Osseointegration of Early Loaded Dental Implants- A Clinico-Radiographic Study.

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Abstract

Aims & Objectives: *The purpose of this study was to evaluate the the osseointegration of early loaded dental implants, clinically and radiographically .****Materials & Methods:*** *20 implants in the form of single crowns or 2-4 unit bridges were placed in 10 patients. The implants were loaded as per the protocol of early loading (8 weeks in mandible & 12 weeks in maxilla). The patients were followed up at 2/3 months, 6 months, 12 months, 24 months of post implant insertion. Post operative evaluation included: Implant mobility;; Peri-implant Radiolucency; & Bone loss.****Observations & Results:*** *Statistical analysis revealed significant differences between crestal bone loss of PRP & non-PRP implants (p-value = 0.004 on mesial side & p-value = 0.020 on distal side). All other clinical parameters were comparable & statistically non- significant. Finally, the overall success rate for these early loaded dental implants was recorded as 100%.* ***Conclusion:*** *Within the limitations of this study, early loading of dental implants is a suitable treatment option in both mandible & maxilla. .*
Keywords: *Dental implant, early loading, osseointegration,*

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I.   Introduction

The concept of Osseointegration [1] which was given by Prof. Branemark in 1952, plays an vital role in implant dentistry & is the ultimate goal for the implantologists to achieve. "Osseointegration" is a direct structural and functional connection between the ordered living bone & surface of a load-carrying implant and consists of direct histological bone-implant contact (BIC), without an intervening layer of fibrous tissue. Branemark's original 2-stage Surgical Protocol [2] highlights the importance of a stress-free healing period for controlled implant integration, which requires: (1). Submerging the implant below the crestal bone & maintaining unloaded implant environment for 3-4 months in mandible, 6-8 months in maxilla; & (2). Uncovering these implants & placing a prosthetic abutment after 3-6 months & then placing the permanent prosthesis. This undue waiting period was always a source of inconvenience, both to the patient and to the clinician, and many a time, the reason for opting against implant therapy.[3] During recent years, the loading protocols have been revised, particularly for decreasing or even eliminating the healing periods before loading the inserted implants.[4] With better understanding of biomaterials, improvements in implant design and surgical protocols, prosthetic loading protocols via either immediate implant loading or early implant loading have gradually become available during later years as additional concepts.   Primary implant stability is considered an important parameter for determining the loading protocol.[5] Although there is no gold standard for measuring implant stability, several methods [6, 7] have been proposed: (1). Clinical assessment by exerting lateral forces with 2 opposing mirror handles, (2). Percussion test, (3). Periotest device, (4). Resonance Frequency Analysis (RFA), (5). Insertion torque.(6). Histologic analysis.(7). Reverse torque test, (8). Radiographic analysis.

II.   Materials & Methods

Patients attending the PG Department of Oral Maxillofacial Surgery, Govt. Dental College & Hospital Srinagar (J&K), who were willing to replace their missing teeth by implants were screened and enrolled, They were prepared under all aseptic conditions and the whole procedure was explained to them. The advantages and disadvantages of the surgical procedure were explained in detail. A written informed consent was taken from the patient or the attendant. This was a prospective study in which patients of both the sexes were included. Each patient was having one or more missing teeth in mandible or maxilla. A total of 20 implants were placed in these patients . Pre-operatively fabricated surgical stent was placed at the proposed site & Implant osteotomy was performed. The implants were loaded with implant prosthesis as per the protocol of early loading. All the implants were placed by a single experienced Oral & Maxillofacial Surgeon to eliminate operator bias. The restorative work was done at a single dental laboratory. All patients were followed for a minimum period of 24 months postoperatively.

Implant Mobility was measured in a method similar to that used to asses tooth mobility. With two rigid instruments, a force of approx 500gms was applied in the labio-lingual direction. The amplitude of implant mobility was scored 0 - 4, The radiographic evaluation of bone level / loss was measured on a panoramic or a periapical radiograph. Bone loss was measured on the mesial and distal aspects of each implant. The distance between the implant platform and the most coronal level of the bone deemed to be in contact with the implant surface was evaluated.. The measurements of the bone level at implant placement were considered as baseline. Radiographic Bone Level (RBL) change was calculated as the difference between the reading at 6 or 12 or 24 months and the baseline value.

We have adopted the method described by Carl E. Misch (2008) to determine the height of the crestal bone, i.e., pitch of implant's thread in the measurement of the marginal bone levels. The measurements were classified into groups of 0.5mm.

III.   Results & Observations

The mean age of the patients was 33.9 years   (range, 20- 66 years) at the   beginning of the study. [Male patients = 36.4 years & Female patients = 31.4 years; Maximum insertion torque value (ITV) was 45 Ncm and the minimum was 30 Ncm. 80 % implants (n=16) were placed with an optimum ITV of 35 Ncm. None of the implants showed any peri-implant radiolucency at follow-up visits. At 6 month, 12 months & 24 months follow-ups, no implant showed any mobility (i.e., 100% success rate). At 12- month follow- up, 25 %implants demonstrated bone loss of 0.5 – 1.0 mm   12-month / 24- month clinical recording and radiographic assessment showed all values within the success criteria. Hence, 100% success rate was recorded Healing, in general, was uneventful with no discomfot to the patients & slight pain & discomfort to the patients in. All the sites maintained excellent peri-implant soft and hard tissue conditions. No implants were lost in any group over a 12-month / 24-month period. Based on clinical findings, all the loaded implants were successful at 6-month, 1-year & 2-year follow-ups. (TABLE 1) (FIG. 1-3)

IV.   Discussion

A successfully osseointegrated oral implant is anchored directly to the bone. However, in the presence of movement, a soft tissue interface may encapsulate the implant causing its failure.[8] To minimize the risk of soft tissue encapsulation, it was recommended by Branemark that implants should be kept load-free during the initial healing period, i.e., 3-4 months in mandible & 6-8 months in maxilla.[3] For edentulous patients, shortening this long time interval between implant insertion and delayed prosthetic loading is advantageous for esthetic, economical, and psychological reasons.[9] Early loading of implants after 8 weeks / 12 weeks of healing period seems to be a valuable treatment option for clinicians and can be recommended under clearly defined clinical conditions. [10] We have conducted a prospective clinico-radiographic study with the purpose of evaluating the treatment outcomes of 20 early loaded implants We have selected and included these patients in our study, based on certain inclusion and exclusion criteria. We excluded patients if they provided a positive history of presence of any medically compromising conditions which prohibit implant surgery, or history of chronic smoking, alcoholism / drug abuse, bruxism, or progressive periodontitis. These criteria of patient selection were in accordance with the studies performed by many investigators. [10, 11,12]   We have placed our implants in adequately healed & remodelled ridges (after a minimum healing period of 4 months) in accordance with the study conducted by many authors.[14,15] as early loading of endosseous implants in healed ridges offers select benefits to both the clinicians & the patients. The insertion torques values (ITV) used in our study varied from 30 to 45 Ncm. In all our cases, the restorations were cemented as per the early loading concept. After a healing period of 8-10 weeks in mandible & 12-16 weeks in maxilla, abutments were placed, impressions made and prostheses fabricated and cemented to the abutments[16] In our study, the temporary crowns were placed in infra-occlusion in an attempt to reduce the rotational forces & the effect of micromotion[17] However, passive forces from lips, chin and active forces during chewing of food can probably not be avoided. The clinical parameters we have taken into consideration were:- absence of infection around the implant; absence of pain, paresthesia, or neuropathy; absence of implant mobility , absence of peri-implant radiolucency & absence of marginal bone loss. The success criteria were in accordance with most of published data[18]   Implant mobility is a direct indicator of the extent of osseointegration.. The presence or absence of mobility was graded as per the grading system given by Carl Misch (2008). Radiographic bone level change (RBL) was the main response variable that was evaluated in this study. Crestal bone level is a significant indicator of implant health. Under ideal conditions, an implant should loose minimum bone. IOPAR is the most reliable method to monitor implant condition (Esposito et al – 1998). The use of standardized radiographs is a significantly more sensitive, direct method to detect changes in bone levels adjacent to implants.   In our study, the average marginal bone loss after 1-year was 0.27 mm As per most of the published data the average crestal bone loss should not exceed 1.5 mm by the end of 1-year, & 2.0 mm by the end of 2 years. All dental implants inserted in our study were considered clinically and radiographically successful according to the implant quality health scale established by

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Carl Misch et al (2003),[19] as there was no pain, paresthesia or tenderness upon function, no exudates or clinical mobility, no peri-implant radiolucency and the radiographic bone loss from initial surgery was less than 2mm. The present study demonstrated an overall implant survival / success rate of 100 % in the partially edentulous maxilla & mandible. This is in agreement with the findings of other studies, which have prospectively evaluated early loaded implants & have shown the overall survival / success rate of more than 95 %[20]

V.   Conclusion

Early loading of dental implants in mandible & maxilla is a highly predictable modality for replacing missing teeth. However, it should be noted that patient selection plays an important role in the success of early loaded dental implants.

References

[1].   Branemark PI, Hansson BO, Adell R, Breine U, Lindström J, Hallén O, et al. Osseointegrated implants in the treatment of edentulous jaw. Experience from a 10-year period. Scand J Plast Reconstr Surg Suppl. 1977; 2: 1–132.
[2].   Lekholm U. Immediate / Early Loading of Oral Implants in Compromised Patients. Periodontology 2000, 2003;Vol. 33:194–203
[3].   Cochran DL, Jackson JM, Bernard JP, ten Bruggenkate CM, Buser D, Taylor TD, Weingart D, Schoolfield JD, Jones AA, Oates TW Jr. A 5-year prospective multicenter study of early loaded titanium implants with a sandblasted and acid-etched surface. Int J Oral Maxillofac Implants. 2011;26(6):1324-32.
[4].   Brunski JB, Puleo DA, Nanci A. Biomaterials and biomechanics of oral and maxillofacial implants: current status and future developments. Int J Oral Maxillofac Implants 2000;15(1):15-46.
[5].   Bergkvist G. Immediate loading of implants in the edentulous maxilla. Swed Dent J Suppl. 2008;196:10–75.
[6].   Grandi T, Garuti G, Guazzi P, Tarabini L, Forabosco A. Survival and success rates of immediately and early loaded implants: 12-month results from a multicentric randomized clinical study. J Oral Implantol. 2012 Jun;38(3):239-49.
[7].   Salvi GE, Gallini G, Lang NP. Early loading (2 or 6 weeks) of sandblasted and acid-etched (SLA) ITI implants in the posterior mandible. A 1-year randomized controlled clinical trial. Clin Oral Implants Res. 2004 Apr;15(2):142-9.
[8].   Testori T, Galli F, Capelli M, Zuffetti F, Esposito M. Immediate non-occlusal versus early loading of dental implants in partially edentulous patients: 1-year results from a multicenter, randomized controlled clinical trial. Int J Oral Maxillofac Implants 2007 Sep-Oct;22(5):815-22.
[9].   Ganeles J, Wismeijer D. Early and immediately restored and loaded dental implants for single-tooth and partial-arch applications. Int J Oral Maxillofac Implants. 2004;19 Suppl:92-102.
[10].   Barber HD, Myers RL. Iverson B, Smith BM. Platelet-rich plasma & Bone grafting in Implant surgery. In: Fonseca's Oral & Maxillofacial Surgery, 2nd edition., St.Louis: Missouri, Saunders Elsevier; 2009. Volume I, Chapter 30, p.501-10
[11].   Pankaj Singh, Norman Cranin. Selection of the proper implant. In: Atlas of Oral Implantology. Mosby Elsevier, Maryland Heights, Missouri; 2010:p.54
[12].   Bogaerde LV, Pedretti G, Mozzati M, Rangert B, et al. Early function of splinted implants in maxillas & posterior mandibles using Branemark system machined-surface implants: An 18-month prospective clinical multicentre study. Clin Implant Dent Rel Res 2003;5(suppl):21-28
[13].   Roccuzzo M, Aglietta M, Cordaro L. Implant loading protocols for partially edentulous maxillary posterior sites. Int J Oral Maxillofac Implants. 2009;24 Suppl:147-57.
[14].   Lethaus B, Kälber J, Petrin G, Brandstätter A, Weingart D. Early loading of sandblasted and acid-etched titanium implants in the edentulous mandible: a prospective 5-year study. Int J Oral Maxillofac Implants. 2011 Jul-Aug;26(4):887-92
[15].   Andersen E, Haanæs HR, Knutsen BM. Immediate Loading of Single-tooth ITI Implants in the Anterior Maxilla: a prospective 5-year pilo\\\\t study. Clin Oral Impl Res 2002;13:281–287
[16].   Marx, R.E. Platelet-rich plasma (PRP): What is PRP and what is not PRP? Implant Dent. 2001;10(4):225-28.
[17].   Karthik K, Sivakumar, Sivaraj, Thangaswamy V. Evaluation of implant success: Review of past and present concepts. J Pharm Bioall Sci 2013;5:117-9.
[18].   Ericsson I, Randow K, Nilner K, Peterson A. Early functional loading of Brånemark dental implants: 5-year clinical follow-up study. Clin Implant Dent Relat Res. 2000;2(2):70-7.
[19].   Misch CE, Degidi M. Five-year prospective study of immediate/early loading of fixed prostheses in completely edentulous jaws with a bone quality-based implant system. Clin Implant Dent Relat Res 2003; 5: 17-28

TABLE 1- Clinical Implant Mobility Scale

SCORE	INFERENCE
0	Absence of clinical mobility with 500gms in any direction
1	Slight detectable horizontal movement
2	Moderate visible horizontal mobility upto 0.5mm
3	Severe horizontal mobility greater than 0.5mm
4	Visible moderate to severe horizontal &/or vertical movement

FIG 1. IMPLANT PLACED

FIG 2. POSTOP IOPAR

FIG 3.FINAL PROSTHESIS