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Case Report Open Access

Platelet Rich Plasma as a Mono Therapy for Diabetic Ulcer

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Abstract

Diabetic non-healing Ulcers are very difficult to treat. Many of such Patients undergo Amputations to lessen the morbidity. There is no defined management for them. Current management requires multiple surgical interventions, drugs and intense local dressing and care.

The authors have developed an innovative therapy called as STARS (Sandeep's technique for assisted regeneration of skin) for wound management. It is basically based on principle of regenerative medicine with autologous platelet rich Plasma (PRP) being the source of regenerative growth factors leading to complete healing of wounds.

This case is a young female, a Juvenile Diabetic with non-healing infected ulcers on both heels since 3 years. She received STARS therapy and her one ulcer healed completely and second ulcer healed 40%.

A complete healing of non healing diabetic ulcer without surgery, drugs and intense dressing, in an uncontrolled diabetic patient, is a milestone in such wound management. STARS therapy led by Platelet regeneration, is an innovative protocol for such cases.

Keywords: Platelet rich plasma; STARS therapy; Monotherapy; Diabetic ulcer; Wound healing; Tissue regeneration

Introduction

Diabetes mellitus is a metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels. The Prevalence of diabetes mellitus foot ulcers is estimated to be between 4-10%, and probability of life time incidence is very high uphill 25%. Amongst those who develop such foot ulcers, an estimated 12% -20% requires amputations [1,2]. These ulcers usually become infected and healing is complicated by peripheral neuropathy, atherosclerotic peripheral arterial disease, leading to huge morbidities [3].

Non healing diabetic foot ulcers are a major complication in patients with diabetes. Despite active research, type 1 diabetes has no cure. Ulcer on sole is one the common site and often refractory to treat. There is no any standardized protocol to treat such ulcer. In an unacceptably high number of cases, the final treatment result is lower extremity amputation, which might have been avoided if an aggressive therapy had been carried out earlier.

Standard treatment for diabetic ulcers includes débridement of necrotic tissue, infection control, local ulcer care, mechanical off-loading, management of blood glucose levels and education on foot care [1,2] including advanced wound care therapies [4].

Emerging cellular therapies such as platelet-rich plasma (PRP) provide completely new ulcer management options that might help to avoid limb loss. PRP is defined as the plasma fraction of autologous blood with a platelet count concentrated above the baseline (3-10 times). The Platelets have full complement of clotting and growth factors in alpha granules. These growth factors (endothelial, angiogentic, epidermal, epithelial, insulin like, etc.) contribute to the healing process of chronic wounds initiating the repair process through cellular signaling and regeneration through molecular responses. PRP limits the amount of inflammation, and promotes the role of macrophages and phagocytes at wound site to initiate tissue repair and leads the angiogenesis and epithelization; eventually leading to regeneration of tissues towards wound healing [5].

Case Report

A 22 year old female came with the complaints of non healing ulcer over bilateral heel since 3 years. She was a known case of uncontrolled diabetes mellitus type I (juvenile type) and was on regular medication. She had an alleged history of thorn prick for which she did not take any treatment. The wound gradually increased in size and reached upto a size of 8 × 4 cm on right side and 6 × 6 cm on left side. The wounds were discharging with infected hyper granulation (Figure 1). She was under lot of medications including heavy antibiotics. At the time of admission, her blood sugar level was 412 mg/dl, for which Injection Insulin R was started on sliding scale which was later changed to fixed dose of insulin. On an average a total of 24 units of insulin were given every day in order to maintain the blood sugar. She underwent STARS therapy. It included PRP infiltration on every 4th day, in the progressively healing wound margins, till wound heals. Twenty milliliter of autologous venous blood was used and double spinned to produce fresh PRP, which was infiltrated at the dose of 0.2 ml-0.5 ml per cm of length, in the wound margin by a 22 G/24 G needle. Such infiltrations were repeated every 4th day till the wound heals completely.

Local Care was provided by dressing with normal saline. No

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Figure 1: Non healing ulcer of right foot.

Figure 2: Showing progressive healing of ulcer.

medications for wound such as antibiotics or analgesics; no further surgeries such as debridements or reconstructions are done. Only Vitamin C was given.

Results

The patient had received a total of 13 Stars session and her wound healed completely on right side (Figure 2) and reduced to 40% on left side. At this point she left the hospital and was lost on follow up. It took 48 days for the wound to heal on right side. The quality of skin regenerated over the wound is almost normal sole like skin.

Discussion

Diabetes mellitus is a major cause of mortality and disability by macro vascular and micro vascular complication. Diabetic foot ulcer as one of the most common complications of diabetes affecting more than 25% of people with diabetes in their lifetime and if not treated properly, can lead to complications such as infection and gangrene and finally, to 20% leads to amputation. The mortality rate in patients with diabetic foot ulcer is 2 to 4 times higher than others with no foot ulcer. Every year about one million amputations occur due to diabetes and this means that every 30 seconds a diabetic patient undergo an amputation worldwide [1]. The infected Diabetic ulcer being the leading cause for hospitalization for lower extremity ulcers, with a financial burden of estimated to be $1 billion per annum and rising further [3].

Standard treatment for diabetic ulcers includes débridement of necrotic tissue, infection control, local ulcer care, mechanical off-loading, management of blood glucose levels, and education on foot care [1,2]. As the rates of recurrences and non healing resin high, many other modalities have been tried in recent times including surgical such as microsurgical free flaps local insulin [2]. These are often termed "advanced wound care therapies" [4].

In recent times the cellular therapy led by PRP has also come to forefront as a successful treatment option and many studies have reported its successful usage in diabetic ulcers [5-9]. A systematic review was also published in 2010, reviewing articles till 2008 for such usage and recommended its use for Diabetic ulcer [10].

These studies done and reviewed have reported the use of PRP as activated Local application over the wounds. Such use is adjunct to the standard Management and once a healthy granulation has been achieved, the wounds are mostly surgically covered with skin grafts/flaps [11]. The activated PRP gel is a commercially available product and in India costs about $500. Also it is not easily available. There is lot of variation regarding PRP concentrate, dose and end points in these studies.

The PRP method as used in the STARS is a novel and different concept of treatment. It is based on the regenerative properties of the platelet for complete healing of such ulcers.

The local infiltration tends to assist the natural regeneration of skin over the ulcer. It relies on the chemotactic property of Platelet to attract the macrophages and initiate auto-phaygocytosis activity to control infection. It is more standardized therapy protocol for PRP use with defined dose, delivery and uniform method for PRP preparation. It uses only 20 ml of autologous venous blood, double spinned to produce fresh PRP, which is infiltrated at the dose of 0.2 ml-0.5 ml per cm of length, in the wound margin by a 22 G/24 G needle. Such infiltration are repeated every 4th day till complete (near Complete) of wound healing. This repeat dose is based on the principle to keep the proliferative stage of healing activated with local delivery of growth factors derived from alpha granules of platelet rich plasma. This is major shift in principles as previous studies are based on life of platelet for repeat dosage (7-10 days). The STARS is mono therapy with PRP only and not as adjunct to wound care.

PRP contains a high level of platelets and a full complement of clotting and growth factors. The secretory proteins contained in the α-granules of platelets include platelet-derived growth factor, transforming growth factor β, platelet factor 4, interleukin-1, platelet-derived angiogenesis factor, vascular endothelial growth factor, epidermal growth factor, platelet-derived endothelial growth factor, epithelial cell growth factor, insulin-like growth factor, osteocalcin, osteonectin, fibrinogen, vitronectin, fibronectin and thrombospondin-1 [12]. These growth factors may contribute to the healing process of chronic wounds by attracting undifferentiated cells in the newly formed matrix and triggering cell–cell division. PRP may suppress cytokine release and limit the amount of inflammation, interacting with macrophages to improve tissue healing and regeneration, promote new capillary growth and accelerate epithelialization [12]. Moreover, the activated platelets apparently have potential antibacterial effects and may thereby support wound healing [13].

This case was successfully treated by STARS therapy. A good quality skin got regenerated over the ulcer with complete healing of right side ulcer.

The stages of healing typically included initially suppression of unhealthy granulation, followed by health granulation filling up the defect and control of infection and eventually epithelization from margins which subsequently matured to yield normal sole skin.

Conclusion

Till to date no therapy has been able to regenerate a normal sole

skin including surgical reconstruction. STARS therapy based on Autologous PRP, as mainstay treatment is perhaps a breakthrough method for treatment in diabetic ulcer, which should be more intensely researched further, as it has potential to be almost an ideal wound therapy management as being based on autologous venous low volume blood and simple centrifuge method, it is accessible; Safe and affordable.

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