

Short Communication**Auto transplantation of impacted tooth aided by 3D printing: A review**Rajeev Lall^{1*}, Sneha Thakur², Anshu Sahu², Soni Kumari², Swati Rai², Priya Bharti²

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Abstract

Advancements in the field of CBCT imaging and 3D printing have opened up new avenues with respect to auto transplantation treatment of impacted tooth especially in the anterior region where esthetics is of paramount importance. This article aims to illustrate the steps involved in this process.

Keywords: Rapid prototyping, CBCT, 3D printing, Impacted teeth.

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1. Introduction

Any reduction in the duration of orthodontic treatment is desirable by the orthodontists as well as the patients. Various factors can affect the duration of orthodontic treatment. The type of malocclusion as well as choice of treatment mechanics are one of the major factors in determining how much time the treatment will take.¹ In this article, an outline has been etched, which can be followed with appropriate modifications, as individual case of impacted tooth in anterior (aesthetic) zone requires.² It illustrates the use of 3D printing as an aid to auto transplantation.

2. Discussion

A case with impacted canine in maxillary left quadrant has been illustrated. (**Figure 1**) After the initial strap-up (**Figure 2**), space is created for the impacted canine (**Figure 3**). A CBCT scan of the maxilla is done to ensure that the canine is not causing any resorption in adjacent lateral incisor or premolar and can be extracted without causing damage to any vital structure (**Figure 4**). The same CBCT scan is then used for creating a prototype by 3D printing (**Figure 5**). Using the prototype, a socket is created for the canine (**Figure 6**). After a satisfactory amount of bone has been drilled in and recipient site prepared in the required shape and size, the impacted canine is exposed attempting minimal damage (**Figure 7**). It is then placed in the prepared socket and splinted with

adjacent lateral and premolar. The tooth is positioned slightly higher than occlusal plane (**Figure 8**). The splint is then left in place for about 8 weeks. Root Canal Treatment is carried out during this duration. Normal orthodontic treatment is resumed. When the tooth is orthodontically extruded, it gives a good emergence profile and gingival contour.



Figure 1: Pre-treatment cast with impacted canine and retained deciduous canine



Figure 2: Strap- Up

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Figure 3: Creating space for canine

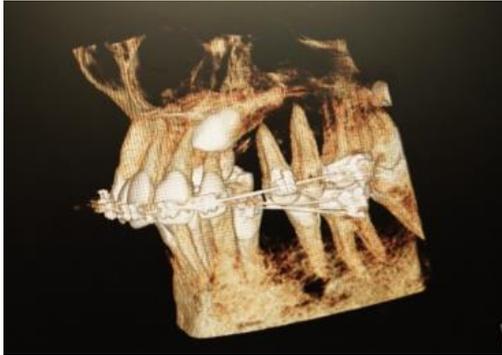


Figure 4: CBCT scan showing impacted canine. It is not causing damage to adjacent lateral or premolar.



Figure 5: Prototype prepared by 3D printing



Figure 6: Recipient site prepared using prototype as guide



Figure 7: Impacted canine exposed and extracted with care



Figure 8: Canine placed at a level higher than occlusal plane and splinted to adjacent teeth.

2.1. Advantages

1. The CBCT scan assisted 3D printed prototype aids in accurate preparation of anatomic site.³
2. Auto transplantation avoids the need of complex traction mechanics and minimizes the risk to damage to adjacent teeth.⁴
3. Can be used in cases where the position of tooth is not favourable thus avoiding possible need for extraction and / or need of prosthetic tooth.⁴
4. The intact periodontal ligament makes orthodontic tooth movement possible.⁶
5. It gives an esthetic outcome because:
 - a. The patient's own tooth is used in its anatomical site.
 - b. The gingival contour matches that of naturally erupted tooth.²
 - c. The tooth retains proprioceptive and functional capacity.⁶

2.2. Disadvantages

1. Case selection is very important.
 - a. Feasibility of extraction of impacted tooth without damaging adjacent structures has to be gauged judiciously.
 - b. Impacted tooth should have intact periodontal ligament.
2. Creates a large bony defect at extraction site that needs to be filled with bone graft.
3. Patient's acceptance to surgery is required.
4. A 10% risk of failure of auto transplantation persists.

3. Conclusion

Rapid prototyping of impacted tooth by 3D printing using CBCT scan ensures that the recipient site it prepared with

considerable accuracy before the impacted tooth is extracted. Hence, the impacted tooth spends minimal amount of outside the oral cavity during surgery. This considerably increases the success rate of the auto transplantation procedure. This auto transplantation procedure allows the patient's own tooth to be brought into its anatomical location with reduced treatment time and increased esthetic outcome.

4. Source of Funding

None.

5. Conflict of Interest

None.

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