Reminder of important clinical lesson

Think before you extract – a case of tooth autotransplantation

Shoba Fernandes,¹ Mohammed Al Habibullah,¹ Goutam Sai Nalam,¹ Preeti P Nair²¹Department of Paediatric Dentistry, Century International Institute of Dental Sciences and Research Centre, Kasaragod, Kerala, India;²Department of Oral Medicine and Radiology, People's College of Dental Sciences and Research Centre, Bhopal, India**Correspondence to** Professor Preeti P Nair, shajihoss@gmail.com**Summary**

Renewed interest in autotransplantation has resulted in additional options in the treatment for rehabilitation of missing anterior teeth. Premolar teeth have been commonly used after extensive modifications while a supernumerary tooth from the anterior region when present would be a more suitable option. This case presents such a scenario, with a successful outcome ensuring adequate restoration of function, economical viability and aesthetic satisfaction for both the patient and clinician.

BACKGROUND

The earliest reports of tooth transplantation involved slaves in ancient Egypt who were forced to give their teeth to their Pharaohs.¹ This procedure of allotransplantation was abandoned due to complications of incompatibility and eventually autotransplantation was adapted.

During the early 1950's the hurdles encountered relating to improper root development of transplants, and root resorption resulted in low success rates (50%).^{2,3} Extensive research during the 1990's brought about a better understanding with regard to periodontal membrane healing and root resorption dramatically improving success rates while renewing clinical application.⁴⁻⁶

The renewed interest has provided several treatment options to the clinician to deal with anterior teeth affected by trauma. Cases of avulsion can be treated by replantation, intrusions by orthodontic extrusion whereas injuries to the pulp by pulpal therapy to state few examples. Treatment options for external/internal root resorptions like surgical intervention, sealing with biocompatible materials like mineral trioxide aggregate have been performed encountering varying success rates.

Other solutions would be extractions followed by fixed or removable prosthesis, osseointegrated implants, orthodontic space closure and autotransplantation of permanent teeth.⁷ Ideal treatment of choice would be, the one with lowest probability of developing complications.⁸ Fixed and removable partial dentures are the mainstay for replacement of missing anterior teeth. These are costly, require lifetime maintenance and have shortcomings relative to gingival health and marginal integrity when restored.^{9,10} Orthodontic space closure is another option but some combinations of malocclusion and space conditions make this option complicated.¹¹ Since the placement of osseointegrated implants in growing bone is contraindicated, transplanting available teeth appears to be a suitable choice for replacing missing units in young patients.¹²

In the past few decades tooth transplantation has been successfully researched for the treatment of anterior tooth loss in young individuals.^{13,14} Premolar teeth seem to be the most commonly used donor teeth when orthodontic related extraction is required. Other donor teeth include primary canine, third molars¹⁵ and intruded lateral incisors.⁸ When pulp therapy is not a viable option due to

Figure 1 Preoperative photograph showing malformed supernumerary with talon's cusp in place of 11.

Figure 2 Preoperative photograph showing labial bulge of erupting 11.

extensive internal/external root resorption in advanced stages affecting prognosis and a donor tooth is available, autotransplantation could be considered as a feasible practical option.

The purpose of this case report is to demonstrate clinical use of autotransplantation when a donor tooth is available to replace a central incisor with questionable prognosis.

CASE PRESENTATION

A 15-year-old female patient reported with a chief complaint of a malformed tooth in the upper front tooth region (figure 1). The tooth was unaesthetic and hence patient wanted to extract the same. The patient was in good general health and medical history was non-contributory.

The intraoral examination revealed a supernumerary tooth in the place of 11. The supernumerary tooth was malformed with an irregular labial surface and a talon's cusp on the palatal aspect. A soft tissue bulge was evident labially above the supernumerary tooth indicating the presence of 11 (figure 2). The patient had a full complement of permanent teeth. All teeth were healthy except 21 which demonstrated discolouration. History of trauma about 2 years ago was elicited from the patient.

INVESTIGATIONS

Diagnostic records procured included intraoral periapical radiograph (IOPA), orthopantomograph radiographs, dental impressions and photographs. The IOPA radiograph revealed internal resorption of 21 extensively involving its root and also erupting 11, with a supernumerary tooth in place of 11 (figure 3).

TREATMENT

Measured considerations were given to the following treatment modalities:

1. Extraction of supernumerary tooth promoting eruption of 11 into normal occlusion. This would be unpredictable and require time.
2. Root canal treatment (RCT) in relation to 21 followed by postendodontic restoration. However the extensive root resorption of 21 made this treatment option unviable (poor prognosis).^{16 17}
3. Extraction of 21 and transplantation of supernumerary tooth into the socket of 21 was considered. However, discrepancy in the root morphology of supernumerary tooth compared to socket of 21 was a genuine cause for concern.
4. The final treatment option decided upon was to allow the supernumerary tooth to be left in place and later reshaped to mimic a central incisor 11. Additionally extraction of 21, followed by the autotransplantation of 11 into the socket of 21 was to be done.

Since a healthy donor tooth was available for transplantation, it was considered that in this case a predictable clinical outcome could be expected.

The patient's primary concern for seeking dental treatment was to improve her appearance. As the patient was unwilling to wait for clinical outcomes (questionable at best) and was more concerned about immediate improvements in aesthetics, hence treatment option four was performed.

The patient was sedated and 21 was extracted under local anaesthesia (2% lignocaine with epinephrine 1:80 000).

Figure 3 Intraoral periapical (IOPA) radiograph demonstrating extensive internal root resorption of 21.

Figure 4 Atraumatically extracted 11 for autotransplantation.

Figure 5 11 placed into the socket of 21 after extraction.

Figure 6 Splint with polyethylene fiber reinforced composite in place.

A mucoperiosteal flap was raised to expose the ectopically erupting 11. The tooth was extracted atraumatically and gently placed in the socket of 21 without handling the root surface and ensuring the extra oral dry time was minimal (figures 4 and 5). The gingiva was sutured and the transplanted tooth was splinted to adjacent teeth in infra occlusion using flowable composite (Tetric Flow, Ivoclar Vivadent) and poly ethylene fiber reinforced composite (Ribbond bondable Reinforcement Ribbon (Ribbond, Inc. Seattle, Washington, USA) (figure 6). The patient was prescribed antibiotics and anti-inflammatory analgesics for 3 days. RCT in relation to 11 was initiated within 10 days, as per the guidelines for mature teeth which are transplanted.⁴ To prevent the complications of sensitivity and pulpal exposure which may have occurred while reshaping the supernumerary tooth, (removal of talon's cusp) intentional RCT was performed.

OUTCOME AND FOLLOW-UP

Evaluations of the tooth both clinical and radiological were performed at monthly intervals for the first 3 months and thereafter at 2 month intervals. Patient follow-up records for duration of 1 year were procured. Patient is being assessed at regular intervals (figures 7 and 8).

DISCUSSION

Autotransplantation has been used as a feasible treatment option for teeth with poor prognosis.¹² The tooth under consideration here had questionable prognosis by conventional methods of treatment. The availability of a supplemental tooth made the treatment option of autotransplantation practical, economical and a viable option. The amazing quality of the transplanted tooth is that it is biological and erupts in harmony with adjacent teeth and growing jaws, which is of particular concern in children and growing adolescents.¹⁸

Autotransplantation has been performed in teeth with mature roots with success rates of 84%,¹⁹ 74–100%¹⁸ with lowest success in teeth with artificially drilled and prepared sockets. The case presented here did not require any preparation of the socket, improving the likelihood of success. The tooth being an incisor was aesthetically better suited in comparison to a premolar which requires extensive modifications in order to be made aesthetically suitable.

Figure 7 Postoperative follow-up radiograph after 1 year.

(Use of premolar was precluded as child was 15-years-old and premolars had erupted).

Most reports advise flexible splinting for 7–10 days,^{20–22} with sutures placed through the mucosa and over the occlusal surface of the crown.^{20–23} Alternatively, adhesive resin, light polymerising resin, or a temporary bridge of autopolymerising resin and wire splint can be used.²⁴ We chose to use flowable composite (Tetric Flow, Ivoclar Vivadent) and poly ethylene fiber reinforced composite (Ribbond bondable Reinforcement Ribbon, (Ribbond, Inc. Seattle, Washington, USA) as a flexible splint for duration of 10 days.

RCT was initiated within 10 days which was well within the time frame required to minimise trauma to the periodontal ligament in initial attachment as well as healing and to prevent complications of inflammatory resorption secondary to pulpal infection.¹⁸ The most important factor for the success of autogenous tooth transplantation is the vitality of the periodontal ligament attached to the transplanted tooth.²⁵ The periodontal ligament is sensitive to pH and osmotic potential, and its viability is reduced if extra oral dry time is long.²⁶ Periodontal ligament healing is also expected when a donor tooth is immediately placed into a fresh, unmodified extraction socket.^{25–27} The procedure followed ensured that the extra oral time of the tooth to be transplanted was minimal, (few min) thereby significantly improving chances of maintaining the vitality of periodontal ligament.

Clinically the autotransplanted tooth at the end of 1 year, was firmly placed in the socket without any inflammation, masticatory function was satisfactory without any discomfort, exhibiting physiological mobility. Radiologically

Figure 8 Postoperative photograph with temporary crowns.

normal lamina dura, without any pathologies demonstrated absence of ankylosis, which was in concurrence with other authors.²⁸

Description of success has been based on various factors. Based on the findings of different researchers^{20 29 30} criterion like normal periapical healing, the absence of inflammatory changes or root resorption, satisfactory masticatory function to name few. In addition, tooth residing in the new socket without inflammation or mobility demonstrating normal lamina dura in the radiographs are indicative of a successful procedure, as observed in the current case presented here.³¹

Learning points

- ▶ Autotransplantation procedures when performed judiciously are excellent options for replacement of avulsed and traumatised anterior teeth.
- ▶ When donor tooth is available, option of autotransplantation should be offered especially to young patients where implants may not be applicable.
- ▶ In adequately chosen cases, autotransplant of natural teeth may provide a suitable replacement for a lost tooth, while promoting the normal development of the tissues and jaws and enabling the rehabilitation of function and aesthetics.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **Cohen AS**, Shen TC, Pogrel MA. Transplanting teeth successfully: autografts and allografts that work. *J Am Dent Assoc* 1995;**126**:481–5.
2. **Apfel H**. Autoplasty of enucleated prefunctional third molars. *J Oral Surg (Chic)* 1950;**8**:289–96.
3. **Miller HM**. Transplantation; a case report. *J Am Dent Assoc* 1950;**40**:237.
4. **Tsukiboshi M**. Autotransplantation of teeth: requirements for predictable success. *Dent Traumatol* 2002;**18**:157–80.
5. **Lundberg T**, Isaksson S. A clinical follow-up study of 278 autotransplanted teeth. *Br J Oral Maxillofac Surg* 1996;**34**:181–5.
6. **Mejäre B**, Wannfors K, Jansson L. A prospective study on transplantation of third molars with complete root formation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;**97**:231–8.
7. **Jahnavi R**, Henry WF. Case report: autotransplantation for a missing permanent maxillary incisor. *Ped Dentistry* 2008;**30**:162–6.
8. **Behiye S**, Engin A, Sema C, *et al*. Autotransplantation of an intruded lateral incisor replacing an avulsed central incisor. *J Clin Pediatric Dentistry* 2009;**34**:107–112.
9. **Czochrowska EM**, Stenvik A, Björck B, *et al*. Outcome of tooth transplantation: survival and success rates 17–41 years posttreatment. *Am J Orthod Dentofacial Orthop* 2002;**121**:110–9.
10. **Zachrisson BU**, Stenvik A, Haanaes HR. Management of missing maxillary anterior teeth with emphasis on autotransplantation. *Am J Orthod Dentofacial Orthop* 2004;**126**:284–8.
11. **Czochrowska EM**, Skaare AB, Stenvik A, *et al*. Outcome of orthodontic space closure with a missing maxillary central incisor. *Am J Orthod Dentofacial Orthop* 2003;**123**:597–603.
12. **Thomas S**, Dent M. Auto transplantation of teeth is there a role? *BDJ orthodontics* 1998;**25**:275–82.
13. **Zachrisson BU**, Stenvik A, Haanaes HR. Management of missing maxillary anterior teeth with emphasis on autotransplantation. *Am J Orthod Dentofacial Orthop* 2004;**126**:284–8.
14. **Kallu R**, Vincier F, Politis C, *et al*. Tooth transplantations: a descriptive retrospective study. *Int J Oral Maxillofac Surg* 2005;**34**:745–55.
15. **Mendoza MA**, Reina SE, Segura-Egea JJ. Treatment of avulsed maxillary permanent central incisor replaced by autotransplantation of a mandibular premolar – 14 year follow up. *Int Endod J* 2010;**43**:818–27.
16. **Gunraj MN**. Dental root resorption. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999;**88**:647–53.
17. **Kaiwar A**, Ranjini MA, Ashwini P. Internal resorption managed by root canal treatment. Incorporation of CT with 3D reconstruction in diagnosis and monitoring of the disease. *J Int Oral Health* 2010;**2**:86–94.
18. **Yau CKE**. Tooth autotransplantation as a treatment option. *Dental Bulletin* 2009;**14**:21–4.
19. **Bae JH**, Choi YH, Cho BH, *et al*. Autotransplantation of teeth with complete root formation: a case series. *J Endod* 2010;**36**:1422–6.
20. **Thomas S**, Turner SR, Sandy JR. Autotransplantation of teeth: is there a role? *Br J Orthod* 1998;**25**:275–82.
21. **Cohen AS**, Shen TC, Pogrel MA. Transplanting teeth successfully: autografts and allografts that work. *J Am Dent Assoc* 1995;**126**:481–5.
22. **Pohl Y**, Filippi A, Tekin U, *et al*. Periodontal healing after intentional auto-alloplastic reimplantation of injured immature upper front teeth. *J Clin Periodontol* 2000;**27**:198–204.
23. **Vriens JP**, Freihofer HP. Autogenous transplantation of third molars in irradiated jaws—a preliminary report. *J Craniofac Surg* 1994;**22**:297–300.
24. **Akiyama Y**, Fukuda H, Hashimoto K. A clinical and radiographic study of 25 autotransplanted third molars. *J Oral Rehabil* 1998;**25**:640–4.
25. **Andreasen JO**. Periodontal healing after replantation and autotransplantation of incisors in monkeys. *Int J Oral Surg* 1981;**10**:54–61.
26. **Lindskog S**, Blomlöf L. Influence of osmolality and composition of some storage media on human periodontal ligament cells. *Acta Odontol Scand* 1982;**40**:435–41.
27. **Shimida T**. Effect of periodontal ligament curetted in alveolar socket for autotransplantation of tooth in adult monkeys. *J Japanese Soc Oral Implant* 1998;**11**:42–500.
28. **Nethander G**. Autogenous free tooth transplantation by the two-stage operation technique. An analysis of treatment factors. *Acta Odontol Scand* 1998;**56**:110–5.
29. **Hernandez SL**, Cuestas-Carnero R. Autogenic tooth transplantation: a report of ten cases. *J Oral Maxillofac Surg* 1988;**46**:1051–5.
30. **Hamamoto N**, Hamamoto Y, Kobayashi T. Tooth autotransplantation into the bone-grafted alveolar cleft: report of two cases with histologic findings. *J Oral Maxillofac Surg* 1998;**56**:1451–6.
31. **Mendes RA**, Rocha G. Mandibular third molar autotransplantation—literature review with clinical cases. *J Can Dent Assoc* 2004;**70**:761–6.

This pdf has been created automatically from the final edited text and images.

Copyright 2011 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.

BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Fernandes S, Habibullah MA, Nalam GS, Nair PP. Think before you extract – a case of tooth autotransplantation. *BMJ Case Reports* 2011; 10.1136/bcr.06.2011.4380, date of publication

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow