Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-95 (p) ISSN Print: 2348-6805

Original Research

Evaluation Of Autologous Concentrated Growth Factor As A Graft Material In Periapical Lesions: A Clinicoradiographic Study

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ABSTRACT:

Periapical surgery is the preferred treatment of choice in failed root canal therapy, chronic periapical lesion, persistent apical periodontitis, etc., when conventional treatment modalities fail. Moreover after periapical curettage the lesions underwent slow healing giving a dilemma of unsuccessful periapical surgeries.This study was thus undertaken to evaluate the use of a novel autologous platelet concentrate-concentrated growth factor (CGF) in periapical defects to ensure better healing of these lesions which were otherwise left ungrafted for the body's own immune response to heal. IOPAR & PAI score were done at baseline & at 6 months to evaluate the efficacy of CGF as a graft material in peri apical defects.in Group A and without graft in Group B. However, the result showed complete healing of the hard and soft-tissue lesions that conform to achieving repair and regeneration at a rapid rate in periapical lesions in Group A as compared to Group B.

Received: 14 April, 2020 Accepted: 19 May, 2020

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This article may be cited as: Mushtaq A, Jan S, Basher B. Evaluation Of Autologous Concentrated Growth Factor As A Graft Material In Periapical Lesions: A Clinicoradiographic Study. J Adv Med Dent Scie Res 2020;8(6):173-176.

INTRODUCTION

The incorporation of autologous platelet concentrates in surgical management of large periapical lesions holds unquestionable promise when regeneration of both hard & soft tissue is contemplated[1] .The regenerative potential of CGF has been demonstrated in a number of applications, e.g. sinus and ridge augmentation [2,3]neurosurgery and sports medicine[4,5].In the same line of thought it was anticipated that this platelet concentrate could also potentially optimize the healing of inflammatory periapical lesions.

OBJECTIVE

To describe the use of CGF as a graft material in periapical lesion in terms of radiographic healing acceleration and periapical area index score.

METHODOLOGY

The study was designed as a prospective clinicoradiographic study, conducted at the Department of Periodontology, Government Dental College Srinagar, with prior ethical clearance.Atotal of 24 subjects were included in the study, having a large periapical lesion > 1cm in diathat did not heal with a conventional endodontic treatment. Two groups were formulated,and subjects were randomly allocated into Group A in which the defect was filled with CGF and Group B in which no grafting material was used. A written informed consent was signed by all the patients prior to the start of their treatment.Subjects with known systemic disease or on any medicationsknown to interfere with the outcomes of periodontal therapy,or subjects using tobacco in any form, pregnant or lactating mothers, were excluded from the study. Patients who had unacceptable oral hygiene after the reevaluation of Phase 1 therapy were also excluded from the study. Subjects were evaluated at baseline & then at follow up visits of 1 month and 6 months using periapical area index score[6,7]&change in radiographic bone density using pixel intensity analysis software in the Image J program[8] (National Institute Of Health, Bethsda, US).

SURGICAL PROCEDURE

Periapical curettage along with apicoectomy with retrograde filling with MTA was performed followed by grafting of the defect with autologous concentrated growth factor in Group A & no bone substitute was used in periapical defects of Group B .

CGF was prepared using 10 ml of blood centrifuged according to the protocol by Rodella et al.[9]At the end of the process, blood was separated into three phases: (i) upper Platelet Poor Plasma (ii) middle CGF (iii) lower RBC layer. The CGF phase was isolated and used to fill the periapical defects in Group A and defects in Group B were allowed to heal by body's own immune mechanism. Primary closure was obtained and standard postoperative instructions and medications (diclofenac sodium 50 mg TID + amoxicillin-clavulanic acid 625mg TID for 5 days) were prescribed. The patients were recalled at 1 week for suture removal, and at 1 month, and 6 months thereafter, when they were examined clinically regarding postoperative discomfort, pain, sensitivity to percussion, and presence/absence of swelling.

STATISTICAL ANALYSIS

The data were analyzed using statistical soft ware SPSS (version 20.0) and Microsoft Excel (version5.00). The results were averaged (mean standard deviation) for each clinical and radiographical parameter at baseline and 6 months. Inter group analysis of data was done by applying Student's independent t-test (also known as unpaired t-test) and for intra group analysis, Paired t-test was employed. A p value of less than 0.05 was considered statistically significant.

RADIOGRAPHIC ASSESSMENT

Radiographic evaluation was done using the PAI scoring system given by Orstavik in 1986. This is a 5-point scale radiographic interpretation designed to determine the absence, presence, or transformation of a diseased state. The reference is made up of a set of five radiographs with corresponding line drawings and their associated score on a photographic print.[6,7] Table 1 represents the description of PAI scores.

Table 1: Description of Periapical index scores (adapted from Orstavik*et al* and Penesis*et al*

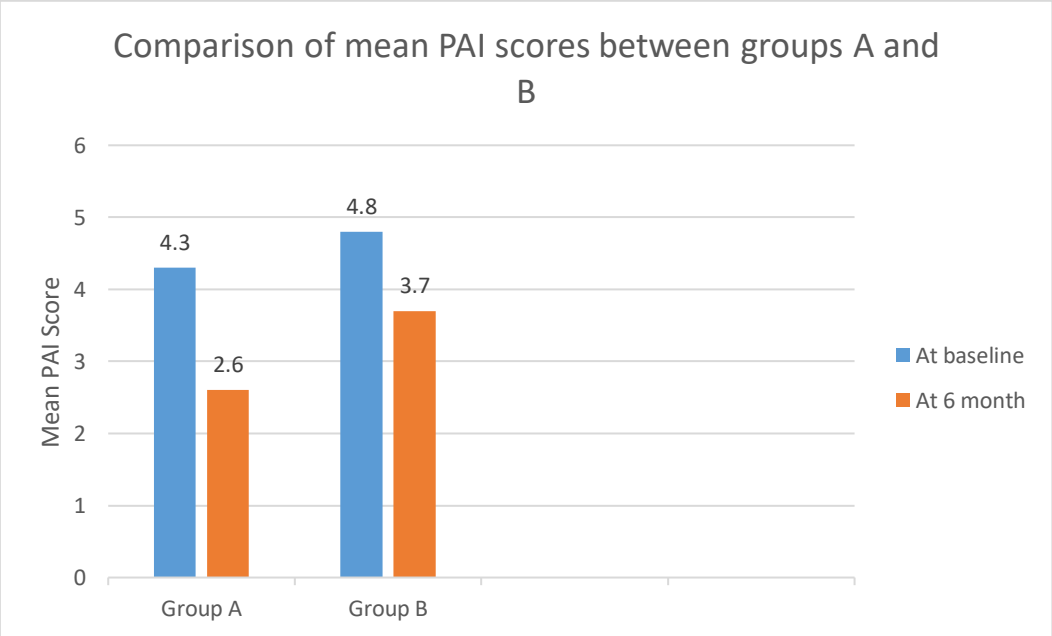
PAI Score	Description of Radiographic findings.
1	Normal Periapical Structures
2	Small changes in Bone Structures
3	Change in Bone Structure with Mineral Loss
4	Periodontitis with well — defined radiolucent area
5	Severe periodontitis with exacerbating features

RESULTS

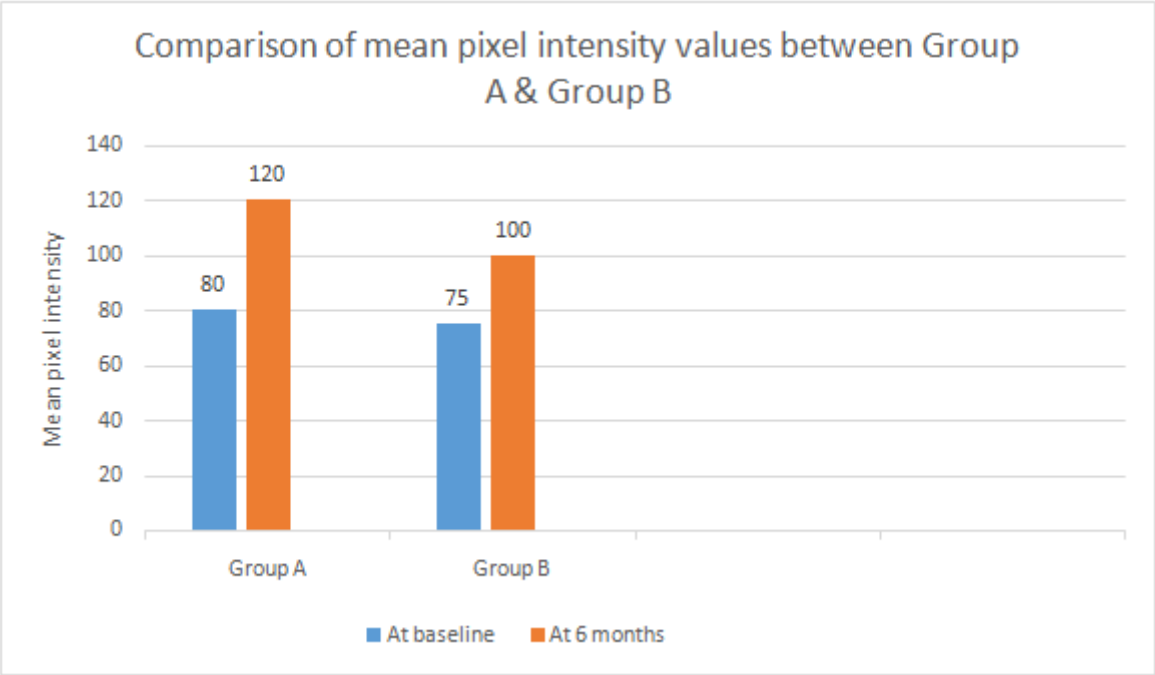
All the 24 patients included in the study did not complain of any unusual or severe pain. There were no signs of infection, untoward reaction, wound dehiscence or extrusion of material in any of the patients.

Graph 1 represents comparison of mean PAI scores between groups A and B.

Group A had mean PAI of 4.4 at baseline which decreased to about 2.6 at 6 months of evaluation. Similarly in Group B,mean PAI at baseline was 4.8 which decreased to about 3.7 at 6 month of evaluation. On comparing both the groups, statistically significant difference in mean PAI score was observed (p-value < 0.05) implicating that Group A with CGF as a grafting material showed better resolution of the defect as compared to Group B without graft.



Graph 2 depicts change in radiographic bone density by analysing mean pixel intensity values using Image J software.Group A had mean pixel intensity value higher than Group B at 6 months of evaluation(p value < 0.05) depicting complete bone regeneration in Group A as compared to Group B at 6 months.



DISCUSSION

Recent treatment modalities focus on augmenting natural healing with bone regenerative materials. Periapical defects do heal after surgical curettage but it is slow and unpredictable process[10]It has been demonstrated that the healing of periapical tissues is a "programmed event." More than the size of the lesion, it is the microenvironment consisting of the progenitor/ stem cells, extracellular matrix, and bioactive molecules that plays a crucial role in tissue regeneration or scar formation during wound healing..[11] Conventionally used bone grafts provide a scaffold and may sometimes also provide inductive factors for bone formation. Conversely, platelet concentrates provide a fibrin scaffold with indigenous growth factors that are crucial for initial angiogenesis, fibroblast proliferation and extracellular matrix formation—without the concern of cross-reactivity and biocompatibility.[12]Though the use of PRF has been demonstrated for this application in earlier studies,[13,14].the use of CGF for periapical defects has been reported only as subjective case reports,[15,16]where substantial healing of periapical defects was seen. A direct effect on osteoblast proliferation[17]has been shown which results in early bone healing with the use of CGF.[18]The present study is in concordance with these findings, as evidence of changes in bone density and area of radiolucency were seen as early as 1 month with the use of CGF in the periapical defects. Pertinently, such changes occur after 1 year for small, and more than one year for large periapical lesions that are left to heal spontaneously.[10]

With regard to changes seen in bone density of the healing lesion,in Group Aprogressive increase was noted throughout the observational period as compared to Group B which indicates a progressive maturation & regeneration of the newly formed .Theresults also indicate a decrease in the overall healing period with the use of CGF. Similar increase in bone density has been reported for postextraction implants[19]and alveolar grafting[20]using CGF, and may perhaps result from the documented osteopromotive effects of CGF.[21]

Hence , the present observations implicate an accelerated healing with the use of CGF in periapical defects as compared to normal healing without the addition of graft. As the CGF matrix has been shown to release growth factors uptil 28 days[22], concurrent with the decisive processes of angiogenesis, mesenchymal cell recruitment, and matrix formation, it can be postulated that these effects together facilitated a "regenerative microenvironment" forearly resolution of the periapical defects.

CONCLUSION

Within the limits of this study, it can be concluded that CGF can be effectually employed singly as a scaffolding medium, eliciting unprecedented response in terms of periapical healing.It can be used as a safe, efficacious and cost-effective alternative to conventional bone substitutes for promoting early resolution of periapical defects. Further studies in comparison with other platelet concentrates should be employed to explore possible differences between these autologous products.

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