Role of autologous platelet rich plasma in prevention of flap necrosis

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Abstract
Flap surgery is a major procedure done in most cases for a definitive cover of the wound. One of the known complications of any flap surgery is partial or complete necrosis. There have been various methods described to prevent this dreaded complications one of which is the use of autologous platelet-rich plasma (APRP).

Keywords: Autologous platelet-rich plasma (APRP), Flap necrosis, Keystone flap.

Introduction
The flap cover is one of the most common procedures done in plastic surgery, be it for traumatic reconstruction and oncological reconstruction. One of the dreaded complications is the flap loss either partial or complete. The causes could be due to patient factors including local wound factors and the patient general factors like advancing age, diabetes mellitus,[1] history of smoking,[2] etc. The other cause is the surgeon factors including the technique, post-operative positioning[3] of the patient, compression on the pedicle to name a few. The keystone flap is a versatile flap that is recently described.[4] The indications for the flap are ever-increasing. We have used the keystone designed flap for the cover of an ischial pressure ulcer. As with every flap, one of the complications is the flap necrosis. To prevent this complication the most important step is to optimize the patient and follow the meticulous technique of raising and handling the flap. However, there is still a risk for flap necrosis. One procedure we would like to discuss is the use of autologous platelet-rich plasma in the flap margin to prevent flap necrosis.

Materials and Methods
The patient was a 30 year male admitted to the Department of Plastic Surgery, with h/o traumatic paraplegia with bowel and bladder incontinence of 7 years duration which has partially recovered. The patient has h/o recurrent pressure ulcer in the bilateral ischial region (Fig. 1), of which right side was operated with inferior gluteal rotation flap 3 years ago Patient is now admitted with grade 4 ischial pressure ulcer of 2 months duration. A thorough evaluation revealed osteomyelitis on the right side. Wound bed preparation was done with negative pressure wound therapy (NPWT) and adjuvant therapy with Low-level LASER therapy (LLLT) and autologous platelet-rich plasma (APRP). Once patient general condition was optimized we planned for debridement with flap cover over the left side while continuing culture appropriate antibiotics to treat the osteomyelitis on the right side. Repeat MRI revealed resolving osteomyelitis and conservative management continued on that side. After debridement, a 3cms defect was present (Fig. 2). A type 1 keystone flap was done. The procedure was done with tumescent anesthesia. The debridement was done is such a way as to produce an elliptical defect of 3cms width at the broadest part of the defect. The same size flap was planned lateral to the defect. fasciocutaneous flap was raised and used to cover the defect. The donor site was closed primarily. At the end of the flap surgery, the APRP was prepared by collecting 4.5ml of patients' own venous blood and mixed with 0.5ml 3.4% sodium citrate. This was centrifuged at 3000rpm for 10minutes. This gave three layers of which the uppermost layer was plasma, the middle layer is a buffy coat and the lower most layer is red blood cells. The upper most layer is aspirated and centrifuged in a fresh conical tube at 4000 rpm for 10 minutes. This will give platelet-rich plasma at the lower one-third of the tube.[5] This is injected at the margin of the flap and margin of the wound. The APRP injection was repeated at the margin of the flap on the 7th post-operative day.

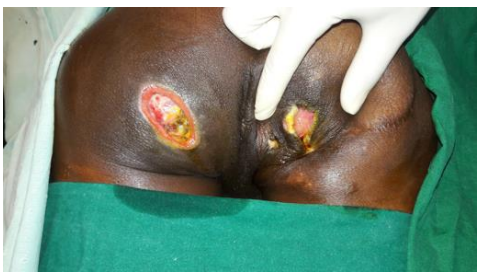

Fig. 1: Grade 4 ischial pressure sore.

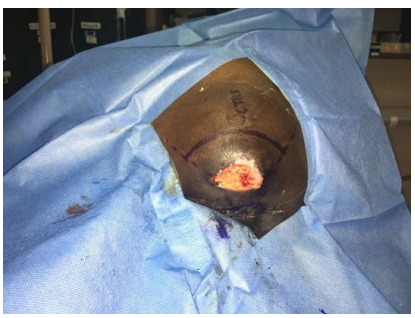

Fig. 2: Flap after debridement and flap marking.

Result
The flap showed no areas of discoloration and necrosis on post day 7.

Discussion
Autologous platelet-rich plasma (APRP) was initially used by hematologists for hemophilia. Over four decades the indications for the use of APRP have multiplied tremendously including use in dental procedures, sports medicine, wound bed preparation for chronic wounds, aesthetic procedures.[6] Its main action is said to be due to the various growth factors that include platelet-derived growth factor (PGDF), transforming growth factor (TGF) –beta, vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), Insulin-like growth factor (IGF)-1, fibroblast growth factor (FGF).[7-9] These growth factors are released into the area where the PRP is sprayed or injected.

There are not many studies done on the use of APRP in flap surgery. We wanted to use the APRP in the prevention of flap necrosis.

Our patient is a known case of recurrent pressure ulcers in the ischial region. There was a high risk of flap failure as we have planned to take a local flap. Keystone designed flap was planned as the raw area was 3cms after debridement and we wanted to preserve other well-known flaps for future cover. However, we wanted to improve the chance of survival of the flap. We believe this is facilitated by the growth factors in APRP based on the in vitro and in vivo studies done by Tanaka Y et al.[10]

Conclusion
Even though this is a single case report, we hope this will lead to larger studies to be conducted for establishing the efficacy of APRP in preventing flap necrosis.

Conflict of Interest
The authors declare that there are no conflicts of interest in this paper.

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