ORIGINAL RESEARCH

To Evaluate The Impact Of Autologous Platelet-Rich Plasma On Chronic Non-Healing Ulcers

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ABSTRACT

Aim: To evaluate the impact of autologous platelet-rich plasma on chronic non-healing ulcers.

Materials and Methods: This research is prospective and includes 50 patients who reported with persistent non-healing leg ulcers to the General Surgery department. This trial included patients aged 18 to 75 years with chronic non-healing ulcers that had been present for over 4 weeks. Patients must have already tried conventional treatments for at least 4 weeks, had ulcers less than 5 cm in size and a hemoglobin level over 10g/Dl were included in this study.

Results: Out of the 50 patients, 35 were male (70%) and 15 were female (30%). Chronic lower leg ulcers were more prevalent in men than in females.The ulcer's length varied from 4 to 8 weeks, with an average duration of 5.55 weeks, as shown in table 2. 12 patients (24%) had a length of less than 4 weeks, whereas 38 patients (76%) had a period of 5-8 weeks. 38% of the ulcers were traumatic (19 ulcers) and 62% were spontaneous (31 ulcers). Spontaneous ulcers were more prevalent in the research. The most prevalent location was the Medial Malleolus. Itwasatallweeksfrom1st to last weekthep-valuewashighlysignificant($p<0.05$).ThisclearlyshowtheimportanceofPRPandtheability of healing of ulcers. The mean duration of healing of the ulcers was in 4.11±0.65weeks. The mean percentage improvement in the area & volumeoftheulcerat3rdweekwas80%&90%.Similarly,at6thweekwas98%&100% respectively.In this study, ulcers treated with PRP had betterwound contraction of mean 8.87 ± 1.76 at 3rd week.

Conclusion: Chronic non-healing ulcers are challenging to repair due to a deficiency in essential growth factors required for the healing process. Traditional treatments are inadequate for proper healing since they lack the key growth factors (PDGF, EGF, VGEF, etc.) required for the healing process. PRP is a secure, cost-effective, biocompatible, and straightforward in-office therapy for treating non-healing ulcers.

Keywords: Plateletrichplasma,legulcers,growthfactors,non-healingulcers

Introduction

A chronic non-healing ulcer is a condition characterized by the loss of skin and subcutaneous tissue, often seen on the leg or foot, that requires more than 4-6 weeks to cure. The occurrence of leg ulcers is shown to range from 0.18% to 1%[1].Epidemiological studies indicate that the occurrence of leg ulcers in the adult population, whether current or healed, ranges from 1% to 2%. Lower extremity ulcers are mostly caused by venous, arterial, and neuropathic factors. More than 70% of ulcers are venous ulcers[2].Chronic non-healing ulcers include venous ulcers, pressure ulcers, traumatic ulcers, and diabetic ulcers. Chronic wounds, particularly in those with diabetes mellitus, pose a significant health obstacle. The typical treatment strategy involves doing a thorough evaluation of the patient and wound, including history, physical examination, and several diagnostic tests to establish the need for infection control intervention, revascularization, excision and debridement, skin graft/flap, wound protection, and education [3].Chronic non-healing ulcers have insufficient growth factors (GFs) which impede proper healing. Traditional recombinant growth factor products, such as becaplermin (recombinant platelet-derived growth factor), have been authorized by the Food and Drug Administration for treating chronic wounds [4,5].The drug is in liquid form and quickly disperses after being applied to the wound. Moreover, it is prohibitively costly and beyond the financial means of emerging nations like India. Autologous platelet-rich plasma (PRP) is a straightforward technique performed in an office setting that aids in improving wound healing by releasing various growth

factors such as platelet-derived growth factors (PDGFs), fibroblast-derived growth factors (FDGFs), and epidermal growth factors (EGFs). Platelet-rich plasma (PRP) is a product obtained from an individual's own blood using gradient density centrifugation. Autologous platelet-rich plasma (PRP) is a secure, uncomplicated, and economical technique that yields favorable outcomes in treating persistent non-healing wounds[6].

Materials and Methods

This research is prospective and includes 50 patients who reported with persistent non-healing leg ulcers to the General Surgery department. This trial included patients aged 18 to 75 years with chronic non-healing ulcers that had been present for over 4 weeks. Patients must have already tried conventional treatments for at least 4 weeks, had ulcers less than 5 cm in size, and a hemoglobin level over 10g/dL. Patients with a platelet count below 100 X 104 /L, patients with confirmed or suspected osteomyelitis, malignancies, or bleeding disorders, ulcers with active infection (visible pus or excessive wound exudates), presence of cellulitis, insufficient blood flow, ischemia, or gangrene. Ulcer size is more than 5 centimeters. Unregulated blood glucose levels, Patients with serum creatinine levels over 1.5mg/dl and Lip dermatosclerosis.

Methodology

Participants provided written informed permission prior to their involvement in the research. A comprehensive history was recorded, which included the individual's name, age, gender, residence, contact number, employment, and medication history. Photographs of the ulcers were taken before and after applying the dressings, as well as culture and sensitivity tests of the sores. The original wound area was measured after sharp debridement by recording the length and breadth using a metric tape following a thorough clinical assessment and appropriate studies. Patients had a comprehensive examination, and ulcer dimensions (length, breadth, and width) were assessed using the clock-face technique as described by Sussman, using a cotton tip applicator and ruler. The size of the target ulcer was measured using a metric tape to determine the result. The results underwent statistical analysis. Using aseptic techniques, 20ml of venous blood was collected and combined with acid citrate dextrose in a 9:1 ratio in a test tube. The mixture was subjected to centrifugation at 5000rpm for 10-15 minutes to isolate red blood cells from platelets and plasma. The supernatant containing platelets and plasma was collected and spun at 2000rpm for 5-10 minutes to separate the platelets. The platelet-rich plasma (PRP) was acquired and 5-10% calcium chloride was added at a ratio of 0.3:1 (0.3ml for 1ml of PRP). PRP was administered to the wound after appropriate surgical debridement. Following the PRP application, the ulcer was covered with a non-absorbent bandage. After 1 week, the dressing was removed using 0.9% normal saline solution and evaluated for progress. The process was performed weekly for a total of 6 weeks. The wound area and volume were determined using the formula length × width × 0.7854 and length × width × depth × 0.7854, respectively, with images taken at each session. The treatment result was determined by calculating the percentage change in the area and volume of the ulcer, which was obtained by subtracting the assessment day measurement from the initial measurement and then dividing by the starting measurement.

Statistical Analysis

Statistical analysis, both descriptive and inferential, was conducted in this research. Continuous data are reported as Mean ± SD (Min-Max) while categorical measures are reported as Number (%). Significance is evaluated at a 5% significance level. A two-tailed dependent Student's t-test was used to determine the significance of research parameters on a continuous scale within each group. The data was analyzed using SPSS 21.0, and graphs and tables were created using Microsoft Word and Excel.

Results

Table:1 Age and Gender of the participants

Gender	No. of Participants	Percentage
Male	35	70
Females	15	30
Age		
Below 30	7	14
30-40	11	22
40-50	22	44
50-60	6	12
Above 60	4	8
Mean Age	46.54±3.76	

The patients' ages in table 1 varied from 20 to 73 years, with a mean of 46.54±3.76. Out of the 50 patients, 35 were male (70%) and 15 were female (30%). Chronic lower leg ulcers were more prevalent in men than in females.

Table2: Duration and Onset of the Ulcers

Duration(weeks)	No. of Participants	Percentage(%)
1-4	12	24
5-8	38	76
>8	0	0
Onset of Ulcer		
Spontaneous	31	62
Traumatic	19	38

The ulcer's length varied from 4 to 8 weeks, with an average duration of 5.55 weeks, as shown in table 2. 12 patients (24%) had a length of less than 4 weeks, whereas 38 patients (76%) had a period of 5-8 weeks. 38% of the ulcers were traumatic (19 ulcers) and 62% were spontaneous (31 ulcers). Spontaneous ulcers were more prevalent in the research. The most prevalent location was the Medial Malleolus.

Table: 3 Initial Platelet Count

Initial Platelet Count	No. of Participants	Percentage
<2.5	14	28
2.5-3.5	22	44
>3.5	14	28

In table 3, 40 ulcers (80%) showed no growth in culture, 10 ulcers (20%) had staphylococcus aureus organisms. Additionally, 14 patients (28%) had an initial platelet count of less than 2.5 lakhs/cu mm, 22 patients (44%) had a count between 2.5-3.5 lakhs/cu mm, and 14 patients (28%) had a count exceeding 3.5 lakhs/cu mm, with a mean platelet count of 2.95 lakhs/cu mm.

Table: 4 Assessment at Different Time Periods- Area

Area	Mean±SD	P value
Baseline	11.21±1.23	<0.001
1st week	8.44±1.26	<0.001
2nd week	5.76±1.11	<0.001
3rd week	2.77±1.45	<0.001
4th week	0.74±0.22	<0.001
5th week	0.16±0.08	<0.001
6thweek	0.05±0.02	<0.001
Last visit	0.01±0.00	

As per table 4 the are a involved showed at different ime periods with base line being reference. It was at all weeks from 1st to last week the p-value was highly significant($p<0.05$).This clearly show the importance of PRP and the ability of healing of ulcers.

Table5:Weeks of Complete Healing

Weeks of healing	No. of Participants	Percentage
1	0	0
2	4	8
3	12	24
4	25	50
5	7	14
6	1	2
7	1	2

As per table 5 The mean duration of healing of the ulcers was in 4.11±0.65weeks. The mean percentage improvement in the area & volume of the ulcer at 3rd week was 80% & 90%. Similarly,at6 th week was98%&100%respectively.In this study, ulcers treated with PRP had better wound contraction of Mean8.87 ± 1.76 at 3rd week. These were found to be statistically significant P<0.001 significant, on Student t test.

Discussion

Managing chronic non-healing ulcers remains problematic in modern medicine due to its dependence on several variables. Wound dressing aims to provide a moist environment for healing, avoid infection, and promote the healing process. Various types of bandages have been used to treat chronic wounds. Platelet-rich plasma has been used in periodontal, maxillofacial surgery, orthopedics, and

trauma surgery. There have been no adverse reactions or complications recorded. This research focused on chronic non-healing ulcers and used platelet-rich plasma for wound dressings. 50 patients were chosen for this research according to certain inclusion and exclusion criteria. This research found a higher incidence of chronic lower leg ulcers in men than in females. The average age in the study was 46.54 years with a standard deviation of 3.76 years. Spontaneous ulcers accounted for 62% and traumatic ulcers accounted for 38% in the research. Spontaneous ulcers were shown to be more prevalent. Ulcers around the medial malleolus of the foot are the most prevalent location, accounting for 36% in this research. Located in the back, making up 28%. 20% of patients developed ulcers on the plantar aspect, 14% on the lateral malleolus, and just 2% on the great toe. The average fasting blood sugar level in this research was 111.21±11.34. Comparable studies were conducted with virtually identical outcomes[7-11]. In our study it was observed that patients receiving Platelet rich plasma dressing hadbetter mean wound contraction of 8.44±1.26in cm2 (50%). Thesewere found to be statistically significant on Student T test ($p<0.001$)suggestingthatPlateletrichplasmaenhanceswoundhealinginchronic LowerLimb ulcers.In thisstudy no adverse reaction orcomplicationshasoccurred.Slightlydifferentresultsin somestudies [12-14]. Inthisstudythemean duration of healing of the ulcers was in 4.11±0.65weeks. The mean percentage improvement in the area &volumeoftheulcerat3rdweekwas80%&90%.Similarly,at6thweekwas98%&100% respectively. In this study, ulcers treated with PRP had betterwound contraction of Mean 8.87±1.76 at 3rd week. Thesewere found to be statistically significant $P<0.001$ significant, onStudentttest.Fromourstudy,wecansay that platelet richplasmadressing therapyfacilitates wound healing in patients suffering from chronic lowerlimbulcers.

Conclusion

Chronic non-healing ulcers are challenging to repair due to a deficiency in essential growth factors required for the healing process. Traditional treatments are inadequate for proper healing since they lack the key growth factors (PDGF, EGF, VGEF, etc.) required for the healing process. PRP is a secure, cost-effective, biocompatible, and straightforward in-office therapy for treating non-healing ulcers.

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