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Case Report

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Auto transplantation of a mandibular third molar with complete root development–a case report

Abstract

Autogenous transplantation is an economical as well as the most sorted option for the treatment of badly destroyed teeth when a suitable donor tooth is available. This paper presents successful auto transplantation of a mature mandibular right third molar (48) without anatomical variance is used to replace a grossly decayed mandibular right first molar (46). The mandibular first molar was nonrestorable due to extensive root caries. After extraction of mandibular first molar, root canal therapy was done for the third molar extraorally, and the tooth was reimplanted into the recipient site. After 1.8 years, clinical and radiographic examination revealed satisfactory outcome with no signs or symptoms suggestive of pathology. In selected cases, autogenous tooth transplantation, even after complete root formation of the donor tooth, may be considered as a practical treatment alternative to conventional prosthetic rehabilitation or implant treatment.

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Introduction

Auto transplantation of teeth has been done for many years but with varying degrees of success. It is considered as an alternative treatment for a single tooth oral rehabilitation and it is possible that it becomes more frequent if the technique respects the protocol to be followed. Auto transplantation is defined as the transplantation of embedded, impacted or erupted teeth from one site into the extraction sites or surgically prepared sockets in the same person.[1] Auto transplantation of tooth ensures maintenance of alveolar bone volume by physiological stimulation of the periodontal ligament (PDL). Recently, auto transplantation has begun to gain attention again, most likely because of the research on PDL healing after auto transplantation has provided helpful information that can be applied to the procedure.[2,3] Transplantation has a key role in the replacement of young patients missing teeth.[4] Osseointegrated implants are generally contraindicated for young patients with developing alveolar bone because infraocclusion results when the implant fails to form alveolar bone. Since the procedure causes bone and dental implant material to be fused together, the implant does not erupt along with the adjacent teeth, so the placement of dental implants may be avoided in young adolescent patients. Because of this tooth auto transplantation, which maintains the PDL, will continue to be a suitable and attractive option in many cases for replacing missing units.[5] Successful tooth transplantation offers improved esthetics, arch form and dentofacial development, mastication, speech and arch integrity. A transplanted third molar also maintains a natural space, with little or no root resorption,[6] alveolar bone volume 4, 7 and the morphology of the alveolar ridge through proprioceptive stimulation.[4–8] The outcome of this procedure depends on careful case selection and understanding of the biological principles. Teeth traditionally selected for this procedure are impacted maxillary canines that play an important role in dentofacial esthetics. A developing third molar is also often transplanted to the socket of an unrestorable or missing first molar. This case report presents a case in which a mandibular third molar was used to replace mandibular first molar with a follow up of 1.8yrs (20 months).

Case report

Patient named Abhilasha 26 years of age reported to the Department Of Oral Medicine In Subharti Dental College with a chief complaint of tenderness in her right mandibular posterior region. After examination she was referred to the Department of Conservative Dentistry and Endodontics for detailed examination. Medical history was insignificant. History of pain revealed long standing pain that aggravated with pressure and subsided after taking medicines. Clinical examination showed grossly carious right mandibular first molar (Figure 1). The crown of the molar was completely decayed. Radiographic evaluation of tooth 46 (Figure 2) showed previously endodontically treated tooth 46 with grossly decayed crown and caries extending to the furcation area leading to the separation of roots. No periapical lesion or changes were evident on the radiograph except for widening of lamina dura along the remaining root of 46. The tooth was unrestorable and patient was advised to get it extracted. Radiograph also showed a mesioangular tilted 3rd molar. The treatment plan suggested to the patient for replacing the extracted tooth consisted of 3 options:

Figure 1 Pre op radiograph.

Figure 2 Pre op clinical.

1. Bridge with the help of support from 2nd premolar and 2nd molar.
2. Implant
3. Transplantation of 3rd mandibular molar to the extraction site. (1st mandibular molar).

The patient was explained all the treatment options. Bridge and implant option was rejected by her as she could not afford the cost of the implant procedure and in case of bridge she did not want to involve her sound teeth. The only option left was transplanting the 3rd molar from its socket to the extraction site and was explained to her to which she agreed. The patient was again clinically and radiographically thoroughly examined for extraction site, root morphology of 3rd molar, clinical condition of 3rd molar. The extraction and transplantation was planned for a single visit procedure.

Surgical procedure

The treatment was planned as a single visit procedure that would comprise of extraction of 46, preparation of the recipient site, extraction of 48, and root canal of 48 and finally placement of donor tooth in the recipient site followed by splinting. The anesthetic technique used was conventional, with local regional block complemented with suprabone infiltrative buccally. Once the operating area was anesthetized, controlled donor tooth luxation was done allowing the tooth to stay in alveolus but also making it possible for an easy and fast extraction. Due to mesioangular angulation osteotomy with bone drills was done to expose the donor tooth. The donor tooth was left in the alveolus but with mobility. Extraction of roots of tooth 46 was done. The preparation of the recipient site included clean extraction of tooth 46 and removal of inter-root septum (Figure 3). The previously luxated donor tooth was now extracted and extraoral root canal was performed on it. Care was taken to minimize extraoral time and not to harm the periodontal fibres. The transplant of the donor tooth was then performed, verifying the adaptation to the recipient site, without forcing its entry so that there is no periapical pressure in any way. The transplanted tooth was fixed with a splint for 2-3 weeks (Figure 4 & 5). Postoperative instructions were given to the patient so as to reduce swelling and pain and maintain a good and clean hygiene that would help in the success of the whole treatment. The patient was recalled for suture removal after 10 days and then for clinical and radiographic follow up after 1 month, 3 months, 6 months and annually (Figures 6–8).

Figure 3 (A) Donor tooth.

Figure 4 Placement of donor tooth.

Figure 5 Placement of splint.

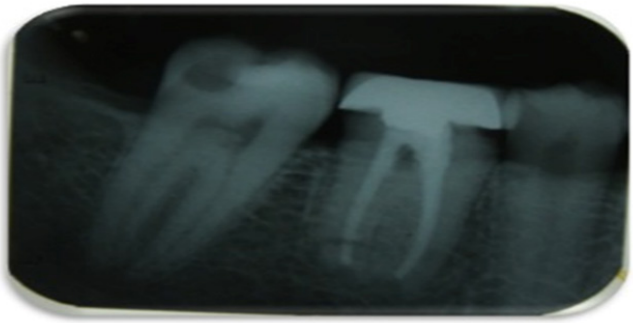

Figure 6 Placement of splint.

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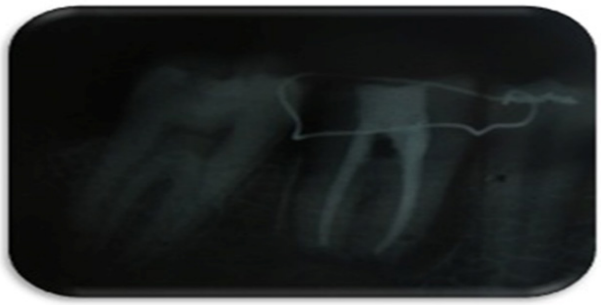

Figure 7 6 month recall radiograph.

Figure 8 Clinical 6 month recall.

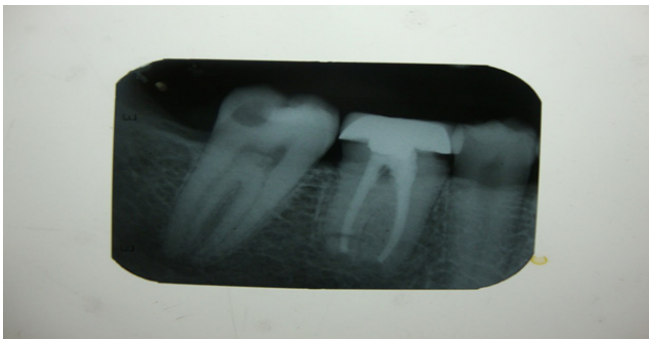

Figure 9 12month recall.

Figure 9 (A) Occlusion.

Discussion

While there are many reasons for auto transplanting teeth, tooth loss as a result of dental caries is the most common indication, especially when mandibular first molars are involved.[9] Various indications for transplantation of teeth are shown in Table 1.

Table 1 Showing indications for auto transplantation

Indications for Autotransplantation of Teeth7, 17-19
Impacted or ectopic teeth
Premature tooth loss
Traumatic tooth loss
Tumors
Iatrogenic grounds
Congenitally missing tooth in one arch with clinical signs of tooth crowding in the opposing arch
Replacement of developmentally missing teeth
Teeth with bad prognosis
Developmental anomalies of teeth and related syndromes

Indications for auto transplantation of Teeth 7, 17-19

1. Impacted or ectopic teeth
2. Premature tooth loss
3. Traumatic tooth loss
4. Tumors
5. Iatrogenic grounds
6. Congenitally missing tooth in one arch with clinical signs of tooth crowding in the opposing arch
7. Replacement of developmentally missing teeth
8. Teeth with bad prognosis
9. Developmental anomalies of teeth and related syndromes

To increase the success rate of autogenous tooth transplantation, a healthy periodontal membrane should be present on the transplanted tooth and the root morphology of the tooth to be transplanted should be simple. In addition infection should be absent in the recipient site, and during surgery, the extraoral period should be short and trauma should be minimized.[10–12] The most important factor for the success of autogenous tooth transplantation is the vitality of the periodontal ligament attached to the transplanted tooth.[13] The periodontal ligament is sensitive to pH and osmotic potential, and its viability is reduced if extra oral time is long.[14] Studies have shown that the viability of the periodontal ligament exposed the extraoral space decreased rapidly after 18 minutes.[15,16] The pulp of a completely mature tooth cannot regenerate. Therefore, if the tooth to be transplanted is accessible, endodontic treatment should be completed before transplantation. Otherwise endodontic treatment should be initiated 1-2 weeks after the transplantation because if it is performed too early additional injury to the periodontal ligament may occur whereas if delayed then after 2 weeks inflammatory resorption may develop from the infected root canal. [15–19]Successful transplantation depends upon specific requirements of the patient, the donor tooth and the recipient site. Patients for auto transplantation must be in good health, able to follow

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post operative instructions, demonstrate an acceptable level of oral hygiene, be amenable to regular dental care and be available for follow up visits. Regarding the recipient site the most important criteria to look for is the adequacy for bone support. There must be sufficient alveolar bone supporting all dimensions with adequate keratinized tissue to allow for stabilization of the transplanted tooth as well as the site should be free of any infection and chronic inflammation.[20] The donor should be positioned such that extraction will be as atraumatic as possible. Abnormal root morphology is generally contraindicated, as it would make tooth removal difficult and sometimes may require tooth sectioning.[21] A tooth with open apex or immature tooth remains vital and continues root development after transplantation whereas tooth with complete or near complete root formation will generally require root canal therapy as in the present case.[16] Transplanted teeth have a poor outcome because of the failure of periodontal reattachment or the occurrence of root resorption in the engrafted cementum-root surface.[22,23] The failure of cementum reattachment may be induced by periodontal inflammation, inflammation in the alveolar socket, or in cases with insufficient early fixation after transplantation. Therefore transplantation is contraindicated in cases with infection in root apex.[24] Success factors of the transplantation of teeth will be the healing of PDL, no progressive root resorption, healing of gingival tissue and alveolar bone, and healing of the pulp and continuation of root development. A criteria for success in auto transplantation is summarized in Table 2. Clinically it appears that satisfactory healing takes place in transplanted teeth when there is no root resorption, maintenance of PDL space, and apparently normal tooth mobility. In transplantation, usually the PDL fibres on the walls of the surrounding prepared sockets are absent. It must be recognized, however, that not only will the intact and vital PDL be attached to the root surface but also PDL attachment to the bony walls of the recipient sockets play an important role in healing.[24] It is desirable to extract a tooth with as much as PDL attached to it as possible, even though the cementoblast layer by itself seems to be effective in preventing root resorption.[24–28] Attention was paid during the plantation not to damage the periodontal ligament of the donor tooth by pushing it into the recipient site. A summary of factors contributing to successful transplantation is presented in Table 3.[24–28] Complete periapical healing and periodontal health are one of the most reliable methods of prognosis and success because slight external root resorption is often not radio graphically detectable.[29] In fact, replacement resorption (ankylosis) may be evident only 3-4 months to 1 year after the procedure, whereas inflammatory may take about 3-4 weeks to become evident.[4–21] Avoidance of trauma is also important for the success of the transplant. Otherwise, trauma will become an extra cause of impaired healing.[30–32] Success is defined as normal periapical healing, without any inflammatory pulpal changes or progressive root resorption.$_4$ Two year follow up of this case showed all signs of healing and no signs of resorption radio graphically and any discomfort clinically was seen. The transplanted tooth retained its normal functioning as any other natural tooth.

Table 2 Showing the criteria for success in auto transplantation of teeth

Categories	Criteria for Success
Radiographic examination	No evidence of progressive inflammatory root resorption.
	Normal PDL space width around the transplanted tooth
	No disturbance in root development
	Lamina dura
	Healing of the alveolar bone
Clinical examination	Normal tooth mobility and function.
	Gingival healing and no indication of marginal attachment loss, inflammation.
	Healing of dental pulp.
	No patient discomfort.
	Normal percussion sound.
Histological examination	The PDL fibres are aligned perpendicular, not parallel, to the root and alveolar bone.
	However, without extraction, it is impossible to evaluate clinical cases histologically.

Table 3 Summary of factors contributing to successful transplantation

Categories	Influencing Factors for Prognosis
Patient Related Factors	Better results in younger patients.
	Good oral hygiene and cooperative attitude
	Patient free of major systemic and metabolic problems or specific habits (e.g. smoking)
Donor tooth related factors	Periodontal ligament (PDL)
	Presence of intact and vital PDL attached to the root surface.
	Preservation of vital PDL when the tooth is outside the mouth using physiologic salt water or milk or preservation liquids and as short a surgery time as possible.
	Enhanced healing of the gingival tissues by placing a 1mm band of PDL fibres on the root above the crest of the bone.
	Major factor in the formation of alveolar bone.
	A chance of inadequate PDL development as an effective attachment with an impacted tooth (non functioning tooth).
Recipient site related factors	Bone width and height should be adequate to receive the donor tooth
	Better healing can be expected if the PDL tissue is still attached.
	Transplantation should be performed the day of transplantation or within 1 month after extraction
Clinical factors	Surgery should be performed by a clinician with experience in such areas as donor tooth extraction, preparation of the recipient site, and tissue management.

Conclusion

Auto transplantation of teeth offers a new treatment option for some clinical situations. It permits tooth movement to distant or opposite sides of the same dental arch, as well as to the opposite jaw. Furthermore, transplantation offers other potential benefits such as

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bone induction and the reestablishment of a normal alveolar process in addition to tooth replacement. Even if transplant fails latter there is an intact recipient area that could be used for implant. A prerequisite for this method, however is a thorough knowledge of the factors that influence the long term result. If done properly this method may supplement and or be used as a viable treatment option in present day clinical situation.

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Conflicts of interest

The author declares that there is no conflict of interest.

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