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Case Report

Treatment of Gangrenous Phalanx using Combination Therapy of Platelets Rich Plasma (PRP) and Photo Bio Modulation (PBM)

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ABSTRACT

Gangrene is a dangerous and potentially fatal condition that happens when the blood flow to an area of tissue or organ is cut off. This causes the tissue to break down and die. Gangrene often turns the affected skin a greenish-black color. Due to poor attention and unhygienic conditions, this becomes more contaminated and in the end amputation remains the only treatment option. Traditional therapies cannot provide necessary growth factors to regenerate. Platelet Rich Plasma (PRP) helps in wound healing process by releasing various growth factors. Photo bio modulation (PBM) is also reported for this purpose. **Objectives:** To evaluate the safety and efficacy of PRP and PBM for the treatment of dry gangrene in the fractured little finger in a roadside accident. **Methods:** We report a case of a twenty-seven-year-old male with fractured little finger (Phalanx) in a roadside accident. The patient reported after 6 weeks with dry gangrene and severe pain. The patient treated with combination of PRP and PBM. **Results**: Over a follow up of six weeks, significant improvement was shown with decrease in pain. Little finger was recovered that was showing mobility and growing nail. **Conclusion**: It is concluded that PRP along with PBM is an effective treatment for dry gangrene.

INTRODUCTION

Gangrene happens due to loss of blood flow in tissues mostly caused by injury or infection. Gangrene commonly affects extremities like limbs, fingers and toes but it can also affect muscles and organs [1]. Serious injury, diabetes, smoking, atherosclerosis, peripheral artery disease and weakened immune system can be major gangrene risk factors [2]. Dry gangrene and wet gangrene are major types. Dry gangrene is mostly associated with autoimmune disease, vascular disease and diabetes [3]. Blood supply to certain area is blocked and it turns purplish-blue to black. Person with dry gangrene generally doesn't have any infection but it may lead to wet gangrene if it becomes infected. Wet gangrene mostly involves infection. It happens when blood supply is cut off to certain area due to burn or trauma in which body part is crushed. It is called wet because of pus formation which can spread to other body parts also [4]. Amputation may occur due to traumatic condition like burn or serious injury or it may also occur due to non-healing wounds in non-traumatic condition. Diabetes is major cause of non-traumatic amputation. The foot amputation has been reported is 8–21% [5]. Worldwide and 85% of these amputations are due to diabetes [6]. Therapies like dressing, surgical debridement and even skin grafting are not satisfactory treatment for wound healing because of unavailability of growth factors that can modulate the healing process [7].

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Use of PRP can be a satisfactory, safe, easy and inexpensive method as it provides growth factors which enhance healing [8]. It has been reported that PRP gel consists of cytokines, growth factors and chemokines which improve tissues growth of acute and chronic wounds [9]. PBM is treatment method in which red and near-infrared light is used to stimulate healing, relieve pain, immunomodulation, reduce inflammation wound healing and tissue regeneration [10]. Due to lack of clear understanding of mechanism of PBM, it is not the part of standardized treatment for wound healing. PBM is non-invasive and has very good effect on stem cells and progenitor cells in enhancing differentiation process which ultimately improves the healing rate of tissues [11]. In our study, A-PRP along with PBM show significant results in case of dry gangrene.

Case Report

A 27-years-old male presented at our hospital with fractured distal metaphysis of little finger (Phalanx) of the right hand following a roadside accident 6 weeks ago. He was treated at a basic health unit (BHU) and the fracture was fixed using a 22-gauge needle. His little finger started turning purplish black and complained of severe sharp shooting pain after 3 weeks. He was referred to our clinic by a Family Physician for the treatment after 6 weeks of fracture. At that time the distal Phalanx of the little finger was already turned into purplish-black color. He was suffering from dry gangrene with severe pain. Firstly, surgical debridement of the wound was done under local anesthesia by the general surgeon. A 22-G needle of 44 mm length was fixed in patient's wound, the needle was taken out. After the debridement the patient was treated with PRP injections and PBM. PBM was performed before PRP injections using 660 nm wavelength 100 mW power soft laser. Affected area was irradiated with PBM from 0.5 cm distance from the wound for 2 min on each side for a total of 8 minutes. The PRP treatment included taking 30 ml of blood from the patient and centrifuging it at 2800 rpm for 15 minutes with a soft spin centrifuge. After the centrifugation the buffy coat was extracted carefully a total volume of 3 ml was extracted. Laboratory report (CBC differential) showed 1.5 million paltelets/ml count of the PRP sample. Photo activation of the PRP sample was done using monochromatic light for 10 minutes. After photo activation, PRP was injected in and all around the wound using 25-Guage 25 mm long needle. 3 Sessions of PRP performed with two weeks intervals and 12 sessions of Photo bio modulation treatment were performed twice a week for 6 weeks.

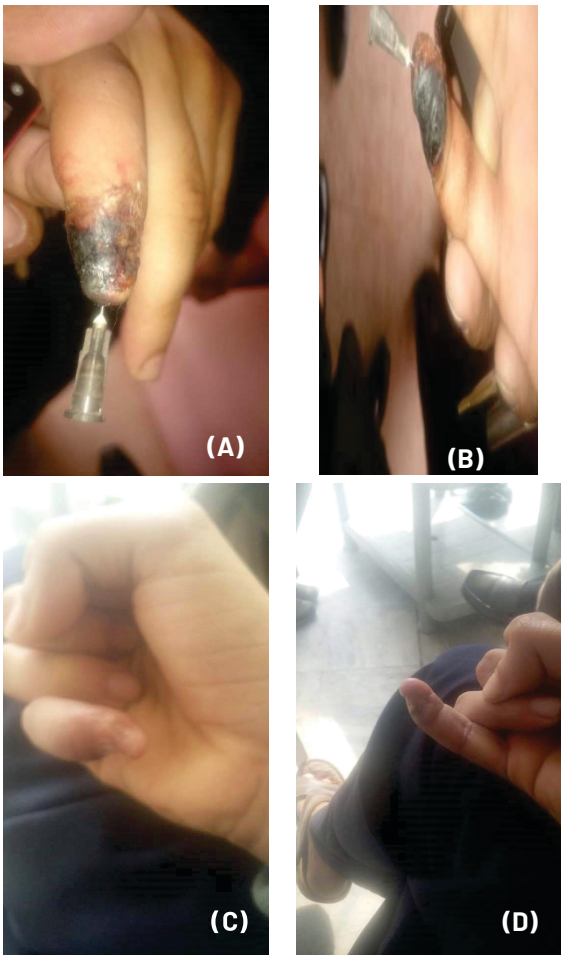

Figure 1: Treatemt of Gegrene in distal phalanx of little finger using combination therapy of PRP and PBM A & B are Day 1 before the treatment with PRP and PBM C & D on final visit on 12 weeks (six weeks after the last PRP session) showing recovereded liitle finger with movement and growing nail

DISCUSSION

Dry gangrene is a condition that involves tissue death and turns it dry, purplish-black, and hard due to arterial occlusion. Body extremities are more prone to it due to insufficient blood supply to the tissues. Ulceration or gangrene is very difficult to treat and often leads to amputation [12]. Traditional methods for wound management are still under practice, but it is an era of regenerative medicine. Use of PRP in wound healing process has progressively increased but still there is a need to establish well-designed randomized trials assessing the efficacy [13]. PRP along with PBM can help in gangrene. The present study hypothesized that combination therapy of PRP and PBM could improve healing process in case of dry gangrene. According to the results, significant improvement was seen in fingertip and nail growth. In parallel to our findings many other reports found PRP as an effective tool to treat gangrene such as in a case study PRP

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along with Split-Thickness Skin Graft was used which reduced the healing time up to half (50%) [14]. Many predisposing factors like smoking, older age and immunodeficiency can delay healing process. In another case study it was shown that healing process was 3 to 6 times less in smokers than non-smokers [15]. Dressing change is painful process and somehow burdensome for medical staff. Use of PRP is helpful in avoiding pressurized dressing and decreased operative time. Valbonesi *et al.*, used PRP in 14 patients and observed rapid wound healing and reduction in infection [16]. Singh *et al.*, made two groups of DFUs. One was treated with PRP and other was treated conventionally. Significant percentage improvement was seen in a group treated with PRP as compared to other group dealt with debridement and simple dressing [8]. PBM promotes accelerated wound healing by stimulating growth factors and the induction of synthesis of vascular endothelial growth factor (VEGF) [17]. It can prevent future complications of wound as well as amputation. In our study combination of PRP and PBM showed effective healing of gangrene as in a study, PBM therapy was used for the treatment of DFUs and significant improvement was observed in all participants with structure and mobility in foot [18]. In a case study, combined effect of antimicrobial photodynamic therapy (aPDT) and photo biomodulation (PBM) was checked on perianal abscess. After 5 days of incision and drainage, infection was clear [19]. The basic purpose of our study was to evaluate the combined effect of PRP and PBM to treat dry gangrene on fingertip, which seemed a very promising approach to heal difficult wounds.

CONCLUSIONS

It is concluded that Platelets Rich Plasma (PRP) along with Photo Bio Modulation (PBM) were effective in the treatment of dry gangrene.

Conflicts of Interest

The authors declare no conflict of interest

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