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Research Article

Combined Autologous Platelet-Rich Plasma and Stromal Vascular Fraction in The Management of Gluteal Burns in A Child

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Abstract:

Burns in the gluteal region present reconstructive challenges due to pressure, contamination risk, and compromised graft survival. Regenerative therapies such as platelet-rich plasma (PRP) and stromal vascular fraction (SVF) have shown promise in enhancing wound healing through angiogenesis, immunomodulation, and cellular regeneration. We report a case of a paediatric patient with mixed deep and superficial gluteal burns managed with split-thickness skin grafting supplemented with autologous PRP and mechanically isolated SVF applied to grafted areas and surrounding superficial burns. SVF was obtained from autologous adipose tissue using a mechanical method, and PRP was prepared from venous blood by centrifugation. The combined therapy resulted in accelerated epithelialization, improved graft adherence, reduced inflammation, and a decrease in the Bates Jenson Wound assessment tool score. Minimal graft loss was observed, and superficial burn areas showed rapid epithelialization. These findings suggest that combined PRP and SVF therapy may enhance wound healing and graft survival in paediatric burn reconstruction and represents a promising adjunctive regenerative modality.

Keywords: stem cells; regeneration; lipoaspirate; platelet rich plasma

Introduction

Burn injuries remain a major cause of morbidity worldwide, particularly in children, with deep burns often requiring surgical intervention including skin grafting for definitive wound closure. Conventional management focuses on early excision and grafting, infection control, and supportive wound care. However, graft loss, delayed epithelialization, and poor scar quality remain common challenges, especially in anatomically difficult regions such as the gluteal area.

Regenerative therapies using autologous cellular products have emerged as promising adjuncts to conventional burn management [1]. Stromal vascular fraction (SVF), derived from adipose tissue, contains a heterogeneous population of regenerative cells including adipose-derived stem cells, endothelial progenitor cells, pericytes, and immune cells that promote angiogenesis, reduce inflammation, and enhance tissue regeneration. SVF contributes to wound healing by enhancing fibroblast proliferation, promoting neovascularization, and accelerating epithelialization [2]. Platelet-rich plasma (PRP) contains concentrated platelets and growth factors such as platelet-derived growth factor, transforming growth factor-β, and vascular endothelial growth factor, which stimulate cellular proliferation, angiogenesis, and tissue repair. Experimental evidence has demonstrated that the combination of SVF and PRP accelerates wound closure, enhances re-epithelialization, and improves vascularization compared with either therapy alone [3]. We present a case of paediatric deep gluteal burns treated with split-thickness skin grafting supplemented with autologous PRP and mechanically isolated SVF, demonstrating improved epithelialization, reduced BWAT score, and minimal graft loss.

Methods

Patient and burn characteristics

A pediatric patient 5-year-old male presented with mixed thermal burns of 20 percent TBSA involving the gluteal region and posterior. Following initial stabilization and wound bed preparation, early excision and split-thickness skin grafting was performed over the deep burn areas.

Preparation of platelet-rich plasma

Autologous PRP was prepared from peripheral venous blood using a two-step centrifugation technique. Whole blood was collected in anticoagulant tubes and centrifuged to separate plasma (3000 RPM for 10 mins). A second

centrifugation concentrated the platelets portion into PRP and PPP (Platelet Poor Plasma). The PRP fraction was used for injection [4,5].

Mechanical isolation of stromal vascular fraction

Autologous adipose tissue was harvested under sterile conditions from the lateral thigh- around 10 ml after infiltration of tumescent solution. Mechanical isolation of SVF was performed by washing in saline and phosphate buffer solution, vigorous agitation, and centrifugation of infranatant (1200 rpm for 5 mins) of lipoaspirate to separate the stromal vascular fraction. The resulting SVF was mixed with APRP prior to injection [3]. (Figure1,2)

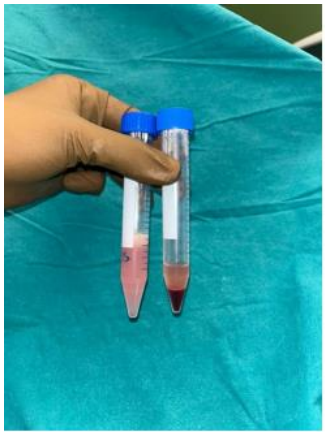

Figure 1: SVF (left side) and APRP (right side)

Figure 2: SVF and APRP mixed

Figure 3: APRP+SVF mixture being injected

Application technique

The prepared SVF and PRP were combined and injected (Figure 3) at dose of 0.1 ml/Sq cm to-

- The graft bed before graft placement
- The surface and margins of grafted areas
- Adjacent superficial burn wounds

Standard postoperative wound care was continued.

Outcome assessment

Wound healing was assessed clinically using:

• Degree of epithelialization

• Graft adherence and graft loss

• Bates Jenson wound assessment tool score

• Clinical signs of inflammation and wound progression

Results

The combined application of autologous PRP and SVF resulted in favourable wound healing outcomes. Accelerated epithelialization was observed in both grafted and superficial burn areas. Superficial burns showed rapid closure without the need for additional surgical intervention. There was a progressive reduction in BJWAT score over serial assessments, indicating improved wound characteristics including reduced inflammation, improved epithelial coverage, and enhanced tissue quality. Excellent graft adherence was observed, with minimal graft loss. The grafted areas showed healthy integration with the wound bed and no evidence of significant necrosis.

Discussion

Management of deep gluteal burns in children presents unique reconstructive challenges due to constant pressure, high contamination risk, and difficulty in immobilization, which may compromise graft survival and delay wound healing. Despite advances in surgical techniques, complications such as graft loss, delayed epithelialization, and poor scar quality remain significant concerns. Regenerative therapies using autologous platelet-rich plasma (PRP) and stromal vascular fraction (SVF) offer a promising adjunct to enhance wound healing and improve graft outcomes [2,3,6]. SVF is a heterogeneous cell population containing adipose-derived stem cells, endothelial progenitor cells, fibroblasts, pericytes, and immune cells. These cells play an important role in wound healing through differentiation, secretion of growth factors, immunomodulation, and promotion of angiogenesis. SVF enhances fibroblast proliferation, increases neovascularization, and accelerates epithelialization, thereby improving tissue regeneration and wound closure [2,3]. Additionally, SVF exerts anti-inflammatory effects by reducing inflammatory cytokines and promoting a favorable microenvironment for tissue repair, which contributes to improved graft survival and wound healing.8 PRP contains a high concentration of platelets and growth factors, including platelet-derived growth factor, vascular endothelial growth factor, transforming growth factor-β, and insulin-like growth factor, which stimulate cellular proliferation, angiogenesis, collagen synthesis, and epithelial regeneration. These growth factors promote keratinocyte migration, fibroblast activation, and neovascularization, all of which are essential components of wound healing [7.8]. PRP also reduces inflammation and enhances tissue remodeling, contributing to improved graft integration and reduced graft loss. The combination of SVF and PRP has been shown to produce synergistic effects that enhance wound healing more effectively than either therapy alone. SVF provides regenerative cells capable of differentiating and secreting cytokines, while PRP provides a rich source of growth factors that stimulate cellular activity and angiogenesis. Experimental studies have demonstrated accelerated wound closure, increased epithelial thickness, improved vascularization, and reduced inflammation when both therapies are used together.

These mechanisms explain the favourable clinical outcomes observed in our case.

In the present case, the combined application of autologous SVF and PRP resulted in accelerated epithelialization, improved graft adherence, reduced inflammation, and minimal graft loss. There was also a progressive reduction in the Bates-Jensen Wound Assessment Tool score, reflecting improved wound characteristics including epithelial coverage, tissue quality, and reduced inflammatory changes. The improved graft survival observed in this case may be attributed to enhanced angiogenesis, improved microvascular perfusion, and reduced inflammatory response facilitated by SVF and PRP [9,10].

Mechanical isolation of SVF offers additional advantages, particularly in pediatric patients, as it avoids enzymatic processing, reduces procedural complexity, and allows rapid preparation for intraoperative use. This technique enables safe and efficient harvesting of regenerative cells while maintaining sterility and viability [3,5].

Although this report demonstrates encouraging results, it is limited by its single-case design. Further studies involving larger patient populations and controlled trials are necessary to establish the efficacy, optimal dosage, timing, and long-term outcomes of combined SVF and PRP therapy in pediatric burn reconstruction.

Conclusion

The combined use of autologous platelet-rich plasma and stromal vascular fraction represents a promising adjunctive therapy in the management of deep burns and grafted wounds in pediatric patients. This regenerative approach enhances epithelialization, improves graft survival, reduces inflammation, and accelerates overall wound healing, as evidenced by reduction in Bates-Jensen Wound Assessment Tool scores and minimal graft loss in our case. The synergistic effects of regenerative cells from SVF and growth factors from PRP contribute to improved angiogenesis, tissue regeneration, and graft integration. Mechanical isolation of SVF provides a safe, feasible, and effective method for intraoperative use. This case highlights the potential role of combined SVF and PRP therapy in improving outcomes in pediatric burn reconstruction. Further clinical studies are required to validate these findings and establish standardized protocols for broader clinical application.

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