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Original Research

Assessment of antibacterial and antifungal effects of PRF and PRFM against root canal microflora

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ABSTRACT:
Background: Platelet-rich fibrin (PRF) is the second generation of platelet concentrates (PCs). A thorough knowledge of the physiological role of platelets in wound healing ensure the use of these agents for regenerative protocols. The present study aimed to assess antibacterial and antifungal effects of PRF and PRFM against root canal microflora. **Materials & Methods:** 30 patients age ranged 25-40 years of either genderwere included. 10 ml of venous blood was obtained, 5 ml of venous blood from each subject was used for preparation of PRFM and 5 ml for PRFM. We prepared 3 groups and each group had 10 patients. In group I, 10 samples of PRF were used as antibacterial group and in group II, 10 samples of PRFM were used as anti- fungal group. Group III comprised of Metapex. The mean value of zone of inhibition was assessed in all groups. **Results:** The mean antifungal score in group I was 1.56, in group II was 0.38 and in group III was 14.7. The mean antibacterial score in group I was 4.52, in group II was 1.73 and in group III was 11.9. **Conclusion:** The highest antifungal and antibacterial scores were seen in Metapex followed by PRF and PRFM group.However, both PRF and PRFM may prove beneficial when used in the revascularization procedure.
Key words: Metapex, Endodontic regenerative, Platelet-rich fibrin

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INTRODUCTION

Endodontic regenerative procedures are widely used methods for regeneration of pulp-like tissue. The indications for these procedures are in carious tooth, traumatic tooth and regeneration of pathological root resorption in cervical, middle, or apical areas. These methods are based on regeneration of dentin-pulp complex.

Platelet-rich fibrin (PRF) is the second generation of platelet concentrates (PCs). A thorough knowledge of the physiological role of platelets in wound healing ensure the use of these agents for regenerative protocols. It contains platelets and growth factors (GFs) within the kind of fibrin membrane. The preparation is from the patient's blood without the use of anticoagulant. These PCs contain biologically active protein whichspeed up the wound healing, and encourages an angiogenesis and tissue repair. It also causes moderate inflammation and an immunologic response.The binding of these proteins with a developing fibrin mesh or to the extracellular matrix can create chemotactic gradients aiding the recruitment of stem cells, hence stimulating cell migration, differentiation, and this promotes repair and regeneration. There is a novel concept in PCs called PRF matrix (PRFM) which is processed using higher gravitational force without the use of bovine thrombin.

There are various aerobic, anaerobic, gram-positive and negative microorganisms which lead to pulpal and periapical lesions. The action of these causative agents is due to their ability to liberatelipopolysaccharide, toxins, and hance the synthesis of enzymes. The present study aimed to assess antibacterial and antifungal effects of PRF and PRFM against root canal microflora.

MATERIALS & METHODS

The present study comprised of 30 patients age ranged 25-40 years of either gender. All agreed to actively participate in the study with their written consent.

Demographic data such as name, age, gender etc. was recorded. 10 ml of venous blood was obtained under aseptic condition from all enrolled subjects. The microbial samples from the root canal were collected under strict asepsis.5ml of venous blood from each subject was used for preparation of PRFM and 5 ml for PRFM. We prepared 3 groups and each group had 10 patients. In group I, 10 samples of PRF were used as antibacterial group and in group II, 10 samples of PRFM were used as anti- fungal group. Group III comprised of Metapex. The mean value of zone of inhibition was assessed in all groups. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III
Agent	PRF	PRFM	Metapex
Number	10	10	10

Table I shows distribution of samples in three group. Each group had 10 samples.

Table II Assessment of the antifungal scores

Groups	Mean	P value
Group I	1.56	0.01
Group II	0.38	
Group III	14.7	

Table II, graph I shows that mean antifungal score in group I was 1.56, in group II was 0.38 and in group III was 14.7. The difference was significant (P< 0.05).

Graph I Assessment of the antifungal scores

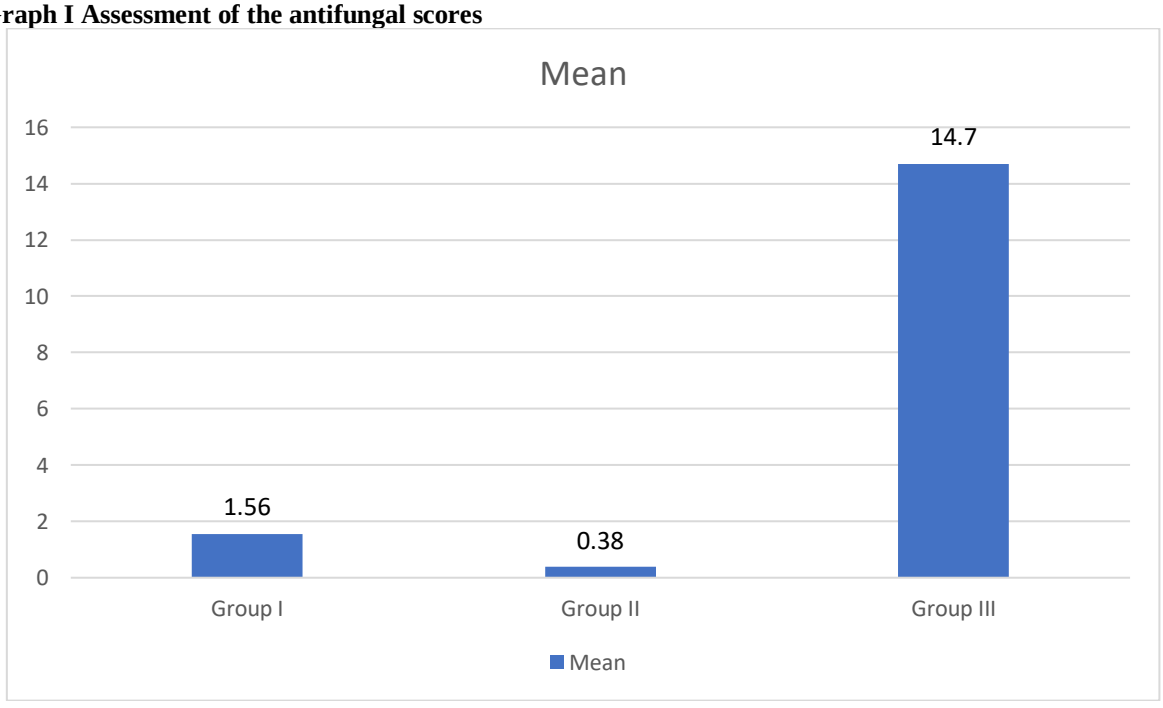
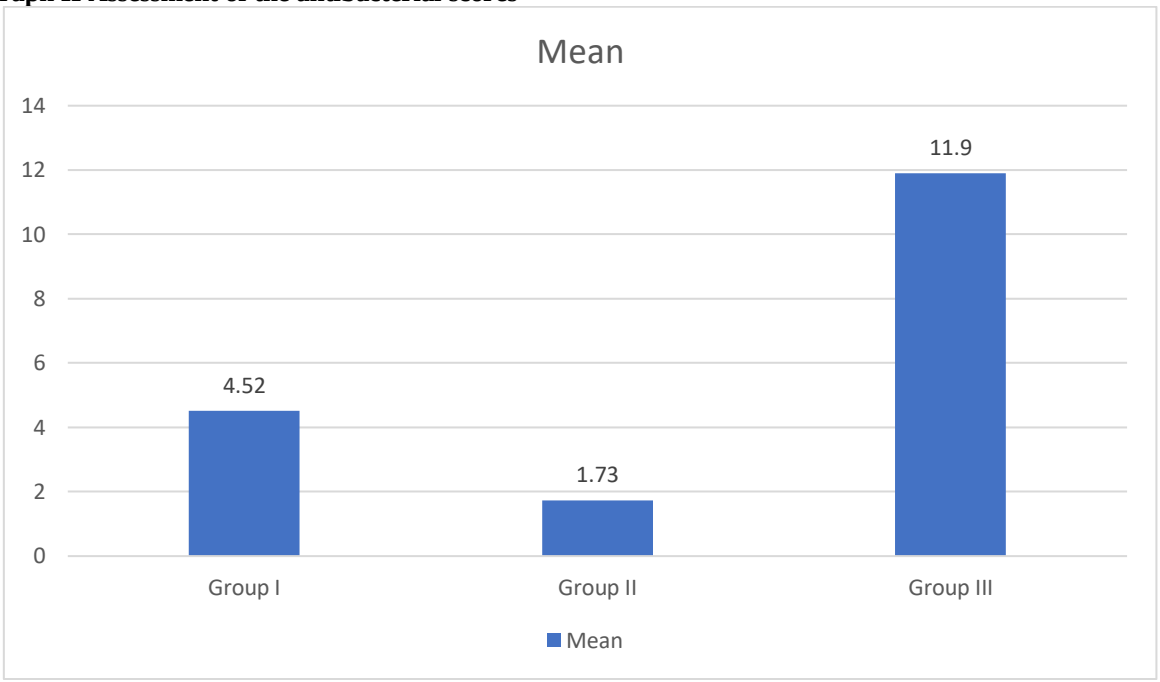


Table III Assessment of the antibacterial scores

Groups	Mean	P value
Group I	4.52	0.01
Group II	1.73	
Group III	11.9	

Table III, graph II shows that mean antibacterial score in group I was 4.52, in group II was 1.73 and in group III was 11.9. The difference was significant (P< 0.05).

Graph II Assessment of the antibacterial scores



DISCUSSION

Pulp revascularization procedures are used to treat immature teeth. However, cases with pulpal and periapical infection usually do not respond favourably to revascularization procedures due to inability to completely disinfect the canal.Microorganisms that lead to endodontic infections are mainly of low virulence. Literature suggests that platelets may play multiple roles in antimicrobial host defence.The mechanism of antimicrobial activity of PC is not well understood. Platelets are capable of binding, aggregating, and internalizing microorganisms, which enhances the clearance of pathogens from the bloodstream. Platelets also participate in antibody-dependent cell cytotoxicity functions to destroy protozoal pathogens, and finally, platelets release an array of potent antimicrobial peptides.The present study aimed to assess antibacterial and antifungal effects of PRF and PRFM against root canal microflora.

We found that in group I, 10 samples of PRF were used as antibacterial group and in group II, 10 samples of PRFM were used as anti- fungal group. Group III comprised of Metapex.Nagaraja et al assessed the antibacterial and antifungal property of platelet-rich fibrin (PRF) and PRF matrix (PRFM).Blood samples were obtained from 16 participants, PRF and PRFM were processed and the susceptibility test against microbiota in the root canal and Candida albicans was assessed through minimum inhibition zone by agar diffusion technique.PRF showed an effective antibacterial property, however, did not perform well against C. albicans strains. PRFM did not show any antibacterial or antifungal properties.

We found that the mean antifungal score in group I was 1.56, in group II was 0.38 and in group III was 14.7. Singh et al evaluated the antibacterial and antifungal effects of platelet-rich fibrin (PRF) and PRFM against root canal microflora.Blood samples were taken from 20 adults, age ranging from 20 to 40 years were obtained and 5 ml of blood was used for the preparation of PRF and 5 ml for PRFM.The highest antifungal scores were seen in metapex followed by PRF and PRFM group. Kruskal–Wallis test showed that there was a statistically significant difference. The highest antibacterial scores were seen in Metapex followed by PRF group and PRFM group and there was a statistically significant difference seen among the groups.

We observed that the mean antibacterial score in group I was 4.52, in group II was 1.73 and in group III was 11.9.Bielecki et al did a study on the impact of leukocyte in PCs and their role in immune reaction and wound healing. Elements of neutrophils such as polymorphonuclear neutrophilic granulocytes granule proteins, cathepsin G, heparin-binding protein, calprotectin, defensins, phospholipase A2, and eosinophils are effective immune mediators.

Karde et al evaluated the antimicrobial property, and platelet count of i-PRF in comparison to other platelet concentrates, i.e., PRF, platelet-rich plasma (PRP), and control (whole blood).Blood samples were obtained from 10 chronic generalized marginal gingivitis patients. The mean zone of inhibition around i-PRF and PRF showed statistical significance. Although a distinct zone of inhibition was seen with PRP, it was not statistically significant. i-PRF showed statistically significant difference in platelet count when compared to control. It was also significant when compared to PRP.

Lour et al in their study, PRP, PRF, and I-PRF are compared for their antibacterial effect against Porphyromonasgingivalis(Pg) and Aggregatibacteractinomycetemcomitans (AA). Blood samples were obtained from ten systemically and periodontally healthy individuals. Platelet concentrates were prepared using standardized centrifugation protocol. Antimicrobial activity was examined on standard strains of Pg and Aa using well diffusion method.Means for the width of zones of inhibition were calculated along with standard deviations, and the comparison was made using Wilcoxon signed-rank test.In case of Pg, I-PRF had the widest zone of inhibition which was significantly wider as compared to PRF. Furthermore, PRP had significantly wider zone of inhibition against PRF. In case of Aa, PRP had wider zone of inhibition which was significantly wider as compared to that of PRF and I-PRF.All the three platelet concentrates PRP, PRF, and I-PRF have antibacterial activity, but PRP and I-PRF are more active as compared to PRF. I-PRF being autologous and easy to prepare can be a very useful adjunct to the surgical therapy in bringing down the bacterial count helping in wound healing and regeneration.

The limitation the study is small sample size.

CONCLUSION

Authors found that the highest antifungal and antibacterial scores were seen in Metapex followed by PRF and PRFM group. However, both PRF and PRFM may prove beneficial when used in the revascularization procedure.

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