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A COMPARATIVE STUDY BETWEEN LOW COST NEGATIVE PRESSURE THERAPY AND IN HOUSE PLATELET RICH PLASMA INJECTIONS IN THE HEALING OF BELOW KNEE ULCERS AT TERTIARY HEALTHCARE CENTRE.

Plastic Surgery

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ABSTRACT

Aims And Objectives – To compare the Epithelialistion and effect on wound contracture between NPWT and PRP. To compare the duration of wound healing after NPWT and PRP. **Inclusion Criteria:** 1. Acute ulcers 2. Chronic Ulcer 4. Diabetic foot ulceru 5. Any Patient with below knee ulcer 6. Age between 30 to 60 years **Exclusion Criteria:** 1. Critically ill patient 2. Seropositive patient 3. Patient with Comorbidities 4. Age less than 30 years and more than 60 years 5. Patient with above knee ulcers 6. Below knee ulcer with unstable fracture and underlining osteomyelitis.

KEYWORDS

INTRODUCTION

1. Lower limb ulcers are the Major health problems in the lower socioeconomic population of the India. Besides to the suffering, pain and failure of the healing process also has financial and social burdens. Leg ulcers have multiple etiologies like vascular (venous, Arterial), Traumatic (Bites, burn), Infections (Bacterial, Fungal), Metabolic Disorder like Diabetes mellitus, Gout.[1] [2]

2. Conventional Treatment includes Debridement and post operative Dressing like gauze Sofra tulle, transparent films, foam and hydrogel but in many cases these treatments do not result in the reliably satisfactory outcome. They have been heightened in developing new advanced therapies for the treatment of the wound like protein rich plasma and negative pressure wound therapy showing promising experimental and clinical results.[3]

3. Our study aims to compare between NPWT and PRP for the wound contracture and duration of the wound healing that patient can be mobilized early for the plastic surgery management at tertiary health care centre.

Negative Pressure Wound Therapy

- Argenta and associates originally described the use of the negative pressure wound therapy by applying sub atmospheric pressure to wound, they demonstrated removal of the chronic edema, increase in the local blood flow and stimulation of the granulation tissue. This technique was used on acute and chronic wounds.
- While further studies showed increased calibre in capillaries and stimulated endothelial proliferation and angiogenesis.
- NPWT produce three dimensional stress within the cell and across the whole area of the wound resulting in the increased cellular proliferation and higher micro vessels density.[4]

Platelet Rich Plasma

- Platelet-rich plasma (PRP) is an autologous blood-derived product that contains a high concentration of platelets in plasma. It is derived from whole blood by centrifugation.
- Activated platelets in PRP can release multiple growth factors and cytokines, including platelet-derived growth factor (PDGF), basic fibroblast growth factor (bFGF), vascular endothelial growth factor (VEGF), insulin-like growth factor-1 (IGF-1) and transforming growth factor-β (TGF-β), and others that are involved in promoting tissue repair and regeneration.[5]
- PRP can release a higher content of VEGF and also promote the wound healing by promoting angiogenesis and cell proliferation.

METHODS

1. Preparation Of The Patient

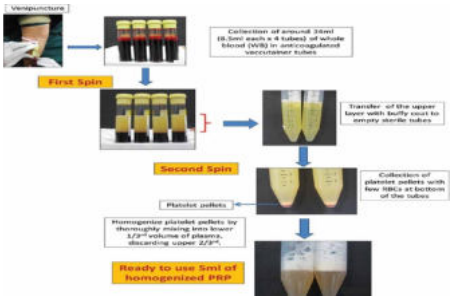
History taking, physical examination, consent, blood investigation like cbc hiv hbsag liver kidney function test blood sugars Hb > 10 g% Sugar monitoring for DM patient.

2. Preparation Of The Wound

1. Debridement should be done for ulcer.
2. Swab for culture and sensitivity.
3. Pre and post results photograph.
4. Cleaning the wound during dressing with normal saline and Betadine.

3. Preparation Of The Platelet Rich Plasma

1. 30ml-60cc of blood depending upon ulcer size is collected from patient then anticoagulant agent like ACD and sodium citrate solution added to the sample.
2. Then process of centrifugation is done.
3. Blood sample devised in to the tubes and placed in a centrifugal machine at 3000 revolution for 10 min.
4. The centrifugated blood sample is divided in Two layers 1. Bottom layer with RBC and WBC 2. Upper layer of Blood Plasma.
5. Remaining layer is Re centrifugated with 1500 spins for 10 min
6. After Discarding upper 2/3, the remaining PRP is filled in a one cc syringe. Injection of half of PRP in the wound at the level of of subcutaneous layer and the other half was put on the surface of the wound. And then sterilized gauze dressing was done over the wound once every 5 days.



4. Application Of The Negative Pressures Wound Therapy

1. After cleaning the wound with the normal saline and betadine solution.
2. The sterile foam is placed over the ulcer with single hole kept for the Ryles tube and covered with the IOBAN.
3. Then suction tube was attached to the suction machine with continuous pressure of -125 mmhg.
4. Switching off the machine For 20 Min each hour.
5. Dressing was changed every 5 days.

Monitoring Of The Wound

The wounds were evaluated by the rate of healing process in relation to the site of wound, size of wound, type of wound, floor of wound, discharge, epithelialisation and shrinkage of wound.

RESULTS

- **Age -** was ranged from the 30-60 Years
- **Gender-** In PRP patients 86.66% were male (13 patients) and 13.44% were Females (2 patients) while in NPWT patients 73.33% were male (11 patients) and 26.77% (4 patients) were female patients.
- **Special habits-** 40%(6 patients) patients were Tobacco users and 60%(9 patients) patient were non Tobacco users in PRP group. 46.77%(7patients) were Tobacco user and 53.33(8 patients) were non Tobacco user in NPWT group. Two study Groups had show no difference regarding age, Gender special habits.

Clinical Data Of The Wound Character

1. **Site Of Wounds-** was 33.33%(5 patients) In the left leg,40%(6 patient) in the right foot, 26.66%(4 patients) on the left foot in first Group. In the second group was 53%(8 patients) in left leg, 27%(4 patients) in left foot and 20% (3 patients) over the right leg.
2. **Size Of The Wound-** in the first group size ranges from 4-16cm and in second group it was between 5-14cm.
3. **Type Of Wound -** was traumatic in 60% cases, diabetic foot ulcer 20% cases in PRP group and 46% cases were traumatic, 26% cases Diabetic foot ulcers included in the NPWT Group. Traumatic and diabetic ulcer were included predominantly.
4. **Floor Of The Wound-** had shown 67% unhealthy floor and 33% healthy floor in PRP patients. While NPWT patient was 54% unhealthy floor and 46% healthy floor of the wound.
5. **Discharge-** In both group had shown 34% Discharge with the 66% of the no discharge from the wounds.
6. **Surgical Debridement -** Before Procedure: 13 Patient in first group had undergone surgical Debridement whereas 2 patients did not undergo debridement. While 12 patient in group two had undergone Debridement before procedure and 3 patients did not undergo debridement.

Clinical Outcomes

- **Healing Process -** The first group (PRP Group) showed complete healing in 94% (14 patients) by secondary intention in which healing was seen with Scar formation in 80%(12 patients) over period of time, epithelialisation with wound shrinking is seen 14% (2 patient) and non healing in one.

In the second group (NPWT), 87% (13 patient) showed complete healing by secondary intention in which scar formation was seen in 20% (3 patient) over period of time, epithelialisation with wound shrinking was seen in 67% (10 patient) and non healing was seen in two patients.

- **Surgical Intervention –** There was no requirement of surgical intervention in 80% (12 patients) treated with PRP Dressing and split thickness graft was done in 14%(2 Patients). While in NPWT patient 20% (3 patients) had no requirement of surgery and split thickness graft was done in the 67% (10 patients).

Wound Size Contraction- In PRP group

SR NO	Initial measurement in cm	After 2 week	After 4 week	After 6 week	Percentage of improvement
1	4.2 x 3.0	3.1 x 1.9	1.8 x 0.9	0.0 x 0.0	99%
2	11.4 x 6.0	8.5 x 4.2	5.0 x 2.9	2.6 x 1.1	77%
3	6.7 x 3.3	5.0 x 2.2	3.0 x 1.3	0.4 x 0.3	94%
4	5.5 x 4.0	7.2 x 2.1	4.1 x 1.2	0.2 x 0.1	97%
5	9.0 x 5.5	6.0 x 4.2	3.7 x 2.1	0.8 x 0.3	91%

IN NPWT Group

SR NO	Initial measurement in cm	After 2 week	After 4 week	After 6 Week	Percentage of impovement
1	5.3 x 3.3	4.1 x 2.1	3.3 x 1.9	2.5 x 1.6	53%
2	8.2 x 5.2	6.2 x 4.2	5.2 x 3.2	4.0 x 2.6	51%
3	12.5 x 6.2	10.2 x 5.1	9.2 x 4.3	7.4 x 3.1	40%
4	6.2 x 3.2	5.1 x 2.9	4.3 x 2.1	3.2 x 1.6	48%
5	7.5 x 4.4	6.6 x 3.8	5.1 x 2.9	3.9 x 2.2	48%

DISCUSSION

- Several study showed that platelet growth factor stimulate epithelial formation by the effect of platelets in the process of healing. It stimulates cell division, proliferation, migration, angiogenesis, and revascularization, thus promoting the wound healing by granulation tissue formation.[6]
- Negative pressure treatment has been introduced as a component of therapy for patient with chronic wounds. It act by maintaining the moist environment, optimizing blood flow, removing exudate and applying negative pressure to promote the wound closure.[7]
- This study had different characteristics from previous trials because previous studies mainly focused on each type of application separately in relation to ordinary dressing.
- As compared to NPWT, PRP showed Superior results in case of the wound contracture and shrinking. Scar formation after the periods of 2-6 week is better with the PRP and 80% patient showed scar formation and no surgical intervention was needed in these patients. While in NPWT patients 67% patient required Skin grafting as the intervention showing superiority of PRP. First Group took lesser time interval for the wound healing as compare to the 2nd group.

CONCLUSION

PRP and NPWT are the novel tools in management of the acute and chronic ulcers. PRP is more simple, more safe, less costly, shorter time for the method, less painful, no hospital stay and autologous nature in the preparation had proven superior over NPWT.

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