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EVALUATION OF THE STABILITY OF IMMEDIATE PLACED DENTAL MAXILLARY IMPLANT IN FRESH EXTRACTED SOCKET VERSUS DELAYED PLACED IMPLANT

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ABSTRACT

Objective: To evaluate the stability of Immediate placed dental maxillary implant in fresh extracted socket versus delayed placed implant in healed site. ***Methods:*** This study consisted of 10 patients having twenty implant divided into two groups. (Ten each) First group, immediate implant placed in fresh extracted socket. Second group, delayed implant at the healed bone site. Both groups were placed at the anterior region of maxilla. Implant stability quotient (ISq) was measured by Osstell mentor device and was recorded at the time of implant placement (T1) and 20 weeks after placement, at the time of implant loading (T2). All implants were not functionally loaded during the follow up period. Cone Beam Computed Tomography (CBCT) were taken to detect the alveolar bone height, width and bone density ***Results:*** No implant failures were reported in the 6-month follow up period. The study showed that no differences in the stability at the time of loading (T2) between immediate placed implant in fresh extracted socket and delayed placed implant in healed sites compared with (T1) during the time of installation. ***Conclusion:*** Immediate implant is better than delayed placed implant in indicated cases due to it is advantages.

INTRODUCTION

Teeth replacement using dental implants has proven to be successful and predictable treatment procedure. Different placement and loading protocols have evolved from the first protocols in order to achieve quicker and easier surgical treatment times. Dental implants are classified according to the timing of dental implant placement as immediate, immediate –delayed and delayed dental implants. In immediate implant, the implant is placed in fresh extracted sockets. In immediate-delayed implant, the implant is placed in less than 8weeks after tooth extraction while in delayed implant, the implant is placed more than 8 weeks after tooth extraction. In delayed implant, after tooth extraction, the alveolar bone remodels and resorbs. Two third of this reduction occurs within the first three months and within one year the clinical width of the alveolar ridge is reduced by approximately 50%. The mean vertical loss of tissue at single extracted sites ranges between 1 and 4mm depending on site location. This physiologic phenomenon occurs at different degree and rates and in some cases it can be very pronounced, this defect affects the possibility of placing dental implants and their aesthetic outcome especially at aesthetic areas and in those patients exposing visible portions of gums when speaking and smiling. So the immediate dental implant can overcome this problem as it decrease the bone resorbtion after extraction. [1,2]

The concept of immediate implant placement following tooth extraction has been introduced in 1976 by Sculte and Heimke. [3] The drawbacks for immediate implant are decrease in primary stability compared to implants placed at healed sites and lack of soft tissue healing with frequent

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flap dehiscence over extraction sites. The problem of primary stability would be solved by direct bone implant contact. The primary stability indicates the future osseointegration and thus long-term success of implant therapy. If there is any problem in the primary stability, it will affect the healing which lead to implant failure. [4,5]

The primary stability is evaluated by percussion, reverse torque test, radiograph analysis, periotest, dental fine tester and resonance frequency analysis (RFA). RFA has been widely used to detect loading and assess changes in implant stability over time.[6,7]

So this study was conducted to evaluate the stability of immediate placed implant after tooth extraction in fresh sockets versus delayed placed implant.

PATIENT AND METHODS

Ten systemically healthy and physical fit. Patients were carefully selected from outpatient clinic at the Department of Oral and Maxillofacial Surgery, Faculty of dental medicine, Al Azhar University. Each patient would have edentulous area for delayed implant placed in healed socket and also complaining of a tooth needed to be extracted and replaced with immediate placed implant in fresh extracted socket. So in this study we have ten patient having twenty implant divided into two groups. First group, immediate implant placed in fresh extracted socket. Second group, delayed implant at the healed bone site. Both groups were placed at the anterior region of maxilla. Preoperative cone beam Computed Tomography were taken for patients to detect width and length of each implant

Surgical procedure

Local anesthesia was injected into the oral mucosa and palatally using mepivacaiene for anesthetizing the site of the surgery then vertical releasing incision, curvilinear beveled and papilla sparing incision to reduce incision scaring. After socket preparation in group A the drilling was done for both group, Implants were installed and smart pegs were attached for recording the primary stability (T1) by Osstell devise. The flap repositioned and closed. After 20 weeks secondary stability were recorded (T2) for both groups

Post-operative evaluation:

Pain has been evaluated by using visual analogue scale (VAS), on the first and seventh days. Patients were asked about the pain severity according to the scale .

Biomechanical evaluation.

The Primary stability

Primary stability was tested by Osstell device and data were recorded and tabulated (Fig 1) Secondary stability also was recorded after twenty weeks by Osstell device and data were recorded and tabulated.

FIG (1) Photographs showing recording Stability

Marginal Bone loss

Pre-implant crestal bone level was measured using (CBCT) at 3, 6 month after the operation. Reference point for the linear measurements were the most coronal margin of the implant collar in relation to the most coronal point of bone -to-implant contact.

Bone density

In the current study (CBCT) images were used for evaluation of bone density around all implant sides all over. At one week, 3, 6 month postoperative. The parameters for production of the image were constant for all images.

Statistical analysis

The collected data were tabulated and statistically analyzed IBM® SPSS® Statistics Version 20 for Windows

RESULT

Implant Stability Quotient (ISQ) results:

TABLE (1): Showing mean values of implant stability in both groups at different intervals

Stability	Immediately placed		Delayed placed		*"t" value*	*p-value*
Time	Mean	SD	Mean	SD		
After 1 day	56.35	±2.44	66.40	±2.00	10.082	0.0000*
After 20 weeks	74.00	±3.72	76.00	±3.43	1.251	0.113 NS
"t" value	14.383		7.09			
p-value	0.0000*		0.0000*			

There was statistically significant increase in implant stability after 20 weeks in both groups. At the surgery time (T1), the delayed implant group showed statistically significantly higher stability (66.40±2.00) than immediately placed implant group (56.35±2.44). This difference was statistical not significant after 20 weeks (T2) (74.00±3.72 for immediately place implant group and 76.00±3.43 for delayed implant group).

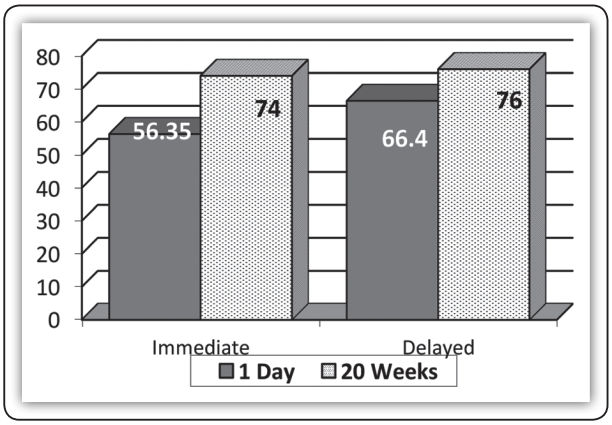

FIG (2) Bar chart showing stability values in both groups in different intervals.

Radiographic bone density results:

Bone density was estimated from the (CBCT) and the descriptive statistics of the result were summarized at table (2) and drown in figure (3).

TABLE (2): Descriptive statistics of bone density around implants in both groups throughout the follow up period.

Bone density	*Immediate*		*Delayed*		"t" value	Probability
	Mean	SD	Mean	SD		
1 W	979.90	±42.68	1079.90	±42.68	5.240	0.0000
3 Months	1035.40	±25.07	1134.90	±25.56	8.789	0.0000
6 Month	1083.00	±28.21	1187.50	±31.91	7.760	0.0000
F ratio	24.616		24.866			
Probability	0.0000		0.0000			
LSD	25.05		25.987			

In both groups there was statistically significant increase of bone density after 3 and 6 months postoperatively. In each interval, the bone density around installed implants was significantly higher in delayed implant group than in immediate implant group.

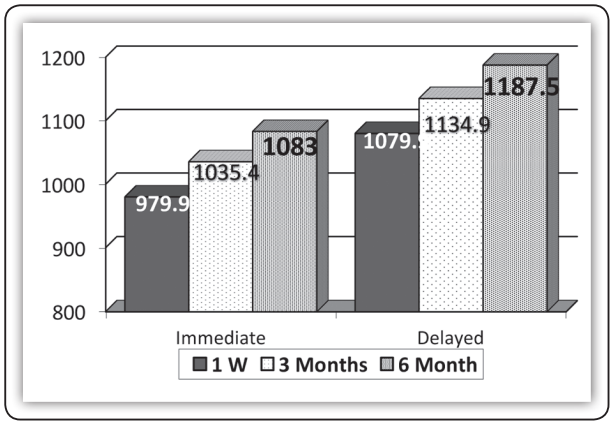

FIG (3) Bar chart showing mean values of bone density in both groups throughout the follow up period.

DISCUSSION

Primary stability is a prerequisite for osseointegration resulting from the mechanical interaction between bone tissue and the implant during surgical insertion, [8] may be affected by the macro-geometry of the screw, surface roughness, and surgical technique and primarily functions to inhibit micromovement of the implant, [9] promotes proliferation and differentiation of the osteoblast cells, and inhibits fibrous tissue invasion and encapsulation.[10] This study was conducted to compare primary stability and secondary stability between implant placed immediately after tooth extraction and implant placed in healed socket by resonance frequency analysis (osstell), to evaluate crestal bone loss occurred in both groups, for this purpose; twenty implants were placed in ten patients each one received two implant one placed immediately after tooth extraction and one placed in healed socket. The patients were six males and four females ranged in age from 25 to 40 years. All the implants were placed in maxilla. Observations were made postoperatively at time of implant placement, three months and six months follow up periods for pain, stability, bone density and crestal bone loss. Subjects were older than 25 years (completed bone growth of jaws), partially edentulous in anterior area of maxilla, having at least 2 mm of attached keratinized gingiva on the buccal and palatal aspects of the bone, ready and ability to comply with pre- and postoperative diagnostic and clinical evaluation required for this study. In each patient, Two Replace Tapered Implant, were placed by the same surgeon. All implants were placed following the concept of two stages. After implant placement, healing period was 20 weeks and then implants were planned to be functionally loaded with a single metal-ceramic crown.

Primary stability is one of the crucial factors in determining long-term success of implant therapy. In addition primary stability is the basis for determination of loading protocols. [11] SO in this study, tapered shape implants were used to enhance primary stability, this was in agreement with Valente et al. [12] as they concluded that better primary stability was achieved using tapered implants in comparison to the cylindrically shaped implants. Drilling has been extended 2 - 3mm apically beyond the apex of the root or the base of the socket to gain primary stability for the implant from the apical bone. The drilling should be deviated bodily toward the palatal side along the drill to preserve the buccal plate of bone (avoid any fenestration of the buccal plate) and to meet the prosthetic requirements. In this study, Osstell Mentor (Integration Diagnostics AB, Goteborg, Sweden) was used for recording Implant Stability Quotient (ISQ) measurement at the time of implant placement (T1) and before loading (T2) after 20 weeks of dental implant placement in both study groups. Implant survival was evaluated according to Misch criteria, [13] implant remained in patient's mouth, no pain on function, no mobility,

no history of pre-implantitis, and less than 1 mm of crestal radiographic bone loss. An ISQ value is generated and shown on the display. It reflects the level of stability on the universal ISQ scale – from 1 to 100. The higher the ISQ value, the more stable the implant. [14] Many studies have shown that implants whose ISQ values exceed 65 before functional loading have 99% survival rate and ISQ values of 57 to 82 have been used as threshold values for implant success. [15] ISQ values less than 45 indicate failure of the implant. The current study has indicated successful implants for all patients throughout this study. The ISQ values recorded in this study at T1 (56.35 with SD 2.44 for immediate implant and 66.40 with SD 2 for delayed implant) and T2 (74 with SD 3.72 for immediate compared to 76 with SD 3.43 for healed sites). The current study was in agreement with Turkyilmaz and mcGlumphy, [16] as their study showed that 170 successful implants had a mean ISQ value of 62.6 compared to 20 failed implants with the mean ISQ value of 54.9. In this study, all implants were functionally loaded 20 weeks after implant placement. Rowan et al. [17] also compared ISQ values between 41 implants placed immediately and 96 implants placed at healed site. All implants were also functionally loaded 20 weeks after initial implant placement. Their results showed the mean ISQ value of 68.56 at t1 and 71.23 at t2 for immediate placement, as well as the mean ISQ value of 70.14 at t1 and 77.31 at t2 for delayed placement. Kim et al. [18] in the literature indicated that successfully integrated implants showed an increase of ISQ values and that RFA is suitable for prediction of implant success/failure. As there were no implant failures in the follow up period, results of this study supported the concept of immediate implant placement following tooth extraction under favorable conditions with delayed implant loading. Future studies including more patients and longer follow up are needed to assess the long-term success of immediately placed implants.

CONCLUSION

From the abovementioned results the following conclusions could be drawn. Immediate implant is better than delayed placed implant in indicated cases due to decrease in number of surgical interventions, Shortened time of treatment, Bone preservation around the socket especially the buccal bone, Orientation of dental implants is easier and ideal, Good aesthetics for soft tissue, Absence of active infections, Adequate mechanical retention due to intact buccal bone and narrow alveolar bone. There is no differences in the stability at the time of loading (T2) between immediate placed implant in fresh extracted socket and delayed placed implant in healed sites compared with (T1) during the time of installation

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