sutures were placed after flap replacement(figure 5).

In Group B under local anesthesia with 2% lidocaine (1:2,00,000 epinephrine) in group B patients, a standard mucoperiosteal flap was elevated following the sulcular incision at both teeth facing the the single edentulous space. Implants were placed using low insertion torque that is \leq 30 Ncm (*figure 6*). Sutures were placed after flap replacement, immediate postoperative radiographs were obtained (*figure 7*).

In both groups, the sutures were removed after 1 week and the Loading of implant was done after 3 months in case of mandible and 4 months in case of maxilla after implant installation **Results and Discussion:**

All the subjects were analysed on the following criteria:

A) Crestal Bone Loss (Table 1, Graph 1)

The mean height in group A at baseline, 3 month and 6 month and 9 month was found to be 0.00, 0.07 ± 0.16 , 0.74 ± 0.46 and 1.37 ± 0.44 respectively. A significant difference was observed in height of crestal bone from 3months-6month and 3 month-9month among group A and also from baseline to 9 months. (P-value<0.05).The mean height in group B at baseline, 3 month, 6 month and 9 month was found to be 0.00, 0.02 ± 0.08 , 0.20 ± 0.21 , and 0.47 ± 0.25 respectively. A significant difference was observed in height of crestal bone from 3months-6month and 3 month-9month among group A also from baseline to 9 months. (P-value<0.05). A significant difference was observed in height of crestal bone among group A and B at 6 month and 9 month. (P-value<0.05)

B) Probing Depth (Table 2, Graph 2)

The mean probing depth in group A at baseline, 3 month and 6 month was found to be 1.20 ± 0.41 , 2.30 ± 0.80 and 2.90 ± 0.31 respectively. A significant difference was observed in probing depth from baseline-3months and baseline-6months among group A (P-value<0.05). The mean probing depth in group B at baseline, 3 month and 6 month was found to be 1.10 ± 0.31 , 1.60 ± 0.50 and $2.25 \pm$ 0.55 respectively. A significant difference was observed in probing depth from baseline-3months and baseline-6months among group B. (P-value<0.05). A significant difference was observed in probing depth among group A and B at 3 month and 6 month. (P-value<0.05)

C) Implant Stability (Table 3 and Graph 3)

The mean score for the implant mobility was 1.0 ± 0.00 for the group A assessed using the mobility index of the endosseous implants developed by Wasserman. The mean score for the implant mobility was 1.0 ± 0.00 for the group B assessed using the mobility index of the endosseous implants developed by Wasserman. The difference between the groups for the implant mobility when analyzed using Chi-square test and was statistically non significant at p = 1.000.

In contemporary dentistry replacing a missing tooth with an implant rather than preparing adjacent teeth is more common. Dental implants are the nearest equivalent replacement to the natural tooth, and are therefore a useful addition in the management of patients who have missing teeth.4 The predictable esthetic and functional outcomes of the procedure depends on a comprehensive diagnostic evaluation and treatment planning.5

A number of studies have identified problems with a reduced capacity for bone repair, a decrease in de novo bone formation, and a reduction in bone-to-implant contact when using higher insertion torques.6-10 Limited body of literature ignores the overwhelming evidence that there is no correlation between PIT and ISQ,11,12-14 Indeed, the effects of higher insertion torque, which have been comprehensively studied in a multiscale analysis, were shown to cause microfractures in the peri-implant bone, increased bone resorption, decreased bone formation, and reduced or compromised vascularity within the bone. Consequently, it was recommended that high insertion torque should be avoided to best preserve the viability of the surrounding bone tissue.9 It is worth remembering that the ultimate goal of implant dentistry is to achieve secondary stability, and to ensure as rapid an onset of osseointegration as possible, with the establishment of high bone-to-implant contact. The use of higher insertion torques has been comprehensively shown to be unnecessary to achieve success, while the use of low insertion torques has been shown to respect the tissues and encourage less resorption, more de novo bone formation, and more rapid osseointegration.6,9 Furthermore, in a recent study by **Rea et al** in which implants were grouped into < 30 Ncm and > 70 Ncm, it was concluded that high torque values for immediate loading procedures were not

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necessary and that low insertion torque values were sufficient to obtain primary stability and may provide better osseointegration.15 **Campos et al** histologically demonstrated that increased insertion torque is associated to greater compression necrosis. On the contrary, necrosis and bone remodeling are minimal when lesser insertion torque values are reached.16

Table 1: intergroup comparison of height of crestal bone between the group a and group B

	Group	A	Group	в	Significance of Difference Using Mann Whitney Test				
	Mean	S.D.	Mean	S.D.	Z	P value	Significance		
Baseline	0.00	0.00	0.00	0.00	0.000	1.000	Non-significant		
3month	0.07	0.16	0.02	0.08	-0.959	0.338	Significant		
6month	0.74	0.46	0.20	0.21	-3.830	< 0.001	Significant		
9month	1.37	0.44	0.47	0.25	-5.071	< 0.001	Significant		

Table 2: intergroup comparison of probing depth between the group a and group B

	Group A		Group B		Significance of Difference Using Mann Whitney Test		
	Mean	S.D.	Mean	S.D.	Z	P value	Significance
Baseline	1.20	0.41	1.10	0.31	-0.874	0.382	Non-Significant
3month	2.30	0.80	1.60	0.50	-2.905	0.004	Significant
6month	2.90	0.31	2.25	0.55	-3.826	< 0.001	Significant

Table 3: Implant Stability Between The Group A And Group B









Legend Figure



Figure 1: Incision given



Figure 2: High Insertion Torque



Figure 3: Implant placed



Figure 4: Sutures given



Figure 5: Post operative IOPA



Figure 6: Low Insertion Torque



Figure 7: Post operative IOPA Conclusion

The present study depicted that implants placed with high insertion torque may be at higher risk than implants placed with low insertion torque and the soft and hard tissue healing outcome might be better when placing implants with the use of low insertion torque. Based on the results of this study, it can be concluded that the rationale for the implant placement with low insertion torque, diminishes crestal/vertical bone loss with reduced probing depth, which helps in achieving an better patient acceptance, furthermore successful results.

References

1. Quesada-Garcia MP, Prados-Sanchez E, Olmedo-Gaya MV, et al. Measurement of dental implant

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stability by resonance frequency analysis: A review of the literature. Med Oral Patol Oral Cir Bucal. 2009;14:538–46.

- Goswami MM, Kumar M, Vats A, Bansal AS. Evaluation of dental implant insertion torque using a manual ratchet. Medical Journal Armed Forces India. 2013
- Norton MR. The Influence of Low Insertion Torque on Primary Stability, Implant Survival, and Maintenance of Marginal Bone Levels: A Closed-Cohort Prospective Study. Int J Oral Maxillofac Implants. 2017;32:849–57.
- Lazzara R, Siddiqui AA, Binon P, Feldman SA, Weiner R, Phillips, R, Gonshor A. Retrospective multicenter analysis of endosseous dental implants placed over a five-year period. Clin Oral Implants Res 1996;7:73-83.
- 5. Stanford, CM. Application of oral implants to the general dental. JADA. 2005;136(10):1092–1100.
- Duyck J, Corpas L, Vermeiren S, et al. Histological, histomorphometrical, and radiological evaluation of an experimental implant design with a high insertion torque. Clin Oral Implants Res 2010;21(8):877–884.
- Büchter A, Kleinheinz J, Wiesmann HP, Jayaranan M, Joos U, Meyer U. Interface reaction at dental implants inserted in condensed bone. Clin Oral Implants Res. 2005;16:509–17.
- Cohen O, Ormianer Z, Tal H, Rothamel D, Weinreb M, Moses O. Differences in crestal bone-to-implant contact following an underdrilling compared to an over-drilling protocol. A study in the rabbit tibia. Clin Oral Investig. 2016;20:2475–480.
- Cha JY, Pereira MD, Smith AA, et al. Multiscale analyses of the boneimplant interface. J Dent Res. 2015;94:482–90.

- Büchter A, Kleinheinz J, Wiesmann HP, et al. Biological and biomechanical evaluation of bone remodelling and implant stability after using an osteotome technique. Clin Oral Implants Res. 2005;16:1–8.
- Degidi M, Daprile G, Piatelli A. Implants inserted with low insertion torque values for intraoral welded full-arch prosthesis: 1-year follow-up. Clin Implant Dent Relat Res 2012;14:39–45.
- González-García R, Monje F, Moreno-García C. Predictability of the resonance frequency analysis in the survival of dental implants placed in the anterior non-atrophied edentulous mandible. Med Oral Patol Oral Cir Bucal. 2011;16:664–9.
- Dos Santos MV, Elias CN, Cavalcanti Lima JH. The effects of superficial roughness and design on the primary stability of dental implants. Clin Implant Dent Relat Res. 2011;13:215–23.
- Barewal RM, Stanford C, Weesner TC. A randomized controlled clinical trial comparing the effects of three loading protocols on dental implant stability. Int J Oral Maxillofac Implants 2012;27:945–56.
- Rea M, Botticelli D, Ricci S, Soldini C, González GG, Lang NP. Influence of immediate loading on healing of implants installed with different insertion torques— An experimental study in dogs. Clin Oral Implants Res. 2015;26:90–5.
- Campos FE, Gomes JB, Marin C, et al. Are insertion torque and early osseointegration proportional? A histologic evaluation. Clin Oral Implants Res. 2015Nov;26(11):1256-60.