Immediate Implant Considerations for Interradicular Bone in Maxillary Molars: Case Reports

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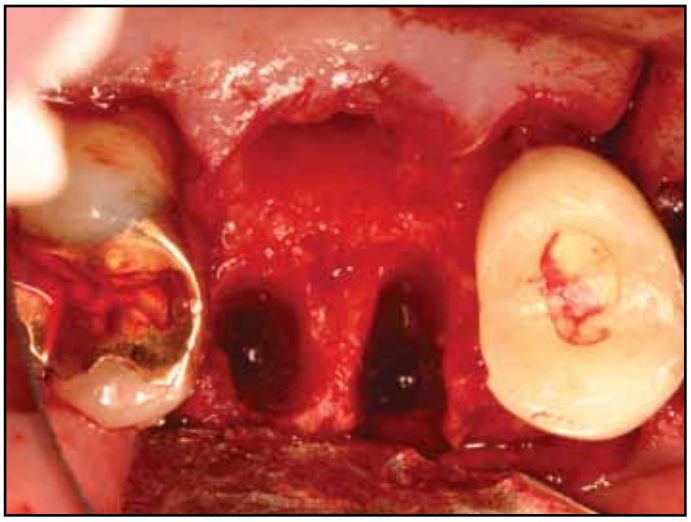
Abstract



Implant placement into fresh extraction sockets is currently a choice to replace missing teeth for anterior and molar sites. In maxillary molar sites the technique involves numerous challenges related to site-specific anatomic, occlusal, and biomechanical factors. There is a wide variability in the anatomy of maxillary molars, which makes the interradicular bone anatomy vary in each case. In some cases there is enough availability of bone in the interradicular maxillary ridge to place an immediate implant. This article reports on the surgical-prosthetic treatment of patients with immediate implants placed in the interradicular bone of the maxillary first molars.

KEY WORDS: Immediate dental implants, maxillary molars, extraction, case report

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INTRODUCTION

Implant placement into fresh extraction sockets has become increasingly routine. Traditional protocols for placing oral implants, especially in cases of single-tooth replacement, have been revised to meet subjective and objective requirements for fewer surgical interventions and shorter implant treatment times.[1] Healing and implant integration may also benefit from the inherent potential for bone repair triggered by the extraction process.[2]

Immediate implant placement is currently a very popular choice to replace a missing single tooth in the esthetic zone of the mouth,3 and several authors have showed that success rates can be achieved similar to those obtained by delayed implants placed into healed extraction sockets.[4,5] In these cases appropriate case selection is important, because improper case choice is the most significant reason for potential complications.[6]

Neither significant difference in implant failure has been found between immediate and delayed implant placement in molar sites.[7,8] However, the immediate placement of a single implant in molar regions involves numerous challenges related to site-specific anatomic, occlusal, and biomechanical factors.[1] The possibility of predictable outcomes with immediate implantation in maxillary molar sites is additionally compromised because of the larger extraction sockets, poor quality of bone,[9] and less bone apical to the socket because of the proximity of the maxillary sinus.[10]

There is a wide variability in the anatomy of maxillary molars, and in particular there is complexity in their furcation topography. The interradicular bone of the maxillary first molars

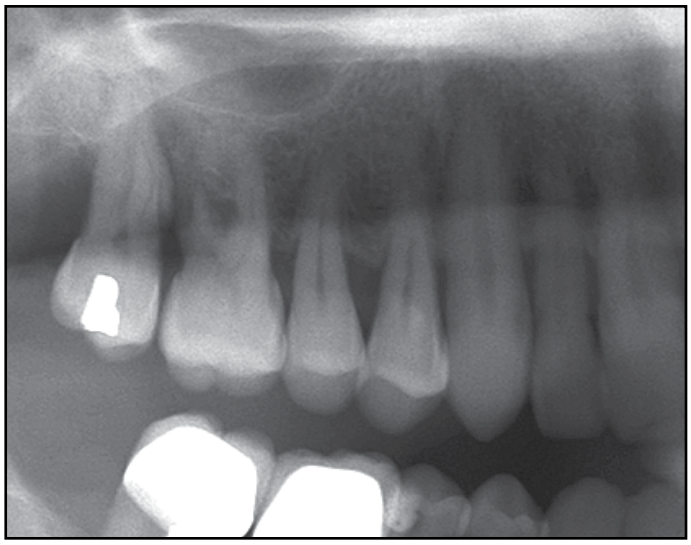

Figure 1: Preoperative radiographic image of the first right upper molar in case one.

vary in width and the socket entrances can be situated at different vertical distances from the cemento-enamel junction in each root.[11] This makes the interradicular bone anatomy vary in each case, and it should be individually diagnosed in the preoperative study.

In some cases there is enough availability of bone in the interradicular maxillary ridge to place an immediate implant. This article reports on the surgical-prosthetic treatment of patient with an immediate implant placed in the interradicular bone of the maxillary right first molar.

CASE REPORT 1

A 67-year old male patient presented to the clinic of author MI-P in Spain with mobility and pain in his first and second right upper molars, with periodontal bone loss and the furcation was affected in the first molar. After clinical, diagnostic casts and x-ray examination, therapeutic planning was performed including extraction of both molars, but only the first was going

Figure 2: Intact interradicular bone preserved after atraumatic extraction.

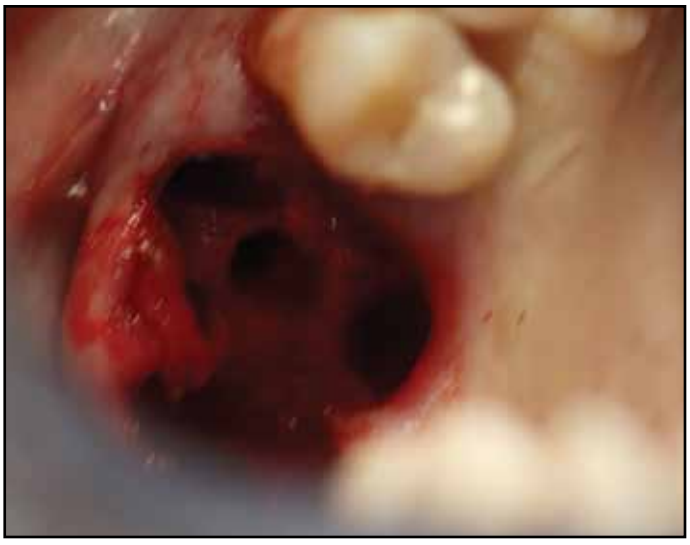

Figure 3: Interradicular bone preparation with a low-speed drilling technique.

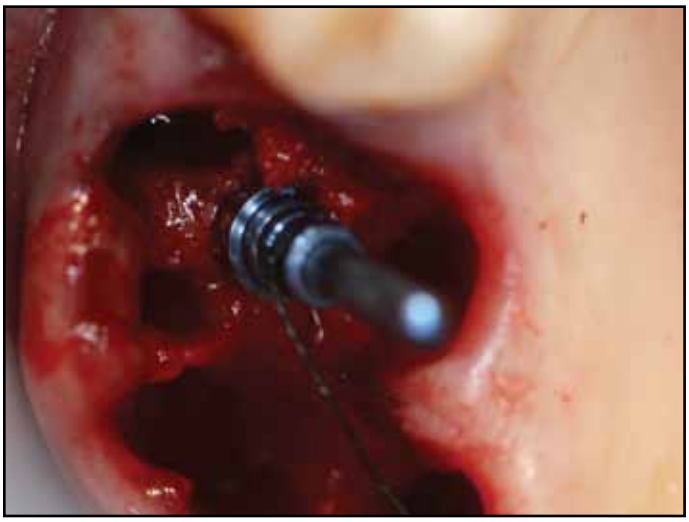

Figure 4: Checking the three-dimensional position of the future implant.

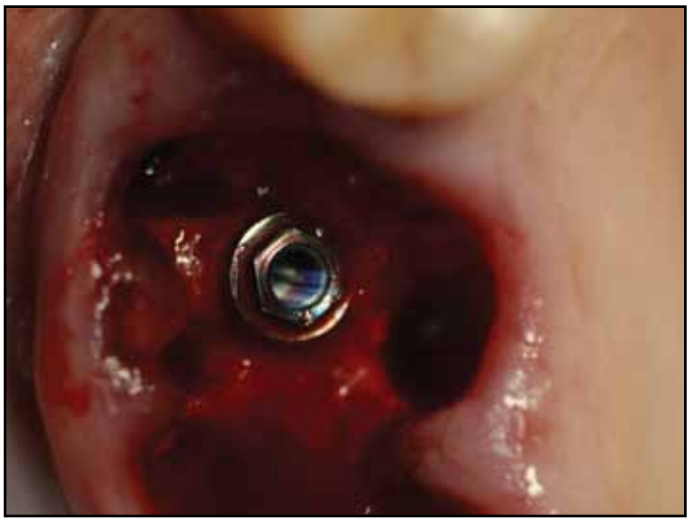

Figure 5: Immediate implant placed in interradicular bone.

to be replaced, because the second did not have opposing teeth. The x-ray diagnosis found enough bone availability in the interradicular bone of the first right upper molar, so an immediate implant was planned in that tooth (Fig. 1).

Careful sectioning of the tooth was performed in a flapless approach, so that the roots could be individually extracted atraumatically with a periotome. This technique preserved intact the interradicular bone (Fig. 2), and after extraction this bone was prepared carefully with a low-speed drilling technique (Fig.

Figure 6: Healing abutment and sutures.

Figure 7: After a 3-month osseointegration period.

Figure 8: Titanium cast framework laser-welded to a machined abutment.

Figure 9: Porcelain fused to metal final restoration.

3). When the interradicular bone was prepared and the three-dimensional position of the future implant was checked, (Fig. 4) one rough-surfaced acid-etched self-tapping tapered implant (Osseotite NT; Biomet 3i, Palm Beach Gardens, FL, USA) was placed, according to the treatment planning with 35N of torque (Figs. 5,6).

After a 3-month osseointegration period the implant was ready to load (Fig. 7), and a titanium cast framework was laser-welded to a machined abutment (Fig. 8), and then covered with ceramic (Fig. 9). Finally a screw-retained single unit prosthesis was delivered and placed on the implant (Figs. 10,11).

Figure 10: Case one final restoration. Occlusal view.

Figure 11: Case one final restoration. Buccal view.

CASE REPORT 2

A 34-year old female patient presented with a vertical fracture in her first left upper molar, in which an endodontic treatment was previously performed 4 years before. After clinical (Fig. 12) and X-ray examination, extraction of the molar was planned. The X-ray diagnosis (Fig. 13) showed a long palatal root entering the maxillary sinus, and both buccal roots shorter and slightly separated, suggesting enough bone availability in the interradicular ridge of this first left upper molar, so an immediate implant was planned for that tooth. Only 2-3mm of bone height was available apical to the buccal roots.

Careful sectioning of the tooth was performed in a flapless approach, extracting all the roots atraumatically with a periotome. This allowed preservation of the interradicular bone (Fig. 14), which was prepared carefully in a minimally invasive approach with a low-speed drilling technique. In order to achieve better primary stability and with the aim of placing a 10mm implant, sinus lift elevation with osteotomes was performed (Figs. 15-16). After that a 4 x 10 mm implant (SLA Esthetic Plus; Straumann, Villeret, Switzerland) was placed, according to the treatment planning with 40N of torque (Figs. 17-19).

After a 2-month osseointegration period the implant was ready to load (Figs. 20-21), and a titanium porcelain fused to metal crown was delivered and screwed on a Syn-Octa (Straumann) abutment (Figs. 22-25).

CASE REPORT 3

A 65 year old African American female presented to the clinic of author DH in Texas with a non-restorable maxillary right first molar due to significant recurrent decay on the palatal aspect of the tooth (Figs. 26, 27). The patient desired a dental implant to be placed immediately if possible. The patient was a heavy smoker (1 pack per day with a 45 year pack history) and was taking medication for glaucoma.

Following the administration of local anesthesia, the tooth was sectioned into three pieces (Fig. 28) so the roots could be individu-

Figure 12: Case two preoperative clinical image of the first left upper molar.

Figure 13: Case two preoperative radiographic image of the first left upper molar.

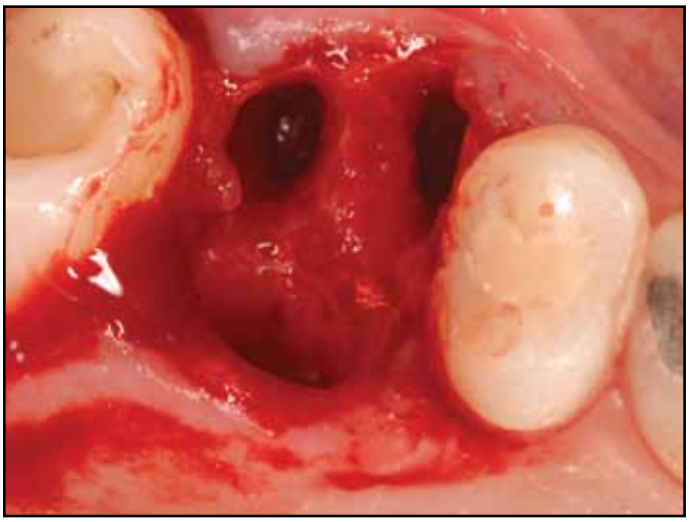

Figure 14: Intact interradicular bone preserved after atraumatic extraction.

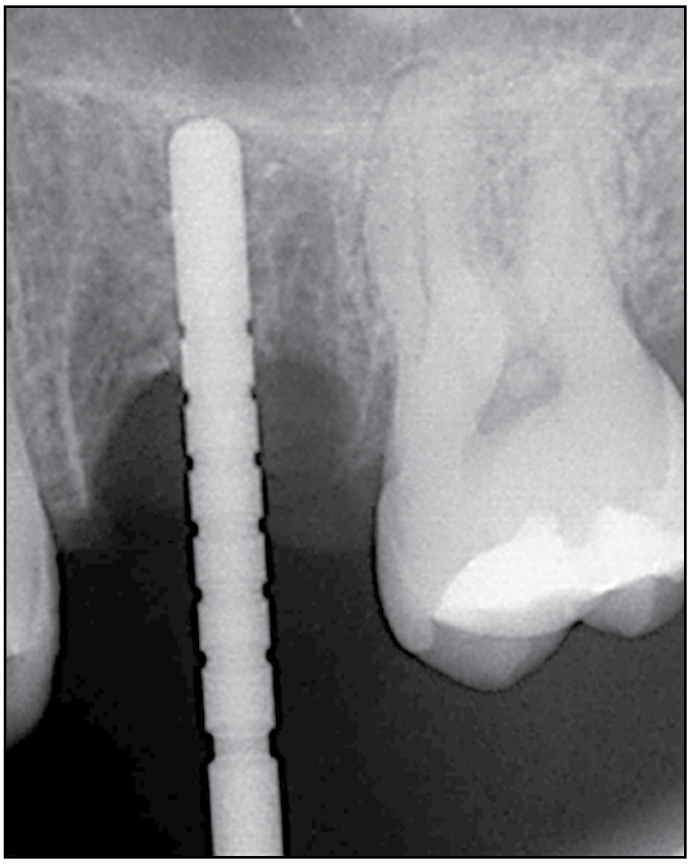

Figure 15: Sinus lift elevation with a 2 mm osteotome.

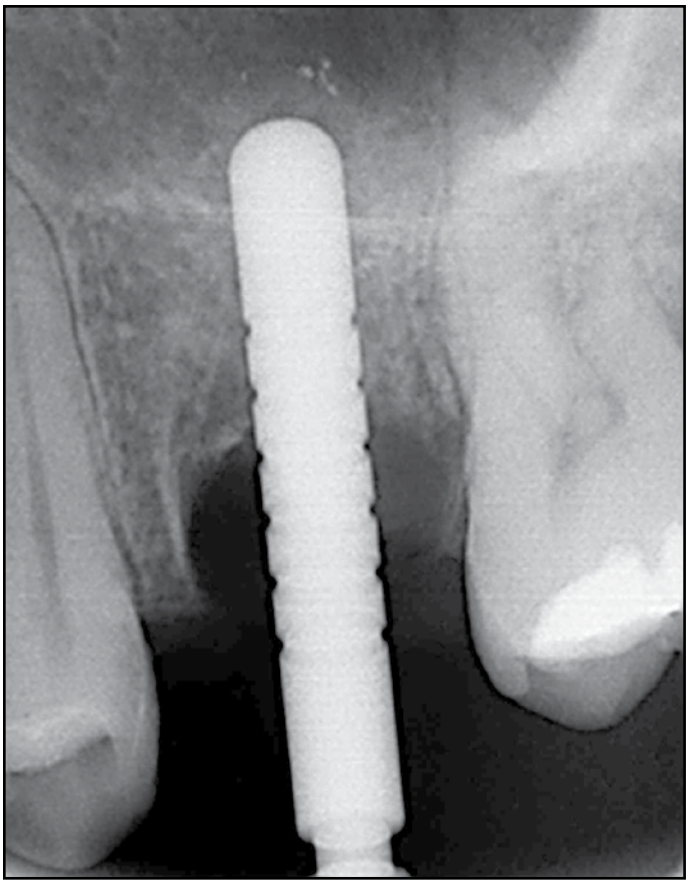

Figure 16: Sinus lift elevation with a 3 mm osteotome.

ally extracted with minimal trauma to the underlying bone. Inspection of the extraction socket following removal of the roots revealed septal bone of adequate dimensions for immediate implant placement (Fig. 29). A 5x11.5mm rough-surfaced acid-etched self-tapping dental implant (MIS, New Jersey, USA) was placed into the septal bone (Fig. 30). Particulated bone allograft (Community Tissue Services, Dayton, Ohio, USA) was used to graft the remaining root sockets (Fig. 31). The implant and grafted socket were then covered with a non-resorbable polytetrafluoroethylene (PTFE) barrier (Osteogenics, Lubbock, Texas, USA) and primary closure was not attempted (Fig.

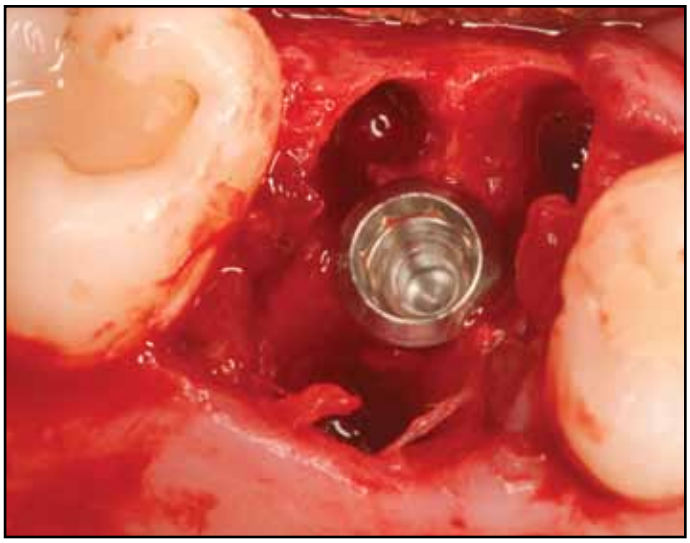

Figure 17: Immediate implant placed in interradicular bone.

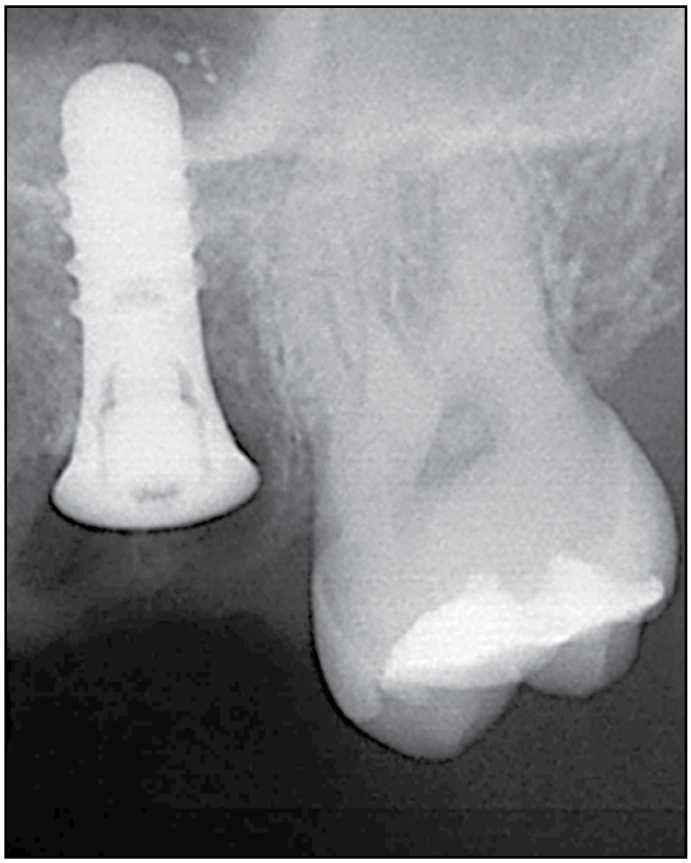

Figure 18: Radiograph of immediate implant placed in interradicular bone.

Figure 19: Healing abutment and sutures.

Figure 20: After a 2-month osseointegration period.

Figure 21: Healing abutment removed after a 2-month osseointegration period.

Figure 22: Synocta abutment placement.

32). The patient admitted to heavy smoking during the early healing phase, which was evident in stains seen on the PFTE barrier (Fig. 33). Removal of the PTFE barrier at 21 days revealed immature granulation tissue that completely covered the bone graft (Fig. 34). Six weeks after the PTFE barrier removal, the tissue over the extraction socket demonstrated complete keratinization (Fig. 35) and further matured by 3 months (Fig. 36). Second stage surgery demonstrated a significant band of keratinized tissue around the healing abutment (Fig. 37). ISQ measurements taken with an Osstell Unit (Osstell, Gothenburg, Sweden) at the second

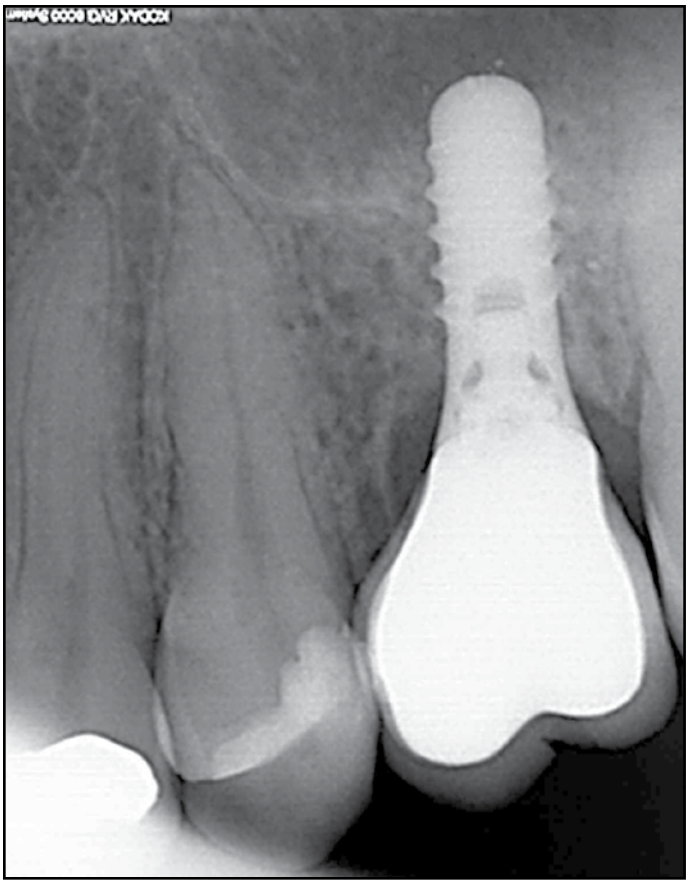

Figure 23: Final restoration X-ray of case two.

Figure 24: Case two final restoration. Occlusal view.

Figure 25: Case two final restoration. Buccal view.

stage surgery revealed values of 74 and 76 and radiographs appeared within normal limits (Fig. 38). At one year after fixture restoration, peri-implant bone levels remained stable (Fig. 39).

DISCUSSION

A key point in successfully applying the immediate implant placement technique is the development of appropriate case selection criteria, with adequate residual ridge architecture for implant placement in a prosthetically driven position with sufficient primary stability.[2] For maxillary molars, the ideal restorative position is in the center of the restoration, regarding force distribution and patient's plaque control.[12] It is not advisable to place implants directly into one of the sockets of an upper molar, as the implant would invariably be located in an inappropriate restorative position.[13] In the proposed technique ideal three-dimensional position of the implant is achieved, and initial implant stability is also obtained by positioning the implant in the interradicular

Figure 26: Presurgical radiograph of Case 3, maxillary first molar.

Figure 27: Recurrent decay on palatal root of tooth #3

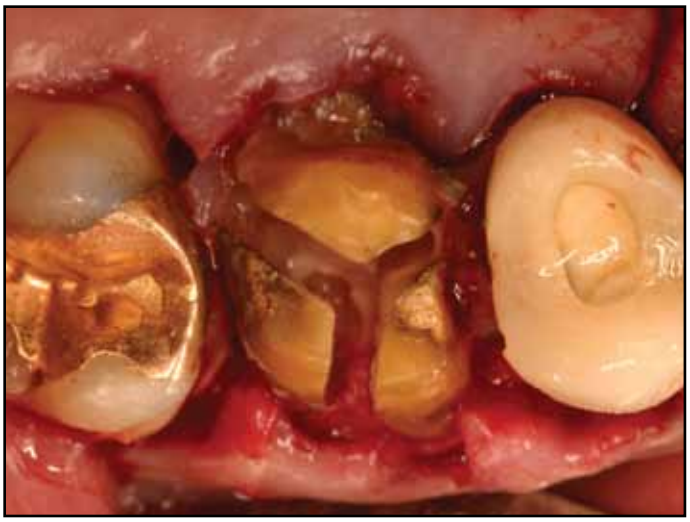

Figure 28: Sectioned tooth #3 prior to extraction.

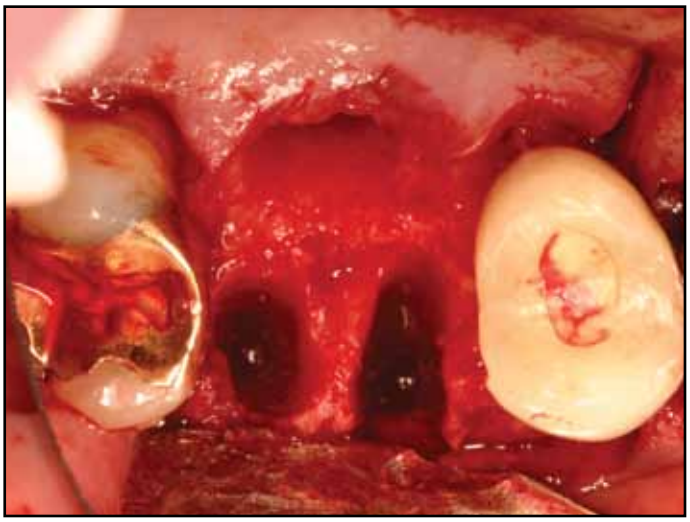

Figure 29: Setpal bone at site #3 remains intact following tooth removal

bone and beyond the apex of the tooth socket.

Also adjunctive use of bone-grafting techniques to correct residual horizontal defects of more than 2 mm between an implant and the walls of an intact extraction socket is usually needed in immediate implants.[2]

In the first case presented in this paper, bone grafting was avoided, simplifying surgical technique and improving patient's postoperative comfort. The implant is surrounded by natural bone, allowing the socket to heal without affecting the implant osseointegration.

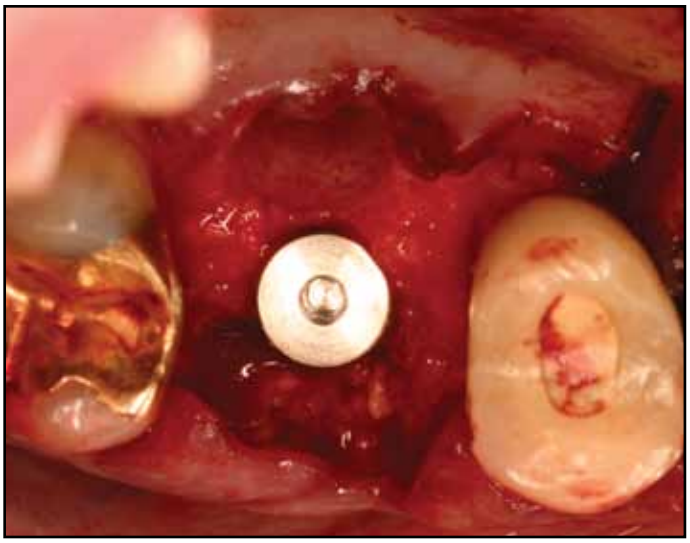

Figure 30: Placement of dental implant into maxillary septal bone.

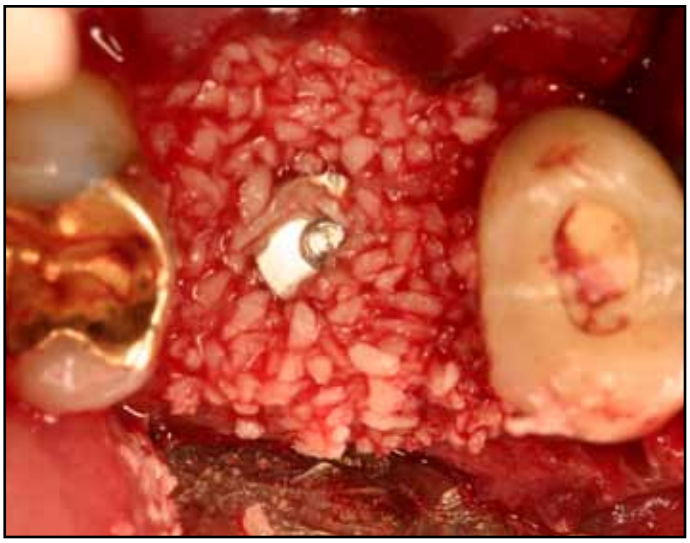

Figure 31: Placement of bone allograft.

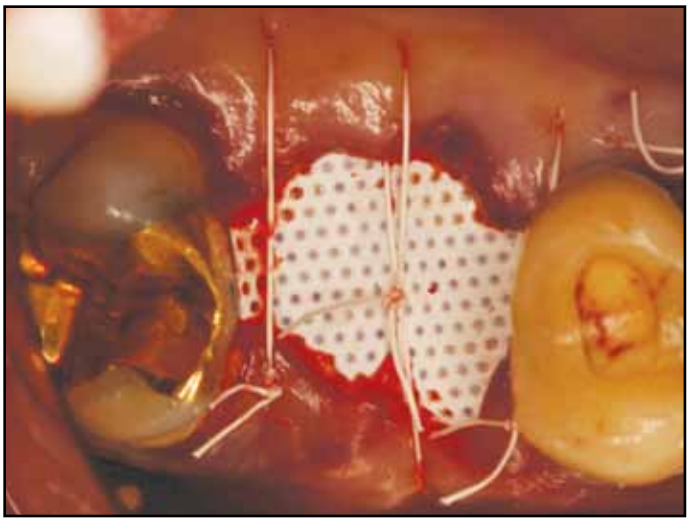

Figure 32: Placment of PTFE barrier. No primary closure attempted.

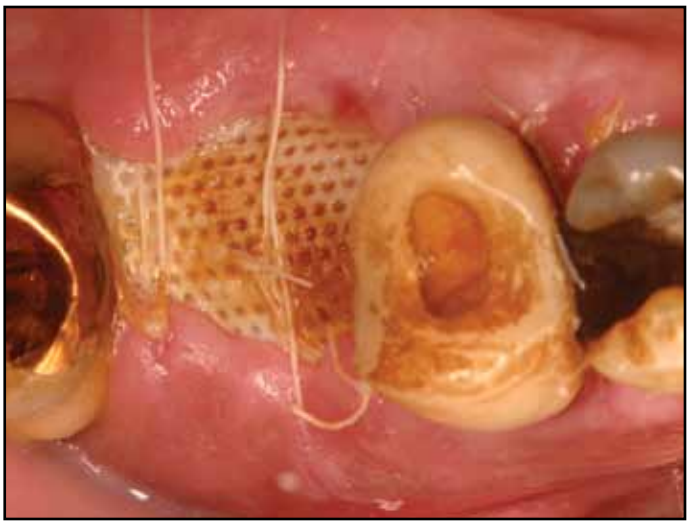

Figure 33: Initial 10 day follow up visit. Note the heavy stain on the PTFE barrier to heavy smoking by the patient during the early healing phase.

In the second case presented in this paper, bone grafting with freeze dried bone allograft was utilized with a non-resorbable PTFE barrier. The PTFE barrier was used to avoid the need for primary closure of the extraction socket. In spite of the patient's heavy smoking habit, the PTFE barrier adequately protected the surgical site during the early phase of healing, allowing a natural barrier of gingival tissue to form over the bone graft. Upon further healing, this tissue formed a thick band of keratinized tissue. The ISQ

Figure 34: Removal of PTFE barrier at 21 days reveals immature granulation tissue covering grafted extraction site.

Figure 35: Tissue keratinization at 6 weeks after surgery.

Figure 36: Continued maturation of keratinized tissue at surgical site 3 months after surgery.

Figure 37: Note the significant band of keratinized gingiva surrounding the healing abutment following second stage surgery.

values taken at the second stage implant surgery demonstrate stability of the implant.

The morphology of the socket at the time of extraction may complicate optimal placement and initial stability of the implant, especially in molars. But sometimes, if correctly diagnosed, a favorable anatomy in the interradicular bone can be found and taken advantage of placing an immediate implant easily.

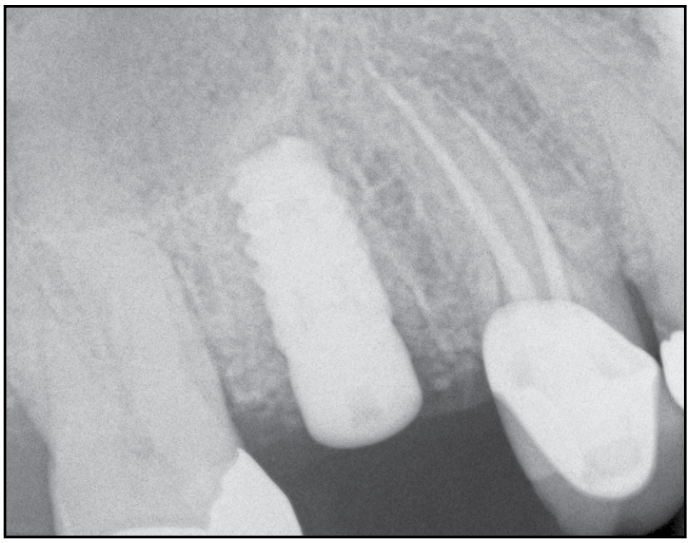

Figure 38: Radiograph 4 months after initial surgery.

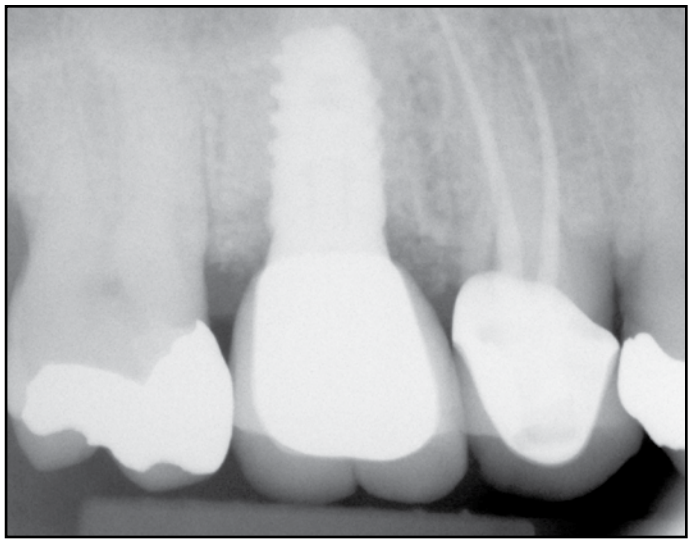

Figure 39: Case three radiograph with final restoration 1 year after placement.

CONCLUSION

If an appropriate and precise preoperative diagnosis is performed, cases of maxillary molars with enough availability of interradicular bone can be detected. This allows immediate implant placement which fulfills all criteria to appropriate function and osseointegration, taking advantage of immediate implants.

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Disclosure
- Dr. Iglesia reports no conflicts of interest with anything mentioned in this paper.
- Dr. Holtzclaw is a consultant with Community Tissue Services and lectures for MIS Dental Implants.

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