

## Introduction

Autologous Platelet Cell Concentrate (APCC) is derived from the patient's own blood, and is enriched for platelets and white cells in a small volume of plasma. It can be used topically as a biological gel dressing<sup>(1)</sup> or injected subcutaneously for soft tissue rejuvenation.

APCC works via the degradation of the alpha granules in platelets, which release synthesized and pre-packaged growth factors<sup>(2)</sup>. More than 95% of the pre-synthesised growth factors are secreted within an hour to initiate wound healing and repair. After this initial burst, the platelets continue to synthesise and secrete additional growth factors for up to 7 days of their viability in the biological preparation.

There is a plethora of publications supporting the beneficial effect of platelet rich plasma on wound healing<sup>(3)</sup>. In addition, platelets are now well recognized for their role in antimicrobial immunity. There have been numerous reports that platelets inactivate, inhibit the growth of, or kill viral, bacterial and fungal pathogens<sup>(4)</sup>.

Degranulation of activated platelets releases a wide array of potent antimicrobial peptides that exert direct microbicidal activities in this local setting. Many of these antimicrobial peptides are also chemokines that simultaneously recruit leucocytes to respond to these sites in antimicrobial host defence. Activated platelets express ligands that assist in leucocyte recognition and adhesion to injured or infected tissues. The microbicidal chemokines released from platelets likely interact with micro-organisms, resulting in activation and potentiation of the ensuing antimicrobial mechanisms of recruited leucocytes.

Interactions with leucocytes provide an additional mechanism by which platelets contribute to antimicrobial host defence. For example, an array of bioactive molecules released from activated platelets are chemoattractants for monocytes and neutrophils<sup>(5)</sup>.

In this presentation, we demonstrate our clinical experience using APCC for the treatment of infected wounds, and our study of the ultrastructural details of the APCC biological scaffold as viewed under scanning electron micrograph.

## Materials and Methods

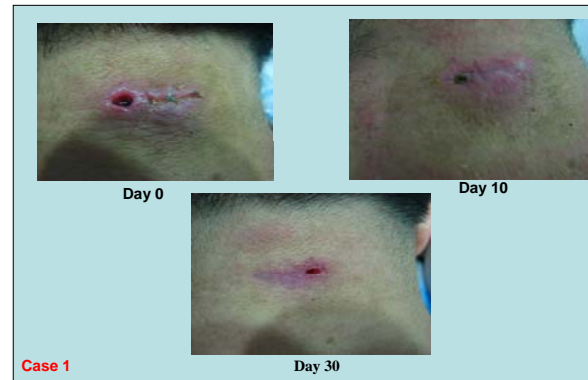
Patients were offered either conventional (standard for the particular clinic / hospital facility) or biological dressings (using APCC.) Often, patients who had experienced slow or delayed healing with conventional dressings opted for biological dressings using APCC.

The APCC was prepared using the Regenkit (Regenlab, Geneva, Switzerland). Peripheral blood was collected by venepuncture in the RegenLab tubes provided, left to stand for 30 minutes, and centrifuged at 3000 rpm for 5 minutes. The APCC was aspirated into a sterile 10mls syringe and to every 4mls of APCC, was added 1.5mls of autologous thrombin. The preparation was immediately applied topically to the wound using the spray applicator (RegenLab). The APCC was observed to set or "gel" over a period of 10 minutes. The wound was then covered with a sterile dry dressing (Alleevyn, Smith and Nephew).

## Results

The following images document the use of APCC in the treatment of infected wounds in two cases. In both cases, patient acceptability and convenience and the time to healing were superior when compared to historic controls.

Case 1 - 24 yr old male with infected scar at nape of neck following excisional biopsy of an infected sebaceous cyst. He received topical application of 4mls APCC + 1.5mls of thrombin on day 0 only



Case 2 - 35 yr old female with a non-healing abscess cavity which was managed with 3 months of conventional dressings. Patient received 8mls APCC + 3mls of thrombin applied as a gel at 3 to 5 day intervals.

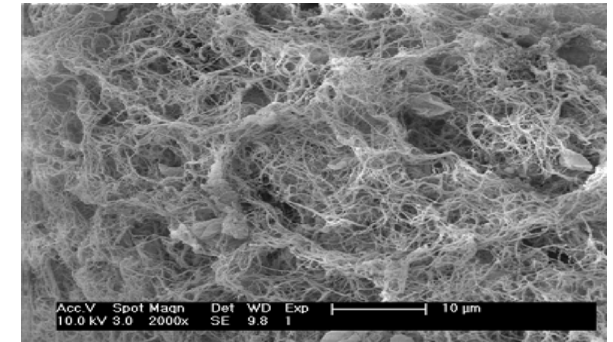


Figure 1: Scanning electron micrograph of gel preparation of APCC (low magnification)

Figure 1 is a Scanning electron micrograph at low magnification of the gel preparation of APCC. The spatial organisation of the fibrin network appears homogenous providing an intact biological scaffold. Within this scaffold activated platelet cells and red blood cells are often observed

## Discussion

The use of APCC as a "live" wound dressing, provides a three-dimensional biologic scaffold containing cells which secrete paracrine growth factors and cytokines, to enhance the healing of chronic and infected wounds. This study and many others, provides further evidence that platelets and white blood cells in the APCC play a key and multifaceted role in host defense against infection. The outcome of the clinical cases reported in this study support the role of APCC as a biological dressing for infected wounds, reinforcing cell therapies as new strategies for the treatment of wound infections and abscesses.

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## References

- Man D, Plosker H, Winland-Brown JE. The use of autologous platelet-rich plasma (platelet gel) and autologous platelet-poor plasma (fibrin glue) in cosmetic surgery. *Plast Reconstr Surg*. 2001; 107(1):229-237.
- Landesberg R, Roy M, Gickman RS. Quantification of growth factor levels using a simplified method of platelet-rich plasma gel preparation. *J Oral Maxillofac Surg* 2000; 58:297-300.
- Eppley BL, Woodell JE, Higgins J. Platelet quantification and growth factor analysis from platelet-rich plasma: implications for wound healing. *Plast Reconstr Surg*. 2004; 114(6): 1502-1508.
- Tang, YQ, Yeaman, MR, Selsted, ME. Antimicrobial proteins from human platelets. *Infect Immun*. 2002; 70: 6524-6533
- Deuel TF, Senior RM, Chang D, et al. Platelet factor - 4 is chemotactic for neutrophils and monocytes. *Proc Natl Acad Sci*. 1981; 78: 4548-4587