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Case Report

Clinico-Radiographic Evaluation and Feasibility of Dental Implant in Infected Dentoalveolar Socket

Dr. Bharti[1*], Dr. Ravi Narula[2], Dr. K.Premnath[3], Dr. Rahul VC Tiwari[4], Dr. Heena Tiwari[5], Dr. V K Sasank Kuntamukkula[6]

[1]Senior Lecturer, Dept of Oral and Maxillofacial Surgery, Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India
[2]Professor and head of department, Dept of Oral and Maxillofacial Surgery, Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India
[3]Professor, Department of Prosthodontics, KGF College of Dental Sciences, KGF, Karnataka, India
[4]FOGS, MDS, Assistant Professor, Department of Oral and Maxillofacial Surgery, Sri Sai College of Dental Surgery, Vikarabad, India
[5]BDS, PGDHHM, Government Dental Surgeon, CHC Makdi, Kondagaon, Chhattisgarh, India
[6]MDS, Assistant Professor, Department of Oral and Maxillofacial Surgery, Sri Sai College of Dental Surgery, Vikarabad, India

***Corresponding author:** Dr. Bharti
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Abstract

Introduction: There are various methods for dental rehabilitation but osseointegrated oral implants are now a days one of the most successful method to restore oral esthetics and function. But still immediate implants are often deferred or avoided at a site where infection is present because of the fear of failure. Recent experimental studies and updated literature have shown that with meticulous socket debridement and prophylactic use of antibiotics, successful outcome can be achieved for implants placed in infected socket. ***Aim and Objectives:*** The aim of this present study was to evaluate the feasibility of immediately placed dental implant into infected and debrided dentoalveolar socket and Clinico radiographic evaluation to assess the osseointegration of immediately placed dental implants. ***Materials and Method:*** A total of Twelve implants were placed in 10 patients reporting to Department of Oral and Maxillofacial Surgery at Guru Nanak Dev Dental College and Research Institute Sunam. All implants were immediately placed following extraction of tooth having periapical pathology where the extraction socket was thoroughly debrided and curetted to remove any granulation tissue and necrotic bone from the socket and treated with clindamycin prior to implant placement. Patients were examined on 1st day, 7th day, 1 month and 3 months post-operatively. ***Results:*** The various parameters evaluated included pain, inflammation, infection/suppuration, detectable implant mobility and periimplant radiolucency. Where pain, inflammation and infection was evaluated at 1st day, 7th day, 1 month and 3 months postoperatively and implant mobility and periimplant radiolucency was checked at 3rd month after implant surgery. None of the implants failed during the healing or follow-up period in our study. No peri-implant complications were seen either. ***Conclusion:*** It can be concluded that successful immediate implant placement in infected dentoalveolar socket depends upon the meticulous debridement of alveolar socket and controlled regeneration of alveolar defect.

Keywords: osseointegrated, dental rehabilitation, periimplant radiolucency.

INTRODUCTION

Teeth replacement using dental implants has proven to be a successful and predictable treatment procedure; different placement and loading protocols have evolved from the initial protocols in order to achieve quicker and easier treatment. The original protocol of a dental implant was to place the implant into a healed alveolar socket. However, that protocol requires time to allow healing of the extraction socket [1]. Schulte and Heimke initially described immediate placement of a dental implant in an extraction socket more than 30 years ago, in 1976 [2]. Reduction in number of surgical interventions, a shorter treatment time, an ideal 3-dimensional implant positioning, the presumptive preservation of alveolar bone at the site of the tooth extraction and soft tissue aesthetics have been claimed as potential advantages of this treatment approach. Additional benefit which is also valued by patients, is the avoidance of a second surgical intervention [1]. Preserving soft and hard tissue once initiating an implant treatment is a crucial goal. The intention of immediate implant placement is to try to preserve tissue contour, dimension and also, decrease treatment time. Immediate postextraction implant placement is a well accepted protocol due to the preservation of aesthetics, shorter total treatment time, maintenance of socket walls, reduced surgical time, and better actual implant placement [3]. An implant placed

in fresh extraction socket was noted as immediate implant and an implant placed within 8 week tooth extraction was called as an immediate delayed implant. An implant placed placed later than 2 months was called as delayed implant [4]. Some of the authors have considered that immediate implant placement is contraindicated in the presence of infections such as periodontal and periapical lesions, but several experimental and clinical studies have reported that immediate implant placement in the presence of periapical pathology do not have more complications and higher failure rates than those placed in a healed area [5]. Bell and colleagues immediately placed 285 implants into sockets that had chronic periapical infections (with seven failures) and 637 implants into extraction sites that were not affected by periapical radiolucencies (with eight failures). The difference between the control group and the group with periapical radiolucency was not statistically significant. Therefore, the only disadvantage of the placement of implants into fresh extraction sockets with periapical lesions is that it can potentially contaminate implant during the initial healing period because of remnants of the infection [6]. Nevertheless, before the dental community can accept placing implants in infected sites as an acceptable routine treatment, more clinical documentation issued by various research groups is warranted. More specifically, it should detail (1) the kind of pathology that is involved in the socket, for example, chronic or acute; (2) the specific cleaning methods of the infected sites, medical, and/or surgical; and (3) the medical treatment implemented before and after implantation [7]. The placement of implant immediately after tooth extraction with periapical lesion is still a debate and requires more studies to be conducted so this study is undertaken to describe the immediate placement of implant in replacing teeth with periapical lesions [8-10].

AIMS & OBJECTIVES

To evaluate the feasibility of immediately placed dental implants into infected and debrided dento-alveolar socket. Clinico Radiographic evaluation to assess the osseointegration of immediately placed dental implants after healing period. To evaluate safety, efficacy and predictability of immediate implant surgery into infected and debrided dentoalveolar socket.

MATERIALS & METHODS

PATIENT SELECTION CRITERIA

A total of twelve implants will be placed in patients reporting to the Department of Oral and Maxillofacial Surgery at Guru Nanak Dev Dental College and Research Institute, Sunam. Detailed clinical history along with routine necessary hematological investigations for each surgical procedure was carried out. Maxillary and mandibular teeth that are indicated for extraction because of presence of periapical and periodontal pathosis were included and Chronic or acute systemic disease (uncontrolled diabetes mellitus, hemorrhagic diathesis, auto-immune deficiency), patients with hypersensitivity to implant material, patients with poor oral hygiene, habits and behavioral consideration were excluded.

PRE- SURGICAL PREPARATIONS

All the patients who were undergoing implant placements in this study were given a detailed explanation of the procedure and also viability of the implant success. An informed consent of the procedure was filled and signed by the patient. All patients were given prophylactic dose of Amoxicillin 1 gram one hour prior to the surgical procedure. Patient was prepped and draped under strict aseptic protocol.

SURGICAL PROCEDURE

Extraction of the Tooth

All the procedures were performed under local anaesthesia. Local infilatration was given at the surgical site with 2% lignocaine with 1:2,00,000 adrenaline. Tooth with periapical or periodontal pathosis, for which implant placement was to be done was extracted as atraumatically as possible. After extraction of tooth the extraction sockets were thoroughly debrided and curetted to remove any granulation tissue and necrotic bone from the socket. Extraction sockets were treated with clindamycin prior to implant placement.

Determination of the Length of the implant to be inserted

Length of the root and diameter of radiolucency present at the apex of the tooth was then measured and 2mm was then added to the above value so as to determine the length of the implant to be inserted.

For example:

- Length of the root – 10mm
- Diameter of the radiolucency – 0.5mm
- Length of the implant to be inserted – 10+ 0.5+ 2 = 12.5mm

Implant Site Osteotomy

Osteotomy was prepared according to standard recommended protocol from the manufacturer. Initially, a pilot drill of 2mm was used upto the calculated implant length. After the socket was prepared upto the desired length using pilot drill, osteotomy was then continued using drills in proper sequence maintaining the same length as in pilot drill till the desired width was achieved. The final drill should engage both buccal and lingual plate (if possible) so that a good primary stability can be achieved by implant.

Implant Placement

After the osteotomy of the socket was completed upto the desired length and width, implant was placed into the socket into its final seating position. Cover screw was then placed.

Grafting

After the implant placement was done in the infected socket, the defects that were present in the socket wall and the implant surface were grafted. Wherever required, GTR membrane was then placed over the grafted site,

Closure

Flap closure is regarded as one of the most important aspect of the immediate implant procedure. Primary (water tight) closure of the surgical site was done.

POST OPERATIVE MANAGEMENT

After surgical procedure, antibiotic therapy amoxicillin 500mg three times daily for five days along with anti-inflammatory and analgesics were prescribed for three days. Patients were given oral hygiene instructions. 0.12% chlorhexidine oral rinses twice daily for seven days was advised.

Patients were recalled after three months for second stage surgery after radiographical examination in which crestal incision was given and mucosal flap was raised under local anaesthesia. After exposing the implant site, the implant was connected to abutment or gum former which allows the gum to heal around it and subsequently form a cuff or collar around it.

POST – OPERATIVE ASSESSMENT & FOLLOW UP

Clinically and radiographically patients were examined on 7th post-operative day, 1 month and 3 month postoperatively.

Clinically, implant success was evaluated on the basis of:

- Pain was scored objectively using Visual Analogue Scale (VAS) of 0 to 10 where “0” suggests no pain and “10” suggests severe pain.
- Presence of soft tissue inflammation, signs of infection at the osteotomy site after 7th post-operative day, 1st month and 3rd month post-operatively.
- Any detectable implant mobility at the osteotomy site at the end of 3 months.

Radiographically, intra oral periapical radiographs were taken at every follow up visit and implant success was evaluated on the basis of osseointegration and any periapical radiolucency indicating infection.

OBSERVATIONS AND RESULTS

This study was conducted to evaluate feasibility of dental implant in infected dentoalveolar socket clinically and radiographically in the Department of Oral and Maxillofacial Surgery, GNDDC, Sunam. In our study total of 12 implants were placed in 10 patients.

Pain

Pain is a subjective criteria and depends upon the patients interpretation of the degree of discomfort. It was evaluated using Visual Analog Scale i.e. VAS (1-10) scale on the 1st, 7th day, 1month and 3months postoperatively. On evaluation of patient there was mild to moderate amount of pain present on 1st and 7th postoperative day. No pain was present at 1month and 3 months postoperatively (Table 6-9).

Inflammation

Mild to moderate inflammation was present on 1st and 7th day postoperatively. No sign of inflammation was present at 1month and 3 months (Table 6-9).

Infection

There was no sign of infection present at any implant site in any patient during the follow up period except 1 patient where infection was present on 7th postoperative day that resolved on its own after suture removal (Table 6-9).

Implant Mobility

At 1 month and 3 months all the implant sites were examined. Any detectable implant mobility was absent (Table 8 & 9).

Radiographic Evaluation

On radiographic evaluation periapical radiolucency that was present preoperatively in all planned sites was absent at 3 month followup post operatively (Table 6 & 9).

Table-1: Age

Age group	Number of patients	Percentage
15-20 years	1	10
20-30 years	2	20
30-40 years	4	40
40-50 years	2	20
50-60 years	0	0
60-70 years	1	10

Table-2: Sex Ratio

	Number of patients	Percentage
Male	8	80
Female	2	20

Table-3: Site of implant placement

	Number	Percentage
Maxilla	6	50
Mandible	6	50

Table-4: Site Distribution

	Number of Implants	Distribution
Maxillary Anterior	5	41.66%
Maxillary Posterior	1	8.33%
Mandibular Anterior	2	16.66%
Mandibular Posterior	4	33.33%

Table-5: Osseointegration Success rate of Implants

SITE	SUCCESS RATE
Maxilla	100%
Mandible	100%

Table-6: Clinical Evaluation of Patient 1st Day after Surgery

CASE NO.	IMPLANT SITE	PAIN	SOFT TISSUE INFLAMMATION	INFECTION/ SUPPURATION	PERI IMPLANT RADIOLUCENCY
1.	21	VAS-4	MODERATE	Not Present	present
2.	36	VAS-1	MILD	Not Present	present
	16	VAS-3	MILD	Not Present	present
3.	32	VAS-5	MODERATE	Not Present	present
	41	VAS-5	MODERATE	Not Present	present
4.	46	VAS-2	MILD	Not Present	present
5.	12	VAS-3	MODERATE	Not Present	present
6.	11	VAS-4	MODERATE	Not Present	present
7.	21	VAS-2	MILD	Not Present	present
8.	11	VAS-2	MODERATE	Not Present	present
9.	47	VAS-1	MILD	Not Present	present
10.	36	VAS-4	MODERATE	Not Present	present

Table-7: Clinical Evaluation of Patient 7th Day after Surgery

CASE NO.	IMPLANT SITE	PAIN	SOFT TISSUE INFLAMMATION	INFECTION/ SUPPURATION
1.	21	VAS-2	MODERATE	Present
2.	36	VAS-0	MILD	Not Present
	16	VAS-0	MILD	Not Present
3.	32	VAS-3	MODERATE	Present
	41	VAS-3	MODERATE	Present
4.	46	VAS-0	MILD	Not Present
5.	12	VAS-0	MILD	Not Present
6.	11	VAS-0	MILD	Not Present
7.	21	VAS-0	MILD	Not Present
8.	11	VAS-0	MILD	Not Present
9.	47	VAS-0	MILD	Not Present
10.	36	VAS-0	MILD	Not Present

Table-8: Clinical Evaluation of Patient 1 Month after Surgery

CASE NO.	IMPLANT SITE	PAIN	SOFT TISSUE INFLAMMATION	INFECTION/ SUPPURATION	IMPLANT MOBILITY
1.	21	VAS-0	Not Present	Not Present	Not Present
2.	36	VAS-0	Not Present	Not Present	Not Present
	16	VAS-0	Not Present	Not Present	Not Present
3.	32	VAS-0	Not Present	Not Present	Not Present
	41	VAS-0	Not Present	Not Present	Not Present
4.	46	VAS-0	Not Present	Not Present	Not Present
5.	12	VAS-0	Not Present	Not Present	Not Present
6.	11	VAS-0	Not Present	Not Present	Not Present
7.	21	VAS-0	Not Present	Not Present	Not Present
8.	11	VAS-0	Not Present	Not Present	Not Present
9.	47	VAS-0	Not Present	Not Present	Not Present
10.	36	VAS-0	Not Present	Not Present	Not Present

Table-9: Clinical Evaluation of Patient 3 Months after Surgery

Case no.	Implant Site	Pain	Inflammation	Infection	Implant mobility	Peri-implant Radiolucency	Osseointegration
1.	21	VAS-0	Not Present	Not Present	Not Present	Not Present	present
2.	36	VAS-0	Not Present	Not Present	Not Present	Not Present	present
	16	VAS-0	Not Present	Not Present	Not Present	Not Present	present
3.	32	VAS-0	Not Present	Not Present	Not Present	Not Present	present
	41	VAS-0	Not Present	Not Present	Not Present	Not Present	present
4.	46	VAS-0	Not Present	Not Present	Not Present	Not Present	present
5.	12	VAS-0	Not Present	Not Present	Not Present	Not Present	present
6.	11	VAS-0	Not Present	Not Present	Not Present	Not Present	present
7.	21	VAS-0	Not Present	Not Present	Not Present	Not Present	present
8.	11	VAS-0	Not Present	Not Present	Not Present	Not Present	present
9.	47	VAS-0	Not Present	Not Present	Not Present	Not Present	present
10.	36	VAS-0	Not Present	Not Present	Not Present	Not Present	present

Table-10: Mean pain score

Post Operative Day	Mean Pain
1st Day	3
7th day	0.66
1 month	0
3 months	0

Table-11: Inflammation

Post Operative Day	Inflammation present (%)	Inflammation absent (%)
1st Day	7 (58.33%)	5 (41.66%)
7th day	3(25%)	9 (75.0%)
1 month	0	12 (100%)
3 months	0	12 (100%)

Table-12: Infection

Post Operative Day	Present (%)	Absent (%)
1st day	0	12 (100%)
7th day	3 (25%)	9 (75%)
1 month	0	12 (100%)
3 months	0	12 (100%)

Table-13: PeriapicalRadiolucency

Post Operative Day	Present (%)	Absent (%)
1st day	12 (100%)	0(0)
3 months	0 (0)	12 (100%)

DISCUSSION

Loss of tooth not only disturbs the occlusion of the patient but also becomes social and psychological setback to the patient. The functional aspect of the tooth is lost and esthetic esteem is at the lowest level. The high predictability of dental implants makes them the first choice for replacing missing teeth. This, in addition to the long–term success of implant-supported fixed prosthesis, results in the wide acceptance of implant therapy among the general population [11, 12]. Treatment modalities have evolved from bonding a natural extracted tooth or composite resin restoration to the adjacent teeth, to the Rochette bridge, to the Maryland bridge, and currently to the single-implant-supported crown. Earlier a conventional three-unit fixed

partial denture and removable partial denture were main treatment modalities available. But invasive nature of fixed partial denture treatment lead to other complications that may include mechanical overload of the abutment teeth with weakening or fracture, risk of endodontic treatment, periodontal problems, decay, and cement failure [13]. If any of these complications occurs on any occurs on one of the abutment teeth, the entire prosthesis will fail. Splinting teeth can overload the supporting structures because teeth function individually, and oral hygiene techniques become more cumbersome [14]. Majority patients were dissatisfied with RPD and the dissatisfaction was related to mastication, esthetics, number of missing teeth and maintenance of oral hygiene [15]. Dissatisfaction to these treatment modalities and as need of hour led to introduction of dental implants into the field of dentistry by Dr. Branemark. Implant promises restoration of normal contour, function, esthetics, comfort, speech, and health which is the main goal of modern dentistry [16]. Original protocol suggested a six to twelve month waiting period for healing of the site before implant placement to allow the complete ossification of the extraction socket which was one of the major disadvantage of implant surgery. Many studies on immediate placement of dental implant in fresh extracted socket had been conducted with success of almost above 90% in all the studies and is now a well established protocol [11]. Most of the teeth that were extracted were due to either periodontal or periapical infection and most of the literature on immediate implant suggests that this procedure should be avoided in the presence of periapical or periodontal pathosis.[17] Erickson *et al*., suggested that proper antibiotic coverage with immediate implant surgery could minimize the implant failure rate [18]. Roberto Crespi gave 1 g amoxicillin 1 hour prior to surgery and 1 g twice a day for a week after the surgical procedure [19, 20]. Various studies on immediate implant placement in fresh extraction socket have confirmed that healing and osseointegration are simultaneous process and they appreciate repair phenomenon associated with extraction socket healing and osseointegrated dental implant. The conditions associated with the repair of extraction socket may be favourable for integration of dental implants [18]. Branemark coined the term osseointegration to describe a direct bone-to- implant interface, where fibro osseous integration implies when there is evident layer of fibrous tissue between bone and implant. Various studies have been conducted on the use of bone graft material with or without barrier membrane in between the implant surface and mucoperiosteal flap [21]. These materials will prevent connective tissue ingrowth between implant and bony wall that might interfere with osseointegration of implant. So, we have used allogenic bone graft material and GTR membrane where it was required. As most of the recent studies emphasize on reducing the time between tooth extraction and implant supported prosthesis. Considering the above views by different authors, an opinion was formed to conduct a study on "Clinico radiographic evaluation and feasibility of dental implant in infected dentoalveolar socket". In this study we have challenged the conventional concept of not placing the implant in infected socket and argued that under a controlled procedure and by following a strict protocol, implants can be placed successfully into debrided infected dentoalveolar socket immediately after extraction. The present study was conducted to evaluate the clinical and radiographic results of osseointegrated implants placed in fresh infected dentoalveolar sockets for 3 months after implant placement. The results demonstrated that immediate implant placement in infected socket offered clinically acceptable result. Pain and tenderness being a subjective criteria depend upon the patient's interpretation of the degree of discomfort. Once the implant has achieved primary healing, absence of pain under vertical or horizontal forces is the primary subjective criteria [22]. In the present study 5 implant sites showed mild pain and 7 had moderate pain 1st day after surgery. On 7th day after surgery 9 sites had mild pain and 3 had moderate pain which completely subsided at 10th day postoperatively. There were no complaints of mild or moderate pain at 1st and 3rd month postoperatively. Moderate soft tissue inflammation was present at 7 implant sites and 5 sites had mild inflammation 1st day after surgery. On 7th postoperative day 3 sites showed moderate inflammation while 9 had mild inflammation. There was no soft tissue inflammation present at 1st and 3rd month postoperatively. An infection or suppuration indicates exacerbation of the periimplant disease that can lead to failure of osseointegration. Suppuration persisting for more than 1 or 2 weeks usually warrants surgical revision of the periimplant area to eliminate causative elements [23]. In the present study, none of the implant sites presented with signs of periimplant infection or suppuration on any day after implant surgery. None of the sites showed radiolucency at 3rd month after implant surgery. The loss of osseointegration is clinically manifested by implant mobility. These signs are considered to arise from replacement of highly specialized bone tissue with fibrous connective tissue capsule, unable to contribute to the functional capacity of bone implant unit [21]. In our study none of the implant sites showed any detectable implant mobility at 1st month and 3rd months follow up. None of the implants failed during the healing or follow-up period in our study. Immediate implants are often deffered or avoided at a site where infection is present because of the fear of failure. The present study was carried out to evaluate the placement of the implants in infected dentoalveolar socket. We found that immediate implant placement of dental implants into fresh extraction sockets comes out to be a predictable and successful procedure when proper protocols were followed. Placement of implants in infected sites were always considered a relative contraindication and also literature suggests that periapical pathology may be a cause of

implant failure. Thus, many surgeons hesitate in placing the implants at infected sites [19]. The placement of immediate implants in chronically infected sites may not be necessarily contraindicated if appropriate clinical procedures like antibiotic administration, meticulous cleaning, and alveolar debridement are performed before implant surgical procedure.[24] In this clinical study, we have performed the placement of immediate implant in the infected sites with the designed protocol. Consideration of preoperative antibiotics for the placement of the implant is a vital tool for the reduction of infection. In all the cases the extraction socket was thoroughly debrided and curetted to remove any granulation tissue and necrotic bone from the socket and the socket was treated with clindamycin gel prior to implant placement. Autogenous bone graft and GTR membrane was placed over the implant site where it was required.

SUMMARY AND CONCLUSION

In the present study, a total of 12 implants were placed in 10 patients selected randomly among the patients reporting to the Department of Oral and Maxillofacial surgery, Guru Nanak Dev Dental College and Research Institute, Sunam. All the implants were placed in infected dentoalveolar socket immediately following tooth extraction and two stage surgical procedure according to standardized protocol following recommendations of the manufacturer were carried out. The aim of the present study was to clinically and radiographically evaluate the success and feasibility of implants placed in infected socket immediately following tooth extraction in terms of health of periimplant tissues and periimplant radiolucency. The parameters studied were pain, inflammation, infection/suppuration, detectable implant mobility and periimplant radiolucency. Where pain, inflammation and infection was evaluated at 1st day, 7th day, 1 month and 3 months postoperatively and implant mobility and periimplant radiolucency was checked at 3rd month after implant surgery. The parameters studied indicated a healthy soft tissue and hard tissue response during the period of observation. While our experience suggest that implant can be immediately placed into debrided infected alveolus, but this procedure requires a surgeon who is highly skilled in differentiating and debriding granulation tissue. Thorough knowledge of maxillofacial anatomy is also essential to avoid the violation of adjacent cavity during intra alveolus instrumentation. Moreover the elaborated protocol that is described in this study can be followed. Finally we want to conclude that successful immediate implant placement depends upon the elimination of the granulation tissue and controlled regeneration of alveolar defect. Since our study was short term evaluation and all of our cases had shown successful osseointegration (100%), still it is advisable to conduct long term follow up after loading of the implant and studies with larger sample size are necessary to predict the safety and efficacy of immediate implant placement in fresh extraction socket with periapical pathology.

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