

Evaluation of the role of immediate implant placement as an alternative therapeutic procedure in surgical endodontics: A retrospective study

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Abstract

Background: Endodontic procedures sometimes exhibit compromising factors that indicate an alternative surgical approach to conventional non-surgical treatment. (e.g. exodontia, hemisection etc.). To derive benefit of the osseous height and width, as well as the natural tooth angulation, immediate placement of implants after extraction is a reasonable alternative treatment.

Methodology: In this study, 32 titanium alloy implants were inserted immediately after extraction of teeth diagnosed during endodontic surgery as having root fractures, perforations, or endodontic-periodontal complications.

Results: After 4 to 6 months of osseointegration, implant failure pertaining to lack of integration was seen only in one implant while the remaining implants were prosthetically restored. Sixteen months after occlusal loading, bone loss of -1.5 mm was seen for the 31 implants remaining.

Conclusion: The reliability of immediate implants following tooth extraction due to endodontic complications is thus well analysed and investigated

through present study. *Keywords:* Endodontic, tooth extraction, Osseointegration, immediateimplants

Introduction

Preservation of natural dentition is the ultimate goal of dentist and expectations of patients. Conventional and nonsurgical endodontic treatment is usually the preferred method of therapy; however, several factors indicate surgical endodontics as the treatment alternative. These factors include:

- (i) Conventional endodontic treatment failure,
- (ii) Difficulties in doing conventional endodontic treatment,
- (iii) Root fractures,
- (iv) Root perforations, and
- (v) Endodontic-periodontal complications.

The above mentioned factors usually have a poor prognosis and there is high probability of failure in these cases. A hopeless tooth has poor prognosis and thus a positive indication for extraction followed by prosthetic rehabilitation. Osseointegrated implants have been used successfully for the replacement of missing teeth ⁽¹⁾. In vivo clinical studies have shown that osseointegrated

titanium implants can be used successfully as abutments for oral reconstruction and that periimplant tissues can be maintained in a healthy clinical state for prolonged periods of time^(1, 2). Adequate bone height and width at the surgical site are important prerequisites for placement of endosseous implants. These two factors would subsequently be reduced following tooth extraction and healing⁽³⁾.

Several investigators have suggested through the findings of their studies that immediate placement of implants following extraction derives advantage of the present osseous dimensions and to minimize further osseous resorption⁽³⁻⁵⁾. Not only in adult patients but immediate placement of a dental implant following root fracture has also proven to be successful in pedodontic subjects whose skeletal bone growth is not yet fully developed⁽⁶⁾.

Aim

The purpose of this retrospective study is to evaluate the role of immediate implant placement as an alternative therapeutic procedure in surgical endodontics.

Materials and Methods

Thirty-two teeth from 31 patients were included in this study. Clinical and radiographic findings indicated the need for endodontic surgery to determine the prognosis of the affected teeth and the possibility of maintaining these teeth. Surgical procedures were performed with the assistance of the Dental Operating Microscope⁽⁷⁾.

The cases were done in oral and maxillofacial surgical departments as oral surgical exposure extraction was recommended due to various complications.

These complications included: 13 teeth with vertical root fractures, 8 teeth with horizontal root fractures, 4 teeth with root perforations, and 7 teeth with combined endodontic-periodontal involvement. The mean patient age was 41 yr old (range 22 to 61) and included 19 females and 12 males. No systemic diseases were reported

by patients on the self-reported health questionnaire. Information on the patients smoking habits was added to the questionnaire because of its importance in the success/failure rate in implantology⁽⁸⁾. Nine subjects indicated they were moderate- to-heavy smokers. Nine subjects indicated they were moderate- to-heavy smokers.

Surgical Technique

After careful asepsis adequate anaesthesia was obtained to the surgical site with lidocaine with epinephrine (1:100,000). Full thickness mucoperiosteal flaps were used for the procedures. Intrasulcular incisions were made with 15c miniblade around the selected teeth with vertical releasing incisions one tooth mesial and distal to the treated tooth. If one of the adjacent teeth was absent, the intrasulcular incisions were extended onto the alveolar crest. The teeth in question were evaluated with the Dental Operating Microscope and complicating factors identified. Based on the clinical findings, teeth judged to be hopeless were recommended for extraction with immediate implant placement. Teeth were extracted in as atraumatic a manner as possible to avoid damage to the socket. Following socket degranulation, the apical portion was prepared to receive the implant using the appropriate manufacturer's instructions in the sequence of drilling and implant placement⁽⁵⁾. Preparation of the site was initiated with a pilot drill at 800 to 1,000 rpm under constant saline solution irrigation, followed by spade drills of increasing diameter (2.5, 3.3, and 4.0 mm). The final drill used was either 3.3 or 4.0 mm, depending on the diameter of the selected implant. The implant size was based on the amount of bone available at the site and by location. Sufficient primary stabilisation was obtained by engaging at least 3 mm bone apical to the socket referred to as preparing implant bed.

A total of six screw-type plasma-sprayed implants and 26 cylinder- type plasma sprayed Mini-Matic implants were

inserted. The screw-type implants were positioned with the manually activated manufacturer's designed tool. The cylinder-type implants were positioned utilizing a positioning instrument with a silicone-coated head. An expanded-PTFE membrane i.e. Gore-Tex Periodontal Material was used in the cases (Table 1) to cover both the implant and the socket due to irregularities or defects in the cortical plate. The remaining 22 implants were inserted without membranes. Osseous grafts were not used in any of the 32 cases. Flaps were sutured in an attempt to obtain primary closure and to avoid excessive pressure over the membranes and implants.

An antibiotic (Amoxicillin 500mg tds) and an anti-inflammatory medication (Aceclofenac 100mg and paracetamol 325mg combination) were prescribed for 5 days. Patients were instructed to rinse with a 0.12% chlorhexidine mouth rinse twice a day for 8 wk. Sutures were removed within 10 days. The Gore-Tex membranes were removed at the time of the second stage surgery (4 to 6 months), unless earlier membrane exposure was noted. As shown in Table 1, two cases had membrane exposure during the first month, and membranes were maintained for 6 wk. In two other cases, membranes were exposed after 8 to 9 wk, and removed immediately. Twenty implants were inserted in the maxilla and 12 in the mandible. The peri-implant bone was clinically evaluated at the second stage surgery. In some cases, peri-implant osteotomy was required to remove excess bone that had grown over the implant. Immediately after the second-stage surgery, a custom-made bite block was prepared for use as an X-ray film holder. Periapical radiographs were obtained, and the custom-made bite block was retained for future use. Twenty-five implants received single crown restorations, whereas seven implants were used as abutments for fixed prosthodontic bridges.

Results

Clinical findings are presented in Table 1. Gore-Tex membranes were used in 10 of the 32 cases. In four cases, membranes were exposed at an early stage; however, this did not interfere with the implant integration. Postoperative swelling of 2 to 3 days duration was reported in 11 cases, of which nine were in the maxilla. Five of the 10 cases treated with Gore-Tex demonstrated swelling. Six patients reported postoperative pain, four of which also presented with swelling. One patient, a heavy smoker, developed an implant-associated abscess that was treated with antibiotics and membrane removal. The fixture failed to integrate in this patient and was removed at the second stage surgery. Healing was uneventful in the remaining 21 implant cases, with no reports of any immediate postsurgical complaints. In this group, no membrane exposure or other unusual findings occurred during the healing time. In this study, 31 implants were in function for a mean time of 16.3 months following prosthodontic restoration. Loss of periimplant crestal bone was determined by radiographic evaluation that compared baseline radiographs taken at the time of the second stage surgery to radiographs taken at the final evaluation (mean, 16.3 months). Measurements were taken from the most coronal implant thread to the peri-implant osseous crest. There was no evidence of bone loss > 1.5 mm, confirming the results of previous reports⁽⁵⁾. Oral hygiene was optimal in all patients, and the gingival tissues showed no sign of inflammation. Two patients presenting with additional endodontic-periodontal complications received comprehensive periodontal treatment. Patients were seen every 3 months for routine periodontal maintenance.

Table 1. Subject Distribution And Clinical Finding

Subject No.	Tooth No.	Diagnosis	Membrane	Post-op complications	Time in function (months)	Fixture integration
1.	14	VF			22	Y
2.	25	VF		Swell,pain	13	Y
3.	24	HF			14	Y
4.	25	EP	Y		5	Y
5.	15	HF	Y	Swell	8	Y
6.	26	EP	Y	M.exp, Swell	9	Y
7.	11	VF			23	Y
8.	34	EP	Y	Swell,pain	25	Y
9.	44	HF			12	Y
10.	47	EP		Swell	3	Y
11.	25	VF			26	Y
12.	21	P		Swell	18	Y
13.	16	VF	Y	m.exp	9	Y
14.	24	HF			19	Y
15.	22	EP	Y	Swell,pain	23	Y
16.	15	HF			34	Y
17.	21	HF	Y	Swell,m.exp	26	Y
18.	34	VF		Pain	18	Y
19.	44	HF		Pain	21	Y
20.	46	VF			19	Y
21.	46	VF	Y	m.exp	7	Y
22.	12	P			18	Y
23.	15	EP		Swell	16	Y
24.	14	VF	Y	Abscess	0	Failure
25.	33	VF			8	Y
26.	23	EP			18	Y
27.	11	VF		Swell	22	Y
28.	21	VF		Swell	20	Y
29.	32	HF			12	Y
30.	46	HF	Y	Pain	13	Y
31.	36	P			17	Y
32.	45	P			6	y

* VF, vertical fracture; HF, horizontal fracture; EP, endo-perio communication; P, perforation. 1 Y, yes. :l: Swell, swelling; M.exp, membrane exposure. Calculated from the time of insertion of prosthodontie appliance

Discussion

Surgical endodontics often involves teeth or roots with complications, such as vertical root fractures. This study shows that, in cases of vertical fracture, preoperative diagnosis is difficult due to lack of radiographic sensitivity⁽⁹⁾. A radiolucency may be the only visible indication of the need for endodontic surgery. Fractures are often diagnosed only at the time of exploratory surgery⁽¹⁰⁾. Once a fracture is confirmed in multirrooted teeth, a root amputation can often be successfully performed. With a vertical root fracture in single-rooted teeth, extraction is often the treatment of choice⁽¹¹⁾, even if occasional success has been reported with different methodologies^(9, 12). Cases with a poor prognosis include teeth having perforations, having large posts, or demonstrating an osseous fenestration or dehiscence, especially when combined with periodontal complications. In these situations, surgical endodontics has a poor prognosis⁽¹³⁾ and frequently leads to tooth loss, resulting in increased patient frustration and extended treatment plans with greater patient expense. Because osseointegrated implants have been shown to have a high rate of success⁽¹⁾, it is reasonable to extract teeth with a hopeless prognosis at the time of the exploratory surgery with immediate implant placement. Without immediate implant placement, healing of the extraction socket results in a reduction of bone height and width.

Alveolarbone is a tooth-dependent structure and edentulous ridges are subject to "resorption and remodeling."¹⁴ To take advantage of the favorable clinical situation better, the insertion of implants at the time of the extraction has been suggested by several authors^(3, 4, 15). Optimum criteria for root-form implants requires healthy bone having at least 6 mm of thickness, 7 to 8 mm of height, and at least 1 to 2 mm from anatomical structures, such as the mandibular canal. The presence of the natural

root and periapical radiographs taken at different angulations provide added security that the insertion of an implant can be safely performed, avoiding the need for more sophisticated radio- graphic analysis. Although the proper size and shape of the implant will be based on the size of the natural root, there is a decreased probability of damage to anatomical formations present at the peri-implant area.

Summary

Immediate implant placement, when compared with delayed implant insertion, offers several advantages that can be summarized as follows:

- (i) decreased operatory time with less trauma to the tissues and less discomfort to the patient;
- (ii) by using the extraction site that follows the natural long axis of the tooth, easier implant orientation and better prosthodontic rehabilitation can be achieved;
- (iii) crestal bone loss can be minimized while still maintaining the implant in the central region of the alveolar crest;
- (iv) through the use of a longer implant, the long-term prognosis can be increased; and
- (v) greater support can be obtained for the guided tissue membrane in cases of bone-implant deficiency to maintain or enhance the osseous width and height better.

Contraindications include the presence of an infected peri-implant environment and difficulty in obtaining primary closure of the soft tissues. Controversy exists in the required level of flap coverage, especially when using guided tissue membranes over the implant. When guided tissue regeneration is used, it is recommended that 2 to 3 mm of bone be overlapped by the membrane. In this study, the use of membranes was limited to cases where cortical osseous defects were present and full membrane

coverage was obtained with the flap. Four membranes were exposed during the healing period. Two membranes were exposed during the first month and were removed at 6 wk, whereas the other two membranes were exposed at 8 to 9 wk and were immediately removed. The remaining membranes were removed during second-stage surgery, when the implants were exposed to receive prosthetic coverage. One implant failed during the study and was removed. This occurred in a heavy smoker and was not unexpected, because smoking has been identified as a major factor in implant failure.

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