

Research Article

Immediate Implantation in the Maxillary and Mandibular Molar Fresh Sockets: Technique and Results

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Abstract

Background and aims. The aim of this study was to evaluate the predictability of implantation at the time of maxillary and mandibular molar extraction.

Materials and methods. Maxillary and mandibular molars were extracted with an atraumatic technique (root separation and careful extraction with a periosteal elevator) to preserve all remaining inter-radicular bone. Then, 115 tapered and straight implants were inserted in extraction sites. Inter-radicular bone was utilized to provide primary stability for the implants. Regenerative therapy including placement of bone substitute and resorbable membrane, was performed around all the implants.

Results. Four out of 115 implants failed and were removed one month after insertion because of mobility and radiolucency around the implants. The 7-year cumulative survival rate (CSR) of implants was 96.5%. The maxillary and mandibular 7-year CSRs were 92.7% and 98.6%, respectively.

Conclusion. The combination of atraumatic extraction of hopeless molars, immediate implant placement and concomitant regenerative therapy is a predictable surgical procedure, affording implant stability for restoration with a single crown.

Key words: Dental implants, immediate, case series, molar.

Introduction

The processes of modeling and remodeling that occur following tooth extraction (loss) result in pronounced resorption of the various components of the alveolar ridge. The resorption of the buccal plate is more

pronounced than that of palatal/lingual wall and hence the center of the ridge will move in the palatal/lingual direction. In the extreme case, the entire alveolar process may be lost following tooth loss.^{1,2} Immediate implant placement is now accepted in clinical dentistry for reconstruction of partially or

completely edentulous mandible or maxilla.^{3,4} This procedure has several advantages, such as prevention of bone resorption, reduced number of surgical visits, reduction of comprehensive treatment time, better esthetics and higher patient satisfaction compared with delayed placement of implants. However, because of the nature of this treatment method, a higher risk for complications and failures might be expected.⁵

The clinical survival rates of immediately placed implants are comparable to those of implants placed following tooth extraction and wound healing.⁶

Most of the available studies on immediate implantation describe their use in the anterior and premolar region. Therefore, the purpose of this study was to assess the 1-7 year cumulative survival rate (CSR) of implants placed immediately into fresh extraction sites of molar teeth.

Material and Methods

From 2002 to 2008, 56 patients (15 females and 41 males), with an age range of 32-87, referred to the authors' offices in Tehran for immediate implant placement. Prior to implant placement and subsequent restoration, thorough medical history was taken from all the patients. Each case was precisely evaluated by thorough examination of intraoral tissues and periapical and panoramic radiographs (and computed tomography sections if needed). Indications for tooth extraction were untreatable carious lesions, endodontic treatment failure, tooth fracture, periodontitis and other factors that could result in a hopeless prognosis (Figure 1). Exclusion criteria were the presence of any systemic diseases that would inhibit the healing process for osseointegration, presence of any pathologic lesion at tooth apex or furcation area and presence of active purulence or fistula.

After obtaining written consents from the patients, the treatment protocol proceeded as follows: 2% lidocaine with 1:80000 epinephrine (Daroopaksh Co., Iran) was administered locally. Sulcular incisions were made on the buccal and lingual/palatal aspects of the teeth to be



Figure 1. Clinical and radiographic views of a maxillary first molar.



Figure 2. The first molar has been trisected and extracted without damaging the inter-radicular bone.



Figure 3. The implant has been placed in the prepared inter-radicular bone.

removed. Full-thickness flaps were reflected. All mandibular and maxillary multi-rooted molars which were to be removed were hemisected and trisected with a high-speed handpiece. Then the roots were removed atraumatically with a periotome to preserve inter-radicular septum to provide primary stability (Figure 2). Only the teeth with intact inter-radicular septa and adequate thickness were included in the study.

Following tooth extraction, the extraction socket defect was debrided thoroughly. An osteotomy technique was carried out in the central part of the septum with a starter drill. Then a guide pin was inserted into the prepared osteotomy, and a radiograph was taken to assess osteotomy depth and angulation. After drilling the implants (Zimmer implant with MTX surface, Bego implant with sandblast surface, SPI implant with SLA surface and Noble Biocare implant with Tiunite surface) were inserted into the osteotomy sites (Figure 3). In cases in which the mesiodistal distance of implant area was more than 14 mm, one implant was inserted in place of each root.

After implant placement, the distance between the implant and the socket wall was filled with Cerasorb (Curason, Germany) graft material or DFDBA (IMTEC, 3M Company, USA); Bioguide (Geistlich,



Figure 4. Three months after insertion.

Switzerland) resorbable membrane was placed over the area. The mucoperiosteal flaps were repositioned to attain passive soft tissue primary closure (if needed with connective tissue graft) and sutured with 4.0 silk (Supa, Iran). Post-operative medications included Gelofen 400 mg (qid) or Celebrex 200 mg (bid) for 7 days, and amoxicillin 500 mg, and metronidazole 250 mg three times a day for 5 days. However, these antibiotics were administered 48 hours before the operation. The sutures were removed 2 weeks post-operatively. The radiographs were taken 2 to 3 months after implant placement to evaluate the implants for restoration with fixed prostheses (Figure 4). In addition, at this time, after installation of gingiva formers, all the implants were evaluated with Periotest (Siemens, Germany). If Periotest value was less than zero, the implant would be ready for loading.

Results

From 2002 to 2008, a total of 115 implants were placed in 56 patients (15 females and 41 males), with an age range of 32-87 years at the time of extraction of hopeless first and second mandibular and maxillary molars. Follow-up began from the time of implant placement up to December 2009. Table 1 shows implant location according to arch and tooth position. A total of 78 straight and 37 tapered implants, with a

Table 1. Implant placement

Location	Maxilla	Mandible	Total
First molar	34	40	74
Second molar	7	34	41
Total	41	74	115

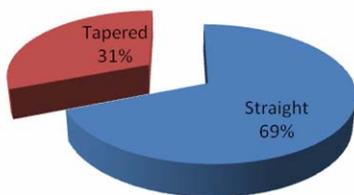


Diagram 1. Implant forms.

mean diameter of 4.5 mm (4.1-5.5 mm) and a mean length of 11.9 mm (10-14 mm) were placed (Diagrams 1-3). Regenerative materials and bioabsorbable membranes were used around all the implants.

There were 4 implant failures (3 in the maxilla and 1 in the mandible) during healing phase and before loading of implants, which were removed 1 month post-operatively because of mobility and radiolucency around the implants. The remaining 111 implants were functioning successfully up to 84 months according to the criteria of Albrektsson et al.⁷

The 7-year cumulative survival rates (CSR) of the implants was 96.5%. The maxillary and mandibular 7-year CSRs were 92.7%, and 98.6%, respectively.

Discussion

Interest in immediate implant placement following tooth extraction has rapidly grown since the first publication on this topic 30 years ago.⁸ Immediate implantation is now considered a clinically predictable procedure.⁹

In our study, 4 out of 115 implants failed and were removed one month after placement because of mobility and radiolucency around the implants. The 7-year cumulative survival rate of the implants was 96.5%. The maxillary and mandibular 7-year CSRs were 92.7%, and 98.6%, respectively.

Schwartz-Arad et al³ in a 7-year follow-up study on immediate implants reported a low frequency of

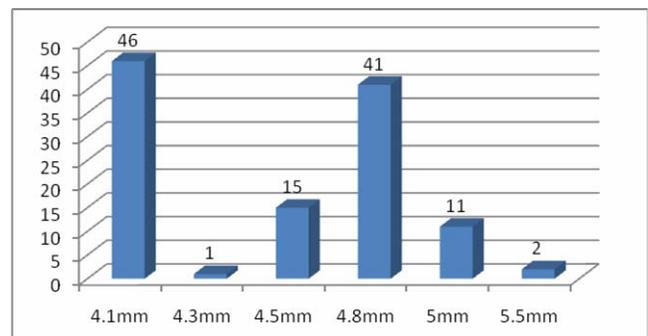


Diagram 2. Implant widths.

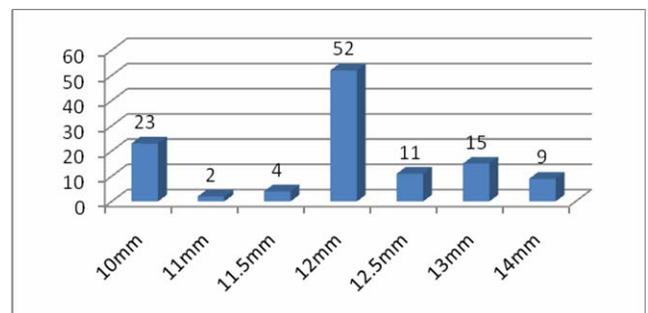


Diagram 3. Implant lengths.

complications during the healing period and a very high survival rate without using barrier membranes. Becker et al¹⁰ placed 134 implants into fresh extraction sockets in 81 patients. No graft material or covering membrane was placed. The cumulative survival rate was 93.3%. However, in the present study, graft materials and appropriate covering membranes were used to help prevent alveolar resorption and collapse.¹¹ Fugazzotto et al¹² placed 341 implants in mandibular molar fresh extraction sockets. Simultaneously, regenerative therapy was performed around 332 of the implants. The 6-year CSR was 99.1%, which is comparable with the 98.6% CSR of our study.

Jemt and Lekholm¹³ reported a 5-year cumulative survival rate of 97.2% for 259 posterior implants placed in partially edentulous jaws. The long-term clinical effectiveness of osseointegrated posterior dental implants in partially edentulous jaws has been reported by Zarb and Schmitt.¹⁴ After periods of loading ranging from 2.6 to 7.4 years (mean 5.2 years), the overall implant survival rate was 94.3%.

The results of our study on immediate implantation is comparable with the results of the two above-mentioned studies on non-immediate implant placement, which implies that immediate implantation in the posterior areas is a predictable treatment alternative.

Schwartz-Arad et al¹⁵ inserted 56 immediate implants in 43 patients following extraction of 51 molars, with simultaneous regenerative therapy. They reported a 5-year CSR of 89%. The maxillary and mandibular 5-year CSRs were 82% and 92%, respectively. Although the 7-year CSR in our study is higher than that in Schwartz-Arad study, the CSR in the mandible was more than that in the maxilla. Several reports have suggested that bone quality is a major prognostic factor for implant success.¹⁶ Bone quality requires evaluation in immediate implantation, too. In the present study, the maxillary and mandibular molar survival rates were 92.7% and 98.6%, respectively. Bone quality might explain the difference.

In contrast to these studies, Fugazzotto¹⁷ reported a CSR of 100% for 83 tapered-end implants in maxillary first or second molar fresh sockets following manipulation of the remaining inter-radicular bone with an osteotome. Regenerative therapy was provided around all the implants. All the implants were functioning successfully for up to 18 months.

Cafiero et al¹⁸ conducted a 12-month prospective multicenter cohort study. They placed 82 tapered implants in molar extraction sites. GBR was used in conjunction with the placement of all the implants. All the implants healed uneventfully, yielding a survival

rate of 100%. No difference was observed with respect to survival rate when maxillary and mandibular molars were compared after 12 months, which does not coincide with the results of the present study.

Conclusion

The results of the present study showed that the use of tapered and straight implants for the immediate placement of maxillary and mandibular molars represented a predictable treatment modality after an observation period of up to 84 months.

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