

## THE PHYSIOGNOMY RESTORATION IN UPPER ANTERIOR MAXILLARY REGION USING A SINGLE IMPLANT BREDED

Mihaela Mitrea<sup>1\*</sup>, Anca Rusu<sup>2</sup>, Partene-Vicoleanu Simona<sup>1</sup>, Dorelia Lucia Călin<sup>3</sup>

1 "Grigore T. Popa" University of Medicine and Pharmacy - Iași, Romania, Faculty of Medicine, Discipline of Anatomy

2 Primary dentist at Private Dental Office "dr. Anca Rusu", București

3 "Grigore T. Popa" University of Medicine and Pharmacy - Iași, Romania, Faculty of Dentistry, Discipline of Cariology and Restorative Odontotherapy

\*Corresponding author: Mihaela Mitrea, DMD, PhD  
"Grigore T. Popa" University of Medicine and Pharmacy  
- Iași, Romania;  
e-mail: [mitrea.mihaela77@yahoo.com](mailto:mitrea.mihaela77@yahoo.com)

### ABSTRACT

The **purpose** of this study was to evaluate the features, results and complications of the surgical procedure in a single step of immediate insertion of a single implant after atraumatic extraction of a single tooth in the maxillary anterior region. **Material and methods** In 21 patient was made the insertion of an immediate post-extraction implant, an immediate temporary reconstruction of the breach and subsequent realization of a metal-ceramic crowns on implant. **Results** A single implant was not integrated. Clinical and radiographic parameters were good. One provisional crown was fractured. At the postoperative control carried out at 6 months it was found that implants were stable without bone loss at radiological exam, the interdental papillae were present. **Conclusions** Single implant placement after extraction in the maxillary aesthetic zone proved to be a procedure with a high acceptability and satisfaction from the patients. Uploading a single implant in the socket immediately after extraction shortens the total treatment time, fewer surgical interventions, preserves the structure of adjacent teeth.

**Keywords:** single-tooth implant, aesthetic problems, immediate loading

### INTRODUCTION

The loss of a single tooth, especially in front of the maxilla is associated with functional, emotional and aesthetic problems [1].

The use of dental implants to replace a single tooth has evolved in a viable alternative which replaces fixed prosthetic bridges. Long-term studies have reported excellent survival rates of implant when it is applied to replace a single tooth [2,3].

The front tooth extraction followed by immediate insertion of an implant and fast

and fixed provisional restoration is regarded as the most acceptable treatment option in most critical situations from aesthetic point of view. Psychological benefits and preserving the structure of adjacent teeth of the tooth to be replaced are among advantages of fixed implant restorations.

The installation of the implant immediately after tooth extraction in the socket shortens the total treatment time, fewer surgical interventions, provides a reduction in loss of peri-implant crestal bone and better soft tissue healing thus improving aesthetics

[4,5]. Placement of a dental implant in the aesthetic zone is a sensitive technique with very little room for error. A subtle mistake in implant placement or incorrect handling of hard and soft tissues can lead to the aesthetic failure and patient dissatisfaction [6].

Placement of dental implants in the maxillary aesthetic zone requires exigent planning and technical skills in order to obtain successful results. To obtain an ideal aesthetic result in rehabilitation with implants, numerous parameters should be evaluated and considered. In the anterior zone the success of a single implant treatment is due not only to the high rate of survival, but also to the long-term assessed quality of the implant that is dictated by several factors: appearance of peri-implant soft tissue should be in harmony with the surrounding mucosa of adjacent teeth, the crown fixed to the implant should be in equilibrium with the adjacent dentition, etc. [7].

#### **Diagnosis and treatment plan**

Preoperative assessment of patient expectations is extremely important.

Both doctor and patient must be realistic about expectations before starting, during and after treatment, and the most important thing for the physician is not to overestimate his own abilities. The need for a treatment plan, not just a diagnosis based on clinical and logical things is required because must be evaluated both psychological characteristics as well as the capacity of each patient to understand and accept the treatment imposed by the dentist. At the basis of the patient's motivation to respect the the proposed treatment by the doctor should not stay overvalued and unsupported results. Thus, without an assessment of these things, the treatment performed may be not only a failure, but even a disaster [8,9].

If the patient has unrealistic expectations, a careful explanation may be necessary to clarify what the patient should expect. The

dentist should explain to the patient clearly that changes in the soft tissue, apical changes, changes in gingival attachment, including the absence of papilla may occur despite surgical and prosthetic restoration efforts. For example, the covering crown may seem at the beginning higher when compared with adjacent soft tissue or supportive tissues, thinner or even colored in relation to adjacent teeth [10].

Development of an appropriate treatment plan requires complete and accurate data.

The database should include the main complaints of the patient, complete medical history, dental history, results of clinical extraoral and intra-oral examination radiographic examination results, patient expectations and an assessment of risk factors for implant failure (aesthetic or functional) [11].

#### **Evaluation of implantation space**

An adequate mesio-distal space is the first criterion that must be met. Correct positioning of the implant should be designed to avoid causing damage to periodontium or other vital anatomical structures such as nerves, and if this can not be achieved the treatment plan needs to be rethought. A minimum distance of 1.5 mm between the implant and existing dentition prevents damage to adjacent teeth and provides osseointegration and proper gingival contours.

Indeed, interdental papilla preservation and remodeling depends on the depth and width of the alveolar bone that supports the mucosa. Space width or depth of implantation or implant and alveolar bone crest often have an increased alveolar bone resorption around the implant head. Therefore, the surgeon must keep an adequate distance between the implant site and adjacent teeth to preserve or compensate any bone loss and maintain sufficient proximal alveolar bone to support the papilla.

A single implant and its location between two natural teeth, normally requires at least 1.5 mm of alveolar bone between the edge of the implant and the root surface of adjacent tooth. When replacing an upper jaw single incisor should be a distance of at least 2 mm to 2.5 mm between the neighboring tooth and the implant. The space between an implant and another should be at least 3 mm of interproximal alveolar bone [12,13].

Standard diameter of an implant that replaces a superior lateral incisor is less than 4 mm, while the diameter of a central incisor or canine does not exceed 5 mm. Of course, the recommended diameter varies from patient to patient depending on individual characteristics or dental idiosyncrasies. Some patients do not usually have enough alveolar bone in mesio-distal direction or a space between the roots allowing the insertion of a conventional implant. Placement of an implant too close to the implants or adjacent teeth can lead to loss of interproximal bone with subsequent loss of papillary height [14].

#### **Assessment of alveolar bone**

The implant requires at least 1 mm of bone in the vestibular sense, as well as palatal. In order to prevent a possible recession is necessary to have a minimum 2 mm osseous tissue [13]. Interproximal bone requirement varies depending on the existence of adjacent teeth to implant. However, should not be less than 1.5 mm. The implantation immediately after extraction is indicated only if there is no sign of an active infection, primary stability can be guaranteed, there is a thick buccal bone, enough interproximal bone, an optimal angle of insertion, the patient understood the possible complications [14].

#### **Evaluation of soft tissue**

The existence of a wide alveolar bed and a sufficient alveolar bone ensure the survival of the implant, but do not promise a satisfying aesthetic result, so that the soft tissue morphology will provide its fulfillment to

create the illusion of a natural tooth. This support bone becomes extremely important in the aesthetic zone because the shape of the papilla will be dictated by the bone support around a dental implant.

Existence or creation of a strong alveolar bone is necessary in order to exist a support for the free marginal gingiva and interdental papilla. Around the anterior maxillary dentition, the standard distance between the free marginal gingiva and alveolar crest is 3 mm and the distance between the tip of the papilla and interproximal bone (eg papilla height) is about 4.5 mm [15]. Even if there is enough alveolar bone, this does not guarantee the mucosal shape that follows the natural contour of the tooth. Even around a correct erupted tooth the soft tissue sometimes deviates from the bone architecture and follows the cemento-enamel junction curve due to the proximity of the root [16].

Long-term stability of the aesthetic soft tissue around the implant depends largely on the presence of an adequate amount of soft tissue in a vertical and bucco-lingual directions. An appropriate volume of soft tissue provides a good profile of emergence of the implant and serves to hide the metal support of the implant [17].

Restoration success through implants depends on the congenital tissue biotype of each individual. Thus, there are two major tissue biotypes: thick / smooth and thin / scalloped [18].

It is much easier to hide the presence of the implant in a patient with a thick / smooth tissue biotype. A thick bone is less prone to resorption, encourages the revascularization during healing and supports the soft tissue. Similarly, a thick gingiva will be more easily treated with surgery and will heal more easily because of its own vasculature.

On the other hand, a thin / scalloped tissue biotype requires a team with plenty of experience, as they have to warn the patient

of the instability of physiognomic results.

Thin tissue, especially the non-keratinized one, generates another obstacle in order to fulfill the aesthetic requirements, as it tends to fall around restoration, becoming slightly inflamed, this being favorable to occurrence of gingival recession [19,20]. Thus, to a patient with a thin / scalloped tissue type and a gingival papilla exceeding 4 mm in height can be created a gap in the soft tissue (eg low papillae size, large teeth and black colored or discolored mucosal edges) around a single implant compared with the existing dentition.

A thin gingival biotype dictates placement of the implant in a slightly palatal position to reduce the possibility of occurrence of recession and prevent the transparency of titanium through the thin gingival tissue [21].

#### **Evaluation of interdental papilla**

The distance between the interproximal bone height of adjacent natural teeth and the final prosthetic contact point dictates the formation and regeneration of spontaneous interdental papillae associated with implant. The height of the gingival papilla adjacent to a single implant should be less than 4 mm (3.85 mm) [16,18].

The prevalence of the existence of a complete attached gingiva around a single implant is 100% when the distance between the contact point and the bone crest is less than 4 mm [22]. Any increase in this distance dramatically reduces the chance of a complete attachment of the gums to the implant, for example if the space between the contact point and the bone increases to 6 mm, the chances are 50% that gingiva should be attached to the implant. The projection of the papilla height between two implants is even shorter of about 3 mm.

#### **Implant placement**

Optimal aesthetic result depends on the proper three-dimensional positioning of the implant. Four positional parameters contribute to the success of restoration and all

must be taken into account during implant placement. These are the buccolingual, mesiodistal, and apicocoronal positions relative to the implant platform, as well as the angulation of the implant.

Correct bucco-lingual positioning of the implant simplifies the procedure of restoration, leads to a proper emergence profile and facilitates oral hygiene. The vestibular wall must maintain a minimum thickness of 1 mm to prevent recession and improve aesthetics. An implant placed too buccally often leads to dehiscence of the cortical bone buccal and has a high potential to cause gingival recession.

To avoid an unfavorable aesthetic result, mesio-distal space must be carefully measured so that the correct implant size may be selected and the appropriate space of the implant should be planned. Placing an implant too close to the implants and adjacent teeth can lead to loss of interproximal bone with subsequent loss of papillary height.

Apico-coronal positioning of the implant is required to mask the metal of the implant and the abutment. If the implant is inserted more apically, the more aesthetic is the restoration. Overloading of the implant towards the apical area may cause vertical and horizontal circumferential crestal bone loss and gingival recession after insertion [23].

In a patient without, gingival recession, it is generally acceptable to use cemento-enamel junction location of adjacent teeth as a reference point to determine the apico-coronal position of the implant platform. Cemento-enamel junction of the maxillary lateral incisor is usually located at 1 mm more coronally than that of the adjacent central incisor and canine.

The natural tooth exhibits a distance from the free gingival margin to osseous ridge of 3 mm, and this should be respected also in the case of the implant in the same measure. To

complete the free gingival margin of neighbors the implant platform must extend 3 mm apically to the gingival margin of the crown, which must not extend more than existing free gingival margin of anterior teeth [24,25].

It is generally accepted that angulation of the implant should imitate inclination of adjacent teeth, if the teeth are fairly well aligned. The implants placed with too much angulation either to palatal or buccal most often compromise the aesthetics and may also have an impact on patient care at home [26].

Surgical guides can help achieve the correct angulation, because this may be difficult to see to time of surgery. In the maxillary anterior region, a subtle palatal angulation is sometimes recommended to increase the labial soft tissue volume and to avoid the problems related to vestibular thin walls [27].

The **purpose** of this study was to evaluate the features, results of the surgical procedure in a single step of immediate insertion of a single implant after atraumatic extraction of a single tooth in the maxillary anterior region, but also the evaluation of possible complications.

## MATERIAL AND METHODS

The present study involved 21 patients (15 women and 7 men) aged 28-46 years who presented at Private Dental Office "Dr. Anca Rusu" with esthetic and phonation disorders induced by the presence on the arch of the upper lateral incisors crown or coronoradicular destruction.

Criteria for inclusion of patients in this study were: no smoking, no bone loss in the affected teeth, absence parafunctions (bruxism), the absence of periodontal disease.

Patients were carefully evaluated from medical, clinical, radiological point of view in order to assess the current health status and to identify any conditions that would require

pre-treatment or contraindications to treatment. All patients necessitated the extraction of lateral incisors due to crown destruction and failure of endodontic therapy.

To all patients was exposed the treatment plan which involved the insertion of an immediate post-extraction implant, an immediate temporary reconstruction of the breach and subsequent realization of a metal-ceramic crowns on implant. Furthermore, they were informed in detail about the surgical procedure and informed consent was obtained.

An example of the performed procedure in the group of patients is presented below. The patient TM, male, aged 35 years, without other significant family history, presented at Private Dental Office „Dr Anca Rusu” accusing physiognomy and speech problems due to damage of lateral incisor 2.2.

At intraoral clinical examination was observed the presence of crown destruction of tooth 2.2. (fig. 2), being completed by radiological examination which confirms that the tooth is not recoverable due to the incomplete endodontic treatment together with a periapical granuloma (fig. 1).



**Figure 1. Orthopantomography initially made. It is observed the incomplete endodontic treatment together with the presence of a periapical granuloma**

Antibiotic prophylaxis was performed 1 hour before the beginning of the procedure with a dose of 2 g Amoxiclav. Plexal



anesthesia was performed, and atraumatic tooth extraction of 2.2 using a periosteal elevator which was inserted into the periodontal ligament space, gradually advancing toward the apex so as not to damage the surrounding tissues in order to preserve the socket walls

and soft tissue architecture (fig.3). Subsequently was performed the post-extraction socket curettage with the removal of the granuloma and the granulation tissue (fig. 4). Alveolus was irrigated for 30 seconds with a 3% solution of tetracycline.



**Figure 2. Initial clinical appearance of the patient, lateral incisor 2.2 crown destruction**



**Figure 3. The extracted tooth.**



**Figure 4. Post-extraction alveolus**



**Figure 5. The implant inserted into a slightly palatal position for the protection of buccal cortical bone.**



**Figure 6. The insertion of provisional implant abutment**



**Figure 7. The acrylic provisional crown before insertion**



**Figure 8. The appearance of the provisional crown inserted on the implant**



**Figure 9. Appearance after removal of sutures**



**Figure 10. The final radiological appearance**

The distance between the buccal gingival margin and alveolar crest was carefully checked because it is crucial for obtaining esthetic outcome.

Then, it was performed the immediate insertion of a Sky-Temp titanium implant from Bredent size 3.5 mm with 14 mm, the insertion being into a slightly palatal position for the protection of buccal cortical bone and to provide an adequate amount of soft tissue (fig. 5). The necessary initial stability of the implant has been obtained by using a longer and wider implant. It was not carried out osseous addition.

Subsequently, the provisional abutment was inserted in the implant (fig. 6), and then was performed the provisional acrylic crown with a cape of celluloid and the flowable

composite resin over the provisional abutment (screw down crown) (fig. 7). The provisional crown was removed from occlusion.

The suture was made with nonabsorbable threads for the attachment of the gingiva (fig. 8), followed by the application of the temporary crown which was inserted on the implant.

Within three months from implant loading, the patient must be present at the cabinet in order to achieve the final crown.

Panoramic radiographs were used to evaluate the bone-implant interface, and the level of marginal bone in relation to the upper part of the implant (fig. 10).

Patients were instructed to consume foodstuffs of soft consistency within 6 weeks

to prevent any movement of the implant.

Administration of antibiotics continued after surgery by 1 tablet every 8 hours for the first 2 days, and in the next 5 days with 1 tablet every 12 hours.

## RESULTS

The healing period following extraction of affected teeth and loading of implants went without complications. In the case of the three implants was observed a slight swelling of the soft tissues.

Of the 21 single implant loaded, 20 of them were osseointegrated and final restoration was done after 6 months from the surgery. A single implant was not osseointegrated, being removed and after a healing period of one month it has been replaced.

Because temporary crowns were placed at the time of surgery, gingival tissues were supported and suffered little change in anatomy and have been obtained very good aesthetic results. Three months after the level of gum was kept.

The complications that could arise were biological and technical order. There were no biological complications such as fistula formation, peri-implant mucositis or soft tissue dehiscence. Among the technical occurred complications, in one case was produced the provisional crown fracture.

At the postoperative control carried out at 6 months it was found that implants were stable and radiologically around the implants there is no bone loss. The interdental papillae were present, "black triangles" absent and obtained aesthetic result was satisfactory for patients.

Single implant placement after extraction in the maxillary aesthetic zone proved to be a procedure with a high acceptability and satisfaction from the patients. Patient satisfaction was assessed using a scale from 0-10 (0 - totally unsatisfactory results, 10 -

complete satisfaction). The average value of satisfaction of the patients involved in the study was assessed at 9.143.

## DISCUSSION

The purpose of replacing a single tooth from maxillary the anterior zone is to restore the appropriate function and esthetics without affecting the hard and soft tissues of adjacent structures.

Lindh et al. [28] have described a probability of survival of 97.5% for implants that replace a single tooth. Insertion of the implant immediately after extraction ensures a maximum volume of available bone because it reduces bone resorption which is more pronounced in the maxilla [29].

In agreement with data from the literature to ensure the success of treatment with implants, certain criteria must be met: evaluation of implant space (particularly the mesio-distal space), the assessment of alveolar bone, soft tissue assessment, placement of the implant [8,10].

In connection with the evaluation of the implantation space, in the present cases was performed the replacement of a single upper jaw incisor, so there must be a distance of at least 2 mm to 2.5 mm between the tooth and the implant.

The location of a single implant or its location between two natural teeth, normally requires at least 1.5 mm of alveolar bone between the edge of implant and root [8,13].

From the point of view of the amount of alveolar bone, the implant requires at least 1 mm of vestibular and palatal bone. Interproximal bone requirement varies depending on the existence adjacent teeth of the implant, but should not be less than 1.5 mm [13].

Existence or creation of a strong alveolar bone is necessary to exist a support for the free marginal gingiva and interdental papilla. Around the previous dentition maxillary the



standard distance between the free marginal gingiva and alveolar crest is 3 mm and the distance between the tip of the papilla and interproximal bone (eg papilla height) is about 4.5 mm [15].

The palatal orientation with the maintenance of at least 2 mm of the vestibular bone offers the dentist more flexibility with a final profile and resorption resistant tissues [13,24]. Similarly, an apico-coronal implant position is influenced by these factors.

## CONCLUSIONS

1. Placing a dental implant in the aesthetic zone is a sensitive technique with very little room for error. The placement of the implant in the aesthetic area requires a thorough understanding of anatomical, biological, surgical and prosthetic principles.
2. In the anterior zone of the maxilla, a number of parameters are combined to make the restoration with the implant viable from

aesthetic and functional point of view.

3. The success of treatment depends on the following steps: diagnosis, the sequence of treatment stages, communication to the patient of the diagnosis step by step, the potential side effects of each stage of treatment and aesthetic results, conservation or regeneration of soft tissue, implant placement with specific vestibulo-palatal, apico-coronal, mesio-distal orientation the achievement of provisional prosthesis to complete the outline of the surrounding soft tissue before the final prosthetic treatment.

4. Uploading a single implant in the socket immediately after extraction shortens the total treatment time, fewer surgical interventions, preserves the structure of adjacent teeth

5. In this study, aesthetic and functional results obtained after loading a single implant in the maxillary esthetic was satisfactory both for the patient and the dentist.

## REFERENCES

- 1 Marinello CP, Mayenberg KH, Zitzmann N, Luthy H, Soom U, Imoberdorf M. Single tooth replacement: Some clinical aspects. *J Esthet Dent.* 1997;9:169–178.
- 2 Scheller H., Urgell JP, Kultje C, Klineberg I, Goldberg PV, Stevenson-Moore P, Alonso JM, Schaller M., Corria RM, Engquist B, Toreskog S, Kastenbaum F. & Smith, CR. A 5-year multicenter study on implant-supported single crown restorations. *International Journal of Oral and Maxillofacial Implants,* 1998;13:212–218.
- 3 Romeo E., Chiapasco M., Ghisolfi M., Vogel G. Long-term clinical effectiveness of oral implants in the treatment of partial edentulism. Seven-year life table analysis of a prospective study with ITI dental implants system used for single-tooth restorations. *Clinical Oral Implants Research.* 2002; 13: 133–143.
- 4 Glauser R, Zembic A, Hammerle CH. A systematic review of marginal soft tissue at implants subjected to immediate loading or immediate restoration. *Clinical Oral Implants Research.* 2006;17:(Suppl.2)82–92.
- 5 Harvey, B. V. Optimizing the esthetic potential of implant restorations through the use of immediate implants with immediate provisionals. *Journal of Periodontology.* 2007; 78:770–776.
- 6 Belser UC, Schmid B, Higginbottom F, et al. Outcome analysis of implant restorations located in the anterior maxilla: a review of the recent literature. *Int J Oral Maxillofac Implants.* 2004;19(Suppl):30–42.
- 7 Meijer, H. J., Stellingsma, K., Meijndert, L. & Raghoobar, G. M. A new index for rating aesthetics of implant-supported single crowns and adjacent soft tissues – the implant crown aesthetic index. *Clinical Oral Implants Research.* 2005; 16:645–649.
- 8 Grunder U. Stability of the mucosal topography around single tooth implants and adjacent teeth: 1-year results. *Int J Periodontics Restorative Dent* 2000. 2005, 20:11–17.
- 9 Tarnow DP, Cho SC, Wallace SS. The effect of inter-implant distance on the height of inter-implant bone crest. *J Periodontol .* 2000;71:546–549.

- 10 Kan JYK, Rungcharassaeng K, Umezu K, Kois J. Dimensions of peri-implant mucosa: An evaluation of maxillary anterior single implants in humans. *J Periodontol.* 2003;74:557–562.
- 11 Barbosa F. Patient selection for dental implants. Part 1: data gathering and diagnosis. *J Indiana Dent Assoc.* 2000;79(1):8–11.
- 12 Grunder U, Gracis S, Capelli M. Influence of the 3-D-bone to implant relationship on esthetics. *Int J Periodontics Restorative Dent.* 2005; 25(2):113-119.
- 13 Spray JR, Black CG, Morris HF, Ochi S. The influence of bone thickness on facial marginal bone response: stage 1 placement through stage 2 uncovering. *Ann Periodontol* , 2000; 5(1):119-128.
- 14 Lekovick V, Kenney EB, Weinlaender M et al. A bone regenerative approach to alveolar ridge maintenance following tooth extraction. Report of 10 cases. *J Periodontol.* 1997;68(6): 563-570.
- 15 Kan JY, Rungchassaeng K, Kois JC. Removable ovate pontic for peri-implant architecture preservation during immediate implant placement. *Proct Proced Aesthet Dent* , 2001; 13(9):711-715.
- 16 Choquet V, Hermans M, Adriaenssens P et al. Clinical and radiographic evaluation of the papilla level adjacent to single-tooth dental implants. A retrospective study in the maxillary anterior region. *J Periodontol.* 2001; 72(10):1364-1371.
- 17 Carrion JB, Barbosa IR. Single implant-supported restorations in the anterior maxilla. *Int J Periodontics Restorative Dent*, 2005;25(2):149–55.
- 18 Olsson M, Lindhe J. Periodontal characteristics in individuals with varying form of the upper central incisors. *J Clin Periodontol* , 1991; 18(1):78-82.
- 19 Esposito M, Grusovin MG, Polyzos IP et.al. Intervention for replacing missing teeth:dental implants in fresh extraction sockets (immediate, immediate-delayed and delayed implants). *Cochrane Database Syst Rev.*2010(9):CD005968.
- 20 Cairo F, Pagliaro U, Nieri M. Soft tissue management at implant sites. *J Clin Periodontol.* 2008; 35(8 Suppl):163-167.
- 21 Buser D, Martin W, Belser UC. Optimizing esthetics for implant restorations in the anterior maxilla: anatomic and surgical considerations. *Int J Oral Maxillofac Implants*, 2004;19(Suppl):43–61.
- 22 Bouri Jr A, Bissada N, Al-Zahrani NS et al.Width of keratinized gingiva supporting tissues around dental implants. *Int J Oral Maxillofac Implant.*2008; 23(2):323-326.
- 23 Sullivan DY, Sherwood RL. Considerations for successful single tooth implant restorations. *J Esthet Dent*, 1993;5(3):118–24.
- 24 Kois JC. The restorative-periodontal inter-face: Biological parameters. *Periodontol* 2000, 1996;11:29–38.
- 25 Saadoun AP, LeGall M, Tonati B. Selection and ideal tridimensional implant position for soft tissue aesthetic. *Pract Periodontics Aesthet Dent.*1999;11(9):1063-1072.
- 26 Davarpanah M, Martinez H, Celletti R, et al. Three-stage approach to aesthetic implant restoration: emergence profile concept. *Pract Proced Aesthet Dent*, 2001;13(9):761–7.
- 27 Tischler M. Dental implants in the esthetic zone. Considerations for form and function. *NY State Dent J* , 2004;70(3):22–6.
- 28 Lindh, T., Gunne, J., Tillberg, A. & Molin, M. A meta-analysis of implants in partial edentulism. *Clinical Oral Implants Research*, 1998, 9:80-90
- 29 Covani, U., Crespi, R., Cornelini, R. & Barone, A. Immediate implants supporting single crown restoration: a 4-year prospective study. *Journal of Periodontology*, 2004 ,75: 982–988.