

TOOTH REPLANTATION: MODERN APPROACHES AND CLINICAL EXPERIENCE*Mansurov Mohir Mahsud o'g'li**Fozilov Mahsud Mansurovich**Quranbayeva Dilxumor G'ayratovna**Assistant of Tashkent State Medical University**Associate Professor at Tashkent State Medical University**Assistant Tashkent State Medical University**E-mail: mmdental335@mail.ru***Abstract**

This article analyzes modern approaches, clinical trials, and new technologies in tooth replantation. The impact of biomaterials, growth factors, and regenerative methods used in the replantation process on periodontal tissue regeneration is discussed. In addition, the influence of antioxidant solutions and antibiotic agents on the long-term preservation of the replanted tooth is highlighted based on scientific research. Clinical cases and advanced technologies are reviewed to explore ways to improve replantation success.

Keywords

Tooth replantation, periodontal regeneration, antioxidant solutions, growth factors, regenerative dentistry, clinical trials, biomaterials, dental ankylosis.

Introduction

Tooth replantation is one of the most relevant procedures in dentistry and has been used in clinical practice since the 1900s. Dental trauma is widespread, especially among children and adolescents, and studies indicate that children aged 7–14 years represent the group most frequently affected by avulsion injuries. According to statistical data, successful replantation is possible in approximately 0.5–3% of avulsed teeth.

Several important factors determine the success of replantation. Research shows that if the extra-oral time of the tooth does not exceed 30 minutes, periodontal ligament fibers and cells are able to maintain sufficient viability. Therefore, modern protocols recommend replanting the tooth as quickly as possible and using appropriate storage media. For example, studies suggest that to preserve tooth vitality, the tooth should be stored in physiological saline or in special solutions such as Hank's Balanced Salt Solution (HBSS). These methods help maintain periodontal tissues in a healthy condition.

In recent years, advances in regenerative dentistry have significantly improved replantation outcomes. For instance, studies conducted by Gulinelli et al. in 2010 demonstrated that the use of antioxidant solutions and growth factors during the replantation of avulsed teeth resulted in improved periodontal regeneration. In addition, clinical studies carried out by Trope in 2015 showed that the application of minocycline or doxycycline solutions to the root surfaces reduced inflammatory responses and increased the likelihood of long-term tooth retention.

The long-term prognosis of replanted teeth is mainly associated with root resorption and ankylosis (direct fusion of the tooth with bone). Studies indicate that younger patients have a higher risk of developing ankylosis in replanted teeth, which may complicate subsequent

orthodontic movement. For this reason, the use of biomimetic materials and stem cell-based protective approaches has become increasingly widespread in recent years.

The main objective of this study is to evaluate modern clinical approaches to tooth replantation, the advanced methods currently in use, and their long-term effectiveness. In addition, the role of new technologies applied in tooth replantation, such as tissue engineering and growth factors, is also examined within the scope of this study.

Methods

This study included both retrospective and prospective approaches. A total of 12 patients participated in the study, in whom teeth avulsed as a result of mechanical trauma were replanted. All procedures were performed in accordance with international clinical protocols. During the study, various stages of tooth replantation were evaluated, including the storage media used, immobilization methods, and the effectiveness of antibiotic therapy.

1. Tooth storage and replantation

After tooth avulsion, it is crucial to preserve the tooth as quickly as possible. Within the scope of this study, several storage methods were evaluated:

- **Physiological saline (0.9% NaCl):** Effective in maintaining short-term viability of periodontal ligament (PDL) cells, but insufficient for long-term storage.
- **Hank's Balanced Salt Solution (HBSS):** Considered the most effective solution, as it helps maintain the viability of PDL cells for up to 12–24 hours.
- **Dry storage of the tooth:** Negatively affects replantation outcomes, as PDL cells may become nonviable after 15–30 minutes.
- **Probiotic solutions:** Currently being investigated in recent studies and may allow prolonged preservation of periodontal cells.

2. Tooth Replantation

Several important stages were performed during tooth replantation:

A. Antiseptic treatment:

- The tooth was treated with **0.12% chlorhexidine** or **povidone-iodine (polyvinylpyrrolidone, PVP)** solution.
- In some cases, **minocycline or doxycycline solutions** were applied to the tooth surface, which helps reduce inflammation of the periodontal ligament (PDL).
- In most cases, before replantation, the root surfaces were rinsed with physiological saline to remove erythrocytes and debris.

B. Replantation procedure:

- The tooth was carefully repositioned into its original alveolar socket.
- After placement, gentle pressure was applied to stabilize the tooth.
- Following replantation, sutures were placed when necessary, depending on the degree of alveolar injury.

C. Immobilization:

To ensure stable positioning of the tooth, immobilization was applied. During the study, various immobilization techniques were evaluated:

- **Flexible splinting:** The most commonly recommended method, stabilizing the tooth for 7–14 days and allowing periodontal ligament fibers to recover.
- **Rigid splinting:** Used in selected cases; however, prolonged rigid immobilization was found to increase the risk of root resorption.

The duration of immobilization was determined as follows:

- **7–10 days:** For uncomplicated avulsion cases.
- **2–4 weeks:** In cases with alveolar damage or associated bone fractures.

3. Antibiotic Therapy and Follow-up

Antibiotic therapy plays a crucial role in preventing infection in replanted teeth. Within the study, the following antibiotics were used:

- **Amoxicillin** (500 mg, three times daily for 7 days): Considered effective in reducing bacterial infection.
- **Doxycycline** (100 mg, once daily for 7 days): Possesses anti-inflammatory properties and improves periodontal tissue healing.
- **Metronidazole combination therapy:** Used to target anaerobic bacterial infections.

In addition, patients were given the following oral hygiene recommendations:

- Rinsing with **0.12% chlorhexidine** twice daily.
- Avoidance of hard foods.
- Regular orthodontic or surgical follow-up examinations.

During the follow-up period:

- Patients were examined regularly over **6 months and 1 year**.
- **Radiographic examinations** were performed every 3 months to assess signs of root resorption or ankylosis.
- Clinical evaluations were based on **tooth discoloration, percussion sensitivity, and the condition of periodontal tissues**.

Additional Methods and New Technologies

In recent years, several innovative approaches have been applied to improve the effectiveness of tooth replantation:

1. Treatment with bioactive materials:

- **Platelet-Rich Fibrin (PRF):** Placed into the alveolar socket to help reduce inflammation.
- **Cell therapy:** The role of stem cells in periodontal regeneration represents a modern direction in regenerative medicine, aiming to accelerate the repair of damaged tissues through the use of stem cells.

2. Laser therapy:

- **Low-Level Laser Therapy (LLLT):** Used to reduce inflammation and enhance the activity of periodontal cells.

3. 3D implant materials:

- In some cases, **bioresorbable materials** were used to promote alveolar regeneration.
- **Results:**

According to the study findings, **good osseointegration** was observed in **75%** of replanted teeth. **Tooth mobility due to resorption** was noted in **16.7%** of patients, while **periodontal inflammation** developed in the remaining **8.3%**. The influence of the storage medium on replantation outcomes was analyzed, and it was determined that teeth stored in **HBSS** had a higher likelihood of achieving favorable replantation results.

Discussion:

The effectiveness of tooth replantation depends on several factors, including the time elapsed after avulsion, the storage medium of the tooth, and the patient's overall dental condition. The study demonstrated that the earlier replantation is performed, the greater the probability of long-term tooth survival. In addition, long-term follow-up and orthodontic support of replanted teeth were found to be essential.

Conclusion:

Tooth replantation is an effective treatment method that continues to improve with advances in medical approaches and technologies. Future research should focus on the analysis of new biomaterials and regenerative dentistry techniques in this field. The obtained results contribute to the improvement of clinical protocols used in dental practice.

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