

A STUDY ON THE ROLE OF PLATELET RICH PLASMA IN THE MANAGEMENT OF CHRONIC ULCERS

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ABSTRACT

BACKGROUND

Diabetic foot ulcer is a devastating complication of diabetes mellitus. The life time risk of developing an ulcer is estimated to be 15%. In a developing country like India, it is important to decrease the morbidity of such patients who if otherwise unchecked will lead on to amputation of the affected extremity and thereby increasing the disability status of the patient and thereby decreasing the overall health status of the country. This study compares the efficacy of Platelet Rich Plasma (PRP) dressing over conventional saline/povidone iodine dressing of diabetic ulcers and elicits a faster rate of ulcer healing with PRP dressing.

The aim of this study was to compare the efficacy of autologous platelet rich plasma (PRP) over moist sterile saline povidone iodine dressing in diabetic foot ulcers– a randomized controlled study.

MATERIALS AND METHODS

60 diabetic patients with foot ulcers from the department of general surgery, were prospectively studied. Detailed clinical history, evaluation of ulcer and presence of wound infection were assessed for all the patients.

RESULTS

PRP dressings were done in 30 patients and saline/povidone iodine dressings were done in 30 patients. It was found that there was a better reduction in area of the ulcer at the end of four weeks in patients who received platelet rich plasma dressings than in moist saline/povidone iodine dressings.

CONCLUSION

Being an autologous preparation there is no risk of allergic reactions and PRP dressing is safe as it just accelerates and concentrates the normal healing process. Readymade preparations are today available in the names of PLERMIN (Becaplermin) but these are quite expensive and does not match the cost effectiveness of treatment because Diabetes Mellitus was always a disease of the rich but Diabetic Ulcer is always a disease of the poor and middle class. Hence the use of autologous PRP in the application of treatment of Diabetic Foot Ulcer should be encouraged and research is ongoing to find more effective growth factor related treatment options which ensures less duration of hospital stay for the patient and also faster healing.

KEYWORDS

Diabetic Foot Ulcer, Chronic Ulcer, Platelet Rich Plasma, Platelet Derived Growth Factor.

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BACKGROUND

Diabetic foot ulcer is a devastating complication of diabetes mellitus. This condition is more common in old patients. The risk in a diabetic patient's lifetime having this complication of diabetic foot ulcer is estimated to be about 15%. Majority of diabetic foot ulcers may heal whereas a smaller percentage will remain active and finally lead to amputation of the limb. Diabetic foot ulcer is one of the most demanding problems and it is recommended that a multidisciplinary team work is essential for management.

Wound dressings constitute a major part of the management of diabetic foot ulceration. An ideal dressing will have to reduce the symptoms, give adequate protection of the wound and promote good healing.

There are many types of dressings available for foot ulcers. There is no particular dressing that fulfils all the requirements of the patient. There is extensive research in this area nowadays. Platelet rich plasma prepared from patients own blood is under extensive research and used in fields of orthopedics¹ and dentistry to promote wound healing. Platelet rich plasma transfers growth factors to the wound surface.² The use of an autologous preparation reduces the risk of allergic reactions and promotes delivery of many growth factors when compared to conventional preparations. There are many studies on the use of platelet rich plasma as a dressing alternative but only very few studies compare the efficacy of PRP with other dressing materials.

This study will compare the efficacy of PRP dressing with moist saline/povidone iodine dressing in diabetic patients having foot ulcers. Only a limited number of studies have been done to compare the efficacy of PRP dressing with other conventional methods. This study was done to evaluate the advantage of PRP over conventional dressing methods.

Aim-To compare the efficacy of autologous platelet rich plasma (PRP) over moist sterile saline povidone iodine dressing in diabetic foot ulcers– a randomized controlled study.

Objectives-To compare the mean reduction in ulcer area at the end of 4 weeks.

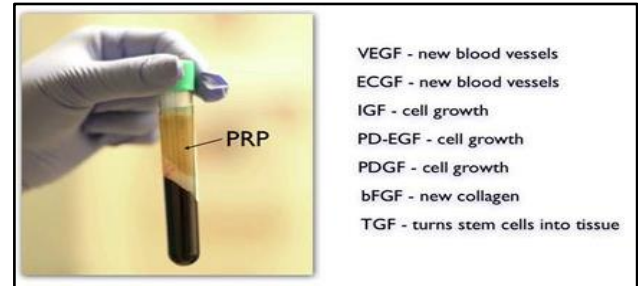
MATERIALS AND METHODS

60 diabetic patients with foot ulcers from the department of general surgery, were prospectively studied. Detailed clinical history, evaluation of ulcer and presence of wound infection were assessed for all the patients.

Preparation of Platelet Rich Plasma-PRP preparation required a table centrifuge under sterile precautions.³ Under all aseptic precautions 10 ml of venous blood is drawn and added to a test tube containing acid citrate dextrose in a ratio of 9:1 (blood: acid citrate dextrose), centrifuged at 5000 rpm for 15 minutes to separate the red blood cells from platelets and plasma. Then the supernatant and the buffy coat composed of platelets and plasma was collected and centrifuged again 2000 rpm for 5-10 minutes. The bottom layer about 1.5 ml is taken and 10% calcium chloride is added (0.3 ml for 1 ml of PRP). The so obtained activated PRP is injected around the ulcer edges and then dressed with non-absorbent dressing material (paraffin gauze).

Dressing Procedure- Group 1 received PRP dressing. It was injected around the ulcer edges and covered with a sterile saline gauze (primary dressing) followed by cotton pad and roller bandage (secondary dressing). The dressing was left in place for 1 week. After 1 week, all PRP remnants were removed with water and sterile gauze. Following this, the next PRP treatment was instituted. A

total of four PRP treatments at weekly intervals were given for a total duration of 4 weeks.



Group 2 received only sterile saline soaked gauze dressing with povidone iodine, which were changed daily.

Baseline Measures after Randomization-

- Ulcer margins (length & breadth) in mm: by measuring greatest length and the greatest width.
- Area of wound derived with measured length and breadth.
- Digital photography taken at beginning and end of treatment.
- Outcome measures at the end of four weeks.

Wound swabs were obtained prior to first dressing and patient was started on culture sensitive antibiotics.

Patients were subjected to two groups. One group of patients received moist saline/povidone iodine dressings. The other group of patients received Platelet Rich Plasma dressing and then compared. The efficacy of platelet rich plasma dressing over moist saline/povidone iodine dressings was assessed by comparing the percentage reduction at the end of four weeks and analyzed using chi square test and ANOVA test.

RESULTS

PRP dressings were done in 30 patients and saline/povidone iodine dressings were done in 30 patients. It was found that there was a better reduction in area of the ulcer at the end of four weeks in patients who received platelet rich plasma dressings than in moist saline/povidone iodine dressings.

Weekly Reduction in Ulcer Area- The weekly reduction in ulcer area was compared between control and test groups.

Ulcer Size	Control		Test		P Value Comparing Consequent Weeks	P Value Comparing Control & Test
	Mean (cm ²)	Std. Dev.	Mean (cm ²)	Std. Dev.		
Week 1	9.03	5.65	8.73	6.30	<0.01	>0.05
Week 2	7.91	4.61	6.13	4.56	<0.01	>0.05
Week 3	6.26	4.63	4.22	3.57	<0.01	>0.05
Week 4	4.74	3.65	2.96	2.65	<0.01	<0.05

Table 1

% reduction of ulcer area at the end of 4 weeks	Control		Test		P Value
	Mean	Standard deviation	Mean	Standard deviation	
	50.5	17.4	66.9	18.2	

Table 2. Percentage Reduction in the Ulcer Area at the End of Four Weeks

DISCUSSION

The use of platelet rich plasma dressing showed better reduction in ulcer area at the end of four weeks when compared with moist saline/povidone iodine dressings. Platelet Rich Plasma is a blood plasma that has been enriched with platelets. As a concentrated source of autologous platelets, PRP contains several different growth factors and other cytokines that stimulate healing of soft tissues and bone by their release through degranulation. PRP was first developed in 1970s and first used in Italy in an open heart surgery procedure. From then on it has been widely used in the repair of tissues such as nerves, muscles, tendons, cartilages, cardiac muscles and other soft tissues. Thus it has also been used in the treatment of diabetic ulcers.

In our study the percentage decrease in the ulcer area at the end of 4 weeks is 66.9% in those with PRP dressing as compared to 50.5% with conventional saline gauze dressing. Several studies by others like Aymen Salem et al, (2015) in Zagazig University Hospitals, Egypt, Dr. Murtuza Aliasger et.al from Dr. D. Y Patil Medical College and Hospital, Pimpri, Pune in April 2017, Dr. Anita Harry and et.al from Meenakshi Medical College, Kanchipuram in May 2017 have all supported the use of analogous Platelet Rich Plasma in treatment of diabetic foot ulcer and thereby proved its efficacy over conventional saline dressing.

The growth factors and other cytokines in PRP include PDF² (Platelet Derived Growth Factor), TGF beta (Transforming Growth Factor beta), FGF (Fibroblast Growth Factor), IGF 1 and 2 (Insulin like Growth Factor 1 and 2), VEGF (Vascular Endothelial Growth Factor), EGF (Epidermal Growth Factor), IL- 8(Interleukin 8), KGF (Keratinocyte Growth Factor) and CGF (Connective tissue Growth Factor).

CONCLUSION

Being an autologous preparation there is no risk of allergic reactions and PRP dressing is safe as it just accelerates and concentrates the normal healing process.⁴ Readymade preparations are today available in the names of Plermin (Becaplermin)⁵ but these are quite expensive and does not match the cost effectiveness of treatment because Diabetes Mellitus was always a disease of the rich but

Diabetic Ulcer is always a disease of the poor and middle class. Other methods like hyperbaric oxygen therapy, bioengineered tissue are also expensive.^{6,7} Hence the use of autologous PRP in the application of treatment of Diabetic Foot Ulcer should be encouraged and research is ongoing to find more effective growth factor related treatment options which ensures less duration of hospital stay for the patient and also faster healing.⁸

REFERENCES

- [1] Pietrzak WS, Eppley BL. Platelet rich plasma: biology and new technology. J Craniofac Surg 2005;16(6):1043-1054.
- [2] Barry LE, Jennifer EW, Joel BSH. Platelet quantification and growth factor analysis from platelet-rich plasma: implications for wound healing. Plastic & Reconstructive Surgery 2004;114(6):1502-1508.
- [3] Everts PA, Brown Mahoney C, Hoffmann JJ, et al. Platelet-rich plasma preparation using three devices: implications for platelet activation and platelet growth factor release. Growth Factors 2006;24(3):165-171.
- [4] Driver VR, Hanft J, Fylling CP, et al. A prospective, randomized, controlled trial of autologous platelet-rich plasma gel for the treatment of diabetic foot ulcers. Ostomy Wound Manage 2006;52(6):68-70,72,74.
- [5] Petrova N, Edmonds M. Emerging drugs for diabetic foot ulcers. Expert Opin Emerg Drugs 2006;11(4):709-724.
- [6] Millington JT, Norris TW. Effective treatment strategies for diabetic foot wounds. J Fam Pract 2000;49(11 Suppl):S40-S48.
- [7] Steed DL, Goslen JB, Holloway GA, et al. Randomized prospective double-blind trial in healing chronic diabetic foot ulcers. CT-102 activated platelet supernatant, topical versus placebo. Diabetes Care 1992;15(11):1598-1604.
- [8] Marx RE. Platelet-rich plasma (PRP): what is PRP and what is not PRP? Implant Dent 2001;10(4):225-228.