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Original Research Article

AN INSTITUTIONAL BASED OBSERVATIONAL STUDY TO EVALUATE THE IMMEDIATE LOADING OF IMPLANTS IN FRESH EXTRACTION SOCKETS

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ABSTRACT

Background: Immediate implant placement is the insertion of dental implant into the extraction socket, at the course of surgical removal of teeth to be replaced. The aim of the study was to observe bone healing after the immediate placement of an implant into a fresh extraction socket via clinical inspection and standardized radiographs over a period of 1 year after loading of the implant. **Materials and Methods:** This clinical study conducted at the department of oral and maxillofacial surgery/College of Jaipur Dental College/MGV University in Rajasthan, during one-year period. The patients were evaluated at 3 months and 6 months for clinical, radiographic assessment and stability measurement. Two independent sample t-test, paired t-test, and Pearson correlation (r) were the statistical methods used to analyse the data. **Result:** Our study shows that most of the patients were in the age group of 30 to 40 years, i.e. 3 (60%), with a mean age of 37.6 years. Male to female ratio was 1:1. All the implants (40 implants) survived during the follow-up period (100% survival rate). The mean ISQ value and standard deviation at base line was (64.55±9.48 ISQ), the mean ISQ value and standard deviation at 16 weeks was (70.38±7.29 ISQ), paired t-test showed a highly significant increase in the ISQ value from the primary stability at baseline to the secondary stability at 16 weeks (P<0.01*). **Conclusion:** We concluded that immediate implant placement in a fresh extraction socket can be regarded as a predictable treatment approach have the benefit of reducing treatment time, the numbers of surgical procedures and can be applied even in the presence of bone defect and gaps recording the same final results when careful preoperative examination and appropriate intraoperative protocol is utilized.

INTRODUCTION

The implant therapy is currently considered to be a successful and acceptable means to restore missing teeth.[1] Immediate implant placement is the insertion of dental implant into the extraction socket, at the course of surgical removal of teeth to be replaced. The initial report in the literature was published in 1976 by Schulte.[2] The concept was reintroduced in 1989 by Lazzara, who explained this method by three case reports.[3]

The immediate implant placement protocol was validated later by Gelb, who reported survival rate of 98% in fifty consecutive cases followed over three years.[4]

Since then several animal and human studies, case reports, and randomizes controlled studies furthered the science of this treatment modality and indicated that immediate implant placement can be as successful as delayed implant protocol whenever correct surgical strategies followed.[5] After extraction of teeth, alveolar bone resorption may be so severe that if left uncontrolled, may lead to severe bone deficiency, which may in turn, even contraindicate the placement of an implant.[6] Immediate implant placement in fresh extraction sockets allows placement of implants during the same visit at which the tooth is extracted, which reduces morbidity and decreases treatment time, allow placement of implant in ideal position from the prosthetic point of view. It also helps to preserve the height of the alveolar bone and to avoid marginal bone loss that typically occurs during socket healing after extraction.[7,8]

When the implant is placed immediately after tooth extraction, it is anchored to a small part of 3 to 5 mm subapical alveolar bone, which provides it with satisfactory initial stability. The size of the peri-implant bone defect (horizontal defect dimension) has effect on the amount of bone-implant contact area. As the gap between implant and socket wall widens, the amount of bone-implant contact (BIC)

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area decreases and the BIC area shift apically.[9] The aim of the study was to observe bone healing after the immediate placement of an implant into a fresh extraction socket via clinical inspection and standardized radiographs over a period of 1 year after loading of the implant.

MATERIALS AND METHODS

This clinical study conducted at the department of oral and maxillofacial surgery/College of Jaipur Dental College/MGV University in Rajasthan, during one-year period.

The sample included patients indicated for implant treatment to replace single or multiple hopeless maxillary and mandibular incisors, canines, and premolars teeth, with implant placement into the extraction socket at the same time of extraction, by means of two-stage implant placement protocol.

Inclusion Criteria

1. Patients age ≥ 18 years old.
2. Patients with a single or multiple tooth indicated for extraction in the area of maxillary and mandibular incisors, canines, and premolars.
3. Availability of bone > 2 mm apical to the root apex to provide adequate primary implant stability.
4. Patients with a good oral hygiene to be candidate for implant success.

Exclusion Criteria

1. Radiotherapy, Uncontrolled diabetics, Heavy smokers (>20 cigarettes/day), immunocompromised patients, and other local and systemic diseases, drugs, and habits that may jeopardize implant success.
2. Patients with medical conditions that preclude any surgical intervention such as patients with bleeding disorders or recent myocardial infarction.
3. Pregnant women.
4. Close proximity of vital structures such as maxillary sinus and mental foramen that make impossible to engage adequate bone apical to the extracted tooth to attain primary implant stability.
5. Sites showing severe bone destruction.
6. Signs of acute infection or pus discharge.
7. Active advanced periodontal disease, and bad oral hygiene.

Clinical and Radiographical Assessment

A thorough history was taken from all the patients who were asked about their chief complaint, past treatment of the tooth/teeth under concern such as trauma, failed endodontic treatment, failed prosthesis, and endodontic surgery.

Clinical examination proceeded with thorough general extra-oral and intraoral examination, with special attention to the teeth that were planned to be extracted, these were carefully examined for the presence of any signs of acute infection such as pain, pus discharge, discharging sinus and swelling. All patients obtained preoperative OPG, and periapical radiograph of the accused tooth.

Surgical Procedure

Prior to surgery, the patient was instructed to rinse his/her mouth with chlorhexidine 0.12 % mouth-wash for 30 seconds, then the skin around the mouth was disinfected with a sterile gauze swapped by povidone-iodine solution.

Surgery was performed under local anesthesia with (lidocaine 2%, adrenalin 1:100000, 2.2 ml cartridge, Septodent, France), by block and/or infiltration technique on both the facial and palatal/lingual sides. The accused tooth was extracted carefully utilizing dental forceps using a gradual rotational force in clockwise and counter clockwise movement, elevator (when needed) was used carefully to avoid crushing and damage to the buccal bone. The socket was then curetted by appropriate surgical curette to remove the remnant of granulation tissue, then the extraction site was thoroughly irrigated by normal saline.

Three-sided full thickness mucoperiosteal flap was reflected, the facial bone inspected for the presence of bone defect or periapical lesion.

Utilizing the measurement provided by radiograph and the original length of the root of the extracted tooth (that was measured directly by endodontic file and ruler), then an implant with appropriate length and diameter was selected.

Drilling started by first pilot drill with the extracted root direction in mandibular anterior and premolar sites, or at the conjunction of the middle and apical thirds of the palatal wall of extraction socket in the maxillary anterior sites.

Sequential drilling continued until the planned size was reached. The implant fixture was inserted at or just below the crestal bone level.

Measurement of the implant stability was performed using Osstell TM ISQ. A Smart peg was placed into the implant body. The transducer probe was directed at the top of the Smart peg with a distance of approximately (2 mm) and held stable until the device beeped and displayed the ISQ value. The measurements were taken twice in bucco-lingual and mesio-distal directions, the mean of the two measurements was represented the ISQ value of the implant at base line record. The cover screw was than inserted over the implant fixture. In cases with bone defects and/or implant-bone gaps (≥2 mm), β-TCP resorbable bone substitute, and autogenous bone (if available) harvested from the implant preparation site were mixed to fill these gaps and defects.

Periosteal slitting at the deepest area of the flap with multiple incisions in the periosteum if required was performed to lengthen the flap and retrieve autogenous blood to the bone grafting material. The absorbable collagen membrane was trimmed and adapted to cover the defect with at least 2 mm extension toward the palatal side for good fixation and to cover the implant completely. The surgical wound was finally closed by simple interrupted suture using 3/0 non-resorbable black silk suture. Following surgical procedure, the patients were

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instructed to apply cold pack over the surgical area extra-orally for the rest of the first day, the patients also were instructed to avoid eating at the site of surgery, eating warm diet and rinsing the mouth on the day of surgery.

The patients were medicated by amoxicillin cap. 500 mg t.i.d., and metronidazole tab. 500 mg t.i.d., the treatment continued for 5 days. In 500 mg was prescribed once daily for 3 days. Paracetamol tab. 500 mg prescribed as analgesic when needed.

The patients were instructed to rinse with 0.12% chlorhexidine mouthwash b.i.d. for two weeks starting from day after surgery, in cases with spontaneously exposed cover screw the mouthwash continued for the rest of the follow up. Sutures were removed 10-14 days after surgery.

Follow up and Data Collection

The patients were evaluated at 3 months and 6 months for clinical, radiographic assessment and stability measurement. The implants were evaluated clinically to detect implant mobility and check the presence of signs and symptoms of infection such as pus discharge or draining fistula, pain, and swelling.

Periapical radiograph was taken to the implant site immediately after surgery, at 3 months and 6 months to show any signs of bone resorption and peri-implant radiolucency, OPG was taken at the 6 months for all cases.

Prosthetic Phase

After 15 days of the second surgery, the healing cap was removed and a two-piece internal hex abutment was placed in the implant. Impression was taken with elastomer impression material using open tray technique. PFM crown was given. X-ray IOPA was taken after 1 year after loading of to assess marginal bone loss.

Statistical Analysis

The analyses were accomplished using two computer software programs: Statistical Package for Social Sciences (SPSS version 20.0v) and Microsoft Office Excel 2007. Two independent sample t-test, paired t-test, and Pearson correlation (r) were the statistical methods used to analyse the data. The level of significance tested according to the P-value, were: P>0.05 (Not Significant), P<0.05 (Significant), P<0.01 (Highly significant).

RESULTS

Our study shows that most of the patients were in the age group of 30 to 40 years, i.e. 3 (60%), with a mean age of 37.6 years. Male to female ratio was 1:1.

Trauma is the most common cause for loss of tooth (45%) and second most common cause is caries (30%). Maxillary central incisor is most commonly subjected to trauma. Twelve implants were placed in the maxilla (60%), eight implants were placed in mandible (40%). Eight implants were placed in the region of maxillary central incisor while four in the region of the maxillary lateral incisor.

Crestal bone loss, as measured from the BIC to implant-abutment junction using (Dental Planning Software) and standard parallel cone-beam technique at the end of 6 and12 months, was statistically nonsignificant when measured by paired t-test. [Table 2 & 3]

All the implants (40 implants) survived during the follow-up period (100% survival rate). The mean ISQ value and standard deviation at base line was (64.55±9.48 ISQ), the mean ISQ value and standard deviation at 16 weeks was (70.38±7.29 ISQ), paired t-test showed a highly significant increase in the ISQ value from the primary stability at baseline to the secondary stability at 16 weeks (P<0.01*). [Table 4]

Table 1: Distribution of patients of single tooth implant according to age and sex

Age group	Male	Female	Total
18-30 yrs	2	3	5
30-40 yrs	6	6	12
40-50 yrs	2	1	3
Total	10	10	20

Table 2: Distal marginal bone loss assessment after loading

Parameter	N	Mean ± SD	SE of mean	Mean difference	Paired t-test p-value
Distal bone loss 6 months	20	0.457 ± 0.043	0.015	–0.147	0.053
Distal bone loss 12 months	20	0.615 ± 0.142	0.056		

Table 3: Mesial marginal bone loss assessment

Parameter	N	Mean ± SD	SE of mean	Mean difference	Paired t-test p-value
Mesial bone loss 6 months	20	0.472 ± 0.061	0.026	–0.157	0.058
Mesial bone loss 12 months	20	0.637 ± 0.153	0.053		

Table 4: The comparison of mean primary and secondary stability

ISQ value	Mean±SD	P-value
Mean ISQ value at baseline	64.55±9.48	<0.01*
Mean ISQ value after 3 months	70.38±7.29	

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DISCUSSION

Immediate placement of implants in fresh extraction sockets have several adavantages over Branemark's protocol for conventional implant placement: Total treatment time and number of surgical procedures is reduced, more ideal implant positioning is possible, soft tissue height and contour are better preserved in the esthetic zone, opportunities for osseointegration are better due to healing potential of fresh extraction socket.[10] The quality of implant surface influences wound healing at implantation site and subsequently affects osseo- integration.[11] HA coating, acid-etching, sandblasting increases the surface area of the implant, thus increasing the implant bone surface contact area and thereby implant stability. Threaded implants are preferred over cylindrical implants because threads of screws maximize the contact area, improve implant stability and favor the dissipation of interfacial stress.

A major moot point is whether it is necessary to fill the gap between the implant and the extraction socket. According to Becker et al when immediate implants were placed within alveolar confines, without using graft materials or barrier membrane, high survival rates were reported.[12] Carlsson et al evaluated titanium implants with initial gap widths of 0.00, 0.35 and 0.85 mm. At the end of 6 weeks, the control group had bone contact reaching 90%, whereas the 0.35 and 0.85 mm sites had residual gap of 0.22 and 0.54 mm respectively.

Wilson et al in his study placed 5 titanum plasma sprayed implants in one patient. One served as control in native bone, whereas four were placed in fresh extraction sockets. After 6 months of implant placement, bone implant contact in the control group was 72%; in two immediate implants with small peri-implant bone defect (<1.5 mm) at the time of implant placement, bone implant contact area was 50%. In the other two implants where peri-implant bone defect was >4 mm and in which e-PTEF membrane was used, the bone implant contact area was 17%. It was concluded from this study that peri-implant bone defect was the most important factor in determining bone-implant contact area and membrane was not useful in the site where peri-implant bone defect was <1.5 mm.[13]

This clinical study showed that all the implants that were placed immediately in the fresh extraction sockets and followed-up for (16 weeks) had survived (100% survival rate), and met the successful criteria of dental implant presented by Misch et al,[14] with absence of failure signs and symptoms (implant mobility, pain, suppuration, and radiographic bone loss or peri-implant radiolucency).

This result comes in agreement with Gokcen-rohlig et al,[15] the authors in their clinical and radiographic study for two years follow up detected 100% cumulative survival rate, and they concluded that placement of implant in the fresh extraction socket is a reliable treatment alternative.

The results also coincided with previous studies on immediate implant placement.[16,17] This high survival rate may be attributed to careful examination, patient selection, aseptic technique, and appropriate surgical procedure with scientific management of difficulties during intraoperative work.

The higher value of mean primary stability in this study may be related to the intraoperative surgeon judgment by under-sized drilling technique or using wider implant diameter than the final drill, especially in sites of soft bone, in order to achieve adequate primary implant stability.

Primary flap closure of the implant site is an important factor to prevent infection and epithelial downgrowth during the crucial healing period.18 In the present study to achieve primary closure periosteal releasing incision was given and flap was coronally repositioned.

In present study, the observed marginal bone level change around the experimental implants was low. In fact, the 12-month mean vertical bone loss of 0.637 ± 0.153 was clinically not significant when measured by paired t-test which was in accordance with the study by Paolantanio et al.[19] Similarly, the 6 months mean for plaque index and sulcular bleeding index also showed no statistically significant differences by Wilcoxon's signed rank test.

CONCLUSION

We concluded that immediate implant placement in a fresh extraction socket can be regarded as a predictable treatment approach have the benefit of reducing treatment time, the numbers of surgical procedures and can be applied even in the presence of bone defect and gaps recording the same final results when careful preoperative examination and appropriate intraoperative protocol is utilized.

REFERENCES

1. Rouck D, 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.
2. Schulte W, Heimke G. The Tubinger immediate implant. Die Quintessenz. 1976; 27(6):17-23.
3. Lazzara RJ. Immediate implant placement into extraction sites: surgical and restorative advantages. Int J Periodontics Restorative 1989; 9(5): 332.
4. Gelb DA. Immediate implant surgery: three-year retrospective evaluation of 50 consecutive cases. Int J Oral Maxillofac Implants. 1993; 8(4): 388-99.
5. Chen ST, Wilson Jr TG, Hammerle CH. Immediate or early placement of implants following tooth extraction: review of biologic basis, clinical procedures, and outcomes. Int J Oral Maxillofac Implants 2004; 19(19):12-25.
6. Atwood DA. Reduction of residual ridge:A major oral disease entity. J Prosthot Dent 1971; 26:266-69.
7. Grunder U, Polizzi G, Geone R, et al. A 3-year prospective multicentre follow-up report on immediate and delayed-immediate placement of implants. Int J Oral Maxillofac Implants 1999;14:210-16.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

8. Schwartz-Arad D, Chaushu G. The ways and wherefores of immediate placement implant into fresh extraction sites: A literature review. J Periodontal 1998; 68;915-23.
9. Akimoto K, Becker W, Persson R, et al. Evaluation of titanium implants placed into simulated extraction socket: A study in dogs. Int J Oral Maxillofac Implants 1999;14:351-60.
10. Schwartz-Arad D, Gulayev N, Chaushu G. Immediate versus non-immediate implantation of full-arch fixed reconstruction following extraction of all residual teeth: A retrospective comparative study. J Periodontal 2000;71(6):923-28.
11. Albrektsson T, Lekholm U. Osseo-integration: Current state of art. Dent Clin North Am 1989;33(4):537-54.
12. Becker BE, Becker W, Ricci A, Geurs N. A prospective clinical trial of endo-osseous screw shaped implant placed at the time of tooth extraction without augmentation. J Periodontal 1998; 69:920-26.
13. Wilson TG, Schenk R, Cochran D. Implants placed in fresh extraction site: A report of histological and histometric analysis of human biopsies. Int J Oral Maxillofac Implants 1998;E3: 333-41.
14. Misch CE, Perel ML, Wang HL, Sammartino G, Galindo-Moreno P, Trisi P, Steigmann M, Rebaudi A, Palti A, Pikos MA, Schwartz-Arad D. Implant success, survival, and failure: the International Congress of Oral Implantologists (ICOI) pisa consensus conference. Implant Dent 2008; 17(1): 5-15.
15. Gökçen-Röhlig B, Meriç U, Keskin H. Clinical and radiographic outcomes of implants immediately placed in fresh extraction sockets. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010; 109(4): e1-7.
16. Barone A, Rispoli L, Vozza I, Quaranta A, Covani U. Immediate restoration of single implants placed immediately after tooth extraction. J Periodontol 2006; 77(11):1914-20.
17. Kan JY, Rungcharassaeng K, Lozada J. Immediate placement and provisionalization of maxillary anterior single implants: 1-year prospective study. Int J Oral Maxillofac Implants. 2002; 18(1): 31-9.
18. Block MS, Kent JN. Placement of endo-osseous implant into tooth extraction site. J Oral Maxillofac Surg 1991;49:1269-76.
19. Paolantonio M, Dolci M, Scarnao A, et al. Immediate implant placement in fresh extraction socket. A controlled clinical and histological study in man. J Periodontal 2001;72:1560-71.

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