Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/6664
DOI URL: http://dx.doi.org/10.21474/IJAR01/6664

RESEARCH ARTICLE

MANAGEMENT OF DEHISCENCE DURING IMPLANT PLACEMENT WITH SANDWICH TECHNIQUE: A CASE REPORT.

Sarika P. S[1], Rajababu P[2], Jagadish Reddy[3] and Vidya Sagar S[4].
MDS, Department of Periodontics and Implantology, Kamineni Institute of Dental Sciences.

Manuscript Info

Manuscript History

Received: 04 January 2018
Final Accepted: 06 February 2018
Published: March 2018

Keywords:-
Ridge augmentation, Peri-implant dehiscence, Sandwich technique**.**

Abstract

The replacement of single anterior teeth by means of endosseous implants implies the achievement of success in restoring both aesthetic and function. Dental implants are established substitutes for replacing missing teeth. For the successful implant placement, the volume of adequate bone at the recipient site is absolutely essential. Peri-implant dehiscence defects are most often encountered at the site of implant placement that requires bone augmentation. These defects may range from very small lack of marginal bone to large areas of denuded implant surfaces. Recent clinical studies have demonstrated that the application of various bone grafts in conjunction with placement of implants leads to successful coverage of the previously exposed implant surfaces. The present case report highlights the bone augmentation of the peri-implant dehiscence defect by novel Calcium phosphosilicate, Hydroxyapatite with collagen bone graft and GBR membrane while performing the first-stage implant surgery for a single edentulous area.

Introduction:-

Implant therapy is regarded as an extremely reliable approach to replace missing teeth. As a general principle in implant surgery, implant surfaces should be surrounded by alveolar bone[1] to function optimally and it must be placed in a biologically acceptable, restoratively driven position. Hence, the three-dimensional positioning of the dental implant is crucial to a successful treatment outcome. However, with the loss of teeth, the alveolar bone remodels and decreases in dimensions at varying rates and degrees.[2]

Buccal bone is relatively thin and bone resorption after tooth extraction in buccal areas is faster. While preparing implant sites in narrow ridges, dehiscence or fenestration defects may occur frequently that threaten the survival of implants.[3] Compared to the lingual bone, especially in the maxillary anterior region, buccal bony housing is thin; thus, bone resorption after tooth extraction in buccal areas is faster and far more prevalent. According to Lam [4] the abundant bone volume does not remain more than a few years following tooth loss, and the original crestal width is reduced by at least 30% within 2 years after extraction.

To overcome the difficulty of space creation around buccal dehiscence defects, several treatment approaches, such as membranes with space fillers or titanium- reinforced e-PTFE membranes, are often utilized in GBR [5,6] non-space making buccal dehiscence defects, commonly encountered in sites edentulous for more than 6 months, have been considered to be one of the most challenging defects. In order to provide prolonged space maintenance and wound

Corresponding Author:- Sarika P. S.

stabilization in nonspace making defects such as buccal dehiscence defects, Wang *et al.* [7] has recently introduced the sandwich bone augmentation (SBA) technique.

In SBA technique, autogenous bone or fast-resorbing allograft is laid under the second layer of slow-resorbing allograft or xenograft to enhance vital bone-to-implant contact via 'creeping substitution' of the inner layer during the early wound healing period.[8,9] In addition, the second cortical layer provides mechanical support for prolonged space maintenance via 'reverse creeping substitution.' Material selection has also been shown to influence the outcome of bone augmentation. Use of an absorbable membrane in combination with a bone filler showed comparable regenerative outcome as a non-resorbable membrane with a bone graft. [10,11]

This case report describes an implant placement in the maxillary right canine region showing dehiscence on the labial cortical plate, along with Calcium phosphosilicate, Hydroxyapatite with collagen bone graft and GBR membrane placed.

Case Report:-
A male patient of age 28 years reported with a missing tooth irt 13 since 1 year (Fig. 1). The patient gives a history of Dental caries due to which the particular tooth was lost. Intraoral periapical radiographs and blood investigations to rule out systemic disorders were advised. Following complete clinical and radiographic evaluation implant prosthesis was planned.

On the day surgery patient was administered local infiltration anesthesia (2 % Lignocaine Hydrochloride with 1:80,000 concentration Adrenaline). Mid crestal and crevicular incisions with vertical releasing incision were made to elevate a full thickness mucoperiosteal flap extending from 11 to 13. On the elevation of the flap, bone dehiscence was observed on the labial plate. The osteotomy procedures were carried out under copious saline irrigation. A self-threaded two-stage implant fixture (Adin Dental Implant Systems Ltd, Afula, Israel) of dimension 3.5 × 11.5 mm was chosen and placed (Fig.2). After achieving a final torque, the dehiscence was augmented with Calcium phosphosilicate (Fig.3), Hydroxyapatite with collagen bone graft (Fig.4) by layering technique followed by placement of guided bone regeneration resorbable membrane covering the graft (Fig.5). Primary implant stability was checked with Ostell (Fig.6) and sutures placed (Fig.7). The patient was advised to take antibiotics and analgesics (Tab Amoxicillin 500 mg+ clavulanate potassium 125 mg, 3 times for 7 days, Tab aceclofenac 100, paracetamol 325 & serratiopeptidase 15, twice daily for 3 days).The patient recalled after one week for suture removal, healing was uneventful (Fig .8).

After 3 months patient came for the second stage of implant surgery, secondary implant stability was measured (Fig.9) and gingival formers were placed. One week after gingival former, secondary Impression was made and porcelain fused to metal prosthesis was fabricated and cemented (Fig.10,11). All the instructions for implant maintenance were given to the patient and follow up was carried out on a regular basis

Discussion:-

The management of dehiscence on the labial aspect of the maxillary left lateral incisor during implant placement is presented. A predisposing factor for the cause of dehiscence is an unfavorable frenum pull, prominent root contours, malpositioning of teeth, labial protrusion of root, thin bony plates, and long-standing trauma. Methods to reconstruct the destroyed alveolar bone include osteoconduction, osteoinduction, and GBR. [12,13,14]

Utilizing collagen membranes to enhance bone augmentation in implant dehiscence defects were clinically and histologically evaluated. Histologic analysis can be considered the gold standard for evaluation of bone regeneration. Due to the difficulty in obtaining histologic materials from humans, animal studies possess the advantage of attaining on standardized lesions for GBR Dahlin *et al.*[15] Hammerle *et al.*[16] which follows the "PASS" principle (which stands for achieving primary wound closure, promoting angiogenesis, maintaining space for regeneration and obtaining primary implant, and blood clot stability) is aimed at promoting bone regeneration.[17]

Guided bone regeneration (GBR) along with the use of various barrier membranes to be a reliable method for the treatment of dehiscence-type of a defect. GBR involves the placement of an occlusal barrier which prevents invasion of non-bone forming cells from the surrounding soft tissues into the defect. It allows time and space for the bone forming cells to repopulate the defect.[18]

In the past expanded polytetrafluoroethylene (e-PTFE) membranes were proven effective but exposure, inflammation and compromising bone regeneration were frequently reported by Becker *et al*., [19] Nowzari and Slots.[20] The disadvantage of non-resorbable materials is the need for a second surgical procedure to remove the membrane. This led to the development of resorbable membranes. Resorbable membranes have shown improved tissue healing, decreased morbidity and fast resorption and reducing the risk of bacterial contamination showed in most cases of GBR, membranes are supported by protective materials consisting allografts, synthetic materials, and xenografts. [21]

Despite the success demonstrated with transplanted autogenous grafts, the use of such grafts is frequently impossible or impractical. For decades various types of synthetic and natural bone substitutes have been utilized for regenerative periodontal treatment in intrabony defects, ridge augmentations, socket preservation, sinus floor elevations etc.[22]

Layering the mineralized cancellous and cortical bone allografts take advantage of the creeping and reverse creeping substitution healing processes and also mimics the macrostructure of native bone.[23] The present case we used synthetic material instead of allograft as synthetic bone grafts should aid in osteointegration, osteoconduction, and ideally should be biocompatible, show minimal fibrotic reaction, undergo remodeling and support new bone formation. From a mechanical point of view, it should have a similar strength to that of the cortical/cancellous bone being replaced. This needs to be matched with a similar modulus of elasticity to that of bone in an attempt to prevent stress shielding as well as maintaining adequate toughness to prevent fatigue fracture under cyclic loading. Synthetic materials have some of these properties which are composed of either calcium, silicon or aluminium.[24]

Calcium phosphosilicate is a bioactive synthetic graft with an osteostimulative and osteoconductive property, manufactured by NovaBone, Florida, available in putty consistency. It consists of two particle phases: Phase 1 – 90–710 μ bioactive glass particles and Phase 2 – 32–125 μ calcium phosphosilicate. Phase 2 particles enhance the physical characteristics and improve handling. Its putty consistency makes it easy to manipulate and adapts well to defects. Spaces between particles permit rapid vascularization and bone ingrowth. Bone forms in several areas in the defect simultaneously, thus enhancing the regeneration. Histological examination of the treated sites showed ossification of the implant pores and the implant periphery. [25]

Bowen *et al*.[26] also found that this graft material offers the potential for increasing new bone mass. A collagen membrane was trimmed and used to contain the bone grafts and also exclude the non-regenerative cells, such as epithelial cells from colonizing the site. This will enable osteoprogenitor cells to colonize the site and use the allografts as a scaffold to regenerate new vital bone. Collagen membranes are preferred because they are absorbable, biocompatible, and enhance hemostasis and chemotaxis of fibroblasts. In addition, a second surgical procedure to remove the membrane is eliminated, increasing patient satisfaction while reducing site morbidity, attachment loss, and treatment time.[27]

Regarding mechanical implant stability, the bone-to-implant contact may not necessarily be as informative as commonly believed.[28] In trabecular regions or in studies where implants with a wound chamber design were used, the initial bony coating may be very thin and may therefore not contribute greatly to mechanical implant stability.[29] To determine mechanical implant stability, other tests can be applied like push-out or pull-out tests, or removal torque analysis experiments, which are used to measure implant anchorage in bone. A noninvasive and widely accepted technique is, however, resonance frequency analysis.[30] This technique can provide clinically relevant information about the condition of the bone-to-implant interface at any time interval after implant placement. Longitudinal monitoring of the resonance frequency analysis values may allow optimal loading times to be determined and identification of implants at risk. The original electronic RFA device used a direct connection (wire) between the transducer and the resonance frequency analyzer. The transducer was an L-shaped cantilever beam, which was connected to the implant via a screw attachment. A piezoelectric crystal on the vertical portion of an L-shaped beam was used to stimulate the implant/transducer complex; a second piezoelectric crystal on the opposite side of the beam was used as the receiving element to detect the response of the beam.[31]

The results of an RFA are expressed as an implant stability quotient (ISQ) on a scale from 1 to 100, which represents a standardized unit of stability. Generally, the ISQ has been found to vary between 40 and 80 for clinically stable implants.[32] While the original RF analyzer was subjected to a variety of inconsistencies, and hence yielded a wide spectrum of ISQ values within a range of normality indicating implant stability [29] the more recent

wireless probe represented a clear improvement in assessing implant stability with higher sensitivity, robustness, and reproducibility. RFA was performed in this case report by using the OsstellTM mentor (Integration Diagnostics AB, Gamlestadsvagen 3B, Gotenborg, Sweden) instrument on implant by inserting a standardized abutment (SmartpegTM, Integration Diagnostics AB, Gamlestadsvagen 3B, Goteborg, Sweden) of fixed length into implant.

The transducer probe (OsstellTM mentor Probe II) was held so that the probe tip was aimed at the small magnet on top of the SmartpegTM at a distance of 2–3mm. The probe was held still during the pulsing time until the instrument beeped and displayed the ISQ value. Double measurements were made for a buccal and an occlusal positioning of the OsstellTM mentor Probe II which is in accordance with the study done by Sim and Lang.[29]

Conclusion:-

Presence of dehiscence during implant procedure can be successfully treated by GBR procedures. A simultaneous procedure of implant placement and GBR using bone grafts and membranes yield good results. The procedure helps in bone formation and prevents failure of implants and improves the prognosis. Hence Simultaneous implant placement with the sandwich bone augmentation technique predictably regenerated bone on implant buccal dehiscence defects.

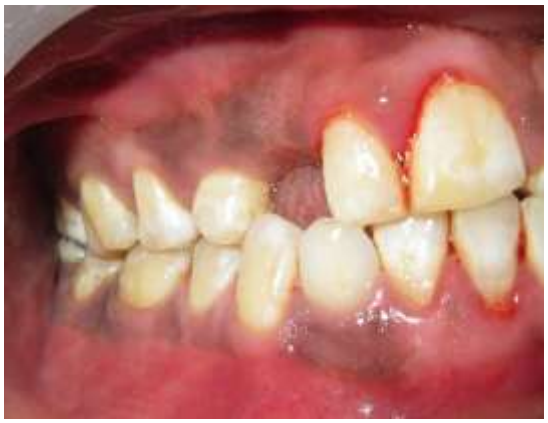

Fig 1:- Pre-operative

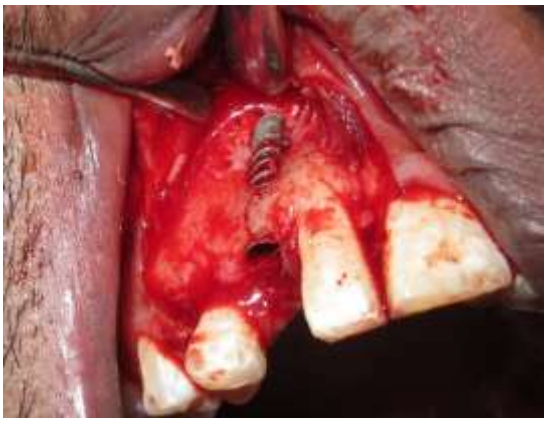

Fig 2:- Buccal dehiscence irt 13

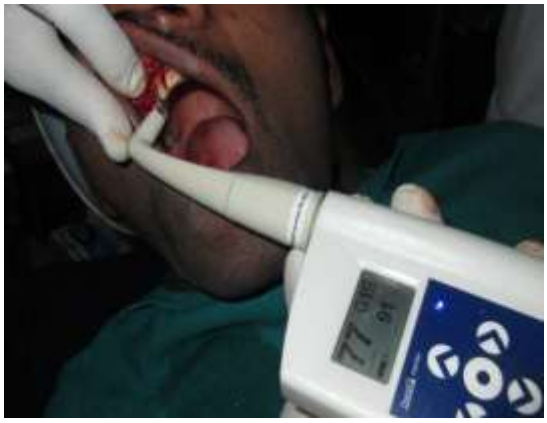

Fig 3:- Primary implant stability with Ostell

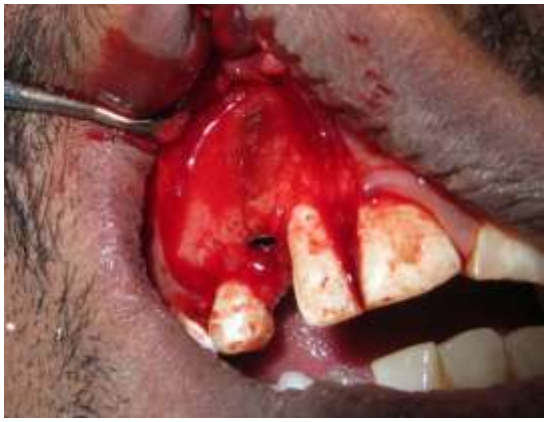

Fig 4:- Placement of Calcium phosphosilicate bone graft

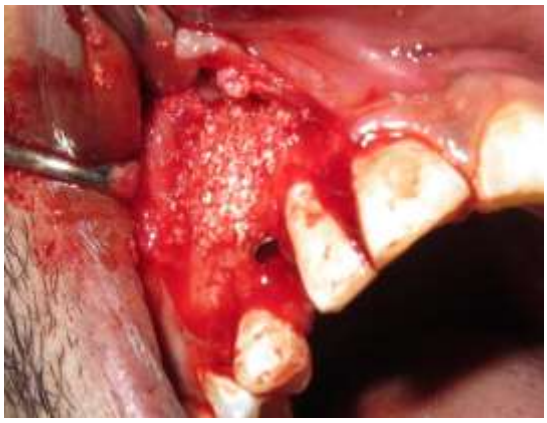

Fig 5:- Placement of Hydroxyapatite with collagen bone graft

Fig 6:- Placement of GBR membrane

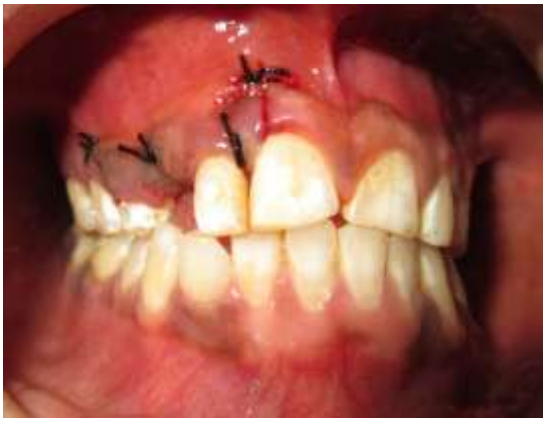

Fig 7:- Sutures placed

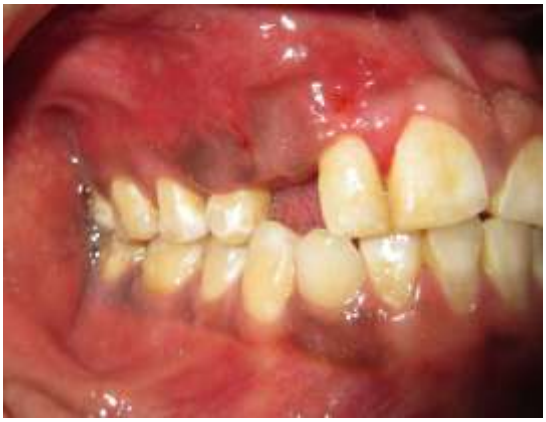

Fig 8:- One week post-operative

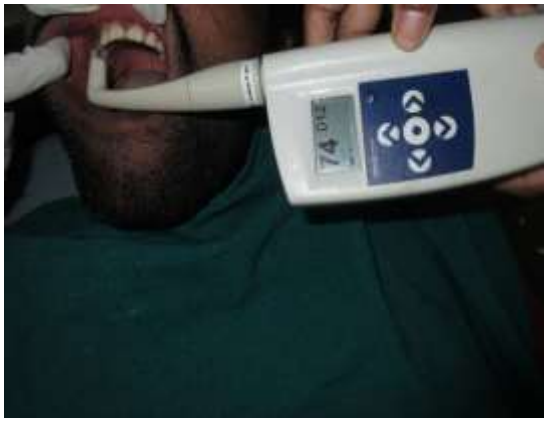

Fig 9:- Secondary stability with Ostell

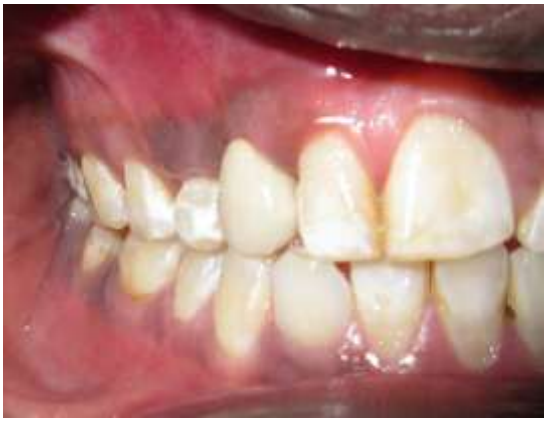

Fig 10:- Final prosthesis lateral view

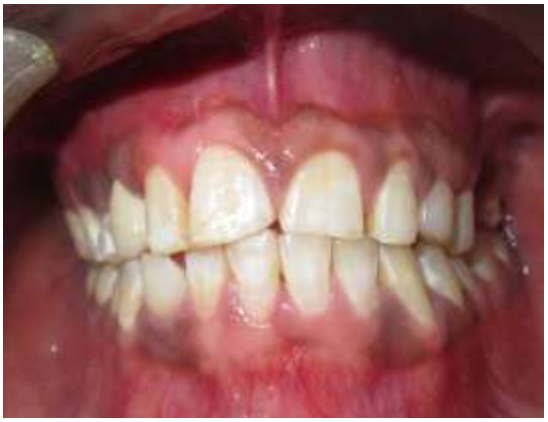

Fig 11:- Final prosthesis frontal view

References:-

1. Abed AM, Pestekan RH, Yaghini J, Razavi SM, Tavakoli M, Amjadi M . A comparison of two types of decalcified freeze-dried bone allograft in treatment of dehiscence defects around implants in dogs. *Dent Res J* 2011:**8** :132–137.2.
2. Tallgren A. Positional changes of complete dentures. A 7-year longitudinal study. *ActaOdontol Scand* 1969;**27**:539-561.
3. Carmagnola D, Berglundh T, Araujo M, Albrektsson T, Lindhe J. Bone healing around implants placed in a jaw defect augmented with Bio-Oss: an experimental study in dogs. *J Clin Periodontol* 2000;**27**:799–805.
4. Lam, R.V. Contour changes of the alveolar process following extraction. *J Prosthetic Dent* 1960;**10**: 25–32.
5. Fritz, M.E., Jeffcoat, M.K., Reddy, M., Koth, D., Braswell, L.D., Malmquist, J. & Lemons, J. Guided bone regeneration of large mandibular defects in a primate model. *J Periodontol* 2000;**71**:484–1489.
6. Simion, M., Dahlin, C., Trisi, P. & Piattelli, A. Qualitative and quantitative comparative study on different filling materials used in bone tissue regeneration: a controlled clinical study. Int J Periodontics Restorative Dent1994;**14**:199–215.
7. Wang, H.L., Misch, C. & Neiva, R.F. ‘‘Sandwich’’ bone augmentation technique: rationale and report of pilot cases. Int J Periodontics Restorative Dent 2004;**24**:232–245.
8. Goldberg, V.M. & Stevenson, S. Natural history of autografts and allografts. Clinical Orthopedic Related Research 1987; **225**: 7–16.
9. Lyford, R.H., Mills, M.P., Knapp, C.I., Scheyer,E.T. & Mellonig, J.T. Clinical evaluation of freeze-dried block allografts for alveolar ridge augmentation: a case series. *Int J Periodontics Restorative Dent* 2003; **23**: 417–425.
10. Gelb, D.A.Immediate implant surgery: three-year retrospective evaluation of 50 consecutive cases. *Int J Oral Maxillofac Implants*1993; **8** : 388–399.
11. Lundgren, D., Sennerby, L., Falk, H., Friberg, B. & Nyman, S. The use of a new bioresorbable barrier for guided bone regeneration in connection with implant installation. Case reports. *Clinical Oral Implants Research* 1994; **5**: 177–184.
12. Buser D, Dula K, Belser UC, Hirt HP, Berthold H. Localized ridge augmentation using guided bone regeneration. I. Surgical procedure in the maxilla. *Int J Periodontics Restorative Dent* 1994; **13**:29–45.
13. Oda T, Sawaki Y, Ueda M Experimental alveolar ridge augmentation by distraction osteogenesis using a simple device that permits secondary implant placement. *Int J Oral Maxillofac Implants* 2000;**15**:95–102.
14. Cordaro L, Sarzi AD, Cordaro M .Clinical results of alveolar ridge augmentation with mandibular block bone grafts in partially edentulous patients prior to implant placement. *Clin Oral Implants Res* 2002;**13**:103–111
15. Dahlin, C., Linde, A., Gottlow, J. & Nyman, S. Healing of bone defects by guided bone regeneration. *Plastic Reconstructive Surgery* 1988; **81**: 672–676.
16. Hämmerle, C.H. Membranes and bone substitutes in guided bone regeneration. In: Lang, N.P., Karring, T. & Lindhe, J., Proceedings of the 3rd European Workshop on Periodontology, Berlin: *Quintessence Publishing Co*.1999;483.
17. Wang HL, Boyapati L. ‘‘PASS’’ principles for predictable bone regeneration. *Implant Dent* 2006;**15**:8-17.
18. Becker W, Lekholm U, Dahlin C, Becker BE, Donath K.The effect of clinical loading on bone regenerated by gtam barriers: a study in dogs. *J Oral Maxillofac Implants* 1994;**9**:305–313.

19. Nowzari H, Slots J. Microbiologic and clinical study of polytetrafluoroethylene membranes for guided bone regeneration around implants. *Int J Oral Maxillofac Implants* 1995;**10**:67–73.
20. Lorenzoni M, Pertl C, Keil C, Wegscheider WA. Treatment of peri-implant defects with guided bone regeneration: a comparative clinical study with various membranes and bone grafts. *Int J Oral Maxillofac Implants* 1998;**13**:639–646
21. Jung RE, Zwahlen R, Weber FE, Molenberg A, Van Lenthe GH, Hammerle CH .Evaluation of an in situ formed synthetic hydrogel as a biodegradable membrane for guided bone regeneration. *Clin Oral Implants Res* 2006; **17**:426–433
22. Froum S, Cho SC, Rosenberg R, Rohrer M, Tarnow D. Histological comparison of healing extraction sockets implanted with bioactive glass or demineralized freeze-dried bone allograft. A pilot study. *J Periodontol* 2002; **73**:94-10.
23. Lee A, Brown D, Wang HL. Sandwich bone augmentation for predictable horizontal bone augmentation. *Implant Dent* 2009;**18**:282-290.
24. Hench LL, Wilson J. Surface active biomaterials. *Science* 1984; **226**: 630–666.
25. Bembi NN, Bembi S, Mago J, Baweja GK, Baweja PS. Comparative Evaluation of Bioactive Synthetic NovaBone Putty and Calcified Algae-derived Porous Hydroxyapatite Bone Grafts for the Treatment of Intrabony Defects. *Int J Clin Pediatr Dent* 2016;**9**:285-290.
26. Bowen JA, Mellonig IT, Gray JL, Towle HT. Comparison of decalcified freeze-dried bone allograft and porous particulate hydroxyapatite in human periodontal osseous defects. *J Periodontol* 1989; **60**:647-654.
27. Lee A, Brown D, Wang HL. Sandwich bone augmentation for predictable horizontal bone augmentation. *Implant Dent* 2009; **18**:282-290.
28. Sennerby L, Meredith N. Implant stability measurements using resonance frequency analysis: biological and biomechanical aspects and clinical implications. *Periodontol 2000* 2008;**47**:51-66.
29. Sim CP, Lang NP. Factors influencing resonance frequency analysis assessed by Osstell mentor during implant tissue integration: I. Instrument positioning, bone structure, implant length. *Clin Oral Implants Res* 2010;**21**:598-604.
30. Albrektsson T, Zarb GA, Worthington P. The long term efficacy of currently used dental implants: A review and proposed criteria of success. *Int J Oral Maxillofac Implants* 1986;**1**:11-25.
31. Han J, Lulic M, Lang NP. Factors influencing resonance frequency analysis assessed by Osstell mentor during implant tissue integration: II. Implant surface modifications and implant diameter. *Clin Oral Implants Res* 2010:**21**:605-611.
32. Huwiler MA, Pjetursson BE, Bosshardt DD, Salvi GE & Lang NP. Resonance frequency analysis in relation to jawbone characteristics and during early healing of implant installation. *Clin Oral Implants Res* 2007;**18**:275-28.