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# The efficacy of autologous platelet rich plasma in pain control at the split skin graft donor site: a prospective cohort study.

General Surgery

KEYWORDS:

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## ABSTRACT

Different types of dressings such ashydrocolloid, alginates, paraffin gauzeand hydro-cellularhave been tested during the past few years in an attempt to reduce pain. Our study shows significant pain reduction when using platelet rich plasma (PRP). The effect was virtually long lasting and without the need for repeated application. Some patients who had previously healed skin graft donor site wounds noted the difference in treatment and found the recovery relatively pain free.Recently, we observed an increase in patient satisfaction following PRP application to split-thickness skin graft (STSG) donor sites. We assessed all patients included in our criteria at theuniversity-based hospital service who underwent STSGsfrom 2014-2016.Based on these criteria, donor site pain was measured by pain analogue scale.

**Introduction:** skin is a highly sensitive organ of the human body. Pain at split skin graft donor site is related to the process of healing as the healing progresses pain subsides and ultimately disappears. Platelets been reported to release endorphins which may be responsible for pain reduction[1].Wound healing remains a challenging clinical problem and correct, efficient wound management is essential. Much effort has been focused on wound care with an emphasis on new therapeutic approaches and the development of technologies for acute and chronic wound management[2].Wound healing involves complex mechanism, which, if properly chaperoned, can enhance patient recovery. The abilities of platelets to stimulate wound healing through the formation of platelet clots, the release of several growth factors and cytokines, and cell proliferation has been widely studied.Platelets play fundamental role in wound healing, primarily through the formation of platelet clots and the release of many growth factors and cytokines. Theoretically, it is possible to amplify the effects of the first steps of the wound healing cascade by increasing the local concentration of platelets which would then induce an increased production of trophic and growth factors.Platelet-rich plasma is an autologous concentrate of human platelets in a small volume of plasma. It is preferred for wound healing because seven fundamental protein growth factors proved to be actively secreted by platelets to initiate all wound healing. It is being used in many fields like maxillofacial bone defects[3], reconstructive surgery[4], chronic wounds[5], cosmetic[6], and spinal surgery[7]. Growth factors are: platelet derived growth factors ,transforming growth factors, vascular endothelial growth factors and epithelial growth factors.[8]

**Material & Method:** This prospective, cohort study was performed in department of general surgery, subharti medical college, meerut on 62 patients equally and were divided into to two groups P&Q($n_P$=31 ; $n_Q$=31) having skin graft donor sites on the thigh, after clearance from the ethical committee and written, informed consent from patients.

**Two groups were formed:**

Group P- Received platelet rich plasma application at the skin graft donor site just before applying paraffin gauze dressing on it. ($n_P$=31)

Group Q- Received conventional paraffin gauze dressing on the skin graft donor site. ($n_Q$=31) ($n_P$+$n_Q$=62)

*INCLUSION CRITERIA*

Either sex, between age group of 18 to 60 years with split-skin graft donor sites, donor site area of >100$cm^2$-150$cm^2$ in size, haemoglobin>10gm% and patients having split-thickness skin graft donor site over thigh.

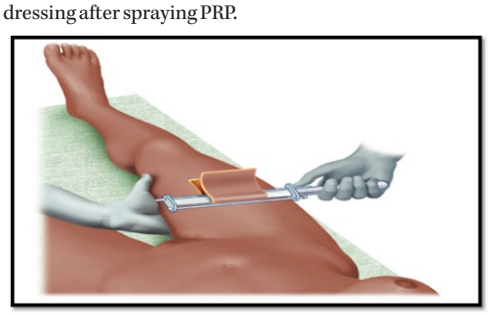
*EXCLUSION CRITERIA*

Screening platelet <$10^5$/L, patients with HIV positives , immune-suppressors or corticoids therapy, patient with serum creatinine>1.5mg/dl, patients with severe peripheral arteriopathy, inadequate donor site areas like hypertrophic scar on the donor site areas, patients with random blood sugar >200mg/dl.

Post-operative pain was taken at the time of dressing change at post-operative day 5,7,9,11,13 and 15. Pain was checked by VAS (visual analogue scale) on post-operative day with 0 representing no pain and 10 representing extreme pain.[8]

**Operative procedure**

After sterile preparation of skin preoperatively 10cc-20cc blood sample was taken from a vein in the upper arm. Blood sample tube was immediately centrifuged for eight minutes at 2,800 rpm leading to a separation of red cells from plasma. Under these conditions the platelet formed a narrow white band at the interface between the red cells and the plasma. The final volume of platelet concentrate ranged between 4.5ml and 5ml. Then the platelet concentrate was be sprayed with the help of syringe mixed with 10%calcium chloride(10:1) for the activation of PRP on the split-thickness graft donor site.[8] Preparation of PRP was done in the operation theatre immediately prior to skin graft harvesting. The blade of the humby's knife and the donor site are smeared with a lubricant such as 2% xylocaine jelly. The blade in the knife was set at a between 0.1 and 1.0 mm depth a thin sheet of split skin graft was harvested. The donor site was sprayed with PRP mixed with $CaCl_2$. The donor site was immediately dressed by paraffin gauze dressing after spraying PRP.



**Skin Grafting**

**Shows split-skin graft harvesting**

**Harvested split- skin graft**

**Shows application of PRP over split-skin graft donor site**

**Post Operative**

Dressing was done with paraffin gauze. Then observations were made by an observer blinded to the type of treatment given.

Wound site dressing were opened on 5th,7th,9th,11th,13th and 15th day post-operatively, under complete sterile environment and carefully observed the inner layer of dressing to assess the wound healing, the inner dressing was not disturbed if it was sticking to the wound.

Pain intensity was checked by visual analogue scale at postoperative days at the time of change of dressing.

- **STATISTICAL METHODS APPLIED:**

The descriptive procedure displays univariate summary statistics for several variables in the tables. The crosstabs procedure forms two-way and multi-way tables and provides a variety of tests and measures of association for two-way tables. The proportion and percentage were calculated in graphical representation. The Chi-square test and the student T- test tabulates a variable into categories and computes a Chi-square statistics. The goodness -of-fit test compares the observed and expected frequencies in each category contains a user-specified proportion of values.

All statistical analysis was done in SPSS (statistical package for the social science) version-19.0 for windows. Level of significance was taken 5%.

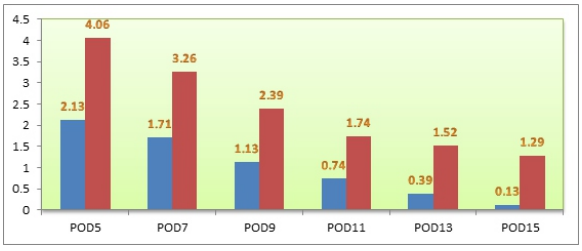
**Results**

**Mean pain on different post-operative periods.**

| POD | GROUP P | GROUP Q | p-value |
|---|---|---|---|
| POD5 | 2.13±1.20 | 4.06±1.73 | <0.001(Significant) |
| POD7 | 1.71±1.91 | 3.26±1.34 | <0.001(Significant) |
| POD9 | 1.13±0.99 | 2.39±1.17 | <0.001(Significant) |
| POD11 | 0.74±0.82 | 1.74±0.96 | <0.001(Significant) |
| POD13 | 0.39±0.56 | 1.52±0.63 | <0.001(Significant) |
| POD15 | 0.13±0.34 | 1.29±0.64 | <0.001(Significant) |

Shows there is a statistically significant difference in the pain in test and control groups (i.e. p- value <0.05).Hence after applying platelet rich plasma there is reduction in pain when dressings of the skin graft donor sites were done.

**Mean pain on different post- operative periods.**




**DISCUSSION**

**Pain intensity**

| Present Study | Samia Guerid et al | John D. Miller et al | Patricia Danielsen et al |
|---|---|---|---|
| p-value <0.001 (Significant) | p-value <0.01(Significant) | p-value 0.0098(Significant) | p-value 0.07(Significant) |

In all the studies the p-value was less than 0.05( i.e. there is significant reduction in pain).

John D. Miller et al study had several limitations. It was a retrospective analysis of a small, comorbid cohort. Furthermore, patients who were able to compare their previous standard STSG with novel interventional approach may have had some memory distortion due to the varying length of time in between operations. It is possible the second occurrence of a similar surgical procedure may seem less painful as an effect of 'learned experience'[9].The sample size of the study was very small.

Present study was prospective and patient learned experience was absent. Pain was assessed on different post- operative days. Present study sample size was 62 to assess the pain variable.

SamiaGuerid et al in prospective, randomized controlled trial

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concluded that the pain reduction by platelet concentrate was significant and even more pronounced reduction by using platelet concentrate with keratinocytes over skin graft donor sites. In present study no keratinocytes were used but the pain reduction was significant as in the control groups of above study[8].

Patricia Danielsen et al concluded in a randomized clinical trial that patients were able to discern pain in one wound from the other on the same thigh. There was a tendency toward less subjective pain at removal of secondary dressings in the platelet-rich fibrin group[10].

Different types of dressings such as hydro-cellular, hydrocolloid, alginates and paraffin gauze have been used during the past few years in an attempt to reduce pain by various authors. Our study shows significant pain reduction when using PRP. The effect was virtually immediate and long lasting and without the need for repeated application. Some patients who had previously healed skin graft donor site wounds noted the difference in treatment and found the recovery relatively pain free. This admittedly unforeseen observation could be partially explained by the ability of the platelet gel to maintain a humid environment around the wound. Different kinds of new dressings ( for example, hydrofibers and hydrocolloids), however, attempt to generate that same effect although the pain does not disappear completely and is usually only attenuated, hinting that there may be more to the story. Indeed, platelets may be releasing or stimulating the release of substances with an analgesic effect. As shown previously, platelets are known to release endorphins, which may explain why the analgesic effect observed was rapid and long lasting[1]. Specific studies must be conducted to explain precisely how the platelet concentrates act directly or indirectly on pain in acute wounds[8].

## CONCLUSION

The present study is a prospective, cohort, comparative study of two groups with PRP and without PRP on skin graft donor sites. The study was conducted with an intension to compare the efficacy of PRP pain modulation.We found that there was a marked decrease in the post-operative pain in PRP applied groups compared to without PRP group in the present study.

## References


1. Driver VR, Hanft J, Fylling CP, Beriou JM. A prospective, randomized, controlled trial of autologous platelet-rich plasma gel for the treatment of diabetic foot ulcers. Ostomy Wound Management. 2006 Jun 1;52(6):68.
2. Natarajan S, Williamson D, Stiltz AJ, Harding K. Advances in wound care and healing technology. American journal of clinical dermatology. 2000 Sep 1;1(5):269-75.
3. Marx RE, Carlson ER, Eichstaedt RM, Schimmele SR, Strauss JE, Georgeff KR. Platelet-rich plasma: growth factor enhancement for bone grafts. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 1998 Jun 30;85(6):638-46.
4. Kakudo N, Minakata T, Mitsui T, Kushida S, Notodihardjo FZ, Kusumoto K. Proliferation-promoting effect of platelet-rich plasma on human adipose–derived stem cells and human dermal fibroblasts. Plastic and reconstructive surgery. 2008 Nov 1;122(5):1352-60.
5. Margolis DJ, Kantor J, Santanna J, Strom BL, Berlin JA. Effectiveness of platelet releasate for the treatment of diabetic neuropathic foot ulcers. Diabetes care. 2001 Mar 1;24(3):483-8.
6. 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. Plastic and reconstructive surgery. 2001 Jan;107(1):229-37.
7. Hee HT, Majd ME, Holt RT, Myers L. Do autologous growth factors enhance transforaminal lumbar interbody fusion?. European Spine Journal. 2003 Aug 1;12(4):400-7.
8. Guerid S, Darwiche SE, Berger MM, Applegate LA, Benathan M, Raffoul W. Autologous keratinocyte suspension in platelet concentrate accelerates and enhances wound healing–a prospective randomized clinical trial on skin graft donor sites: platelet concentrate and keratinocytes on donor sites. Fibrogenesis& tissue repair. 2013 Apr 9;6(1):1.
9. John D. Miller, Timothy M. Rankin, Natalie T. Hua, Tina Ontiveros, Nicholas A. Giovinco, Joseph L. Mills, David G. Armstrong: Reduction of pain via platelet-rich plasma in splitthickness skin graft donor sites: a series of matched pairs: Diabetic Foot & Ankle 2015, 6: 24972.
10. Danielsen P, Jørgensen B, Karlsmark T, Jorgensen LN, Ågren MS. Effect of topical autologous platelet-rich fibrin versus no intervention on epithelialization of donor sites and meshed split-thickness skin autografts: a randomized clinical trial. Plastic and reconstructive surgery. 2008 Nov 1;122(5):1431-40.