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RESEARCH ARTICLE

TOOTH AUTOTRANSPLANTATION- RATIONALE, TECHNIQUE AND CLINICAL OUTCOMES.

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Abstract

Tooth transplantation was first documented in ancient Egypt where the slaves were forced to give their teeth to the Pharoahs. However most of these cases resulted in failure due to complications of histocompactability.
Tooth auto transplantation however eliminates histocompactability issues and is successfully used with varying success. Our current understanding of periodontal healing has improved success rates and clinicians interest in the procedure. This article provides an overview of auto transplantation and considerations for clinical success.

Introduction:-

Tooth transplantation was first documented in ancient Egypt where the slaves were forced to give their teeth to the Pharoahs.[8] However, due to complications of histocompatibility; this practice was abandoned in favor of auto transplantation.

Auto transplantation involves the transfer of a tooth from its alveolus to another site in the same person,[9,27] either an extraction socket or surgically prepared alveolus.[27,32] This technique was first introduced by M L Hale in 1954 with varying success.[10] Over the years an improved understanding of periodontal ligament healing and root resorption has dramatically enhanced the success rates and clinicians interests in this technique.[33,19,20]

Case selection:-

General factors:-

Meticulous Case Selection is a key to success in autotransplantation. Some of the general factors to consider are:

a) Patient should be in good general health.
b) Patient should have good oral hygiene.
c) Patient should be willing to be present for regular timely follow up.
d) Patient should understand, appreciate and follow all instructions.
e) Patient cooperation and compliance are indispensible for a predictable clinical outcome.

Local factors:-

a) The recipient area receiving the transplant should be healthy with adequate alveolar bone support.[6]
b) Should be free of any infection or chronic inflammation.[22]
c) Donor tooth should be extracted atraumatically, hence abnormal root morphology is a contraindication for transplantation.[8]
d) Teeth with closed or open apices may be transplanted.

Teeth with Closed apices:-

A tooth with complete root formation requires Root canal treatment after transplantation. Root canal treatment is usually done after transplantation and may be completed before removal of the splint.

Teeth with Open apices:-

The most predictable clinical outcomes is achieved when teeth between half and two third root completion are transplanted.[8,19,22,17,14,24,1,26,29] These teeth remain vital ensuring root end closure physiologically with no need for endodontic treatment.[6]

These are some of the clinical situations in which auto transplantation can be considered.

a) **Tooth loss secondary to dental caries:** The first molars are the most common permanent tooth lost due to caries and periodontal diseases. The third molars may be considered for the replacement of this tooth.[23,15,18]
b) **Tooth Agenesis:** The third molars followed by mandibular second premolars are the teeth most commonly involved.[35] The condition may be associated with certain malocclusions.[5] Age, occlusion, space requirements of the patient as well as the size and shape have to be carefully evaluated for the formulation of the treatment plan.[16]
c) **Traumatic tooth loss:** Children are more prone to injuries in the anterior dentition. Trauma is more frequently observed in males, in those with Class II malocclusion and in the age group of 8-10 years.[7]
d) **Atopic eruption of canines:** The routine management of ectopically positioned canines is surgical exposure followed by orthodontic extrusion. Auto transplantation may provide reliable, fast and simplified treatment, atleast in some of these cases.[34,2]
e) **Teeth with poor prognosis (large endodontic lesions, localized severe periodontitis[32] and cervical root fractures** [31]
f) **Cleft lip and palate patients:** Tooth transplantation is preferred for the replacement of teeth in cleft lip and palate patients as it induces alveolar growth potential especially during adolescence. This is a viable alternative to other treatments because of predictable clinical outcomes.[30]

The clinician may need to consider the following factors which severely limit the success of the procedure. These include

a) Cardiac anomalies
b) Poor oral hygiene
c) Lack of motivation or inability to maintain oral hygiene.
d) Insufficient bone width at recipient site secondary to alveolar ridge resorption.[32]

Depending on the clinical situations the auto transplantation procedure may be modified. The autrotransplanted tooth can be placed in an extraction socket or alternatively in a specifically prepared recipient site.

In certain cases where growth needs to be completed or orthodontic space regaining is required the auto transplant can be cryopreserved for use at a later date. The general procedure of autotransplantation into an extraction socket is discussed here.

Diagnostic records include radiographs (Intra Oral Peri Apical and Occlusal), casts and photographs.

- IOPA and occlusal radiographs of the donor tooth and recipient sites are made.
- The procedure is generally performed under local anesthesia.
- Once anesthesia is achieved, the tooth at the recipient site is extracted.
- The donor tooth is then carefully extracted as atraumatically as possible.
- Donor tooth should be handled by the crown only and immediately placed in recipient site.
- If there is a need to make final adjustments in the recipient area, the donor tooth may be replaced in its original extraction socket.
- The time between extraction and transplantation should be minimum to maintain periodontal ligament cell viability.

- Once the tooth is placed in the final position in the recipient site, it should with stabilized preferably in infra occlusion to prevent any trauma to the tooth. [32]
- In case of teeth with incomplete apex, the transplanted tooth is placed at the same occlusal level of as the donar site. This ensures root development when compared to tooth placed in a more superficial position. [32]
- Physiologic splinting for about 2 weeks is generally advised. Suture splint, acrylic splint or adhesive resin may also be used.
- Patient is advised a soft diet and to avoid mastication on the transplanted tooth.
- Post operative antibiotics and analgesics[8,19,1,21,3] and chemical agents for plaque control are advised.[8]
- Post operative evaluation at 2 days post operatively,at weekly intervals for 1 month and then every 3-6months for the next 2years is recommended.

Success criteria:-

A case of autotransplantation may be called a success if it is associated with normal healing without inflammatory resorption, the tooth is firm with no pain on mastication. However there are certain radiographic and clinical criteria to determine success.

Radiographically a case may be deemed successful when healing occurs with a normal lamina dura[32,34,11] with no evidence of root resorption . It is pertinent to note here that minimal inflammatory or replacement resorption may not be apparent on the radiograph[25] immediately. It takes upto 3-4 months[12] or even 1 year[27] after the procedure to be detected. Inflammatory resorption on the other hand is evident in about 3-4 weeks [8,27]

In case of teeth with immature apex being transplanted, normal physiologic root development must be observed. Normal tooth mobility, healing without inflammation, no marginal attachment loss and a healthy pulp indicates a successful transplant clinically.[12]

The success rates are highest when donor teeth are premolars, with half to two third root formation transplanted with minimal trauma and extra oral dry time.[6,29] Therefore we can conclude that the procedure is technique sensitive.

Conclusion:-

Although auto transplantation may not be the treatment of choice for the replacement of every missing tooth, the procedure definitely warrants more attention especially so in certain clinical situations.

In the growing child, traditional fixed prosthesis and implants may impede normal growth and development of the facial bones and are thus contra indicated. [8,13] In such cases , the transplantation of a tooth with incomplete root formation allows normal growth of the tooth and alveolar bone.[8,13] The correction of severe ectopic eruption of canines is another clinical situation where transplantation offers a viable and predictable clinical outcome.[4]

In the recent era two new techniques namely umbilical cord mesenchymal stem cells and cryopreservation have unfolded a vast clinical prospect for autotransplantation. The Umbilical cord mesenchymal stem cells (UCMSC) have shown excellent pluripotent and proliferation potential and have the ability to form cementum-like tissue, suggesting to be promising resource of mesenchymal stem cell for periodontal healing after autotransplantation of teeth.

Cryopreservation refers to the storage of a living organism at an ultra-low-temperature in such a way that it can be revived and restored to the same living state. In dentistry, cryopreservation finds application in stem cell banking, tooth banking. These cryopreserved teeth retain the potential for periodontal ligament cells regeneration and even orthodontic movement.

This technology opens a new avenue for preserving one's own cells and tissues to be used at a later time. Considering the possibilities, it is necessary that when a tooth needs to be extracted, clinicians should consider if autotransplantation may provide alternative treatment options in those clinical situations. Needless to add, meticulous case selection and surgical technique is the key to success in these cases.

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