Allotransplantation of Tooth: A Case Report

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Tooth transplantation has attracted great interests since ancient times. A successful case of tooth allotransplantation is presented. A mandibular first premolar from the donor was implanted into the socket of maxillary central incisor. Follow up after 12 months indicated good periapical healing with no resorption. Clinically, the transplantation site was free of symptoms and there was no evidence of periodontal disease or tooth mobility. This article suggests tooth transplantation as an alternative to other restorative options.
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INTRODUCTION

Allotransplantation is the transplantation of tooth or teeth from one person to another and is an age old procedure. One of the earliest references in dental literature describing tooth allotransplantation relates to Ambroise Pare,[1] a French surgeon dating back to the 16th century. This is considered one of the earliest dental procedures and may represent the first ever transplant in between individuals. In ancient times, tooth allotransplantation served to be one of the fastest and most economically feasible means of replacing teeth and was considered to be better than a prosthetic substitute for lost teeth.

Although extensive experimental and clinical research have been performed on allotransplantation, very little information has been obtained about its long term clinical prognosis.

Many authors suggest a low success rate of tooth allografts and attribute this to lack of histocompatibility.[2,3] The long term fate of an allotransplanted tooth has been influenced by a number of factors such as surgical trauma, damage to periodontal ligament or the cemental layer of the root surface, the effect of splinting, developmental stage of the graft, immune reactions against the donor histocompatibility antigens etc.

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However, despite a progressive replacement resorption, which is a frequent complication of a transplanted tooth, allografts function effectively, often symptomless with clinically normal gingiva for many years. In a study published by Schwartz,[4] the mean functional time of the allografts was 6.8 years, with the teeth remaining free of symptoms.

With the introduction of dental implants and the continuous progress that is being made in this direction, allotransplantation of teeth is being gradually sidelined as an alternative. However, considering the prohibitive cost of implants, allotransplantation of teeth could still be an effective alternative for the poorer sections of society especially in the third world countries. This case report is one year follow up of tooth allotransplantation.

Case Report

A seven year old boy reported to the department of Pedodontics three hours after trauma with the chief complaint of missing upper front tooth. Examination revealed that the permanent upper right central incisor was avulsed and the socket was filled with an unhealthy looking blood clot (Figs 1,2). A haematological investigation revealed that the child was suffering from a bleeding disorder related to deficiency of Factor XIII. Initial hemostasis was achieved with a wet cotton plug, containing styptochrome (Adrenochrome Monosemicarbazone). Tetanus prophylaxis status revealed that the patient had received a booster dose of tetanus vaccination within the last 3 months.

Simultaneously, a 13 year old girl who had to undergo routine first premolar extraction prior to Orthodontic treatment was identified as the donor. It was planned to transplant the lower first premolar from this patient in to the socket of the avulsed upper right central incisor. The donor was investigated for Hepatitis B, C and HIV which turned out to be negative. Informed consents were obtained from both the donor and the recipient. Under Local Anesthesia, single sitting root canal treatment was done in lower right first premolar. The tooth was then carefully extracted with

minimal trauma and placed immediately in a chilled solution of 2 % Chlorhexidine. Holding the tooth by the crown, the root surface was thoroughly cleaned off all the blood in the same solution. Apart from this cleaning of the root surface, the root apex was sealed with a fresh mix of Glass Ionomer cement. All through this procedure, care was taken to ensure that the root surface of this tooth was left undisturbed. This was to ensure minimal damage to the periodontal fibres. The tooth was then transplanted to the recipient's site within ten minutes of extraction (Fig 3) and was splinted with acid-etch resin composite splint (Fig 4). The occlusal surface was relieved. Hemostasis was once again achieved using a styptochrome cotton plug and followed by Tranexamic acid 500 mg TDS for five days. No antibiotics were prescribed for this child. The wound healed uneventfully and the tooth had become stable in 2 weeks time. The splint was removed and the tooth was allowed to stabilize for a further period of 4 weeks. Subsequently composite resin was used to build up the tooth to the shape of a central incisor and tooth preparation was done for a temporary acrylic jacket crown which was then cemented (Fig 5). Periodic follow up over the last one year has revealed that the allograft has been taken up with proper bony contours of the alveolus and normal soft tissue profile (Fig 6). This case is being continuously monitored to detect any future resorptive activity.

Figure 1. Blood clot filling the empty socket.

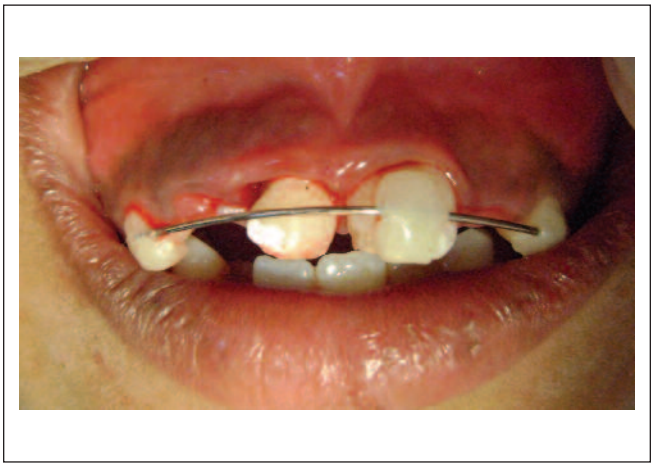

Figure 3 . Transplantation of Premolar from the donor.

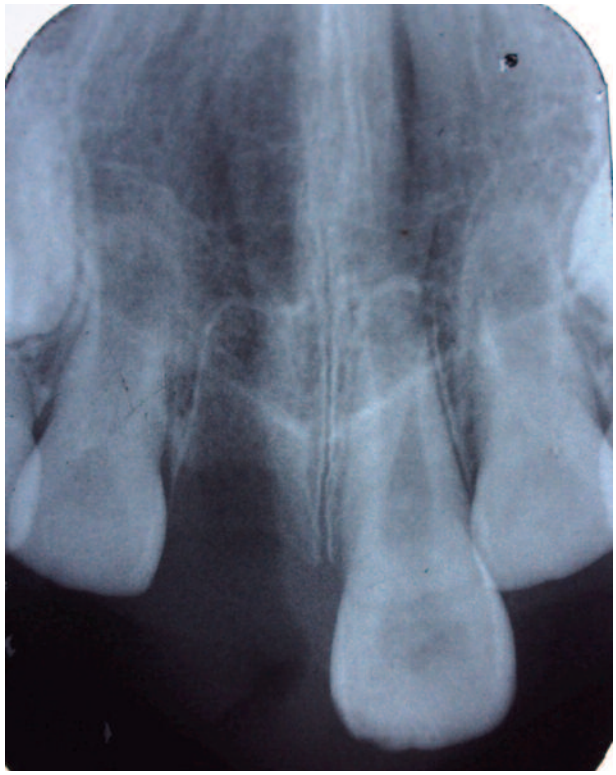

Figure 2 . Empty socket after Avulsion of central incisor.

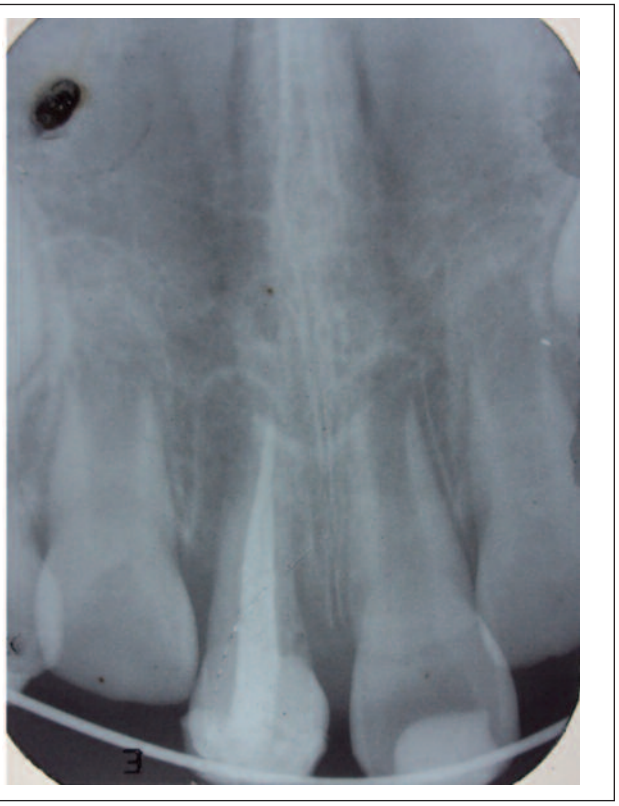

Figure 4. Periapical Radiograph showing transplanted premolar.

Figure 5. Restoration of the transplanted premolar.

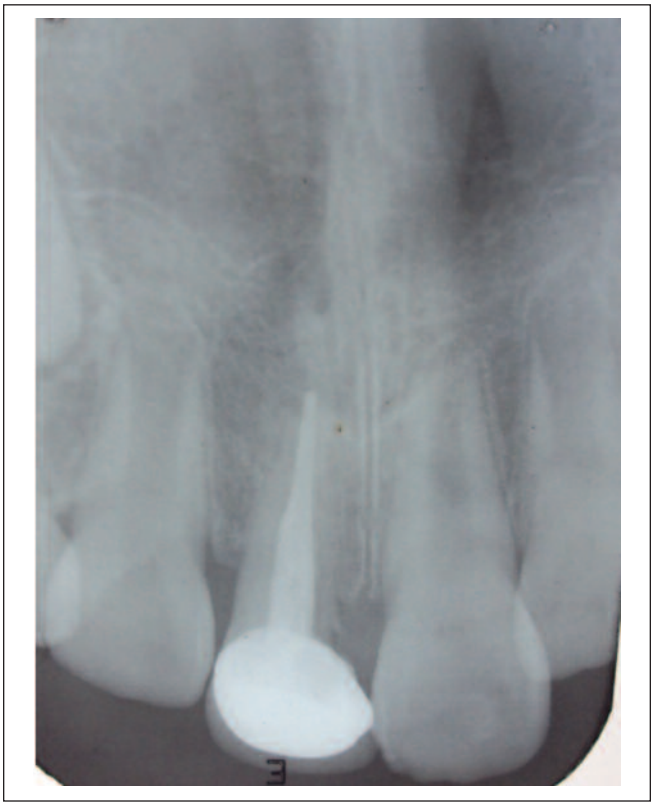

Figure 6. Follow-up after 1 year.

DISCUSSION

Tooth allotransplantation has attracted great interest since ancient times. The main concern of tooth allotransplantation is the survival of the allograft. An allotransplanted tooth which differs genetically from the donor is usually rejected by a cell mediated immune response, the histopathological sign of which is a chronic inflammatory infiltration of the graft tissue. The biological factor determining the long term prognosis of allotransplanted teeth is supposed to be the alloimmune reaction of the recipient against donor histocompatibility antigens. They have been related to resorption of allografts within 6 months after transplantation.[5]

Although Ivanyi and co-workers[6] demonstrated a significant increase in the function time of allografts only up to 2 years after matching histocompatibility antigens, a long term function time of allotransplanted teeth (10–16 years) has been described in series of allografts carried out even before the discovery of HLA system in man.[4]

The developmental stage of the donor teeth can influence the natural survival of the transplant. The donor teeth selected should be fully formed because the immature donor exposes antigenic pulp to the recipient.[7] A fully formed donor tooth with a larger root for stability and significantly more hard tissue would survive longer than partially formed immature teeth. The donor tooth in the present case was a fully formed premolar. Although immune suppression and histocompatibility testing have not been done in the present case, the donor tooth has been treated appropriately in an attempt to prolong the survival. Use of Chlorhexidine solution, short handling time of the transplant undoubtedly would contribute to the survival of periodontal ligament cells.

The tooth allografts could have a naturally prolonged survival rate based on a number of factors[8] such as the weak antigenicity of teeth; the fact that the tooth transplants are a special type of allografts - they donot have to stay alive to continue to function as do allovital kidney transplants; their acellularity; high density and low resorbability; and their capacity to function asymptomatically inspite of extensive resorption.

CONCLUSION

In cases of non availability of auto transplants and the use of implants being contraindicated in young children, tooth allotransplants could be a better treatment option for loss of teeth rather than a prosthetic substitute. Initial results have proved to be successful and are encouraging, although long term follow up may be required. The prognosis of allotransplant in a recipient without immunosuppressives and antibiotics and mere treatment of the allograft to prolong the survival may be studied. With the ease of availability of donor teeth and proper case selection, tooth allotransplant may be considered a more biological and economical treatment option for tooth loss.

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