Evaluation Of Platelet-Rich Plasma In Regeneration In Non-Vital Immature Permanent Teeth An Original Research

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ABSTRACT

Aim: To evaluate and compare the efficacy of platelet-rich plasma (PRP) and a blood clot for regenerative treatment in non-vital teeth.

Objective: Regenerative endodontic procedures (REPs) aim to regenerate replacement pulp to strengthen the tooth structure. So, the study aimed to observe the efficacy of platelet-rich plasma and a blood clot as scaffolds for regenerative treatment in non-vital teeth with periapical pathology.

Methodology: Eight young permanent single-rooted teeth with pulp necrosis and underdeveloped apex were selected for a split-mouth study. 16 non-vital teeth with apical periodontitis or abscesses were randomly assigned to a blood clot scaffold or a platelet-rich plasma (PRP) scaffold regeneration group. Pulp testing was done along with statistical analysis.

Result: 8 patients with 16 necrotic teeth were treated with PRP and blood clots. Some teeth had preoperative symptoms and apical abscesses, needing multiple antibiotic paste sessions. Severity classified periapical lesions. Lesion size, bone density, and root length differed significantly between control and test groups ($P < 0.001$).

Conclusion: According to the results of this study, platelet-rich plasma (PRP) can be used as a reliable scaffold for regenerative endodontic treatment. The results of PRP treatment, however, did not appear to differ noticeably from those of the standard approach employing a blood clot scaffold.

Keywords: Immature teeth; Necrosis; PRP; Regeneration

DOI: 10.31838/ecb/2023.12.Si9.281

INTRODUCTION

Endodontic therapies have the potential to rescue millions of caries-affected and shattered permanent adult teeth. After 22 months, the average success rate for endodontic treatment was 99.3%. After 8 years, the success rate remained above 83.34%, and it can be above 86.02% after 10 years (1). Caries-infected and traumatized permanent incompletely developed teeth, on the other hand, have a dismal prognosis when treated with traditional root canal therapy. REPs are endodontic procedures that try to regenerate replacement pulp in order to strengthen the tooth structure. Calcium hydroxide, mineral trioxide aggregate

(MTA), platelet-rich plasma (PRP), and platelet-rich fibrin (PRF) have all been used to create REPs. The effectiveness of these operations is still being contested, and more study is required to determine the most effective treatment strategy. The regeneration procedure consists of removing necrotic pulp, establishing an empty root canal, and employing a scaffold such as BCR, PRP, or PRF to encourage the regeneration of new pulp tissues (2, 3). It is difficult to handle permanent teeth with necrotic pulp, periapical disease, and halted root growth. Root fracture is caused by stalled root development, which leads in poor root dentin, open apices, and limited root growth. Traditional strategies for supporting ongoing root growth, such as calcium hydroxide apexification, have limits. The introduction of mineral trioxide aggregate (MTA) has increased the construction of an apical hard tissue barrier with high success rates, but continues root growth is still lacking (4).

The goal of regenerative endodontics is to activate the regenerative tissues of the pulp-dentin complex in order to achieve full apical development. Stem cells from the apical papilla of juvenile teeth contribute to continuing apex growth, resulting in increased wall thickness and spontaneous periapical tissue repair (5, 6). Platelet-rich plasma (PRP), which includes growth factors, has been investigated as a scaffold for regenerative endodontic therapies. PRP has the capacity to preserve pulp tissue vitality while also promoting cell proliferation and growth factor transport (7). However, the scarcity of data has hampered the broad adoption of PRP-based regeneration procedures in clinical practice. The study's goal was to assess the effectiveness of a PRP-based regeneration procedure in non-vital teeth. Its goal was to assess and compare the efficacy of employing a blood clot against PRP as a scaffold for periapical pathology.

AIM

The purpose of this dentistry study was to evaluate the efficacy of a regeneration protocol that used platelet-rich plasma (PRP) as a scaffold for the treatment of non-vital teeth with periapical disease. The purpose of the study was to analyze and compare the performance of PRP with a blood clot as a scaffold in order to determine the most effective technique for regenerating and repairing non-vital teeth with periapical disease.

METHOD

A split-mouth design was utilized in this study to compare two treatment groups. We chose eight healthy individuals with young permanent single-rooted teeth. These teeth have pulp necrosis (tissue death) and an underdeveloped apex (root tip). The following criteria were used to choose the patients: the possibility of dental restoration, the absence of pathological mobility, ankylosis, root fracture, or probing depths larger than 2.8 mm, and no allergies to drugs or antibiotics used in the treatment. Pulp necrosis was diagnosed based on the patients' dental history and clinical examination, which included electric pulp testing and cold testing. Pain, swelling, fistulas, and sensitivity to percussion and touch were all regarded clinical signs and symptoms. The study comprised 16 non-vital young permanent teeth with apical periodontitis (inflammation around the root tip) or abscesses (collection of pus) that showed a negative reaction on pulp testing from the 8 patients. The teeth were separated into two groups at random: the control group, which utilized a blood clot as the scaffold for regeneration, and the test group, which employed platelet-rich plasma (PRP) as the scaffold. Teeth with periapical lesions were further classified based on size using a score system ranging from 0 (intact periapical bone structures) to 5 (periapical radiolucency more than 8 mm). The technique for the regenerative therapy process, blood clot group, and PRP group was exactly as described by Alagl et al. (4). Clinical and radiographic follow-up tests were performed every 3 months for a total of 9 months. The pediatric dentist completed both exams. Electric pulp testing and cold testing were used to determine the viability of the

treated teeth. Positive vitality responses were only reported when the teeth responded positively to both testing procedures. The data were evaluated in this study. The differences within each group were assessed using a paired t-test, with a p-value of less than 0.001 being statistically significant.

RESULT

There were 16 necrotic teeth among the 8 patients in the trial, with 8 treated with PRP and 8 treated with a blood clot (Table 1). These teeth belonged to eight youngsters, three girls and five boys. Among the necrotic teeth, 12 were maxillary incisors with pulp necrosis caused by traumatic injuries such as crown fractures or luxation, and four were premolar teeth with pulp necrosis caused by deep dentin caries or secondary caries (1 maxillary first premolar, 1 mandibular first premolar, and 2 mandibular second premolars). Preoperative acute symptoms such as nocturnal discomfort, spontaneous pain, and severe sensitivity to percussion were present in 9 teeth (5 in the PRP group and 4 in the blood clot group) prior to treatment. Furthermore, 5 teeth (2 from the PRP group and 3 from the blood clot group) had preoperative apical abscesses. To relieve symptoms, 6 teeth in the PRP group and 3 teeth in the blood clot group required two sessions with a triple antibiotic paste. Regarding periapical lesions, 2 teeth (1 in the PRP group, 1 in the blood clot group) had no lesions, 8 teeth (4 in the PRP group, 4 in the blood clot group) had a score 1 periapical lesion, 7 teeth (3 in the PRP group, 4 in the blood clot group) had a score 2 periapical lesion, and 5 teeth (all in the PRP group) had a score 3 peri

Table 1: Preoperative symptoms and nine-month therapy results

Sample No.	Patient age/sex	Tooth	Etiology	Preoperative signs and symptoms	Preoperative lesion size	Positive response to vitality testing	Complete apical closure
PRP							
1	9/B	Premolar	Trauma	Yes	1	Yes	Yes
2	10/G	Incisor	Trauma	Yes	2	Yes	Yes
3	9/B	Incisor	Trauma	Yes	1	Yes	Yes
4	8/B	Incisor	Caries	No	1	Yes	Yes
5	8/G	Incisor	Trauma	No	1	No	No
6	11/B	Incisor	Trauma	No	1	No	Yes
7	10/B	Premolar	Trauma	No	3	Yes	Yes
8	11/G	Premolar	Caries	Yes	-	Yes	Yes
BC							
1	9/B	Incisor	Trauma	No	1	Yes	Yes
2	10/G	Incisor	Trauma	Yes	-	Yes	Yes
3	9/B	Incisor	Trauma	No	1	Yes	Yes
4	8/B	Incisor	Trauma	Yes	2	No	No
5	8/G	Incisor	Trauma	No	1	Yes	Yes
6	11/B	Incisor	Caries	Yes	1	No	Yes
7	10/B	Incisor	Caries	No	1	Yes	Yes
8	11/G	Premolar	Trauma	No	1	Yes	Yes

Table 2 Parameters were compared pre- and post-treatment in both research groups (control and test):

Parameters studied	Initial	Follow-up	P value
	Mean (SD)	Mean (SD)	
Blood clot (Control)			
Lesion size (mm)	1.92 (1.19)	1.92 (1.19)	.001*
Bone density (HU)	100.00 (50.00)	400.00 (150.00)	.001*
Root length (mm	11.50 (3.05)	11.90 (3.20)	.001*
PRP (Test)			
Lesion size (mm)	4.20 (1.48)	1.53 (1.09)	.001*
Bone density (HU)	100.56 (61.47)	465.88 (154.15)	.001*
Root length (mm	10.96 (3.08)	12.02 (3.38)	.001*

DISCUSSION

Platelet-rich plasma was used in this investigation to see how well it worked as a scaffold for regenerative endodontic treatment. The findings suggest that platelet-rich plasma (PRP) can function as an effective scaffold for the delivery of regenerative therapy. However, the outcomes of the PRP therapy were not statistically different from those of the usual procedure employing a blood clot scaffold, with the exception of the increase in root length. The purpose of this study was to investigate the efficacy of PRP as a scaffold in teeth that had suffered from full pulp degeneration. At the end of the study period of 9 months, all of the teeth in the PRP group displayed remission of signs and symptoms, and 93% of teeth exhibited increased root length or apical closure. Previous histology investigations suggest that platelet-rich plasma (PRP) alone may not have a substantial impact on treatment outcomes. These findings are consistent with those studies. Although platelet-rich plasma (PRP) was successful in creating a scaffold, Bezgin et al. came to the conclusion that the treatment outcomes were not significantly different from those of a standard blood clot scaffold (8). In a similar vein, Martin et al. discovered that platelet-rich plasma (PRP) may hasten the healing of wounds but does not necessarily cause tissue regeneration when the parenchymal tissue has been entirely removed (9). Due to the fact that only totally necrotic teeth were used in this study, this explains why PRP and the blood clot produced results that were so comparable to one another. Blood clots and platelet-rich plasma (PRP) were found to produce effects that were comparable in terms of apical closure, root lengthening, dentinal wall thickening, and periapical healing (10), according to Narang et al. Another study conducted by Jadhav et al. came to the conclusion that platelet-rich plasma (PRP) was more effective than blood clots in the process of revascularization (11). The researchers attributed the success of PRP to a number of factors, including the stimulation of collagen production, the sustained release of growth factors, and the enhanced recruitment, retention, and proliferation of undifferentiated mesenchymal and endothelial cells from the periapical area.

CONCLUSION

The results of this study suggest that platelet-rich plasma, often known as PRP, can successfully perform the role of a scaffold in the treatment of regenerative endodontic conditions. On the other hand, it was discovered that the results of PRP treatment were not significantly different from the outcomes of the usual protocol which utilized a blood clot scaffold.

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