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APPLICATION OF PLATELET RICH PLASMA (PRP) IN TREATING OF A COMPLICATED POSTOPERATIVE WOUND IN A CAT: A CLINICAL CASE

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ABSTRACT

Platelet Rich Plasma (PRP) therapy was used in treating postoperative wound complications in an 11 years old cat. After mechanical debridement of the wound, the wound edges were infiltrated three times at certain intervals with PRP. The wound healed completely 50 days after treatment. This clinicalcase indicates that autologous Platelet Rich Plasma (PRP) can be successfully used in treating postoperative wounds with complications in the cat.

Key words: PRP, postoperative wound, platelet, plasma, cat.

Introduction

Until recently it was thought that platelets have exclusively haemostatic function. Presently we have evidence indicating that platelets are responsible for different functions in the body. The first clinical study describing the use of the PRP method in accelerating healing of tissues was published in 1988 by oral surgeons [1]. In this case, autologous PRP was applied to cancellous bone grafts in reconstruction of mandibular defects in humans.

Platelets - anatomy and function

Platelets are small disc-shaped blood cells (approximately 1–3μ m) with average count in peripheral blood of 1.5–3.0 × 109 / L. Their usual life span is 5 to 9 days. Platelets are produced by the megakaryocytes in the bone marrow by cytoplasmic fragmentation after which they are released in the peripheral blood flow [2].

Platelets do not have nuclei; they have an extensive cytoskeleton, mitochondria, lysosomes and ribosomes [3]; modified smooth endoplasmic reticulum and multiple unique organelles [4]. Platelet function is determined by the size and age of the cells [5]; younger and bigger cells have more clearly defined hemostasis than smaller and older cells.

Platelets can express different substances depending on the stimuli used to activate them [6, 7]. Their internal structure includes three types of granules: alpha-granules, dense granules and lysosomes. Alpha-granules are most numerous and serve more important function than the other two. Alpha-granules contain more than 300 proteins, including clotting/coagulation factors, growth factors and other proteins most of which are synthesized or secreted by the megakaryocytes [8, 9]. Dense granules are relatively low in number and contain several small molecules such as serotonin, adenosine diphosphate (ADP), adenosine triphosphate (ATP), GDP, GTP, histamine, calcium, magnesium and polysulfide [9]. Platelet lysosomes are similar to those in other cells; it is unclear whether they perform platelet-specific functions [4].

In addition to their hemostatic function, platelets perform other functions such as anti-inflammatory, immune and tissue repair.

Growth factors in PRP

The alpha-granules of platelets contain polypeptide growth factors such as PDGF [10]; TGFb [11]; IGF-1 [12]; VEGF [13]; HGF [14]; EGF [15]; and bFGF.

Traditionally, platelets have been used therapeutically to treat the thrombocytopenia and platelet dysfunction [16]. Our current knowledge on the topic has been expanded; we now know that platelets also play a key role in restorative processes due to tissue traumas, as they contain platelet growth factors released by activated platelets.

Platelet growth factors initiate and sustain wound healing of bone and soft tissue [17, 18]. The presence of platelet-derived growth factors (PDGF) is essential to the restorative process. PDGF consist of heterodimeric A and B chains as well as A-A and B-B chain homodimers [19]. Other growth factors which play an essential role in the tissue and bone restorative processes include: transforming growth factor-beta (TGF-β 5), vascular endothelial growth factor (VEGF 6), minor quantity of insulin-like growth factor (IGF 7), epidermal growth factor (EGF 8) and connective tissue growth factor (CTGF-9).

It is hypothesized that accelerated wound granulation and epithelization requires four to five times greater platelet concentration than the baseline platelet numbers [1, 20].

Wounds in animals usually do not heal or heal slowly due to poor blood flow, decreased oxygen supply, insufficient inflammatory response to trauma and others [18, 20].

The purpose of this case report is to describe our experience using PRP in treating complicated and difficult to heal wounds in cats.

Clinical Case

The patient – a 12 years old female Turkish Angora cat named Kido – presented with a tumor formation on the right cranial and left caudal mammary glands.

Both tumor formations were removed surgically on 12/07/2015 and the sutures were removed on 18.12.2015 at which time evidence of impaired wound healing was not visible. Ten days later, the skin in the area of the cranial mammary gland ruptured forming a wound measuring 4 by 6 cm. (Picture 1, 2). Conservative treatment, administered for the following ten days, did not produce any results. The wound had atrophic dry bottom, tapered wound edges, multiple pockets and was covered with necrotic tissue and scabs. On 08.01.2016, the wound was mechanically debrided and 2 ml of autologous PRP were infiltrated in the edges and bottom. Seven days after the treatment, a number of islets of granulation tissue were visible. The wound shrunk to 3.5 by 5 cm. (Picture 3).

Picture 1.

Picture 2.

Picture 3.

A second course of PRP treatment as administered on 21/01/2016. The edges of the wound were covered with granulation tissue; necrotic tissue was present only in a few small areas. The wound measured 2.5 by 2.5 cm. Gradual reduction of the size and number of necrotic tissue areas was observed (Picture 4).

The adjacent smaller wounds healed without any treatment and the seborrhea significantly decreased. By 02/27/2016, the wound had completely healed (Picture 5).

Picture 4.

Picture 5.

PRP Preparation

16 mm of whole blood was drawn from the jugular vein using a 22 gauge needle. The blood was placed into 2 heparin vacutainers. The average time lapse between blood draws and PRP extraction was about 10 minutes.

Double centrifugation method

The blood was centrifuged for 20 min at 2800 rpm to achieve separation of cell layers. This procedure divides the blood into three basic components: red blood cells, platelet rich plasma (PRP) and platelet poor plasma (PPP). Each vacutainer yielded approximately 4–5 mL of PRP, 80 % of it was discarded.

The part containing platelets and mononuclear cells was carefully removed using a spinal needle attached to a syringe and re-suspended in 2 ml of the remaining plasma. The final solution, obtained by mixing the resulting PRP and plasma, was placed in sterile vacutainers and was centrifuged at 1300 rpm for 15 min for better separation of the platelet pellets from the supernatant layer

of PPP. The platelet pellets accumulated at the bottom of the container and the PPP on top. The PPP was removed; only the PRP was left in the containers. The platelet pellets were re-suspended within the remaining plasma with a vortex mixer; the final PRP was drawn up with a syringe.

Discussion

A number of clinical studies in animals and humans have shown the important role of platelets in the process of wound healing when applied topically. PRP accelerates healing due to release of growth factors (GF) contained in platelets.[18]

GF can stimulate the inflammatory and proliferative phase in wound healing.

In our clinical case, PRP was applied topically to treat a complicated postoperative wound in a cat. During the course of treatment with PRP, no other medications were administered either topically or internally (such as systemic antibiotics and/or anti-inflammatory agents).

There are different methods for PRP preparation: cuvettes, quadruplicate blood samples, manual preparation using open, closed or automated systems.[21] The double centrifugation method using vacutainers, employed in this study, is inexpensive, relatively easy to implement and does not require expensive or complex equipment.

PRP can be applied topically by continuous dripping or a spray in the form of a gel or injection in wound edges.

PRP stimulates faster wound healing and provides antibacterial and anti-inflammatory environment.[22.23.24] PRP exhibit antimicrobial properties against various microorganisms by inhibiting their growth.[22.25.26]

The results of this clinical case suggest that, the PRP method is an effective therapeutic method in treating atopic and slow healing wounds. Regenerative therapy can be applied in order to improve the quality of tissue regeneration and the rate of wound healing in cats.

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