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RESEARCH ARTICLE

MARGINAL BONE LOSS AROUND IMMEDIATE DENTAL IMPLANTS IN MANDIBULAR MOLAR REGION WITH SYNTHETIC HYDROXYAPATITE GRAFT OR AUTOGENOUS GRAFT

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ABSTRACT

Purpose: The present study is designed to evaluate the marginal bone loss after immediate implant placement in mandibular molar region with autogenous versus synthetic hydroxyapatite graft.
Materials and Methods: Twenty-four adult patients with an mandibular molar is indicated for extraction were included in this study. Patients were divided into 2 groups: group I, received immediate implants augmented with autogenous bone graft and group II, received immediate implants augmented with synthetic hydroxyapatite graft. Implant success, plaque index PI, and bleeding index BI, and marginal bone loss MBL were evaluated.
Results: All the implants were successfully osseointegrated over 18 months. The results of the present study showed that at 18 months the mean values of MBL were 1.15±0.14 in group I, 1.20±0.14 in group II, there were no statistical differences between the test and control group regarding, BI, PI, and MBL through follow- up periods.
Conclusion: Autogenous and synthetic Hydroxyapatite graft could be used effectively with immediate placement of dental implants into Fresh Extraction sockets in mandibular molar region.

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INTRODUCTION

Immediate implant placement in postextraction sites, is a treatment modality that has received much attention, and has shown favorable results1-6. In animal 7, 8 and human9 studies, it was shown that immediate postextraction implant placement failed to prevent the natural bone resorption that occurred in the socket walls and especially in the buccal wall. In cases where the distance between the implant and the extraction socket is less than 2 mm, spontaneous bone healing can be expected without the necessity for additional grafting procedures. However, if the distance is larger than 2 mm, then grafting procedures are necessary 10–13. Although limited data are available on the different protocols used for grafting in these cases, the grafting of extraction sockets is a well-established treatment modality.11-14 Autogenous grafts are still considered the gold standard to which all other biomaterials are compared (Dimitriou *et al*., 2011). However, the use of autogenous tissue involves the need of harvesting it from a donor site, with the consequent drawbacks in terms of costs, procedure time, patient discomfort and possible complications (Zouhary, 2010). To overcome these limitations, a variety of exogenous substitute materials, including allografts, xenografts and alloplasts have been introduced in clinical practice (Bauer and Muschler, 2000; De Long *et al*., 2007). HA is the most studied calcium phosphate and it has been used clinically in dental, craniofacial and orthopedic surgery 19-22. The present study is designed to evaluate the marginal bone loss after immediate implant placement in mandibular molar region with autogenous versus synthetic hydroxyapatite graft.

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MATERIALS AND METHODS

All patients were asked to sign surgical consent forms. The study protocol was approved by an ethical committee of Al-Andalus University of Medical Sciences. Twenty-four adult patients (16 females and 8 males) ranging in age 33-55 years with an mandibular molar is indicated for extraction were included in this study. Patients were divided into 2 groups: group (I), received immediate implants augmented with autogenous bone graft, and group II received immediate implants augmented with synthetic hydroxyapatite graft. All patients in this study were at physically able to tolerate the procedure, had to be in good health, with no chronic disease or smoking habits. Patients were excluded if any of the following were evident: any disease, condition, or medication that might compromise healing or osseointegration; or inability or

unwillingness to return for follow-up visits. All implants in this study were Advanced implants (Advanced®, Syria). Primary stability (torque 25 N/cm) of the implants was achieved during the surgical procedure. The dimensions ranged 12 to 14 mm in length and 4.9 mm in diameter.

Surgical procedure

One hour before surgical procedure, patients began a prophylactic regimen of 600 mg clindamycin. All procedures were performed after the administration 3.6-5.4 ml of combination consisting of a local anesthesia (MepevacaineHcl 2%) and a vasoconstrictor (Levonordefrin) at ratio of 1:20,000. Full-thickness mucosal flaps were raised, and then the teeth were gently extracted by extraction forceps, with minimum surgical trauma and without any damage to the adjacent hard tissues. The bony sockets were then carefully debrided with a sharp curette to remove any granulation or fibrous tissue present and irrigated with sterile saline. Integrity of the socket walls and socket depth from the alveolar crest of bone to the socket apex were checked with the osteotomy probe. Depth of the socket was measured to determine the drilling needed after the root apex. Osteotomies were performed via standard protocols in all cases, including, slow-speed sequential drills, and copious irrigation. Drilling extended at least 3-5 mm beyond the root apex. Implants were manually screwed into the prepared osteotomies at the crestal ridge. Implant stability was monitored and noted upon placement. After screwing the implants, the space between the alveolar bone and the implants filled withautogenous bone graft collected from retromolar area in group (I), and with synthetic hydroxyapatite graft in group (II)without using barrier membranes . Closure of the wound was obtained by coronal repositioning of the flap. Fig 1,2

Postoperative Phase

Post-operative instructions were given to the patients, which included extra-oral ice packs application for 2 hours on the first day to minimize oedema, oral hygiene instructions including warm 0.2% ChlorhexidineHcl as an antiseptic mouthwash twice daily for 7 days, to continue the use of 300 mg clindamycin orally every 6 hours postoperatively for five days and to take ibuprofen 600 mg twice daily for 7-10 days. A direct digital panoramic radiograph was taken immediately after implants placement to evaluate the implants position. Patients were recalled after 1 week for the removal of sutures and to assess the presence of any pain, swelling, or infection. After a healing period of 6 months, the second-stage surgical procedure was performed with the placement of a healing abutment on the implant. Prosthetic rehabilitation started 2 weeks after the second stage surgical procedure, in which the prosthesis were cemented with temporary cement.

Follow-up Phase

A-Clinical Evaluation

All patients were examined immediately after surgery and during the first week to check if there was pain, discomfort, swelling, or infection. The plaque index PI and bleeding index BI were used for clinical evaluation at 12 and 18 months after implant placement. In accordance with Mombelli *et al*. (1987)

B-Radiographic Evaluation

Radiographic examinations with digital panoramic radiographs were performed directly after surgery (baseline) and at 6,12 and 18 months. The reference for the measurements was the implant-abutment interface. The saved image was opened in Image J program. The scale was determined in reference to the known implant length. From "Analyze" command, "Set Scale" command was selected to convert pixels dimension to millimeters. A line was drawn from the implant apex to the implant shoulder. The length of the implant was measured and compared to the real implant length to determine the magnification factor in the image. The distance from the implant apex to the first seen point of Bone Implant Contact was measured. The difference between it and the implant length represents vertical marginal bone defect. The measurements were noted mesially and distally and the mean was calculated in mm according to the magnification factor of the image. All the measurements were taken three times then, the mean was calculated. In accordance with Buser *et al*. (1990) an implant was classified as having survived if the following parameters were met: (1) absence of recurring peri-implant infection with suppuration; (2) absence of persistent subjective complaints such as pain, foreign body sensation, and/or dysesthesia; (3) absence of a continuous radiolucency around the implant; and (4) absence of any detectable implant mobility.

Data analyses

The statistical analyses were performed using SPSS version 17 software (SPSS Inc., Chicago, IL, USA). Comparison between quantitative variables were carried out by Student t-test of two independent samples. The results were considered to be significant at P- values less than 0.05.

RESULTS

All patients showed good compliance and the healing period was uneventful for both treatment groups without infection or complications. The survival rate was 100% in the two groups and none of the implants lost osseointegration through follow up periods. Baseline analysis of marginal bone loss showed no significant differences between group I and group II, thus allowing post-treatment results to be compared.

Plaque Index (PI)

There were no significant differences between the two groups at 12 and 18 months, at 5% level (P>0.05), (Table 1), mean plaque index values were 0.64±.0 36 in group I, 0.79±0.25 in group II at 12 months ,and they were 0.70±0.53 in group I, 0.81±0.5 in group II at 18 month

Bleeding index BI

There were no significant differences between the two groups groups at 12 and 18 months, at 5% level (P>0.05), (Table 1), mean Bleeding index values were 0.64±0 36 in group I, 0.70±0.53 in group II at 12 months and they were 0.70± 0.53 in group I , 0.85±0.85in group II at 18 months

Marginal bone loss MBL

There were no significant differences between the two groups groups at 6,12 and 18 months, at 5% level (P>0.05), (Table 2),

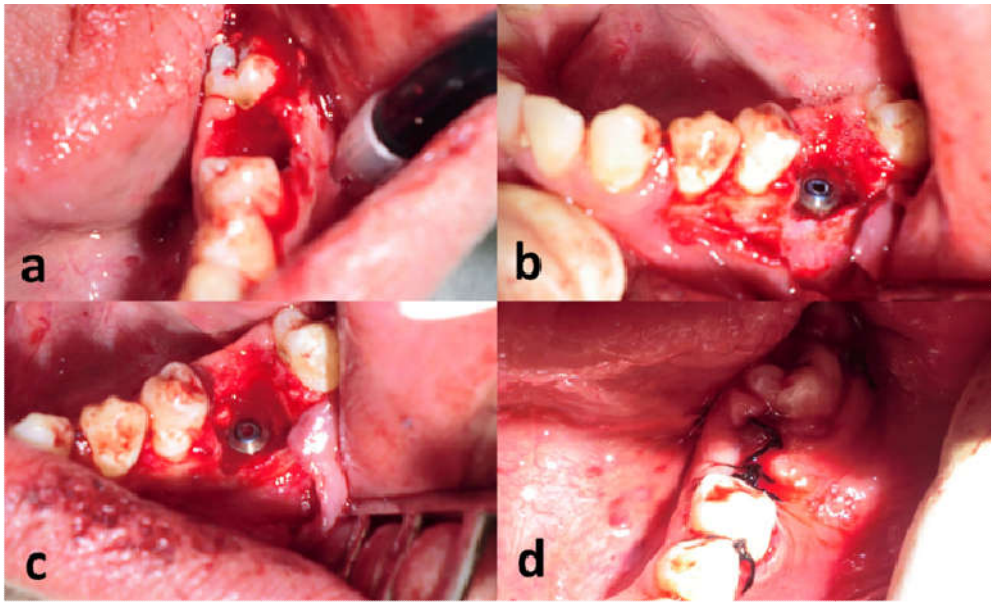

Fig. 1. (a) After extraction. (b) implant placement (c) grafting. (d) after suturing (group I)

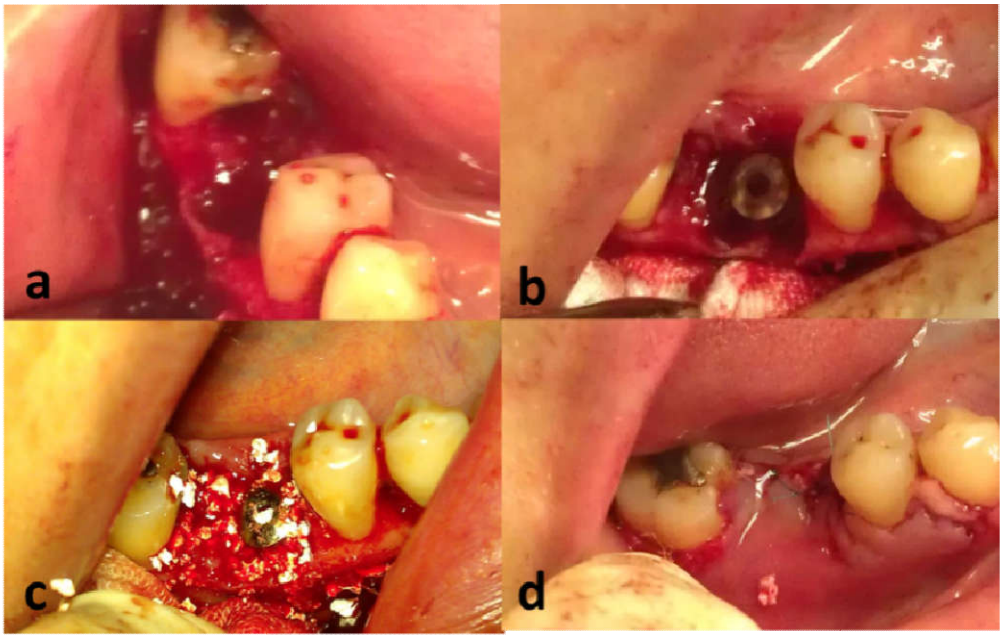

Fig. 2. (a) After extraction. (b) implant placement (c) grafting. (d) after suturing (group II)

Table 1. Mean± SD and t test of plaque index (PI) ,bleeding index (BI) in the tested groups (I and II) during different observation periods

	PI			BI		
	I	II	P value	I	II	P value
12mo.	0.64±.0 36	0.79±0.25	.076	0.64±0.36	0.85±0.27	0.267
18mo.	0.70±0.53	0.81±0.54	1.00	0.70±0.53	0.85±0.85	0.640

Table 2. Mean± SD and t test of marginal bone loss (MBL) in the tested groups (I and II) during different observation periods

	MBL		
	I	II	P value
Baseline	0.03±0.05	0.04±0.06	0.670
6mo.	0.38±0.12	0.34±0.11	0.505
12mo.	0.89±0.09	0.90±0.08	0.771
18mo.	1.15±0.14	1.20±0.14	0.472

mean Marginal bone loss were 0.38±0.12 in group I, 0.34±0.11 in group II at 6 months, 0.89±0.09 in group 0.90±0.08 in group II at 12 and they were 1.15±0.14 in group I, 1.20±0.14 in group II at 18 months. (Table 2)

DISCUSSION

Immediate implantation is now considered a clinically predictable procedure.25 In our study, all implants were found to be successfully osseointegrated without any signs of peri-implantitis through follow-up periods. Fugazzotto *et al*, 26 placed 341 implants in mandibular molar fresh extraction sockets. Simultaneously, regenerative therapy was performed around 332 of the implants. The survival rate was 99.1% whereas the survival rate in Talebi Ardakani *et al*, study 27 was 98.6%. Schwartz-Arad *et al*, 28 inserted 56 immediate implants in 43 patients following extraction of 51 molars, with simultaneous regenerative therapy. They reported a survival rate of 92% after extraction of mandibular molars. Cafiero *et al*, 29 conducted a 12-month prospective multicenter cohort study. They placed 82 tapered implants in molar extraction sites. GBR was used in conjunction with the placement of all the implants. The survival rate in their study was 100%. Immediate implant placements in mandibular molar sites have been a subject of debate due to the difficulty in achieving primary stability, poor bone quality, possibility of loss of the interseptal/interradicular bone during the extraction and thus increased width of the extraction socket.30Some investigators have tried to regenerate the missing bone between the implant surface and the sockets using various bone augmentation techniques such as autogenous bone grafts 31,32, guided bone regeneration with resorbable or nonresorbable barriers 33,34. Carlino *et al*, investigated the he use of GBR with resorbable membrane to cover Biooss, in association with immediate implant insertion at posterior sites, radiological analysis showed strength contact between peri-implant bone and the fixture without any defect between bone and implant. 35 In the present study we compared between autogenous bone graft and synthetic hydroxyapatite graft to regenerate the missing bone. There were no statistical differences between the two groups regarding. marginal bone loss through follow-up periods. At 18 months follow-up period, the mean values of marginal bone loss in this study were 1.15±0.14 mm in group I and 1.20±0.14 mm in group II. In the study performed by Scott and Maurice, (Scott and Maurice, 2002) using a synthetic bioactive restorable bone graft of low-temperature HA material mixed with autogenous bone graft for implant reconstruction. The results were showed that, the underlying implants were found to be covered with a thick layer of mature bone. Paulino Castellon *et al*. (2004) investigated the immediate implant placement in sockets augmented with HTR synthetic bone.

They concluded that, immediate implant placement in combination with HTR synthetic bone graft is a predictable procedure and provides a good bone for successful prosthetic reconstruction. Hassan *et al*. (2008) demonstrated a comparative evaluation of immediate dental implant with autogenous versus synthetic guided bone regeneration. The results showed that the autogenous bone graft appeared to be superior and the graft of choice because it maintained bone structure and has activated the osteogenesis process. The marginal bone loss after 12 month in their study was 1.65 ±0.23 in autougenous graft group and 2.55 ± 0.51when the synthetic guided bone regeneration is used.

Conclusion

Within the limits of the present study Autogenous and synthetic Hydroxyapatite graft could be used effectively with immediate placement of dental implants into Fresh Extraction sockets in mandibular molar region. The results of our study however, need to be confirmed in the long term and with a larger sample of patients.

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