

# The Effect of Immediate Implant Placement and Immediate Loading on Interdental Papillae Heights in Single Implants and Adjacent Implants

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## Abstract

This study purposed to evaluate papilla height changes after immediate implant placement and loading in single implants and adjacent implants. A total of 33 implants were placed immediately to the extraction sockets and all the implants were immediately loaded. While 16 of implants were single (SI), 17 of implants were adjacent to another (AI) with 2 different implant brands/types (Astra Tech and Biohorizons). Papilla height measurements were obtained by measuring the distance between implant shoulder and papilla tip for single implants and adjacent implants seperately. The measurements were recorded every 1. week, 1. month and 4. month. The Pink Esthetic Score (PES) was also used to evaluate the soft tissue appearance. Each parameter was assessed with a score of between 0-2, while a total score of 8 was acceptable 12 was the excellent. No statistically difference was found between 2 implant brands/types. ( $p>0.05$ ) The comparison of papilla heights between single implants and adjacent implants were found statistically different. ( $p<0.01$ ) It was found while the interdental papilla was increasing between tooth and implant; was decreasing between implants. For adjacent implants a mean PES of 8.57 was obtained, considered to be an acceptable esthetic score. For single implants a mean PES of 11.72 was obtained. Immediate implant treatment process is an effective approach to maintain the soft tissue esthetics, has similar survival rates when compared to conventional methods; however, the single implant scenario demonstrated better clinical esthetic results than those implants adjacent to another.

## Introduction

Teeth are lost for a variety of reasons, including dental caries, periodontal disease, endodontic failure, and trauma. In addition, teeth may be removed as part of prosthodontic and orthodontic treatment processes [1]. Teeth, more specifically tooth roots, when they are able to be restored and saved in the dental arch, may reduce the loss of bone and prevent soft tissue volume. The literature reports that the level of the bone height influences the presence and volume of interdental papillae between teeth and dental implants [2].

Rehabilitation of teeth loss in the anterior maxilla is typically more difficult than in other regions in the mouth because of esthetic considerations and mechanical difficulty. Tooth-supported or implant-supported fixed partial dentures are the most common options [3]. However, the elimination of tooth preparation, placing, and loading immediately of dental implants make implant-supported prostheses more popular [4].

Following tooth extraction, significant bone loss starts in the first month and continues for at least 6 months [2,5,6]. This loss in bone volume also affects soft tissue height and may be responsible for the reduction of the gingival papillae. Several treatment protocols, such as ridge preservation with bone grafts [7], flap design modification, soft tissue specific grafts, including sub-epithelial connective tissue grafts [8,9] immediate implant placement and loading, provisionalization contouring of the provisional crowns, and orthodontic extrusion [10] help to reduce the loss of papillae.

The current literature reports that implants placed immediately after extraction have similar survival rates as implants placed with early or delayed protocols [11-13]. However; waiting for healing after extraction of teeth will result in bone and soft tissue loss, as discussed above. Placing implants after the bone heals in the anterior segment can result in longer crowns and shorter implants than expected and the

interdental papillae will typically appear as triangular black areas because of the loss soft tissue. The main cause of the loss of gingival papillae is the flattened bone surface in the anterior maxilla, which occurs after tooth extractions. In these situations, restoration-induced illusions will help to close some parts of the black areas. Clinically, this view is undesirable for patients. Immediate implant placement has several favorable outcomes, such as decreasing the treatment time, reducing the number of surgeries, and decreasing the risk of hard and soft tissue resorption [14-15]. On the other hand, immediate loading becomes a necessary process for anterior maxilla. Although there are different techniques for provisional prostheses during the healing time period (removable or adhesively luted dentures) [16-17], immediate loading will provide comfort and will reshape the interdental papillae.

The aim of this study is to evaluate the preservation of peri-implant soft tissues after residual root extraction, the immediate placement of two different types of implant brands (Astra Tech and Biohorizons), and implant loading.

## Materials and Methods

Data associated with implants placed immediately in the maxilla were collected with a prospective study design. The implants were placed between March 2010 and January 2011, in Baskent University Dental Clinics, Umitkoy, Turkey. A single surgeon placed all of the implants and all of the prostheses were completed by a single prosthodontist.

Patients were included in the study based on the following criteria:

I: All or almost all crowns lost due to endodontic failure or caries

II: Implant placement and loading in the maxillary anterior or premolar sites following residual root extraction

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III: Single implants or adjacent implants (two or three implants)

IV: Adequate socket conditions subsequent to root removal

V: Non-contributory medical health

VI: Spaces larger than 1.5 mm observed between the implants and the sockets

Chlorexidinedigluconate (0.2%) oral disinfectant mouthwash was utilized prior to surgery. In total, 33 roots were extracted from 23 patients (11 female and 12 male) and 33 implants were placed. Implants were placed adjacent to each other (17) or single (16) according to areas where roots were extracted and two different implants were placed (Astra Tech AB, Mölndal, Sweden; Biohorizons, Birmingham, AL, USA). Antibiotic coverage was provided after implant placement (amoxicillin/clavulonic acid 1 g, twice a day for 5 days or azithromycin 500, once a day for 3 days), in addition to analgesic medication (ibuprofen, 600 mg every 6 hours for 2 days after placement).

The teeth or roots were extracted with minimal trauma using periostomes (Astra Tech AB, Mölndal, Sweden). Granulation tissue and other remnants were removed and extraction socket curettage was performed. All implants were placed with a 1-stage procedure at the time of extraction. All implants were placed with a minimum of 30 N cm placement torque. A flapless procedure was utilized in all instances. Incisions or damage to the interdental papillae were avoided.

Immediately following the implant placement, impression copings were positioned and impressions were made with condensation silicone (Speedex, Coltene/Whaledent AG, Altstätten, Switzerland). An irreversible hydrocolloid impression (Blueprint Cremix, Dentsply De Trey, GmbH, Konstanz, Germany) was made of the opposing dentition. All impressions were poured with type IV dental stone (Amberok, Anadolu Dental Products, İstanbul, Turkey) and the casts were articulated on a semi-adjustable articulator (ProtarEvo 2, Kavo, Birberbach, Germany) via an interocclusal record. Provisional restorations were fabricated using autopolymerizing resin (3M ESPE, St. Paul, MN, USA) and delivered on the same day as the surgery. All provisional crowns and fixed partial dentures were cemented with provisional cement (TempBond Clear, Kerr Corporation, Orange, CA, USA).

All patients were reviewed after 1 week, 1 month, and 4 months. At each recall appointment, the provisional restorations were removed, cleaned, and adjusted to the improved soft tissue contours, as necessary. For six patients showing pontic space reshaping, new impressions were obtained and new provisional restorations were fabricated to adapt to the new contours. Definitive implant restorations were delivered at the end of study (at 4–6 months).

The measurements were recorded using a periodontal probe (CP 15 UNC, Hu Friedy® Chicago, IL, USA). Papilla height measurements were recorded between the implant shoulder and the papilla tip. Following removing of provisional crowns at every appointment (1 week, 1 month, and 4 months), the papilla height measurements were recorded. Papilla height measurements were recorded separately in the mesial and

distal areas and evaluated in two main groups: papillae between implant-tooth (I-T) or papillae between implant-implant (I-I). For single implants, all measurements were recorded between I-T (mesial and distal sites). For adjacent implants, all measurements were recorded between I-I (mesial and distal sites). A non-parametric Mann-Whitney U test was applied to detect the papilla measurement differences between the I-T and I-I groups in addition to the difference between implant types (Astra Tech and Biohorizons).

The Pink Esthetic Score (PES) described by Fürhauser et al. [18] was used to evaluate the appearance of soft tissues adjacent to the implants. This index includes seven variables: mesial papillae, distal papillae, midfacial level, midfacial contour, alveolar process deficiency, soft tissue color, and soft tissue texture. Each parameter is assessed with a score of between 0 and 2, with 2 being the best and 0 being the worst. A total score of 8 was considered acceptable, with a score of 12 being considered excellent [19].

## Results

A total of 33 roots were extracted from 23 patients and 33 implants were placed immediately single or adjacent to another. A success rate of 100% was observed in 33 implants over 4 months in this study with immediate placement and loading protocol. According to the data, 23 mesial and 23 distal measurement were recorded for I-T and 10 mesial and 10 distal measurements were recorded for I-I. According to the results of the test, except for mesial measurements in the first week, papilla height measurements between the I-I and I-T groups showed a significant difference ( $p < 0.01$ ). The papilla level results between the I-I and I-T groups were compared according to the sites (mesial and distal). In mesial site, we found that there were differences between the groups ( $F_1, 31=54,587$ ;  $p < 0.001$ ). When compared between themselves ( $F_1, 31=32,344$ ;  $p < 0.001$ ), we found that the papilla levels in the I-T groups of the mesial sites increased while the papilla levels in the I-I groups of the mesial sites decreased. For the distal site, the papilla levels between the I-I and I-T groups were found to be statistically different ( $F_1, 31=45,466$ ;  $p < 0.001$ ). According to the results, while the gingival papilla levels between the I-T groups were increasing, the gingival papilla levels between I-I were decreasing ( $F_1, 31=20,680$ ;  $p < 0.001$ ). According to the papilla measurements for the I-T groups, an increase in papilla height of 0.75 mm was observed for the mesial site and an increase of 0.43 mm was found for the distal site at the end of the fourth month. On the other hand, a 1.60 mm reduction for the mesial site and a 1.40 mm reduction for the distal site were observed for the I-I groups.

*Graph 1* shows the increase in papilla heights for the I-T groups for the mesial and distal sites; *Graph 2* shows the decrease in papilla heights in the I-I groups. Also, the Mann-Whitney U test was used to determine the difference between the implant brands (Astra Tech and Biohorizons). According to the results of this test, no significant difference was found between the two implant brands ( $p > 0.05$ ).

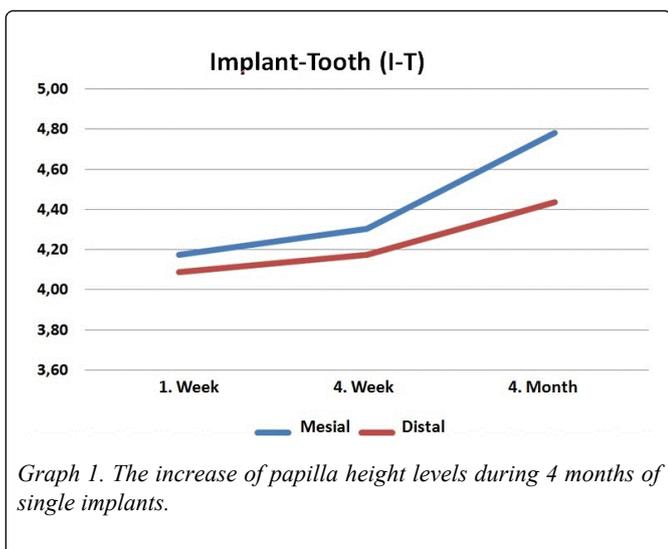
## Discussion

The immediate placement of implants and the loading provide many benefits, including a shortened treatment time, the elimination of second-stage surgery, convenience of fixed provisional prostheses delivered on the day of implant placement, and the opportunity to contour peri-implant soft tissue. The comparison of the effect of immediate loading with gingival papilla heights in single implants and implants adjacent to one another at the same time differentiates this study different others. Furthermore, two different brands of implants were compared with respect to immediate loading and papilla heights.

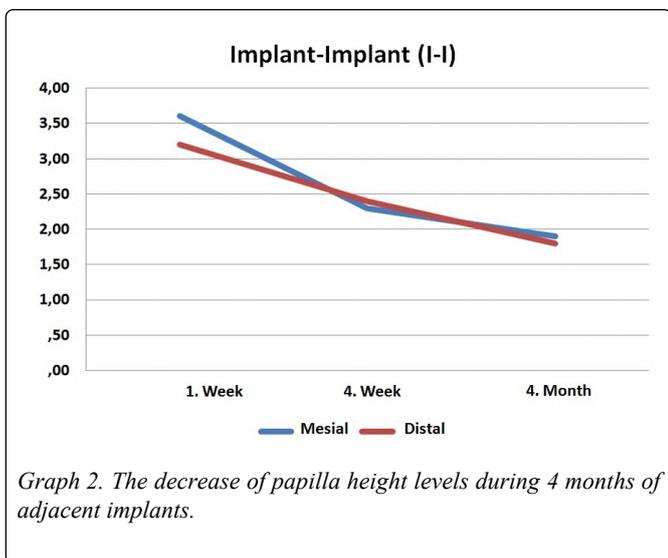
Peri-implant soft tissue level is influenced by interproximal bone level [20]. After tooth extraction, soft tissue resorption will occur with bone resorption during the healing time period. However, immediate implant placement may preserve peri-implant soft and hard tissue [21-23]. Furthermore, it was shown that applying well-controlled pressure by provisional restorations to the peri-implant soft tissue will facilitate interdental papilla formation and maturation [24-25]. Galucci et al. [26] reported that the placement of implant restoration can increase papilla heights as well.

A peri-implant bone loss of 0.2–0.5 mm in 1 year for immediately placed implants [27-28] is in the normal range. In the single implant placement study of Kan et al. [27], after immediate implant placement and provisionalization, 0.53 and 0.40 mm mesial and distal papilla recession levels were found. In another study, Pieri et al. [29] found that although marginal bone loss was observed (0.51 mm), no papilla recession was found. Koh et al. [23] found similar results as Pieri et al. (i.e., they found no soft tissue changes). However, there are other studies that advocate increasing papillae heights with the help of soft tissue pressure provided by the immediate implant supported restoration [17,24,25]. Cosyn et al. [19] placed implants into extraction sockets immediately and re-evaluated patients for three years. These authors found that papilla heights increased between the first- and third-year follow-ups. In the present study, 0.75 and 0.43 mm (mesial and distal) increased papilla levels were found for I-T and 1.60 and 1.40 mm (mesial and distal) reductions were found for the I-I groups. Provisional abutments were used and provisional crowns were delivered on the same day of the surgery. Provisional crowns were adjusted to the soft tissues and the interdental papilla areas. Controlled pressure was applied to the mesial and distal papillae. At the end of the first week, all patients were recalled and provisional prosthesis were removed, adjusted to the soft tissues, and recemented. *Figure 1* shows the patients' treatment process. The provisional restorations were adjusted at each follow-up appointment, as needed.

There are many factors that affect the peri-implant soft tissue: implant fixture angle, the interproximal bone level, depth of implant, and distance from crown contact point to the bone [27]. Furthermore, there are some differences between tooth and implant soft tissues [10]. Soft tissues around implants have larger collagen tissues and lower fibroblast cells compared with soft tissues around teeth. Fewer blood vessels are observed around osseointegrated implants and



Graph 1. The increase of papilla height levels during 4 months of single implants.



Graph 2. The decrease of papilla height levels during 4 months of adjacent implants.

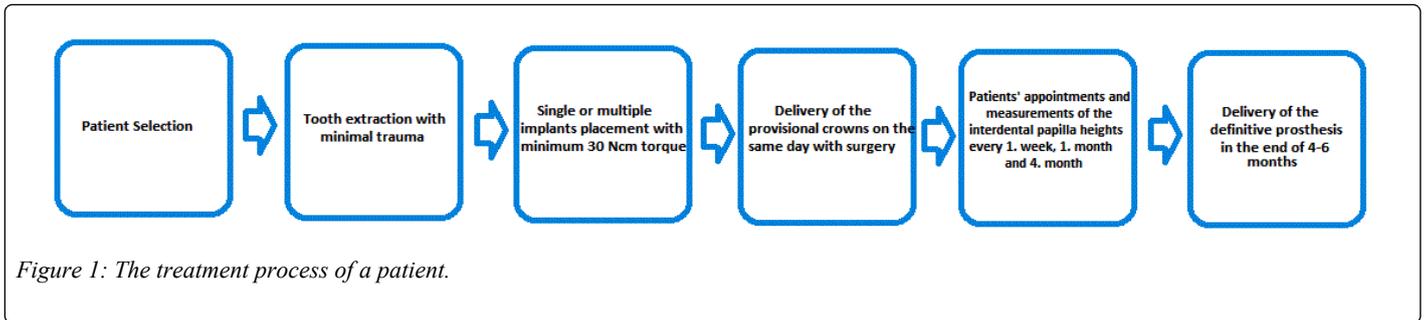
For adjacent implants, we obtained a mean PES of 8.57, which is considered to be an acceptable esthetic score. 85.8% of implants in the adjacent implant group scored an acceptable PES (between 8 and 10), while 14.2% of the adjacent implants scored in the unacceptable range of less than 8.

Table 1. Pink Esthetic Score (PES) scores of adjacent implants (AI) and single implants (SI).

	Below 8	08-Nov	12 or more
SI	9.1	22.72	68.18
AI	14.2	85.8	0

None of the adjacent implants exhibited an excellent esthetic outcome (a value of 12 or more). For single implants, a mean PES of 11.72 was obtained. 68.18% of implants in the single group exhibited a score of 12 or more. An additional 22.7% of implants exhibited scores of between 8 and 12, considered acceptable; 9.1% of implants scored lower than 8 and were considered unacceptable. The PES numbers for single implants were higher than those scored for adjacent implants (Table 1).

implants typically placed under the line of the alveolar bone level [10].



In the present study, single implants and adjacent implants were compared. While increasing interdental papilla heights in single implants were found (0.75 mm; 0.43 mm), a decrease in interdental papilla levels between implants (1.60 mm; 1.40 mm) was found, which supports the explanations discussed above. The vital environment, which surrounds the tooth and includes the periodontium, cement, larger collagen tissues, and blood vessels, may cause increased soft tissue height around the teeth. The interproximal bone level maintained by the adjacent teeth can contribute to the better PESs and the significant increase in papilla height in the single implant groups.

We have found that where the inter-implant distance is less than 3 mm, bone resorption and interdental papilla recession can be seen [30]. An inter-implant distance of 3 mm or more is recommended to preserve bone and interdental papilla heights [31,32]. In the present study, in the I-I groups, implants were placed an inter-implant distance of 3 mm or more.

In the present study, two different implant designs were compared. The Astra Tech implant system has a surface with TiOblast combined with fluoride called Osseospeed, micro threads on the surface, and a conical seal design. Astra Tech implant systems also have an abutment connection with platform switching. The platform switching concept is based on drawing away inflammatory cells from the bone and moving stress concentrations away from the coronal bone-implant surface. The abutment diameter is smaller than the implant platform in platform switching implants, which allows for positioning of the implant-abutment connection – the known “microgap” – away from the bone. On the other hand, Biohorizons Laser-Lok implants have microchannels to create connective tissue attachments [33,34] and have biocompatible, resorbable blast media surfaces, a tapered implant body, and buttress threads that are larger and wider. Biohorizons implants also have a gold-coated abutment surface that is biocompatible with soft tissue. Although Astra Tech implants are produced from Grade 4 CP titanium, Biohorizons implants are produced from Ti-6Al-4V alloys. No difference was found between that two different implants; both showed statistically acceptable results and the survival rates of both implants were 100%.

The short time control period can be thought as a limitation of this study. However, after the definitive denture was delivered to the patient, the healing of patient was treated as finished. We maintain that following the healing of patients' soft tissues is not meaningful.

## Conclusions

In the present study, teeth were extracted and implants were placed into the fresh extraction sockets and loaded in the same day. Increased papilla levels were found in the single-implant groups. However, the inter-implant papillae showed a reduction at the 4-month follow-up in the adjacent implants groups. The PESs for single implants were higher than those for adjacent implants. Within the limitations of the current research, the structural and anatomical differences between implant and tooth can cause differences in PESs. An immediate implant treatment process is an effective approach to maintain the soft tissue esthetics and has similar survival rates when compared with conventional methods. However, the single implant scenario showed better clinical esthetic results than implants located adjacent to one another.

## References

1. Valentini P, Abensur D, Albertini JF, Rocchiesani M. Immediate provisionalization of single extraction-site implants in the esthetic zone: a clinical evaluation. *International Journal of Periodontics and Restorative Dentistry*. 2010; **30**: 41-51.
2. Choquet V, Hermans M, Adriaenssens P, Daelemans P, Tarnow DP, Malevez C. Clinical and radiographic evaluation of the papilla level adjacent to single-tooth dental implants. A retrospective study in the maxillary anterior region. *Journal of Periodontology*. 2001; **72**: 1364-1371.
3. Bruno V, Badino M, Sacco R, Catapano S. The use of a prosthetic template to maintain the papilla in the esthetic zone for immediate implant placement by means of a radiographic procedure. *Journal of Prosthetic Dent*. 2012; **108**: 394-397
4. Finne K, Rompen E, Toljanic J. Three-year prospective multicenter study evaluating marginal bone levels and soft tissue health around a one-piece implant system. *The International Journal of Oral & Maxillofacial Implants*. 2012; **27**: 458-66.
5. Van der Weijden F, Dell'Acqua F, Slot DE. Alveolar bone dimensional changes of post-extraction sockets in humans: a systematic review. *Journal of Clinical Periodontology*. 2009; **36**: 1048-1058.
6. Araújo MG, Wennström JL, Lindhe J. Modeling of the buccal and lingual bone walls of fresh extraction sites following implant installation. *Clinical Oral Implant Research*. 2006; **17**: 606-614.
7. Lasella JM, Greenwell H, Miller RL, Hill M, Drisko C, Bohra AA, Scheetz JP. Ridge preservation with freeze-dried bone allograft and a collagen membrane compared to extraction alone for implant site development: a clinical and histologic study in humans. *Journal of Periodontology*. 2003; **74**: 990-999.
8. Zucchelli G, De Sanctis M. The papilla amplification flap: a surgical approach to narrow interproximal spaces in regenerative procedures. *International Journal of Periodontics and Restorative Dentistry*. 2005; **25**: 483-493.

9. Gomez-Roman G. Influence of flap design on peri-implant interproximal crestal bone loss around single-tooth implants. *The International Journal of Oral & Maxillofacial Implants.* 2001; **16**: 61-67.
10. Chow YC, Wang HL. Factors and techniques influencing peri-implant papillae. *Implant Dentistry.* 2010; **19**: 208-219.
11. Interventions for replacing missing teeth: dental implants in fresh extraction sockets Immediate, immediate-delayed and delayed implants. The Cochrane Collaboration. 2010 Published by John Wiley & Sons, Ltd.
12. Hans-Peter Weber, Dean Morton, German O. Gallucci, Mario Rocuzzo, Luca Cordaro, Linda Grütter. Consensus Statements and Recommended Clinical Procedures Regarding Loading Protocols. Fourth ITI Consensus Conference August 26-28, 2008, Stuttgart, Germany.
13. Christoph H. F. Hämmerle, Stephen T. Chen, Thomas G. Wilson. Consensus Statements and Recommended Clinical Procedures Regarding the Placement of Implants in Extraction Sockets. *The International Journal of Oral & Maxillofacial Implants.* 2004; **19**: 12-25.
14. De Rouck T, Collys K, Cosyn J. Single-tooth replacement in the anterior maxilla by means of immediate implantation and provisionalization: a review. *Int J Oral Maxillofac Implants.* 2008; **23**: 897-904.
15. Chen ST, Darby IB, Reynolds EC, Clement JG. Immediate implant placement postextraction without flap elevation. *Journal of Periodontology.* 2009; **80**: 163-72
16. Boff LL, Oderich E, Cardoso AC, Magne P. Retrofitting a tooth-supported crown with an implant and abutment: a clinical report. *Journal of Prosthetic Dentistry.* 2010; **103**: 262-6
17. Ozdemir E, Lin WS, Erkut S. Management of interproximal soft tissue with a resin-bonded prosthesis after immediate implant placement: a clinical report. *Journal of Prosthetic Dentistry.* 2012; **107**: 7-10.
18. Fürhauser R, Florescu D, Benesch T, Haas R, Mailath G, Watzek G. Evaluation of soft tissue around single-tooth implant crowns: the pink esthetic score. *Clinical Oral Implants Research.* 2005; **16**: 639-644.
19. Cosyn J, Eghbali A, De Bruyn H, Collys K, Cleymaet R, De Rouck T. Immediate single-tooth implants in the anterior maxilla: 3-year results of a case series on hard and soft tissue response and aesthetics. *Journal of Clinical Periodontology.* 2011; **38**: 746-753.
20. Nisapakultorn K, Suphanantachat S, Silkosessak O, Rattanamongkolgul S. Factors affecting soft tissue level around anterior maxillary single-tooth implants. *Clinical Oral Implants Research.* 2010; **21**: 662-670.
21. Denissen HW, Kalk W, Veldhuis HA, van Waas MA. Anatomic consideration for preventive implantation. *The International Journal of Oral & Maxillofacial Implants.* 1993; **8**: 191-6.
22. Watzek G, Haider R, Mensdorff-Pouilly N, Haas R. Immediate and delayed implantation for complete restoration of the jaw following extraction of all residual teeth: a retrospective study comparing different types of serial immediate implantation. *The International Journal of Oral & Maxillofacial Implants.* 1995; **10**: 561-7.
23. Koh RU, Oh TJ, Rudek I, Neiva GF, Misch CE, Rothman ED, Wang HL. Hard and soft tissue changes after crestal and subcrestal immediate implant placement. *Journal of Periodontology.* 2011; **82**: 1112-1120.
24. Kim TH, Cascione D, Knezevic A. Simulated tissue using a unique pontic design: A clinical report. *Journal of Prosthetic Dentistry.* 2009; **102**: 205-210.
25. Kim TH, Cascione D, Knezevic A, Nowzari H. Restoration using gingiva-colored ceramic and a ridge lap pontic with circumferential pressure: a clinical report. *Journal of Prosthetic Dentistry.* 2010; **104**: 71-76.
26. Gallucci GO, Grütter L, Chuang SK, Belser UC. Dimensional changes of peri-implant soft tissue over 2 years with single-implant crowns in the anterior maxilla. *Journal of Clinical Periodontology.* 2011; **38**: 293-9.
27. Kan JY, Rungcharassaeng K, Lozada J. Immediate placement and provisionalization of maxillary anterior single implants: 1-year prospective study. *The International Journal of Oral & Maxillofacial Implants.* 2003; **18**: 31-9.
28. Cornelini R, Cangini F, Covani U, Wilson TG Jr. Immediate restoration of implants placed into fresh extraction sockets for single-tooth replacement: a prospective clinical study. *International Journal of Periodontics and Restorative Dentistry.* 2005; **25**: 439-447.
29. Pieri F, Aldini NN, Marchetti C, Corinaldesi G. Influence of implant-abutment interface design on bone and soft tissue levels around immediately placed and restored single-tooth implants: a randomized controlled clinical trial. *The International Journal of Oral & Maxillofacial Implants.* 2011; **26**: 169-178.
30. Gastaldo JF, Cury PR, Sendyk WR. Effect of the vertical and horizontal distances between adjacent implants and between a tooth and an implant on the incidence of interproximal papilla. *Journal of Periodontology.* 2004; **75**: 1242-6.
31. De Almeida FD, Carvalho AC, Fontes M, Pedrosa A, Costa R, Noleto JW, Mourão CF. Radiographic evaluation of marginal bone level around internal-hex implants with switched platform: a clinical case report series. *The International Journal of Oral & Maxillofacial Implants.* 2011; **26**: 587-592.
32. Elian N, Bloom M, Dard M, Cho SC, Trushkowsky RD, Tarnow D. Effect of Interimplant distance (2 and 3 mm) on the height of interimplant bone crest: a histomorphometric evaluation. *Journal of Periodontology.* 2011; **82**: 1749-1756.
33. Nevins M, Nevins ML, Camelo M, Boyesen JL, Kim DM. Human histologic evidence of a connective tissue attachment to a dental implant. *International Journal of Periodontics and Restorative Dentistry.* 2008; **28**: 111-21.
34. Frenkel SR, Simon J, Alexander H, Dennis M, Ricci JL. Osseointegration on metallic implant surfaces: effects of microgeometry and growth factor treatment. *Journal of Biomedical Materials Research.* 2002; **63**: 706-13.