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Autotransplantation of an Impacted, Immature 3rd Molar Using a 3D Printed Model and a Tooth Replica

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OKU Sutro Excellence Day Project Cover Sheet

Project Title

Autotransplantation of an Impacted, Immature 3rd Molar Using a 3D Printed Model and a Tooth Replica

Full name(s) and class year(s) of all project collaborators

Example: Jane Smith, DDS 2022; John Smith, DDS 2022

Michael Glenn DDS, William On DDS, Gordon Lai DDS, MSD & Adham A. Azim DDS, BDS

Project Category

DDS/IDS - Clinical Awards: Endodontics

Enter your abstract text here (max 300 words)

Early loss of the first molar due to caries or fracture can represent a restorative dilemma, particularly when the patient is between the age of 15 and 20 years old. Orthodontic movement of the 2nd molar following its eruption can be complicated and may take a long time. Placement of a dental implant is also contra-indicated at this age. While auto transplantation can be an option, it is technically complex at this age as the third molar is not fully erupted and may have little to no root formation to provide primary stability. In this table clinic, we present an auto-transplantation of an impacted, immature 3rd molar in the position of a non-restorable maxillary first molar in a 16-year-old male patient. Prior to the procedure, a tooth replica of the impacted 3rd molar was 3D printed and used to check the adaptability of the donor tooth into the extraction site on a 3D printed model. Following surgical extraction of the 1st molar, the 3D replica was inserted into the extraction socket to check its adaptability in the patient's mouth. Once the adaptability was confirmed, a mucoperiosteal flap was raised to extract the 3rd molar and immediately insert it into the donor site with under 1 minute of extra oral time. The tooth was then stabilized in place using a flexible splint. Short-term follow-up showing complete tooth stability and soft and hard tissue remodeling. The approach presented herein can serve as an alternative option to lengthy and more cost-effective treatment options while maintaining proprioception and allowing for pulp regeneration of a third molar that would otherwise be extracted at a later stage.

Autotransplantation of an Impacted, Immature 3rd Molar Using a 3D Printed Model and a Tooth Replica

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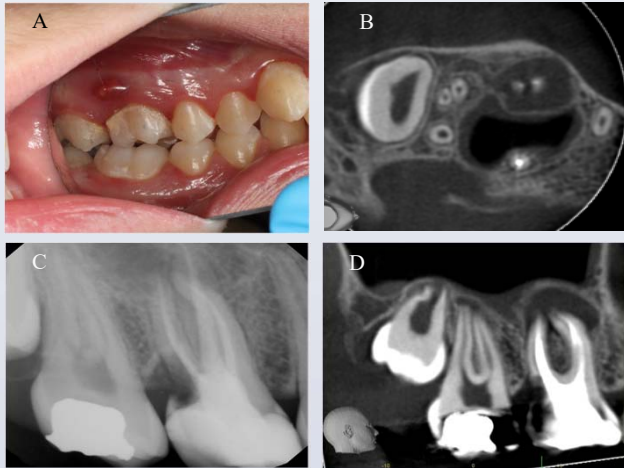
INTRODUCTION

Autotransplantation in dentistry is a procedure in which one tooth is moved to the position of another in the same patient. It offers many benefits because the donor and the recipient are one in the same, but it is technically complex. Some of the benefits of the procedure include potentially improved esthetics, maintenance of the PDL, and greater resistance to occlusal loading. (1, 2) Success in autotransplantation procedures has been determined by the amount and condition of remaining PDL on the donor root. (2, 3, 4) Root development is the most important factor in immature donor teeth in the autotransplantation procedure (4). The procedure is often overlooked as a treatment option but can be a viable option under the appropriate circumstances.

CASE REPORT

A 15-year-old male patient presents to the UOP PG endodontic clinic for evaluation and treatment of tooth #3. The patient has a history of a root canal on tooth #3 which was performed 5 years prior and was symptomatic at the time of evaluation. The tooth was then evaluated clinically and radiographically. The tooth was determined to be non-restorable by restorative faculty at UOP.

PRE-OPERATIVE



Tooth	Periodontal probing (M->D) B, P	Percussion	Palpation	Cold	EPT
#2	4-3-3 4-2-3	-	-	+	+
#3	3-4-7 3-3-6	+	+	-	-
#4	3-2-3 3-2-3	-	-	+	+

Figure 1: A – soft tissue image showing presence of a draining sinus tract; B – axial image with the extent of the lesion as well as proximity of the sinus; C – Periapical showing the apical extent of the caries on the distal root; D – sagittal slice

TREATMENT PLANNING DISCUSSION

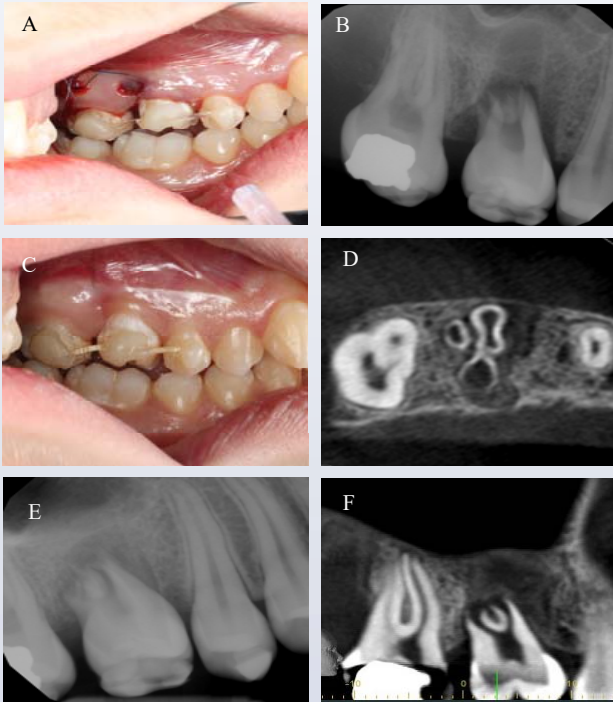
The patient received an implant consultation and was determined to be too young to receive an implant at the time of the evaluation. Because of this, alternative treatment plans were formulated. These treatment plans were included; extraction alone, orthodontic movement of #2 into place of #3, Auto-transplantation of tooth #1 to site #3. After thorough discussion and RBA presented, all parties elected for the latter of the options

CHALLENGES OF THIS CASE

The major challenges of this case are that the tooth is both immature as well as impacted. The tooth itself has little more than the crown developed at the time of extraction. Because of this, obtaining primary stability as well as preserving the tooth structure present become imperative for this surgical procedure.

3-D MODEL AND THE SURGERY

Dragonfly software was utilized to analyze CBCT scans from the Accutomo machine present in our clinic and render them into 3-D models which. The guide was used for planning the procedure and as a guide for the osteotomy intra-operatively as well. This allowed for increased efficiency of the procedure and minimization of extraoral dry time for the donor tooth.



Tooth	Periodontal probing (M->D) B, P	Percussion	Palpation	Cold	EPT
#2	3-2-3 3-2-3	-	-	+	+
#3 (1)	2-1-2 2-1-2	+	-	+	+
#4	3-2-3 3-2-3	-	-	+	+

Figure 2: A – Soft tissue immediately post procedure; B – Post operative PA; C – soft tissue with healing and adaptation of the gingival margin; D – axial image showing continued root development; E – Periapical which shows bony growth; F – sagittal slice where root development can be visualized

INITIAL FOLLOW-UP AT 1 AND 2 MONTHS

The initial plan for this case was suture removal at 1 week post-op and splint removal at 1 month. The images above (C-F) were taken at the 1 month follow up. The tooth was slightly sensitive to percussion but was also mobile. Therefore, the decision was made to splint the tooth for an additional month. At the time of the follow up 2 months post-surgery. The tooth had gained stability and was no longer sensitive to percussion or mastication per the patient. It was then determined that the splint could then be removed and that the follow up phase of treatment would begin.

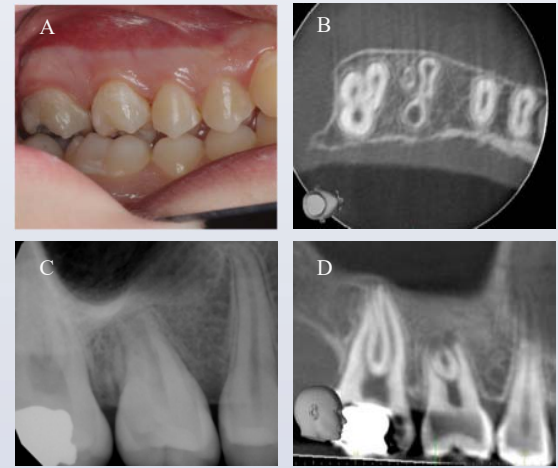
LONG TERM FOLLOW UP PLAN

The patient as well as his parents are aware that there may be a further need for testing but, at this point, the patient is planned to be monitored in the same fashion as an avulsion case per the International Association of Dental Traumatology guidelines but that he will be seen more frequently should any symptoms develop.

6 MONTHS POST SURGERY

The tooth was evaluated clinically and tested in the same fashion as before. The tooth was testing vital to both cold as well as EPT and remained asymptomatic to percussion and palpation. The CBCT taken at that point in time suggested further root development as well as no signs of pulpal pathology.

8-MONTHS POST SURGERY



Tooth	Periodontal probing (M->D) B, P	Percussion	Palpation	Cold	EPT
#2	3-2-2 2-2-2	-	-	+	+
#3 (1)	2-1-2 2-1-2	-	-	+	+
#4	3-2-3 3-2-3	-	-	+	+

Figure 3: A – soft tissue with healing and adaptation of the gingival margin; B – axial image showing continued root development; C – Periapical which shows bony growth; D – sagittal slice where root development can be visualized

CONCLUSION

Autotransplantation of an impacted, immature 3rd molar is a treatment option given the appropriate conditions. There is evidence to show that the pulp can not only be preserved but that further root development can occur.

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