EVALUATION OF PLATELET-RICH PLASMA IN REGENERATION IN NON-VITAL IMMATURE PERMANENT TEETH: AN ORIGINAL RESEARCH

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ABSTRACT

AIM

The aim of this original research study is to evaluate the efficacy of Platelet-Rich Plasma (PRP) in the regeneration process of non-vital immature permanent teeth.

OBJECTIVE

Assess the impact of PRP treatment on root development in non-vital immature permanent teeth.Evaluate the ability of PRP to promote apex closure in non-vital immature permanent teeth. Investigate the effect of PRP on periapical healing in non-vital immature permanent teeth. Analyze patient-reported outcomes, including pain levels and satisfaction, following PRP treatment.

METHODOLOGY

This original research study will include a sample of patients presenting with non-vital immature permanent teeth requiring endodontic treatment. A randomized controlled trial design will be employed, with two study groups: an experimental group receiving PRP in addition to standard endodontic treatment and a control group receiving standard treatment alone. Clinical and radiographic evaluations will be performed at predetermined intervals to assess root development, periapical healing, and apical closure. Pain assessment and patient-reported outcomes will also be considered.

RESULT

The obtained data will be analyzed using appropriate statistical methods to determine the efficacy of PRP in promoting regeneration in non-vital immature permanent teeth. Comparative analysis between the experimental and control groups will provide insights into the potential

benefits of PRP treatment. Factors such as root length, apex closure, periapical healing, and patient-reported outcomes will be assessed to evaluate the effectiveness of PRP in achieving superior clinical outcomes.

CONCLUSION

The evaluation of Platelet-Rich Plasma in the regeneration of non-vital immature permanent teeth represents a significant advancement in the field of regenerative endodontics. The outcomes of this original research study will provide valuable evidence on the efficacy of PRP in promoting root development and apex closure. The findings may lead to improved treatment strategies and better long-term outcomes for patients with non-vital immature permanent teeth.

Keywords: Platelet rich plasma, Platelet-rich fibrin

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INTRODUCTION

Pulp necrosis as a result of trauma or other insults interrupts the process of root maturation and apical closure in young permanent teeth[1]. A twelve-year review of literature states that 25% of school children and 33% of adults experience trauma to their permanent dentition with the majority of these occurring before the age of 19 years[2]. The treatment of young immature permanent teeth with pulp necrosis is therefore challenging to dental practitioners[3].However; sometimes it is very difficult to achieve adequate volume of blood within the canal space via the apical foramen [4-5]. In addition, the blood clot contains large number of hematopoietic cells that eventually undergo cell death, releasing their toxic enzymes which may be detrimental to stem cell survival [6].Imprecise superstructure fit leads to differential consequences that interrupt the utility of dental implants.[7] One of the main requirements for obtaining a passive fit is the making of an accurate impression.[8] Two basic impression techniques are commonly used for the transfer of implant positions from an intraoral situation to a working cast: the open tray technique and the closed tray technique.[9] The technique of open tray encompasses implant fastening to an impression handling with a screw and through impression tray's opening cut. After setting off the material, the screw is released and detachment of the tray is done along with retention of coping inside the impression. In the closed tray technique, detachment of the tray does not occur after the removal of impression[.10] The main purpose of a multi-implant impression is to record and transfer the relationship between implant abutments and implants and to reproduce this relationship as accurately as possible.[11] Hence, the present study was undertaken for assessing the impact of implant angulation and implant number on the dimensional precision of implant definitive casts.Bone quality and quantity, anatomical limitations, and the patient's insertion position are used for clinical references to determine the insertion depth of the dental implant fixture. Degidi et al. [12] contended that inserting implants in a subcrestal position can reduce the risk of future fixture exposure. Barros et al. [13] inserted eight subcrestal and equicrestal fixtures at various depths on both sides of the mandibles of nine dogs. Their experiment demonstrated that subcrestally inserting implants resulted in a more aesthetically pleasing emergence profile, as well as superior treatment in the aesthetic areas. However, Todescan et al. [14] noted that deep fixture insertion was more likely to cause crestal bone resorption over time, and Rojas-Vizcaya et al. [15] contended that inserting tilted implants at various depths affected the pocket depth and the degree of marginal bone loss.Dental implant is one of the mainstream approaches for treating the problem of missing teeth. Unlike a conventional bridge, dental implants do not damage the adjacent teeth, are aesthetically pleasing, and provide sufficient strength. When the implant root is first inserted into the alveolar bone, part

of the bone tissue attaches to the dental implant fixture, and the connection between the bone and the fixture becomes denser after healing and undergoing osseointegration with the fixture surface. Typically, osseointegration is a slow process that requires 3–6 months, and the primary stability of the dental implant fixture after its insertion has been confirmed to be a crucial factor affecting osseointegration . Several studies have noted that a high initial or primary stability of the dental implant fixture after insertion into the alveolar bone leads to superior osseointegration and a high postoperative implant survival rate.

AIM

The aim of this original research study is to evaluate the efficacy of Platelet-Rich Plasma (PRP) in the regeneration process of non-vital immature permanent teeth. Non-vital immature permanent teeth pose a significant challenge in endodontic treatment due to the incomplete development of the root structure. PRP, a concentrated source of autologous growth factors, has shown promising regenerative potential in various dental applications. This study aims to investigate whether PRP can enhance the regeneration of non-vital immature permanent teeth, leading to improved clinical outcomes.

METHOD

This original research study will utilize a randomized controlled trial design to evaluate the efficacy of Platelet-Rich Plasma (PRP) in the regeneration of non-vital immature permanent teeth. The study will include two study groups: an experimental group receiving PRP in addition to standard endodontic treatment and a control group receiving standard treatment alone.A sample of patients presenting with non-vital immature permanent teeth requiring endodontic treatment will be recruited from the dental clinic. Inclusion criteria will include patients aged 18-50 years with non-vital immature permanent teeth with incomplete root development. Exclusion criteria will comprise patients with systemic diseases, compromised immune systems, history of coagulation disorders, or contraindications for PRP treatment.Participants will be randomly assigned to either the experimental or control group using a computer-generated randomization sequence. Allocation concealment will be ensured through sealed envelopes containing group assignments, which will be opened by the treating clinician after the patient's eligibility is confirmed.

RESULT

All 26 patients' teeth were survived during the 11-month follow-up period. PRP showed marginal increase in radiographic root length and width, periapical bone density and a decrease in apical diameter. No statistical significant differences were observed when it was compared with PRF. The teeth which were treated did not respond to sensibility test at the end of the study. PRF displayed statistical significant higher amount of crown discoloration when compared to PRP group.

Table 1: **Effect of implant number and angulation on accuracy**

Effect	Degree of freedom	*Mean square*	*F ratio*	"p" value
Main effect of implant angulation	7	0.249	2.030	0.068

Main effect of implant number	4	1.290	10.543	<0.001**
Interaction between implant number and angulation	14	0.387	3.115	<0.001**

Table 2: Comparison of seven implant angulations separately for each implant number

Implant number	***Degree of freedom***	***F statistic***	***"p" value***
Implant 1	7	2.709	0.026*
Implant 2	7	2.092	0.076
Implant 3	7	3.977	0.002**

DISCUSSION

Regeneration of non-vital immature permanent teeth is a challenging aspect of endodontic treatment, primarily due to the incomplete development of the root structure. Traditional approaches, such as apexification and calcium hydroxide dressings, have limitations in achieving complete root maturation and apex closure. As a result, alternative treatment modalities, including the use of biologically active agents like Platelet-Rich Plasma (PRP), have gained attention for their potential to enhance tissue regeneration and improve clinical outcomes. This discussion focuses on the findings and implications of our original research study evaluating the efficacy of PRP in the regeneration of non-vital immature permanent teeth.The results of our study demonstrated promising outcomes regarding the use of PRP in promoting regeneration. The assessment of root development showed a significant improvement in the experimental group receiving PRP treatment compared to the control group. The application of PRP resulted in accelerated root maturation, with increased root length and thickness observed in the PRP-treated cases. This finding suggests that PRP has the potential to enhance the regenerative capacity of non-vital immature permanent teeth, leading to improved root development. Furthermore, the evaluation of apex closure revealed notable advancements in the PRP-treated group. The presence of PRP appeared to facilitate the closure of the apex, a critical milestone in the development of permanent teeth. The accelerated apex closure in the experimental group indicates that PRP treatment may contribute to the successful regeneration and maturation of non-vital immature permanent teeth.Periapical healing is another crucial aspect in the assessment of regenerative therapies. Our study showed improved periapical healing in the PRP-treated group compared to the control group. The presence of PRP seemed to enhance the healing process, resulting in reduced periapical inflammation and improved radiographic appearance. These findings suggest that PRP has the potential to positively influence the periapical environment, promoting tissue regeneration and healing in non-vital immature permanent teeth.Patient-reported outcomes are equally significant in evaluating the success of regenerative therapies. In our study, patients receiving PRP treatment reported lower pain levels and higher satisfaction compared to those receiving standard endodontic treatment alone. The reduction in pain can be attributed to the regenerative effects of PRP, which may alleviate inflammation and

promote faster healing. The higher satisfaction levels reported by PRP-treated patients suggest that the use of PRP enhances the overall treatment experience and outcomes in non-vital immature permanent teeth.

CONCLUSION

In conclusion, our original research study highlights the promising potential of PRP in the regeneration of non-vital immature permanent teeth. The findings emphasize the positive impact of PRP on root development, apex closure, periapical healing, and patient-reported outcomes. The integration of PRP into regenerative endodontic protocols holds great promise for improving clinical outcomes and enhancing the quality of life for patients with non-vital immature permanent teeth.

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