

EVALUATION OF TISSUES SURROUNDINGS ENDOSTEAL DENTAL IMPLANTS

Dr. Shagun Chengappa (MDS)

P.G. Student

Prof. P.B. Singh (MDS)

Head of Department, Department of Dental Surgery

Institute of Medical Sciences,

Banaras Hindu University, Varanasi

INTRODUCTION:

Teeth are integral part of masticatory system. Healthy and well arranged teeth provide structural balance to masticatory system besides efficient oral functions and pleasing esthetics. Loss of tooth/teeth results in loss of structural balance, inefficient oral functions, poor esthetics, besides caries, periodontal disease and positional changes of remaining natural teeth. In order to reduce adverse affects of tooth loss, replacement of teeth may be necessary. Tissue supported tooth tissue supported and tooth supported dentures are common and established methods for the replacement of teeth. Another method of tooth replacement is found to be satisfactory and predictable, method, this has become popular as Endosteal dental implant supported prosthesis, where an alloplastic biomaterial is implanted in jaw bone and is used to support a fixed or removable denture^{9,10}.

Endosteal dental implants are either tapped or screwed into site prepared in the bone, these implants are primarily of two types based on the design.

1. ROOT FORM:

Which are designed to use a vertical column of bone.

They are subdivided into:

- (a) Cylinder root form
- (b) Screw root form
- (c) Combination root form

2. PLATE FORM IMPLANT

Endosseous dental implant are osseointegrated which means, there is no other tissues between the implant and the bone. Peri implant tissues are bone, periosteum and oral mucosa. The most common complication seen in the peri-implant hard tissues, is the crestal bone loss.

MATERIAL AND METHODS

Purpose of this study was to evaluate the health of peri-implant tissues after inserting and loading the screw type endosteal dental implants. Patients for the study were selected from out patient department, department of Dentistry.

Dental History and Examination Recorded which included:

1. History of habits
2. Cause and duration of tooth loss
3. Assessment of oral health
4. Occlusion
5. Parafunctional habits

Clinical evaluation of future implant site was done to evaluation:

- Amount of attached keratinized mucosa
- Amount of bone
- Unfavourable frenum or high muscle attachment

With diagnostic wax up on articulated study cast, surgical guide was made on it, in clear heat cure acrylic. Stent was finished and polished. This stent when placed in mouth or on cast has a hollow space (shaped like missing teeth) over future implant site. This hollow space was filled with radio-opaque marker. This stent was worn by the patient during radiographic examination (CT-scan).^{11, 15, 16, 21, 25, 26.} Radiographic pre-operative examination was performed using sytisc 400I CT Machine to evaluate the jaw bone at future implant site. Serial axial and coronal cross-sections were made with slice thickness of 1.0mm. Bone available in vertical, mesiodistal and labiolingual directions was measured by inbuilt distance cursor. Exact position of adjacent vital structures such as inferior alveolar canal, floor of nasal cavity, floor of maxillary sinus was assessed.

CT determined the exact amount of bone available, bone density in the region, ideal implant dimension, ideal, implant location and angulation with regard to bone and restoration

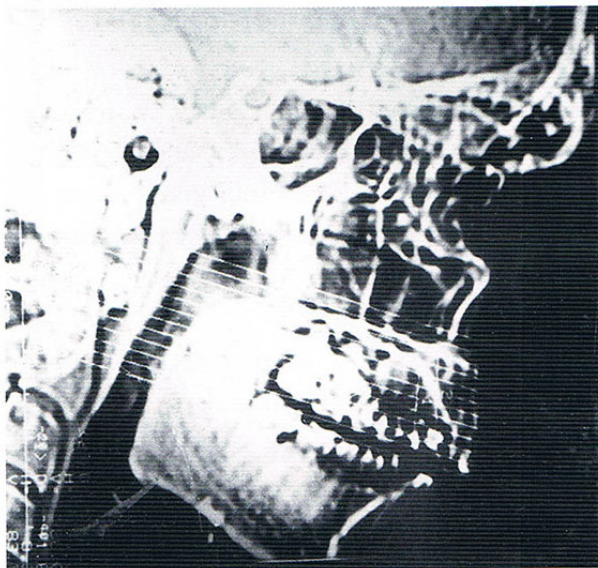


Fig. 1: Scout of a patient showing the radio-opaque marker and the height of bone measured in the right and left canine. the white lines represents axial scans made.

INSTRUMENTS USED

- High torque hand piece
- Pilot drill (Bur)

Two sizes of pilot bur was used. The diameter of both were 1.25 mm and length varied, the longer one had the cutting depth of 28 mm, the shorter one had 18mm cutting depth.

Twist drill

Two sizes of twist drill was used. The diameter of both being 2.25 mm
Length being 18mm and 26mm.

Depth gauge

It has a diameter of 2.25 mm. It measures the depth of the osteotomy. The marking starts from 16 mm to 24mm.

Finger Key

Used to screw the implant in the prepared osteotomy site. It fits both square and round head.

Extension for finger key

It is used were the finger key has to be elongated, to prevent the interference from the adjacent teeth.

Post bending pliers

Used to bend the head of the implant. It is used only on square head biocortical implant.

Post Holding Instrument

Used to hold the implant while bending so the stress is prevented on the bone interface

Implant used

Biocortical screw implant of various sizes with two types of heads i.e., square and round.

After evaluation of bone:

Blood investigation was done. Then Pre Surgical Medication administered 24 hr. before the operative procedure.

Operative Procedure:

1. The area was anaesthetised by infiltration
2. Stent was placed in the mouth and point of entry marked
3. Incision given
4. Drilling was done at low speed 800 to 1500 rpm without applying pressure.
5. The implant was screwed in place.

The patient was examined weekly for one month, monthly for first three months and there after every third month.

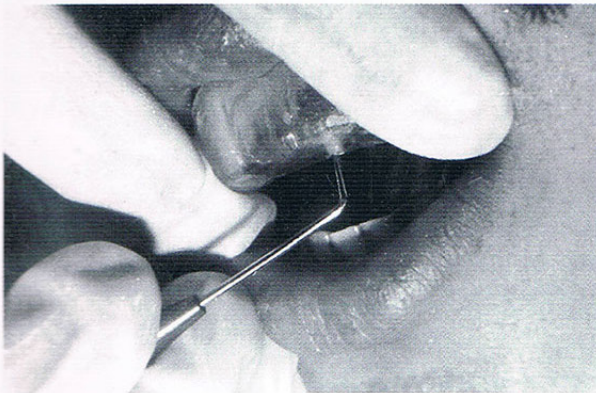


Fig. 2: Marking the point of entry through guiding hole in surgical stent with sharp straight probe



Fig. 3: Bleeding point as seen on the gingiva

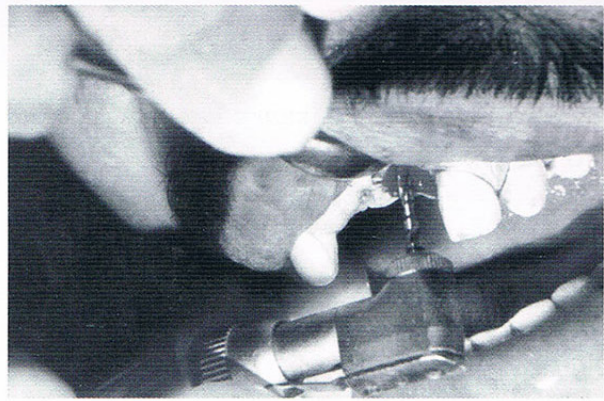


Fig. 4: Osteotomy preparation for placement of the biocortical implant.

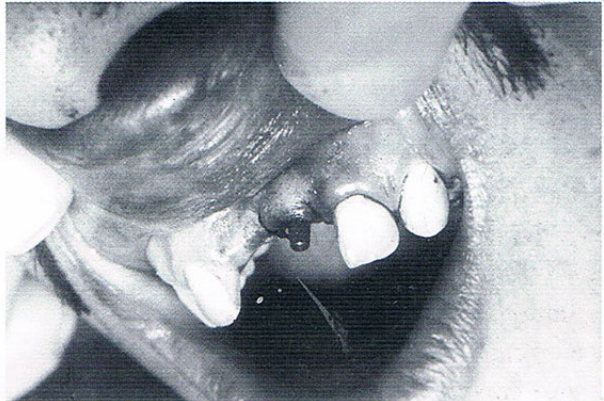


Fig. 5: Flap repositioned and black silk suture placed

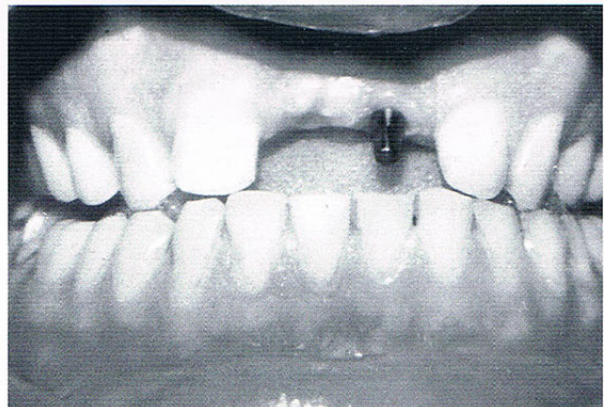


Fig. 6: Dent after healing

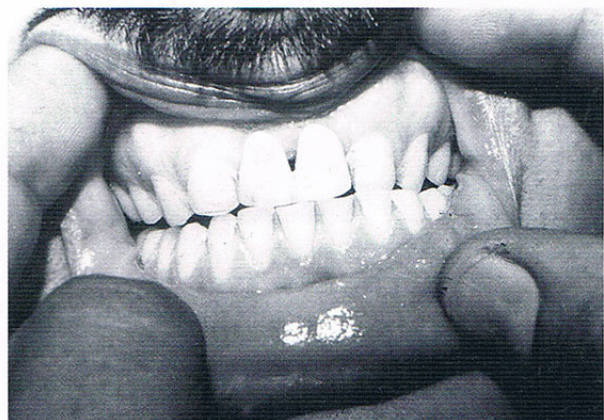


Fig. 7: Restoration in anterior teeth

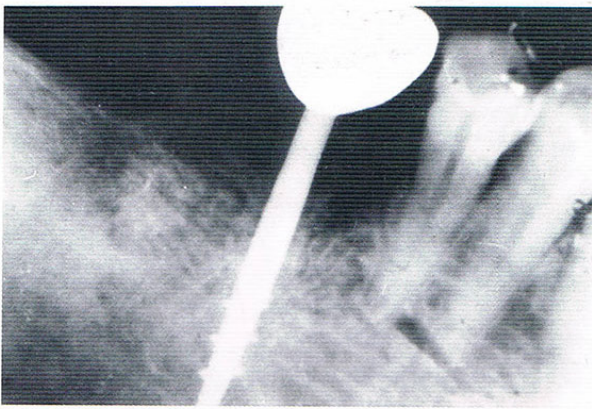


Fig. 8: Radiograph taken 2 years after loading of implant

Clinical response was evaluated on the following criteria:

1. Mobility
2. Plaque Index
3. Gingival Index
4. Probing depth⁵
5. Marginal bone loss^{1,3,4,6}
6. Periapical radiolucency recorded as present / absent^{13, 14}

Table 4: Comparable change in mobility as recorded at different time intervals.

Case No.	At1 Months	At3 Months	At6 Months	At9 Months	At12 Months	At18 Months	At24 Months
1	0	1	1	1	1	-	-
2	1	1	2	2	-	-	-
3	0	0	0	-	-	-	-
4	0	0	-	-	-	-	-
5	0	0	0	0	0	0	0
6	0	1	1	1	1	1	1
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0

Mobility recorded as (Carranza)-

Grade 0 – Zero Mobility

Grade 2 – Moderate Mobility

Grade 1 – Mild Mobility

Grade 3 – Severe Mobility

Buccolingually and mesiodistally combined with vertical displacement.

The above table shows there was grade 2 mobility

in case No. 2 after 9 months and cases no 1 6 showed grade 1 mobility after 1 or 2 months. Rest 6 cases showed no change in mobility and were immobile throughout the time of examination.

Table 5: Comparison of change in plaque index at different time intervals

Case No.	At1 Months	At3 Months	At6 Months	At9 Months	At12 Months	At18 Months	At24 Months
1	0	0	1	1	1	-	-
2	0	1	1	0	0	-	-
3	0	0	0	-	-	-	-
4	1	0	-	-	-	-	-
5	0	0	1	1	1	1	1
6	0	1	0	1	0	0	0
7	0	1	1	1	1	1	1
8	0	0	0	1	0	0	0
9	0	0	0	0	0	0	0

Quigley and Hein plaque Index-

Grade 0 – No plaque Grade 1 – Plaque within apical third of crown

Grade 2 – Plaque within middle third of crown Grade 3 - Plaque within coronal third of crown

The above table shows that all the patients exhibit satisfactory oral hygiene maintenance at each time interval.

Table 6: Comparison of change in gingival Index at different time intervals

Case No.	At1 Months	At3 Months	At6 Months	At9 Months	At12 Months	At18 Months	At24 Months
1	0	1	0	0	0	-	-
2	0	0	0	0	0	-	-
3	0	0	0	-	-	-	-
4	0	0	-	-	-	-	-
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0

Loe and Silness gingival Index -

Grade 0 – No. inflammation

Grade 1 – Moderate inflammation

Grade 1 – Mild inflammation

Grade 3 – Severe inflammation

Shows no gingival inflammation was seen in any of the cases except case no. 1 showed grade 1 inflammation on mesial side when examined at 3 months.

Table 7: Presence/Absence of peri implant radiolucency at different time intervals.

Case No.	At1 Months	At3 Months	At6 Months	At9 Months	At12 Months	At18 Months	At24 Months
1	A	P	P	P	P	-	-
2	A	A	P	P	P	-	-
3	A	A	A	-	-	-	-
4	A	A	-	-	-	-	-
5	A	A	A	A	A	A	A
6	A	P	P	P	P	P	P
7	A	A	A	A	A	A	A
8	A	A	A	A	A	A	A
9	A	A	A	A	A	A	A

A - Absent P - Present

The above table shows that cases no 1, 2 and 6 showed peri-implant radiolucency at different time

intervals. Rest of the cases showed no peri-implant radiolucency at any time intervals.

Table 8: Comparison of change in mean marginal bone loss at different time intervals (in mm)

Case No.	At1 Months	At3 Months	At6 Months	At9 Months	At12 Months	At18 Months	At24 Months
1	0.0	0.5	0.7	1.0	1.8	-	-
2	0.0	0.2	0.5	0.9	1.4	-	-
3	0.0	0.0	0.2	0.2	-	-	-
4	0.0	0.0	0.2	-	-	-	-
5	0.0	0.0	0.4	0.5	0.5	0.5	0.5
6	0.0	0.0	0.4	0.7	1.0	1.0	1.2
7	0.0	0.0	0.0	0.2	0.2	0.2	0.2
8	0.0	0.0	0.2	0.2	0.2	0.2	0.4
9	0.0	0.0	0.2	0.4	0.5	0.5	1.5
Mean	0.0	0.35	0.31	0.45	0.64	0.48	0.76

The above table shows that mean marginal bone loss at 1 month was 0.0 mm at 3 months 0.35 mm at 6 mm at 9 months 0.45 mm at 12 months 0.64, at 18 months 0.48 and at 24 months was 0.76.

Table 9: Comparison of change in mean probing depth at different time intervals (in mm).

Case No.	At1 Months	At3 Months	At6 Months	At9 Months	At12 Months	At18 Months	At24 Months
1	0.5	0.5	0.75	1.0	1.5	-	-
2	0.5	0.75	1.0	1.0	1.0	-	-
3	0.35	0.5	0.5	-	-	-	-
4	0.25	0.5	-	-	-	-	-
5	0.5	0.4	1.4	0.4	0.4	0.5	0.5
6	0.5	0.5	0.75	0.75	0.75	0.75	0.75
7	0.25	0.25	0.25	0.25	0.25	0.25	0.25
8	0.25	0.25	0.35	0.35	0.35	0.35	0.35
9	0.4	0.35	0.35	0.35	0.35	0.35	0.35
Mean	0.38	0.44	0.58	0.58	0.65	0.44	0.44

The above shows there was no significant change in probing depth at different time intervals.

DISCUSSION

To evaluate the health of peri-implant tissues various parameters have been discussed by authors. A review of 35 published articles from 1977 to 1989 reveals that most common clinical criterion reported is the survival rate that whether a implant is still physically in the mouth or has been removed.

There were different criteria given for to mark the success of implant. But the parameters used in this study are as:^{2,3,4,8}

Pain:

Once the implant has primarily healed there should be no more pain under vertical or horizontal forces. Out of all the cases, 2 of them complained of pain. one immediately & other after a week.

Mobility:

M Komiyama Y Motta Het at in these report on implant mobility stated that a healthy implant moves less than 75 micro m hence, it has zero clinical mobility. If the above study case 1,2 & 6 had mobility of 1 mm in horizontal direction and no vertical mobility.

Gingival health:

In this study to assess the health of soft tissue Loe and Silnes gingival index was used and Quigley and Hein plaque index was used to assess oral hygiene.

Probing depth:

The sulcular epithelium creates a new sulcus after the regeneration of attached gingiva. The probing

depth is not related to health in implants as in sound teeth. The probing depth in more significant sign in normal tooth. Increasing probing depth is more significant sign than a probing depth in case of implants.^{18,19,28,23,22}

Marginal bone loss:

First sign of bone loss occurs on facial aspect but in this study as we have taken IOPA x ray we were able to record the bone loss in mesial and distal aspect^{5,12,13,17}.

CONCLUSION

Based on the clinical and radiological observation, their analysis and discussions, the following conclusions were drawn from the present study:

1. Osseointegration can be achieved if patient selection is done properly, the size of the implant used is according to the quality and quantity of bone present at the site.
 2. The C.T. scan helps to judge the quality, quantity of the bone present and position of vital structure present in proximity. Thus it helps to select the required dimension of implant for the particular site in the jaw.
 3. Health of peri-implant tissues directly affects the success of the implant.
 4. If the implant is loaded prematurely (before 4 to 6 months) the chances of marginal bone loss is increased. As in case 1.
1. Except 2 all patients were satisfied esthetically and functionally. So a single tooth implantation can be a choice of treatment in future.

REFERENCES:

1. Adell R, Lekholm, U, Rockler B et al: Branemark PI : A 15 years study of osseointegrated implants in the treatment of the edentulous Jaw, Int J Oral Surg 6 : 387-416, 1981
2. Albrektsson T, Jacobsson M : Bone metal interface in osseointegration J Prosthet Dent 1987, 57, 597-607
3. Albrektsson T, Zarb G et al. The long term efficacy of currently used dental implants : A review and proposed criteria of success. Int J oral Maxillofac Implant, 1986,1-11-25
4. Albrektsson T, Lekholm UF et al. Osseointegration : current state of art dent clin North Amer 1989-33-537-54.
5. Andersson B, Odman P, Carlsson L et al : A new Branemark single tooth abutment, int J oral Maxillofac Imp 7 : 105-111, 1992
6. Bauman GR, Rakley Jw, Hallman WW et al : the periimplant sulcus, Int J Oral Maxillofac Imp 8(2) : 273-280, 1993
7. Both RT. Beaton Le, Davermpport HA Reaction of bone to multiple metallic implants. Surg gynecol Obstet 1940, 71:598-602
8. Bragger U, burgin W, Log WP et al Digital subtraction radiography for the assessment of Changes in Peri-implant bone density, Int J Maxillofac Impl 6 : 160-166, 1991
9. Branemark PI, Hansson BO, Adell R Osseointegrated implant in treatment of edentulous jaw experience from a 10 years period. Scand J Plast Reconstr Surg 1977 : 11 (6)
10. Cardioli G, Castagna S, Consatali E : single tooth implants rehabilitation a retrospective study of 67 implants Int. J Prosthodont 7:525-531, 1994
11. Checheve. The spirial post implant Inform Dent 1960:42 534-5
12. Eckerdal O Krient S : Presurgical planning for osseointegrated implants in the maxilla : tomographic evaluation of available alveolar bone and morphological relations the maxilla int J Oral Maxillofac Surg 15 : 722-726, 1986.
13. Engquist B, Nilson H, Astrand P : single tooth replacement by osseointegrated Branemark implants

- A retrospective study of 82 implants, *Clin Oral Implants Res* 6(3) : 238-245, 1995
14. James RA, Kelln E : A histopathological report on the nature of the epithelium and underlying connective tissue which surrounds implant post *J Biomed Mat Res* 5 : 373, 1974
 15. Jemt T, Lekholm U, Grondhal K : three year follow up study of early single implant restoration an modum Branemark, *Int J Perio res Dent* 10:340-349, 1990
 16. Kircos Lt : Quantitative implant imaging with a focus on interactive computed tomography successful impent cases. Are they possible?for how long? Loma Linda University, March 13-14, 1994
 17. Kircos LT : quantitative implant imaging with a focus on interactive computed tomography and eletronic surgery, *Int Con Oral Implant* March 15-16, 1995.
 18. Laney WR, Jent T, Marrio D et al : Osseointegrated implant for single tooth replacement progress report from a multicenter prospective study after 3 years. *Int J Oral Maxillofac Impl* 9: 49-54, 1994.
 19. Lekholm U, Adell R, Lendhe J et al : Marginal tissue rections at osseintgrated titanium fixtures 11 : a cross sectional restrospective study *Int J Oral Maxillofac surg* 1 : 53-61, 1981
 20. Lekholm U, Adell R, Lendhe j et al : marginal tissue reactions at osseointegrated titanium fictures (II) across section retrospective study : *Int J oral Maxillofac Surg* 15:53-63, 1986
 21. Malevez C, hermans M, Daelemans P : Marginal bone levels at Branemark system implants used for sigle tooth restoratio *Clin Oral Implants Res* 4(2) : 162-169, 1996.
 22. Misch CE : Treatment planning and implant dentistry, *In J Oral Implant* 7 : 9-17, 1990
 23. Richard K. K Ow, george A Zarb and Adrienne Schmitt : Longitudinal peri Implant Clinical responses *JPD* 1979: 81 689-95
 24. Schmitt A, Zarb GA : The longitudinal clinical effectiveness of osseointegrated dental implants for single tooth replacement, *Int J Prosthodont* 6 : 187-202, 1993
 25. Somarabandu J Allen K Hausmann E et al : Registration technique for digital subtraction radiography, *Dentomaxillofac Radiol* 23 (2) : 117-119, 1994
 26. Swartz Ms, Rothman SLG, Rhodes ML et al : Computed tomography in dental surgery, *Dent Clin North AM* 33 : 555-597, 1989
 27. Zabalegui J, Gil JA Zabalegui B : Maganetic resonance imaging as an adjunctive diagnostic aid in patient selection for endosseous implants : preliminary study, *Int J. oral Maxillofac implant* 5 m: 288 1991
 28. Zarb GA, Schmitt : The Longitudinal clinical effectiveness of osseointegrated dental implant. The Toronto study. Part I Surgical result *J Prosthet Dent* 1990; 63451-457
 29. Zarb; G.A; Alberktsson T and Akse P. Gingival integration in osseointegration in preparation 1986.