AUTO-TRANSPLANTATION OF MAXILLARY IMPACTED CANINE, A CLINICAL STUDY OF 25 CASES

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Abstract
Twenty five patients underwent auto-transplantation surgery. Seventeen were females and 8 males. Preoperative PA films were taken for each case for localization of impacted canine. Eleven were palatal impacted and 14 were labially impacted. The technique used is shifting technique and OPG. The status of surrounding tissues was evaluated radiographically. No case was associated with any pathology and complete mature root formation. The average age of patients ranged from 20 to 35 years. In most of them, there was a retained deciduas teeth.

Introduction

The aim of study was to evaluate the prognosis of auto-transplantation of impacted maxillary canine teeth with fully developed roots followed by endodontic treatment.

Autogenously tooth transplantation, or auto-transplantation, is the surgical movement of a tooth from on location in the mouth to another in the same individual. Once thought to be experimental, auto transplantation has achieved high success rates and is an excellent option for tooth replacement. Although the indications for auto transplantation are narrow, careful patient selection coupled with an appropriate technique can lead to exceptional esthetic and functional results. One advantage of this procedure is that placement of an implant-supported prosthesis or other form of prosthetic tooth replacement is not needed.

The earliest reports of tooth transplantation involve slaves in ancient Egypt who were forced to give their teeth to their pharaons[1]. However, transplantation of a tooth from one individual to another was eventually abandoned because of problems of histo-compatibility and so was replaced with auto-transplantation.

Autogenous tooth transplantation or auto transplantation, is the surgical movement in one individual of a vital or endodontically treated tooth from its original location in the mouth to another site[2]. Autogenous tooth transplantation was first well documented in 1954 by M.L Hale. The major principles of the technique are still followed today[3]. The science of auto-transplantation has progressed, as evidenced by the high success rates reported in studies over the past decade[1,4-8]. These studies demonstrate that auto-transplantation is a viable option for tooth replacement for carefully selected patients

Successful transplantation depends on specific requirements of the patient, the donor tooth and the recipient site.

Candidate Criteria
Patient selection is very important for the success of auto-transplantation. Candidates must be healthy, able to follow postoperative instructions, and available for follow-up visits. They should also demonstrate an acceptable

level of oral hygiene and be amenable to regular dental care. The most important thing is that patients must have a suitable recipient site and donor tooth. Patient cooperation and comprehension are extremely important to ensure predictable results.

Recipient Site Criteria

The most important criteria for success involving the recipient site is adequacy of bone support. There must be sufficient alveolar bone support in all dimensions with adequate attached keratinized tissue to allow for stabilization of the transplanted tooth. In addition, the recipient site should be free from acute infection and chronic inflammation[8-12].

Donor Tooth Criteria

The donor tooth should be positioned such that extraction will be atraumatic as possible. Abnormal root morphology makes tooth removal exceedingly difficult and may involve tooth sectioning. This is contraindicated for this surgical manipulation.
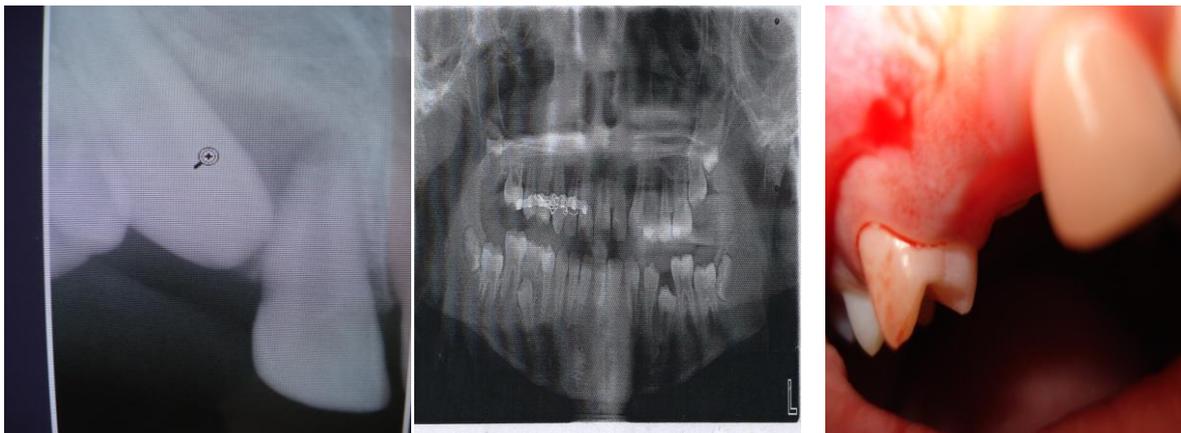
Method and materials

Impacted maxillary canines, which were impossible to be erupted orthodontically with completely developed roots were chosen for auto-transplantation to their actual positions. Aberration were made on the status of each case retained deciduous canine side and number of implantation. Sex, age of the patients or any pathology associated as well as treatment method employed was recorded. In the present study 25 of maxillary impacted canine were surgically exposed for auto-transplantation treatment. Only 11 canine were removed using a palatal approach while the rest 14 case of impacted canine were removed via the labial approach. All of these impacted teeth were transplanted to newly created socket and simple wire fixation

is used in all cases for fixation of tooth with adjacent teeth for 1 month. Post operative x-ray was ordered. The endodontic treatment was started after 45 days from operation for all cases then the follow up continue for 1year. Interval of checking was every 3 month, 6 month and 1 year. Radiographically and clinically follow up was accomplished by measuring the density of bone formed and the measuring the level of attachment.

Surgical procedure

A muco-gingival flap was elevated, alveolar bone covering crown of the impacted canines was resected and the teeth were extracted carefully so as not to damage the healthy periodontal ligament remaining on the root surface. Root lengths were measured and extracted canines were kept in saline solution until they were auto transplanted. Artificial sockets were prepared by means of round surgical burs as fast as possible. After preparing the sockets, extracted teeth were placed carefully to their actual positions. At that point, if any root surfaces that are not facing the walls of prepared sockets are present, previously resected bone was used to restore that missing tissue. Auto-transplanted canines were splinted to adjacent teeth for 6 weeks and root canal treatment was started 2 weeks later.

The procedure for tooth transplantation is usually no more traumatic for the patient than the removal of impacted canine. Depending on patient preference, local anesthesia alone or in conjunction with some form of sedation is sufficient for the surgical procedure. Once sufficient anesthesia is obtained, the tooth at the recipient site is extracted and the recipient socket prepared. Occlusal and periapical radiographs of the donor tooth should be used to determine its labiolingual and mesiodistal dimensions.

Preoperative   X-ray   **Preoperative clinical picture**

This replica allows them to prepare the recipient site using a guide with dimension similar to those required for the donor tooth. Next, the donor tooth is carefully removed to ensure minimal trauma to the periodontal ligament. Extraction involves flap elevation, bone removed, traumatic injury to the root surface of the transplant due to inadequate periodontal ligament regeneration. This is important for integration at the recipient site. Once removed, the donor tooth should be handled as little as possible and the practitioner should be careful to touch only the crown. The tooth is then placed in the recipient socket. Minimal delay between extraction and transplantation is important to ensure maintenance of periodontal membrane vitality. If further adjustment of the recipient socket is required, the donor tooth can be easily stored its original socket.

Mucoperiostcal flap   **Osteotomy socket creation**   **Removal of impacted canine**

Results

Clinical observation:

All the 25 patients who were given auto-transplantation treatment of canine, were followed up for 12 months. When evaluating the outcomes of oral implant treatment, the clinical examination of tissue covering implanted tooth site seamed healthy. No interference with soft tissue or healing could be observed in any operated upon areas. No sign of gross infection or tissue reaction.

During the course of follow up period, all 25 auto transplanted canine teeth were found stable in the bone, when tested by bidigital palpation and by percussion give sharp and resonance ringing. In all patients, toleration of both hard and soft tissue was excellent. All these signs indicates that there is osseointegration of implanted tooth.

Radiographic examination;

The radiographs were examined by independent person by using magnifier glasses for more precise interpretation. The degree of bone loss around auto implanted tooth was estimated by means of intra-oral radiograph during

follow up period and a references of image should be taken immediately following surgery and comparison was carried out of cases during study.

From radio and clinical examination, there were different densities of bone detected by osteotomy preparation ranging from porouse cortical to fine trabecular.

Standardization of x-ray was difficult, so radiographic estimation rather than measuring is used to evaluate the amount of bone formation and resorption depending on density of bone around the implanted tooth. The marginal bone loss was small except in one case which reached more than 2mm.

The changing in density measured in mesial and distal crystal regions of bone around auto-implanted tooth occur very clearly in all healing period of follow up.

Probing depth (PD), clinical attachment loss (CAL) and radiographic examinations were performed (radiographic examination alone) 3, 6 & 12 months postoperatively. All teeth were well maintained without any discomfort for the maintenance period of 12

Table I: The amount of bone loss during follow-up period

No of Case	Degree of bone loss	No of Case	Degree of bone loss	No of Case	Degree of bone loss	No of Case	Degree of bone loss	No of Case	Degree of bone loss
1	2.9	6	2.3	11	2.7	16	2.5	21	3.5
2	2.8	7	2.8	12	2.6	17	2.2	22	3
3	2.5	8	2.9	13	2.5	18	2.7	23	3.5
4	2.3	9	3	14	2.6	19	2.2	24	2.9

5	2.4	10	2.8	15	2.4	20	2.3	25	2.9

months and no root resorption or ankylosis was observed radiographically. The highest PD score was 3.5 mm and the highest CAL score was 3 mm at the last examination. At 3 month, PD score was obtained by probing depth form all aspects by using periodontal prop for measuring the depth and pocket around tooth structure.

After 45 days post operatively

After 6 month

Discussion

The factors that lead to success have been extensively investigated. The most significant determinant for survival of the transplant is the continued vitality of the periodontal membrane. In cases were the periodontal ligament is traumatized during transplantation, external root resorption and ankylosis is often noted[1,13]. Schwartz tried to link the loss of the graft to specific prognostic factors and found that success rates are highest when donor teeth are premolars, have one-half to two-thirds root development and experience minimal trauma and limited extra oral time during surgery. The experience of the surgeon also affects the success because this procedure is technique-sensitive.

Although retention of the tooth and restoration of the edentulous space is the desired outcome for patients, more specific parameters have been used to measure the health of the surviving transplant. These parameters include marginal periodontal attachment, mobility, pain, root resorption, root development, sensitivity to percussion, gingival pocket depth, presence of gingivitis, and presence of fistulae [14-20] However, these studies are difficult to compare because each used different measures to determine success.

The most common cause of failure of the auto transplant is chronic root resorption[15]. More specifically, the causes of tooth loss following transplantation from most common to least common are inflammatory resorption, replacement resorption (ankylosis), marginal periodontits, apical

periodontits, caries, and trauma[16]. Inflammatory resorption may become evident after 3 or 4 weeks, while replacement resorption may not become evident until 3 or 4 months after transplantation. The incidence of both types of resorption can be decreased with a traumatic extraction of the donor tooth and immediate transfer to the recipient site to minimize the risk of injury to the periodontal ligament[1,21-23].

In conclusion, the bone loss in this study is even smaller, this might be explained by the fact that surgical factor have been as important factor, but oral hygiene was found to be most important factor associated with marginal bone loss. The probable cause for the mobility is that a primary stability was only attained by point of frictional fit.

Auto transplantation of mature impacted maxillary teeth is a reasonable treatment alternative to conventional prosthetic rehabilitation or implant treatment from both therapeutic and an economic points of view.

Suggestion

To improve our understanding of how the specificity of jaw bone condition affect auto transplantation outcomes, researchers needs to be aimed at establishing reliable and valid measures of jaw bone condition.

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