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Immediate Implant Placement in Deficient Bone Sites

THIS ARTICLE HAS BEEN PEER-REVIEWED.

Introduction

The presence of a low-lying sinus floor and inadequate bone volume often precludes the successful placement of implants. The following Case Report describes a protocol for an immediate placement of a maxillary molar implant where the vertical height of bone is inadequate due to the presence of the sinus floor. The following protocol for predictable immediate molar implant placement and concurrent sinus augmentation relies on the principles of osteogenesis upregulation through the use of growth factors and particulate osseous grafting.

This particular method consists of the following steps:

- extraction of the tooth
- immediate crestal approach sinus graft using bovine mineral and plasma rich in growth factors (PRGF)
- immediate implant placement
- particulate bone grafting in conjunction with the use of PRGF
- three to four months of healing
- attachment of the final prosthesis.

In contrast to a more traditional staged approach, this case illustrates how time and expense can be reduced using this immediate placement protocol.

CASE REPORT

A 43-year-old healthy male presented with an initial complaint of a fractured upper right tooth and spontaneous intermittent sensitivity. His medical history was non-contributory as he was taking no medications and was not being treated for any illnesses.

Tooth #16 was originally endodontically treated due to carious pulpal exposure. Ten years later it was endodontically re-treated due to the development of an acute infection. Six months after the re-treatment, the coronal portion of #16 fractured at the level of the gingiva. At this point, radiographic examination revealed an apparent periapical periodontitis and the tooth was deemed non-restorable. Upon evaluation, tooth #16 was given a hopeless prognosis and consent was obtained from the patient for extraction with immediate implant placement[1,2,3] as well as a modified SA2 sinus elevation procedure.[4]

Prior to extraction, two 9 mL vials of blood were drawn from the patient's left antecubital fossa. These were used to generate the plasma rich in growth factors (PRGF)[5] to be used during the surgery.

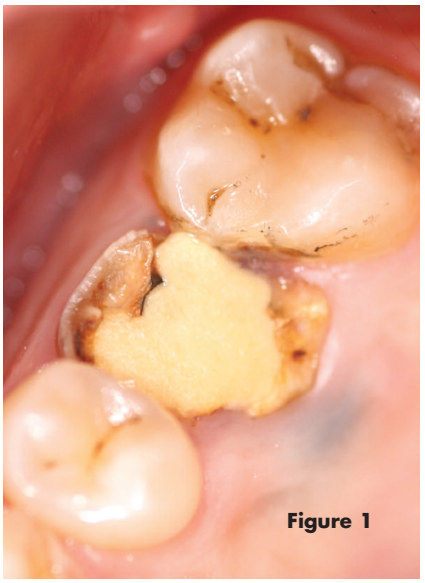

Figure 1

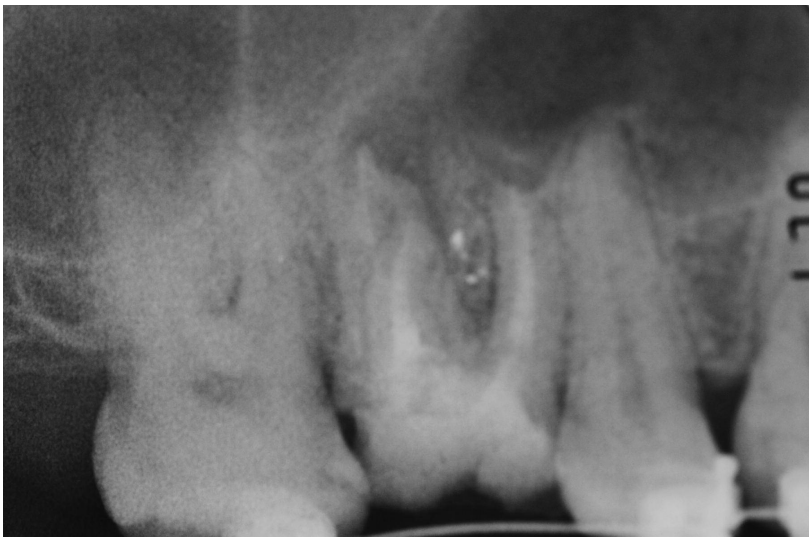

Figure 1a

Clinical Procedures

Figures 1 & 1a – Initial clinical and radiographic appearance of tooth #16.

Figure 2 – Tooth was sectioned and extracted using a periotome and forceps technique in order to maintain interseptal and buccal bone walls.

Figure 3 – An osteotomy was created in the mid-interseptal bone. The osteotomy was advanced to include the floor of the sinus.

Figure 4 – The **F1** fibrin-rich biogenic membrane derived from the patient's plasma. This membrane is obtained by centrifuging the patient's blood and withdrawing the superior most fraction, which is considered to be most highly concentrated with fibrin. This layer, which is referred to as the **F1**, is then coagulated using calcium chloride to create a homologous membrane.[6]

Figure 5 – A fibrin-poor biogenic membrane derived from the patient's plasma with particulate bovine xenograft integrated within it. After centrifugation, the fibrin-poor layer (known as the **F2** layer) of the patient's plasma is used and coagulated with the added mineralized xenograft.

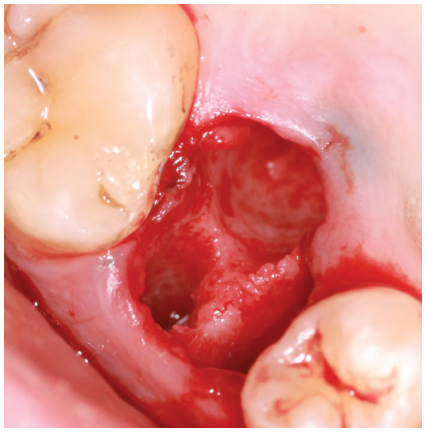

Figure 2

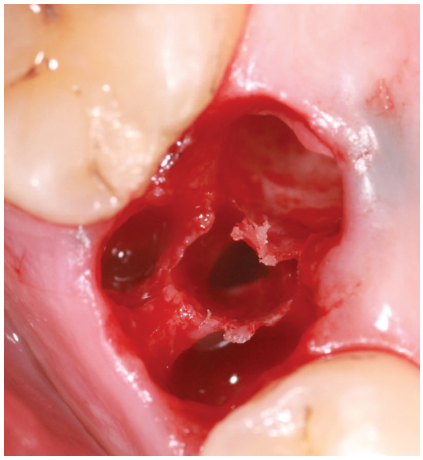

Figure 3

Figure 4

Figure 5

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Figure 6 – The F1 fibrin-rich plasma membrane is placed first into the osteotomy and pushed apically to form the new sub-antral floor. It can also repair any microscopic tears or perforations of the Schneiderian membrane.

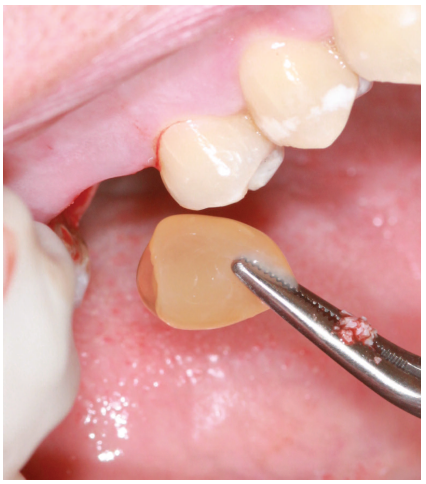


Figure 6

Figure 7 – The **F2** or fibrin-poor plasma membrane containing the mineralized xenograft is **then** placed into the osteotomy and also pushed apically into the floor of the sinus. This will act as the sinus graft and form new bone around the apex of the implant. It has been shown that bovine mineral alone will form new bone in the maxillary antrum.[7,8,9] In this technique, the addition of biologic modifiers (growth factors found in the patient's own plasma, from the F2 layer) should have a positive influence on the predictability, quality and speed of maturation of the newly-formed bone.

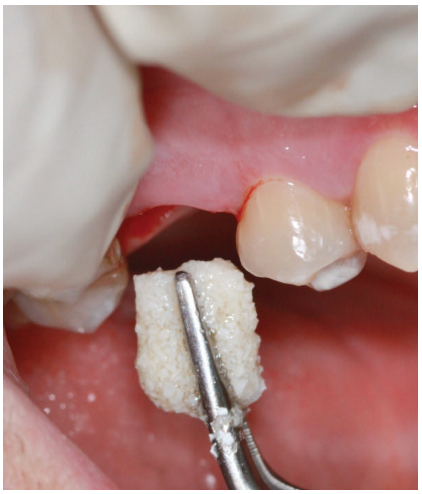


Figure 7

Figure 8 – View of PRGF and graft placed in extraction socket and into sinus floor.

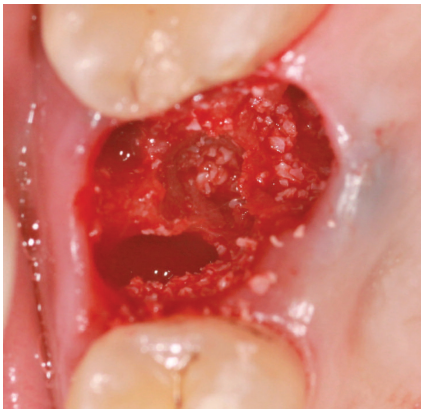


Figure 8

Figure 9 – A 5.6 x 10.5 mm tapered Laser-Lok Biohorizons implant is dipped in the growth factor rich plasma layer creating a bioactive surface.[10] A cortico-cancellous allograft can also be seen in the bowl soaking in this layer of the patient's plasma, which was drawn up from the plasma closest to the sedimented red blood cells after centrifugation. This graft was used to partially fill in the bony defects around the implant body.

Figure 9

Figure 10 – View of final implant position in the extraction socket.

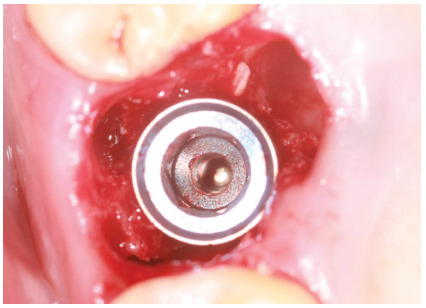
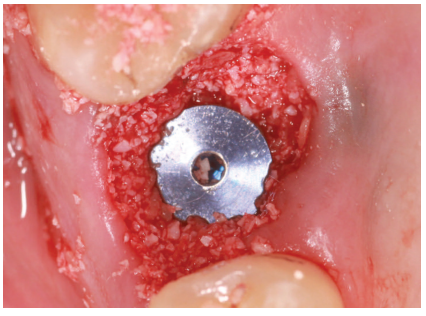


Figure 10

Figure 11 – Additional heterologous graft (mineralized xenograft integrated F2) was used to fill bony deficiencies.

Figure 11

Figure 12 – Final view of implant surrounded by grafting material. A freeze-dried bone allograft soaked in the growth factor rich plasma was also used to fill the defects.



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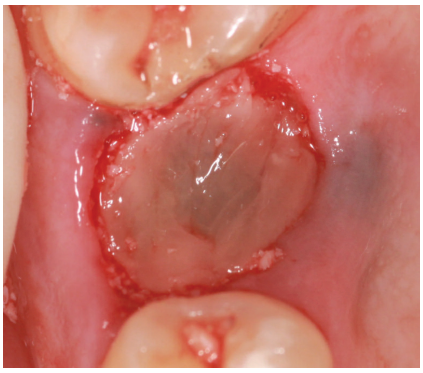


Figure 13

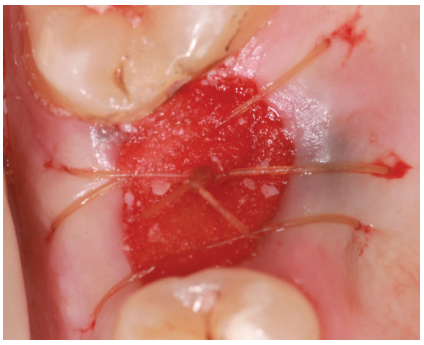


Figure 14

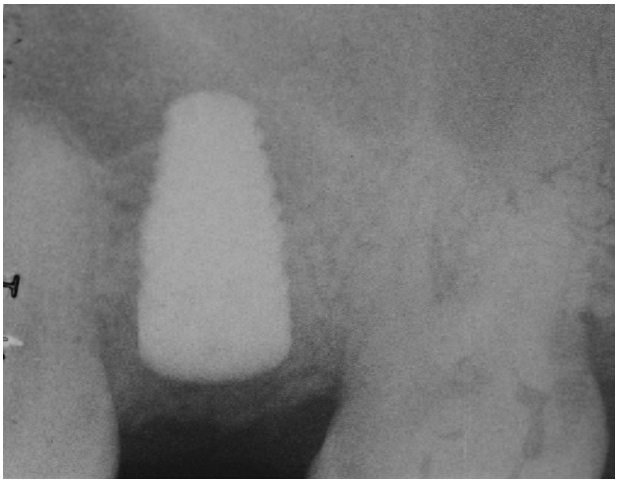


Figure 15

Figures 13 & 14 – The remaining fibrin-rich **F1** membrane was used as an occlusive dressing on top of the socket. A Gelfoam hemostatic sponge was placed on top and sutured in place in order to ensure all previous graft materials remained secure.

Figure 15 – Final post-surgical radiograph of implant fixture.

Figure 16 – Ten-day post-operative view shows fibrin membrane still well in place and initial epithelial creep.

Figure 17 – Post-operative view at 10 weeks.

Figures 18 & 18a – Healing abutment in place at 10 weeks post-operatively. Healthy and robust appearance of soft tissue cuff at three months post-operatively.

Figure 19 – Stock Biohorizons 3-in-1 abutment placed at crown cementation appointment.

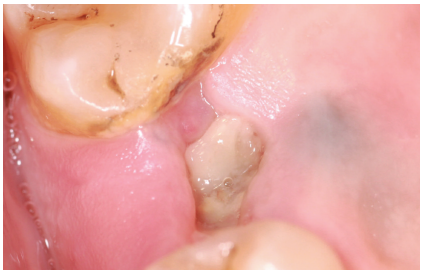
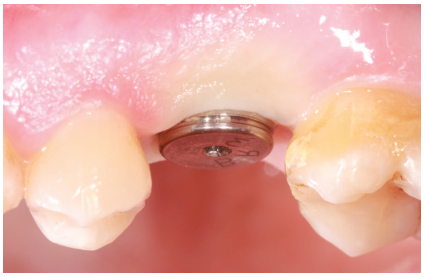


Figure 16



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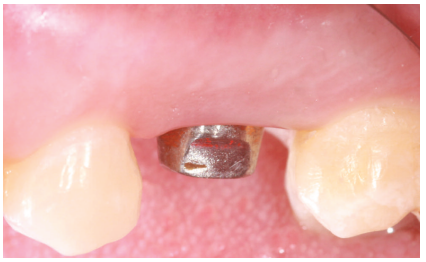

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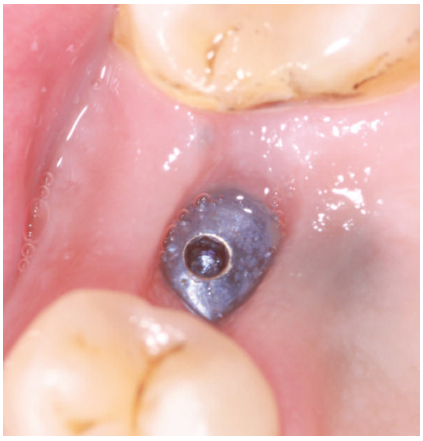

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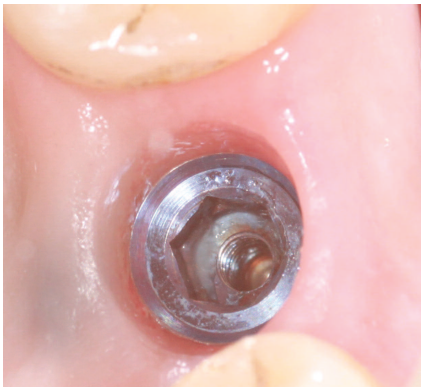

Figure 18a

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Figure 20 – Cotton pellet placed in abutment screw hole to prevent the cement from obstructing access to the abutment screw.

Figure 21 – Resin cement used to lute crown to abutment. This technique circumvents the need for a cast UCLA abutment style screw-retained crown. Screw-retained implant crowns can be created by asking the laboratory to provide an opening on the occlusal surface of the porcelain-fused-to-metal crown. As a result, the cost of the final prosthesis is greatly reduced. The cost to have this type of crown fabricated would be similar to the cost of a cement-retained crown, while having the advantages of screw retention, such as no excess cement extrusion into the soft tissues.

Figure 22 – The crown is seated on the abutment and excess resin cement over the screw hole is quickly removed using an explorer. Maxcem Elite (Kerr) was used here to create an extremely strong bond between the titanium abutment and the metal ceramic crown.

Figure 23 – The patient is instructed to bite tightly on a cotton roll for four to five minutes for complete cement setting as per the manufacturer's instructions.

Figure 24 – Intra-oral view of cemented crown.

Figure 25 – The crown (now luted to the abutment) is removed by unscrewing the abutment screw.

Figure 26 – Intra-oral view of implant.

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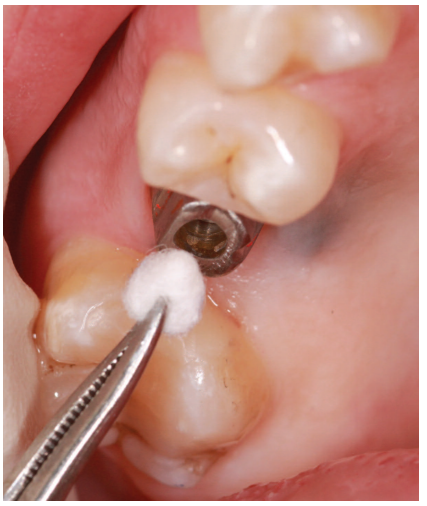

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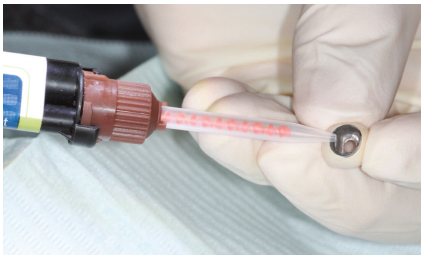

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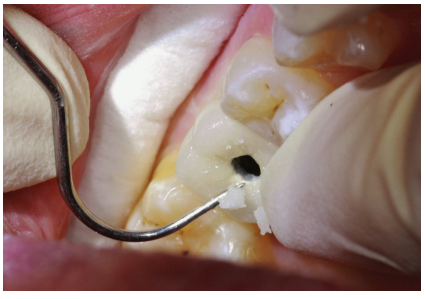

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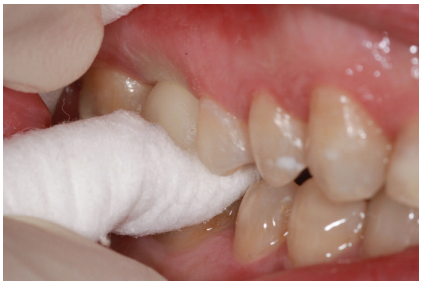

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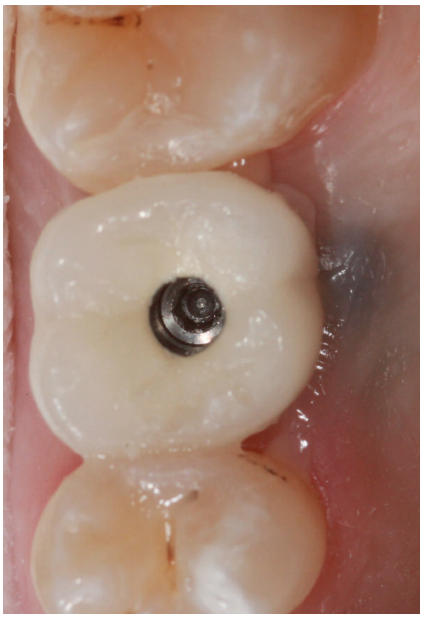

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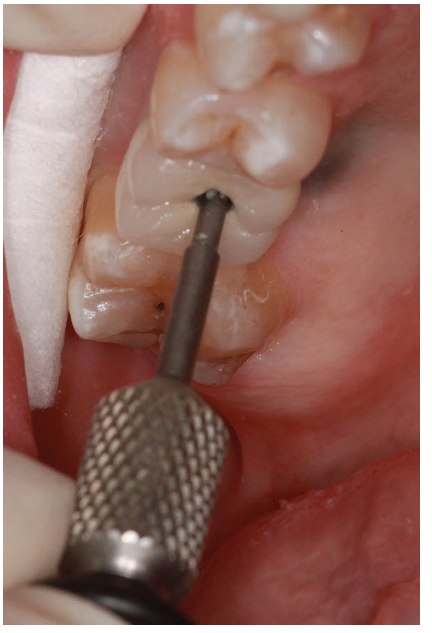

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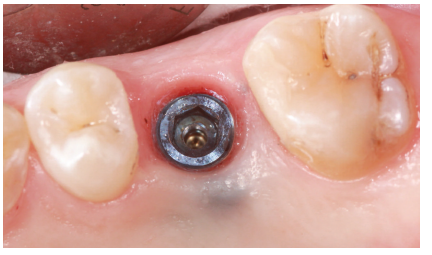


Figure 26

Figure 27 – Excess cement is removed from the crown-abutment assembly.

Figure 28 – Modified "screw-retained" crown is torqued to manufacturer's recommended level (30 Ncm).

Figure 29 – A cotton pellet is placed in order to prevent the final restorative material from bonding to the head of the abutment screw.

Figure 30 – A composite restoration is placed to seal the screw hole, the occlusion is checked, and the restoration is finished/polished.

Figures 31 & 32 – Final implant crown appearance. A three-month post-crown insertion follow-up reveals good emergence profile and healthy gingiva.

Summary

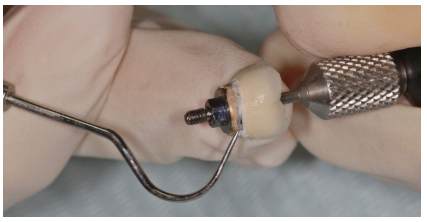
As shown in this case, there are some advantages to following an accelerated implant placement procedure and a simplified prosthetic protocol for screw retention. From a surgical perspective, the most important advantages are:

- fewer surgeries and therefore decreased cost to the patient compared with the traditional approach of extraction, waiting for socket healing, bone grafting and sinus elevation and finally implant placement
- shorter total treatment time, compared with the traditional approach

The key benefits from the described prosthetic approach are:

- elimination of excess cement extrusion into the soft tissues versus traditional cement-retained restorations
- lower cost for the dentist of a "screw retained" restoration

Overall, this protocol has been shown to be a predictable, less expensive and quicker option when compared with the traditional approach. It is a protocol from which, in my view, both the practitioner and the patient may realize a significant benefit.



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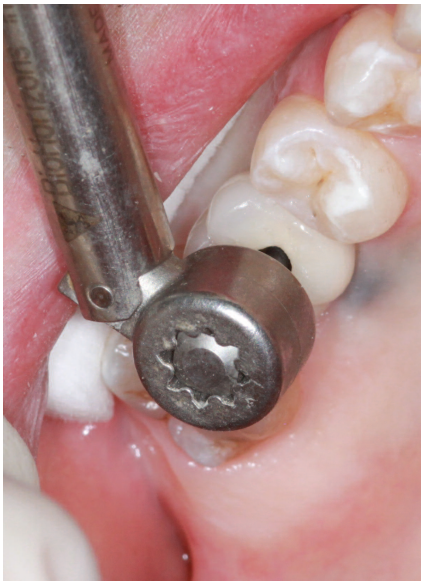

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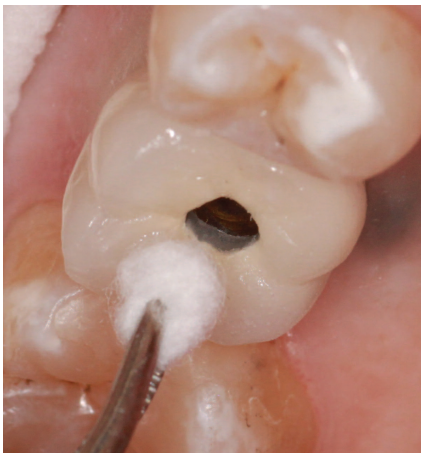

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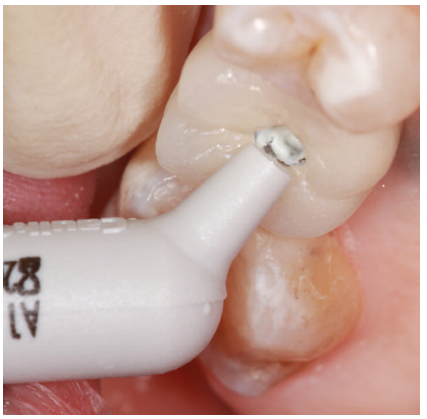

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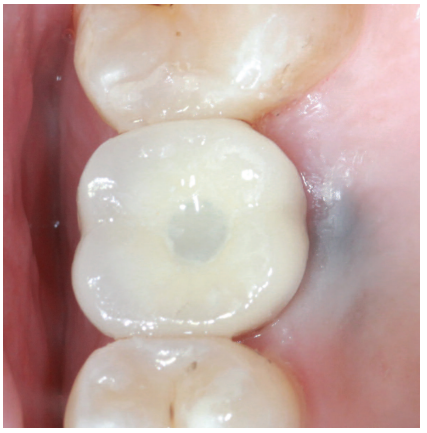

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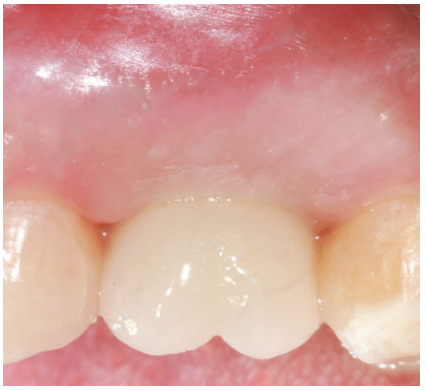

Figure 32

Dr. Chopra is a 2000 graduate of the Schulich School of Medicine & Dentistry at Western University. He is a Fellow of the International Congress of Oral Implantologists and currently maintains a private practice in Mississauga, Ontario. Dr. Chopra may be reached at 905-270-0007 or at rchopra1@gmail.com.

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