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STUDIES ON EFFICACY OF AUTOLOGOUS PLATELET-RICH FIBRIN GEL FOR WOUND HEALING IN BOVINE

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ABSTRACT

Platelet-rich fibrin gel has condensed growth factors and cytokines, known to be used in various dental and orthopedic procedures for its better healing efficacy. Present study was conducted on 12 bovines having clinical wound reported to Teaching Veterinary Clinical Complex (TVCC), College of Veterinary Science and Animal Husbandry, Rewa. The animals were randomly divided into two groups having 6 animals each. Wound of group I was treated by topical application of APRF on 0th, 5th, 10th, and 15th day post-treatment. Wounds of group II acted as control and were treated with Normal Saline Solution. The wounds were evaluated on the basis of gross appearance, exudation, pain at the site on 0th 5th, 10th, 15th and 20th post-treatment day and wound contraction rate on 5th, 10th, 15th, 20th and 25th post treatment day. Respective intensity of colour and moisture of both the groups were in descending order on 10th day of evaluation. Wounds of control groups were mild moist and moderate pink; however, intensity was clearly faint and wounds were dry in appearance APRF group. No pain was manifested by any animal of group I on 15th post-treatment day however, it was still present in some of the animals of control group.. Wound contraction on 15th post treatment day in group I was 87.82 percent as compared to 37.27 percent in control group.

Key Words: Autologous platelet-rich fibrin, Bovine, Topical application, Wound contraction rate

INTRODUCTION

Wound is very common surgical affection in bovines as well as other animals. From time immemorial wound healing had been a challenge for clinicians, as time progressed antiseptics, antibiotics have drastically changed the path in healing process. Later as science developed further newer herbal as well as biological substances emerged in shortening course of wound healing. Wound healing is an innate response of body in order to repair and restore the tissue in terms of normal anatomy and physiology. The pace of healing of tissue may differ on the nature and extent

of injury which may lead to various complications. Wound healing involves highly complicated biological process which initiates after trauma leading to cascade of physiological chain of cellular and biochemical events till complete healing.

Wound healing incorporates four complex integrated mutually overlapping phases: hemostasis, inflammation, proliferation and tissue remodeling or resolution (Gosain and Dipietro, 2004). Each and every phase has crucial important role in healing process hence substances which help in coagulation, reduction in inflammation at microscopic levels resulting in fibrous tissue proliferation and remodeling the tissue were used as wound repair enhancers. Platelets innately posses growth factors and cytokines which promotes each and every process of wound healing. Platelets have major role in haemostasis and affect processes such as angiogenesis, inflammation in the healing process (Nurdenet al., 2008). Autologous platelet-rich fibrin contains highly dense growth factors which may promote wound repair (Alishahiet al., 2013).

MATERIALS AND METHODS

The study was conducted on 12 clinical wound of calves of either sex of six months to one year of age. Selected calves were randomly divided in two treatment groups. The wounds of groups I were refreshed and treated with autologous platelet-rich fibrin (APRF group) and wounds of group II were treated with Normal Saline Solution (CONTROL group). The wounds were evaluated on the basis of gross appearance, exudation, pain at the site on 0th 5th, 10th, 15th and 20th post-treatment day and wound contraction rate on 5th, 10th, 15th, 20th and 25th post treatment day. Physiological parameters like heart rate, respiration rate and rectal temperature (ºF) were recorded for first five days post treatment.

PREPARATION OF APRF

10 ml blood was collected aseptically in a vacutainer without anticoagulant from same animal having wound and was centrifuged at 3000 rpm for 10 minutes. This provided a top layer of acellular plasma, middle fibrin clot and bottom red section of RBCs. A large number of platelet was entrapped in fibrin clot. Upper a- cellular plasma was discarded and middle fibrin clot was collected with the help of a forceps and RBCs adhered to fibrin clot was removed using sharp scissor (Dohanet al., 2006).

SURGICAL DRESSING

All the wounds irrespective of groups were cleaned with normal saline solution and debrided when approached for treatment. Wound of group I was treated with autologous platelet-rich fibrin by squeezing it in between two sterile gauge pieces with the help of clean glass slides and applied directly on wound on 0th, 5th, 10th, and 15th day post-treatment as per the modification of method described by Khalaf and Salih (2018). Wound of group II was dressed on alternate day with normal saline solution in these time intervals.

RESULTS

Appearance of wound on 5th post treatment day in control group was marked moist and moderate red indicating persistence of proliferative phase whereas, it was dry and moderate pale in APRF treated wounds showing transition from proliferative to remodelling phase of wound healing. Respective intensity of colour and moisture of both the groups were in descending order on 10th day of evaluation. Wounds of control groups were mild moist and moderate pink; however, intensity was clearly faint and wounds were dry in appearance APRF group.Wound on 15th day of observation showed dry and mild pinkappearance in wounds of Normal Saline treated group whereas, colour of wound treated with APRF were brown. Gross appearance on 20th day revealed dry and pale wounds in Normal Saline treated group whereas, wounds under scab in APRF treated animals.

These findings are supported with the findings of Singh and Singh (2010), who noticed various stages of wound healing and reported that inflammatory phase starts just after injury and can last anywhere between 1-5 days whereas, proliferative phase starts after 12 hours of injury. All these phase overlaps each other and can usually last between 4-21 days. They further mentioned that remodelling of wounds occurs in between 21 days to a year.It was observed that exudation was decreasing over the time. Maximum exudation was observed on 0th day in boththe groups due to inflammation. 5th day of observation depicted least exudation in group I as compared to group II. No exudation was observed in group I on 10th day whereas, it was mildin control group at this time interval. 15th day observation revealed no observation in wounds of any of the group.These findings werein correlation with the findings of Safdaret al. (2015) and Farghaliet al. (2017). Both thegroups exhibited a declining trend in pain perception. On 5th day maximum pain was observed in Group II as compared to group I. 15th day data revealed complete absence of pain in both the groups except in few animals of control group. These finding are in agreement with the findings of Kimura et al. (2005) and Farghaliet al. (2017) who mentioned that PRP as an anti- inflammatory agent which alleviates pain bypreventing prostaglandin E1 (PGE1).

It was observed that wound contraction in group I was progressive and significantly higher at different time interval as compared to wound contraction in group II. Wound contraction in group I was 43.93, 71.56±3.10, 87.82±2.26, and 96.54±1.49and 98.93±0.44on 5th , 10th , 15th, 20thand 25th post treatment day. Maximum contraction were recorded in APRF group as compared to Control group at all-time intervalAbove findings are in agreement with findings Farghaliet al. (2017) who studied the wound healing property of autologous platelet rich plasma (PRP) in dogs and found 85.57 percent wound contraction in PRP treated group as compared with 74.93 percent in control group on 14th day post treatment.

CONCLUSIONS

During present study topical APRF application showed significant enhancement of wound epithelialization, reduced scar formation, extensive wound contraction, and early diminution of scar. APRF can be easily processed and used without any hindrance in those cases where delay in healing process is observed, as it is a treasure of growth factors responsible to catalyze healing.

Hence topical application of APRF can be recommended as newer alternative for enhancement of wound healing in animals.

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