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An Evaluation of Short Term Success and Survival Rate of Implants Placed in Fresh Extraction Socket Post Prosthetic Rehabilitation- A Prospective Study

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ABSTRACT:
Purpose: To study short term success and survival rate of immediate implants after three months of prosthetic rehabilitation.
Method: Twelve immediate implants were placed in twelve patients of either sex in both maxilla and mandible. Clinically pain, probing depth and implant mobility were assessed postoperatively at implant placement (baseline), at loading and three months after loading. Modified plaque index and modified gingival index were assessed at loading and three months after loading. Radiographically, crestal bone levels were assessed at baseline, three months after placement, at loading and three months after loading.
Results: The success and survival rate of all implants was 100% at all times. Clinically, pain and mobility decreased to zero at consecutive steps. Average probing depth increased from 1.5mm at baseline to 2.5mm after three months of loading. Gingival index and plaque index increased after three months of implant loading. Crestal bone loss was observed after at loading and three months after implant loading. But the average bone loss was less than 3 mm.
Conclusion: Immediate implant placement is a reliable method of implant placement with shorter waiting period and thus more patient compliance.
KEYWORDS: immediateimplant, fresh extraction socket, methods of implant placement, dental implants.

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INTRODUCTION: Implant therapy has emerged as the treatment of choice for replacing the missing teeth. There is a constant evolution in implant placement methods in terms of timing and surgical protocols to suit the patient's requirements. Immediate implant protocol has dominated the implant therapy since their invention due to the reduced surgical time, patient compliance and economic benefit. In addition to this early implant placement has also made its place in the clinical practice.

MATERIALS AND METHODS: Twelve implant sites in both maxilla and mandible, were chosen in patients of either sex for placement of implants in fresh extraction sockets. 5 implants were placed in anterior teeth and remaining seven were placed in posterior teeth. Out of 12 implants, five were placed in mandible and seven in maxilla Clinically pain, probing depth and implant mobility were assessed post-operatively at implant placement (baseline), at loading and three months after loading. Modified plaque index[1] and modified gingival index[1] were assessed at loading and three months after loading. Radiographically, crestal bone levels were assessed at baseline, three months after placement, at loading and three months after loading. **Results:** The implant survival and success rate was 100% for all the immediately placed implants.

METHOD: Atraumatic extraction technique was employed to preserve the buccal/labial bone. Implant was placed lingually in incisor and canine region and centrally in premolar area. Implant length was chosen so as to leave at least 3-4 mm bone for primary stabilization and implant diameter was chosen to leave minimum gap between the socket and implant. In most of the cases the gap between implant and the socket was not more than 2 mm, thus need for graft was obliterated. The implants were placed at the level of crestal bone or 1 mm below the cementoenamel junction of adjacent teeth. Before achieving primary closure, primary stability was determined by using two mouth mirrors. Probing depth was measured by inserting Williams Periodontal probe in mesial, distal, midbuccal and lingual side of implant. Primary closure was obtained and 4-0 vicryl sutures were placed. Post-surgical instructions were given.

FOLLOW-UP: Patients were recalled after three months and an IOPA was taken along with the pain assessment. Follow-up radiographs were taken after every month till the osseointegration.

Second-stage surgery: After the osseointegration of implant got confirmed on a periapical radiograph, second stage surgery was performed. The average time before loading was 5 months. With tissue punch, minimum amount of tissue was removed just to expose the implant. Cover screw was gently removed and gingival former placed. The soft tissue around the gingival former was allowed to heal for about 7-14 days

Prosthetic stage: After the desired healing and soft tissue contouring, impression post was attached to the implant to take impressions (3M ESPE BASE AND CATALYST PUTTY). Closed tray impression taking method was used in most of the cases. After impressions were made, abutment (transfer coping) and implant analog were attached to it and they were sent for lab. At the time of loading, pocket probing depth was measured on all the implant surfaces viz mesial, distal, and buccal and lingual/palatal with the calliberatedWilliams periodontal probe. Also, modified gingival index [1] and modified plaque index [1] were assessed with the same probe. A periapical radiograph was taken at the loading with abutment attached. PFM or all ceramic crown depending on the region were cemented or screw retained to the implant abutment. Another periapical radiograph was taken to measure the crestal bone level. Another follow-up

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was after three months of loading. Modified gingival and plaque indices were taken at the follow-up and a peripaical radiograph as well.

Post loading: After three months of prosthetic rehabilitation, another radiograph was taken to measure the crestal bone level. Pain, mobility, gingival and plaque index were assessed at this time. Periapical radiograph was taken to measure crestal bone level.

RADIOGRAPHIC CRITERIA: Alteration in bone height occur after placement of implants in the functional period. Marginal bone loss was evaluated radiographically, and was usually no greater than 1.5 mm in the first year.Intraoral X-rays were used to measure marginal bone loss. IOPA radiographs were taken using the long cone paralleling technique. Measurements were made from the neck of the implant or abutment implant junction after loading to the first contact of implant to bone mesially and distally. This was measured using UTHSCA image tool (version 1.28.70.0). An average of the mesial and distal values was taken. The differences between the values of the the second (3 months after placement) and third measurement at loading and final measurement 3 months after loading will be used to establish marginal bone loss after loading. Crestal bone level change after the functional loading was established using the values obtained by average of sum of difference of values at loading and other value at three months after loading.

RESULTS:

Success and survival rate was 100% for all the three groups. Thirty-six implants, twelve in each group were placed in fresh extraction socket. Mobility of implant is a measure of osseointegration. It was clinically tested using two hand instruments and grading was done. The score of mobility came out to be grade 0 for all cases at all the time intervals i.e. at baseline, at loading and three months after loading. This implies that the implants were well osseointegrated at the time of evaluation. (Table 1) Pain was absent in all cases at baseline, three months after placement, at loading and at three months after loading except for two cases. Mean for pain at baseline, 3 months after placement and 3 months after loading was 0.33, 0.00, 0.00 and 0.00 respectively (Table 2) Probing depth at baseline ranged from 1.25-2.0mm. Probing depth at loading ranged from 1.5-2.5mm. Probing depth 3 months after loading ranged from 1.5-2.5mm. The mean probing depth changed from 1.625 at baseline to 1.958 at 3 months follow-up. (Table 4) At loading, 3 had no signs of gingival inflammation and 9 cases had mild inflammation. Four cases after three months of loading had no signs of inflammation, while 8 cases mild inflammation. Mean gingival index at loading was 0.417 and three months after loading was 0.354. The mean value decreased from 0.417 to 0.354.It explains the oral hygiene status of the patient, and it was measured using William‘s periodontal probe. Scores were given from 0-3 and were interpreted as follows:

1. SCORE 0- EXCELLENT ORAL HYGIENE
2. SCORE >0 BUT <1- GOOD ORAL HYGIENE
3. SCORE 1-3 –FAIR ORAL HYGIENE
4. SCORE >3- POOR ORAL HYGEINE

The oral hygiene status did not change much after three months of prosthetic loading. 11 (91.7 %) cases had good oral hygiene, while 1(8.3 %) patient had excellent oral hygiene. Mean at loading was 0.583 and 0.562 months after loading. (Table 4,5) CHANGE IN BONE LEVELS

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(LI): It is the average of difference of crestal bone levels at baseline and after three months of prosthetic loading. Average LI came out to be 0.469±0.1045. Initially after placement of implants, there was a decrease in the mean crestal bone level indicating formation of bone. After three months of prosthetic rehabilitation, crestal bone level increased, indicating bone loss.CHANGE IN BONE LEVELS AFTER PROSTHETIC LOADING (L2): It was the average of sum of differences in crestal bone levels at loading and after three months of prosthetic loading. Average L2 was -0.04±0.08.(Table 6)

TABLE 1: MOBILITY

CASE NO.	MOBILITY SCALE		
	At baseline	At loading	3 months after loading
1.	Grade 0	Grade 0	Grade 0
2.	Grade 0	Grade 0	Grade 0
3.	Grade 0	Grade 0	Grade 0
4.	Grade 0	Grade 0	Grade 0
5.	Grade 0	Grade 0	Grade 0
6.	Grade 0	Grade 0	Grade 0
7.	Grade 0	Grade 0	Grade 0
8.	Grade 0	Grade 0	Grade 0
9.	Grade 0	Grade 0	Grade 0
10.	Grade 0	Grade 0	Grade 0
11.	Grade 0	Grade 0	Grade 0
12.	Grade 0	Grade 0	Grade 0

TABLE 2: PAIN

SR NO.	At baseline	3 months after placement	At loading	3 months after loading
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	2	0	0	0
8	2	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0

TABLE NO 3: POCKET DEPTH

Case no.	POCKET DEPTH (At baseline)					POCKET DEPTH (At loading)					POCKET DEPTH (3 months AFTER loading)				
	Mesial	Mid Buc	Distal	Lingual	Average	Mesial	Mid Buc	Distal	Lingual	Average	Mesial	Mid Buc	Distal	Lingual	Average

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		cal					cal					cal			
	2	1	2	2	1.75	2	1	2	2	1.75	2	2	2	2	2
	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2.25
	2	1	1	1	1.25	2	1	1	2	1.5	2	2	1	2	1.75
	2	1	2	2	1.75	2	1	2	2	1.75	2	2	2	2	2
	2	1	1	1	1.25	2	2	1	1	1.5	2	2	1	2	1.75
	2	1	2	1	1.5	2	1	2	1	1.5	2	1	2	2	1.75
	2	2	1	1	1.5	2	3	1	1	1.75	2	3	1	2	1.75
	1	2	2	1	1.5	2	2	2	2	2	2	2	3	2	2.25
	2	2	2	2	2	2	2	3	2	2.25	2	2	3	2	2.25
	3	2	1	3	2.25	3	2	1	3	2.25	3	2	2	3	2.5
	2	1	2	1	1.5	2	1	2	1	1.5	2	1	2	2	1.75
	2	1	1	1	1.25	2	1	1	2	1.5	2	1	2	1	1.5

TABLE 4: GINGIVAL INDEX

CASE NO.	GINGIVAL INDEX GROUP I	
	AT LOADING	3 MONTHS AFTER LOADING
1	0	0
2	0.5	0
3	0.5	0.5
4	0.75	0.5
5	0.75	0.75
6	0	0
7	0.5	0
8	0.5	0.5
9	0.5	0.5
10	0	0.5
11	0.5	0.5
12	0.5	0.5

TABLE 5: PLAQUE INDEX

CASE NO	PLAQUE INDEX : GROUP I	
	AT LOADING	3 MONTHS AFTER LOADING
1	0.75	0.5
2	0.5	0.5
3	0.75	1
4	0.5	0.5
5	0	0.75
6	0.75	0.5
7	0.5	0.5
8	0.75	0.5
9	0.75	0.5
10	0.5	0.5
11	0.5	0.5
12	0.75	0.75

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TABLE 6: CRESTAL BONE LEVEL

CASE NO.	RADIOGRAPHIC ANALYSIS (MESIAL)				RADIOGRAPHIC ANALAYSIS (DISTAL)			
	At baseline	3 months after placement	At loading	3 months after loading	At baseline	3 months after placement	At loading	3 months after loading
1	2.41	2.52	2.1	2.71	2.24	2.44	2.1	2.51
2	2.34	2.2	1.98	2.1	2.45	2.1	2.32	2.1
3	2.365	2.22	2.76	1.98	2.64	2.41	2.91	2.32
4	3.12	2.98	2.56	2.76	3.24	3.1	2.42	2.91
5	2.81	2.76	2.65	2.56	2.92	2.62	2.85	2.42
6	2.94	2.81	1.88	2.65	3.21	2.96	2.36	2.85
7	2.14	1.98	2.21	1.88	2.51	2.46	2.42	2.36
8	2.42	2.31	2.32	2.21	2.62	2.52	1.89	2.42
9	1.84	1.76	2.54	2.32	2.41	2.1	2.43	1.89
10	2.94	2.76	2.1	2.54	2.84	2.54	2.31	2.43
11	2.76	2.45	2.56	2.1	2.68	2.52	2.76	2.31
12	2.82	2.64	1.54	2.56	3.1	2.94	1.42	2.76

DISCUSSION:

In this study, patients of both the sexes with an age range of 21-54 years were selected for the study from the Department of Oral and Maxillofacial surgery depending on the inclusion criteria described previously. In the present study, five implants were placed in maxilla and seven implants were placed in mandible. The length and width of the implants varied in different sites which was determined by using diagnostic cast and periapical radiograph.Primary stability is defined as the absence of mobility in the bone bed after the implant has been placed. It depends on the mechanical engagement of an implant within the fresh bone socket. During the early stages of healing, mechanical stability decreases and biological stability increases. In an osseointegrated implant, the stability depends on the biological component.[2]In our study primary stability/mobility was clinically tested by applying alternating pressure in two opposite directions using two hand instruments against each implant. A two point scale was applied and the mobility status was given the score 0 and 1 for absence of mobility and any degree of detectable mobility respectively.[3]All the implants evaluated in our study at the time of surgery, at the time of exposure (2^{nd} stage surgery) and 3 months post loading of implants did not show any amount of mobility. All the implants, at all stages were give score 0, i.e. absence of mobility. This is in accordance with study results of Lang N P, Lui P, Lau K Y, Li K Y, Wong M C M (2012) [4], who, in his systematic review on immediate implants found that implants remained stable after one year of prosthetic loading. Fareed W M (2016) [5], in his study compared immediate and delayed implants on various paramateres, mobility was one of them. He found that both immediate and delayed implants remained stable after 6 months of prosthetic rehabilitation and

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mobility scores were zero at all the time for both the groups. Bhardwaj I, Bhushan A, Baiju C S, Bali S, Joshi V (2016) [6] reported that although osseo-integration is a prerequisite for long-term implant stability, the proper soft tissue seal to the titanium surfaces at the most coronal aspect of the implant body is required to prevent pathology that may interfere with osseo-integration process. Probing of the peri-implant mucosa either in the presence or absence of bleeding on probing is an important assessment to distinguish a tissue condition of peri-implant health or disease.[7]In contrast to natural teeth, for which average periodontal probing depth (PD) has been reported, the physiologic depth of the peri-implant sulcus of successfully osseointegrated implants has been a matter of debate. Increasing periodontal probing Depth and loss of clinical attachment are pathognomonic for periodontal diseases. Pocket probing is therefore an important diagnostic process for the assessment of periodontal status and for the evaluation of periodontal therapy.[7]In healthy peri-implant conditions, experimental studies have indicated that when a light probing force was used (0.2–0.3 N), the tip of the probe will stop coronal to the bone level, at the apical extension of the barrier epithelium. However, in sites with peri-implant disease, the probe tip penetrated to a position closer to the alveolar bone crest. Lang N P, Wetzel A C, Stich H, Caffese R G (1994) [8]; Schou S, Holmstrup P, Stoltze K, Hjørting-Hansen E, Fiehn N E, Skovgaard L T (2002)[9]; Abrahamsson I, Soldini C (2006)[10]Progressive increases in Probing Depth may be an alarming sign. Therefore, the establishment of baseline Probing Depth values at the time of delivery of the prosthetic suprastructure is of critical importance in allowing comparison with future.The analysis of probing depth was done at the time of implant placement, at loading and after three months of prosthetic loading. In our study the average probing depth at baseline (placement of implants) came out to be- 1.625±0.328. Three months after loading the average probing depth was 1.958±0.298.We observed that most implants presented with pocket depth of less than 3 mm. Pocket depth increased for all the implants after three months of implant placement and three months after loading as well. This is in accordance with Juodzbalys and Wang 2007 [11]Nishimura K, Itoh T,Takaki K, Hosokawa R, Naito T and Yokota M (1997)[12] found no increase in pocket depth in subsequent follow-up which is in contrast to our study.González-Santana H, Peñarrocha-Diago M, Guarinos- Carbó J, Balaguer-Martínez J (2005)[13] said, following dental implant placement, patients present different degrees of pain and swelling as a direct consequence of surgery. However, it should also be noted that pain could arise from factors not associated with the surgical method itself, such as surgical time and the patients‘ fear, stress and anxiety levels.[14]Patients received tablet combiflam (500 mgs) and capsule amoxicillin (500 mgs) postoperatively for three days.Pain and discomfort were evaluated using the Numeric pain rating scale [15]. Pain increased to mean of 0.42 at baseline and then reduced to zero for all the patients after 3 months of implant placement and no patient experienced pain at loading and three months after loading.Several microbiologic features of the subgingival biofilm around implants have been correlated with the presence of clinically detectable plaque. Furthermore, periodontal pathogens from residual pockets of remaining teeth in patients treated for periodontal disease have been documented to colonize oral implants.[7]Modified Plaque index (mPI)[1]was recorded at loading and three months after loading for all three groups. using a Williams Calliberated probe. Around implants, however, soft tissue texture and color depend on the normal appearance of the recipient tissues before implant placement, and may be influenced by the material characteristics of the implant surface. Furthermore, difficulties in recording mucosal inflammation have been reported, such as nonkeratinizedperi-implant mucosa normally appearing redder than keratinized tissue. In a longitudinal study, only a weak correlation between GI scores and changes in periimplantcrestal

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bone level was reported.[7]Patients in this study were assessed for gingival status around the implant using the Modified Gingival index (mGI), (Mombelli A, Lang N P 1998)[1].Modified Gingival index (mGI) [1], was given by Silness and Loe and Hass and workers) specifically for implants. Presence of any gingival inflammation, bleeding on probing was calculated using this index at loading and after three months of prosthetic loading in all the three groups. The Modified Gingival Index (mGI) [1] was used to access the soft tissue texture, colour of the mucosa, edema, and inflammation around the implants..In this study we studied change in gingival and plaque status at loading and three months after loading. It was observed that gingival status of the patient declined after three months of loading owing to low reinforcement of oral hygiene measures. Plaque index was also found to be increased after three months of loading. This is in contrast to the study done by Nishimura K, Itoh T, Takaki K, Hosokawa R, Naito T and Yokota M (1997)[12] which reported no increase in plaque and gingival index after one year of prosthetic rehabilitation.Bone resorption can be activated by surgical trauma or bacterial infection, as well as by overloading at the bone-implant interface. Under functional forces, overloading of periimplant bone can be induced by a shortcoming in load transfer mechanisms, primarily due to improper occlusion, prosthesis and/or implant design, and surgical placement. As a consequence, high stress concentrations at the bone-implant interface may arise and, according to well-supported hypotheses, related strain fields in bone tissue may stimulate biological bone resorption, jeopardizing implant effectiveness. Baggi L, Cappelloni L, Di Girolamo M, Maceri F, Vairo G (2008)[16.]Disruption of the vascular network through elevation of the mucoperiosteum during surgery has been attributed to approximately 1 mm of peri-implant bone loss or saucerization that traditionally has been reported to occur around the cervical ends of implants at stage 2 surgery, but this hypothesis is not universally supported because similar saucerization does not appear around natural teeth after soft tissue elevation for osseous surgery. Bone-loss thresholds to diagnose peri-implantitis suggested by the authors differ: albrekttsson suggested that bone loss > 2 mm indicated peri-implantitis, while Misch et al [17] suggested the threshold of > 4 mm. None of the patient in our study had crestal bone loss more than 2 mm.[18]Despite the high success and survival rates of dental implants, failures may arise. The nomenclature regarding the success and survival of implants may need to be addressed in implantology.[19]Buser et al described these 2 terms in detail. Success was defined as ―the absence of recurring periimplant infection with suppuration; absence of persistent subjective complaints, such as pain, foreign body sensation, and/or dysesthesia; absence of a continuous radiolucency around the implant; and absence of any detectable implant mobility,‖ whereas survival was defined as the aforementioned criteria without suppurativeperiimplant infection, because such implants could survive with the aid of various treatment options.[19]Misch et al[17] (The International Congress of Oral Implantologists (ICOI) Pisa Consensus Conference) categorized dental implants into four groups: successful, satisfactory, compromised, and failed. Successful implants present no pain, no history of exudate, and no mobility or bone loss (< 2 mm detected radiographically). Satisfactory implants present radiographic bone loss of 2 - 4 mm. Compromised implants correspond to slight to moderate peri-implantitis.These implants may cause sensitivity, have PD > 7 mm, may have exudate history, no mobility and bone loss > 4 mm or < 1/2 the implant body. In cases of failure the implant presents pain, exudate, mobility, and bone loss > 1/2 the length of the implant. The success and survival rate of all implants were found to be 100% at all the times in our study. In literature, Pennarrocha-diago et al. (2011) [20] reported a success rate of 96.9% for immediate group which is in accordance with our study.

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CONCLUSION: From this study we concluded that placing implants in fresh extraction sockets is a reliable method for implant placement. Its main advantage is patient compliance due to reduced waiting period and cost effectiveness.

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