

Ultrasound Therapy in Diabetic Foot Ulcer: A Single Case Report

ShanmugaRaju P¹, Surya Narayana Reddy V², Ramlingam P³, Venkata R⁴, Ravinder T⁵

¹Asst. Professor
Department of Physical Medicine
& Rehabilitation,

^{2,3}Professor, ⁴Asst. Professor,
Department of General Surgery,
⁵Professor, Department of Pathology
Chalmeda AnandRao Institute of
Medical Sciences,
Karimnagar- 505001,
Andhra Pradesh, INDIA.

Correspondence :

¹Dr. P. ShanmugaRaju,
MPT (Pediatric Neurology), MIAP
E-mail:shanmugampt@rediffmail.com

ABSTRACT

Aim: Diabetic foot ulcer is potentially serious leading to high morbidity and sometimes amputation of the lower limb. The aim of this study is to see the effect of ultrasound therapy in diabetic foot ulcer- a single case trial.

Methods: Continuous mode, ultrasound therapy (UST), frequency 3 MHZ, treatment period at 12 weeks.

Results and Conclusion: the study showed decreased infection, improved granulation tissue, blood flow, and size of wound is reduced in diabetic ulcer within 12 weeks.

KEY WORDS: Diabetic foot ulcer, great toe amputation, ultrasound therapy, wound healing.

INTRODUCTION

India is a country with 50 million people with diabetes ⁽¹⁾. Diabetic foot ulcer is potentially serious leading to high morbidity and sometimes amputation of the lower limb. Difficult –to- heal wounds lead to high rates of morbidity and mortality, negative effects on quality of life and lengthy periods of medical care. Conservative treatments, such as pressure relief / off loading, the use of various dressings, debridement and topical antibiotics ⁽²⁾. Advanced adjunctive modalities for the treatment of diabetic foot ulcers include the use of growth factors, bio-engineered tissues, electrical stimulation, ultrasound therapy, and negative wound therapy ⁽⁴⁾.

Ultrasound therapy is a non-invasive adjunctive therapy and to help promote wound healing ⁽⁵⁾. Till today, very limited literature is available on the effects of ultrasound therapy in healing of diabetic foot ulcer. The purpose of this study was the description of treatment of ultrasound therapy outcomes and diabetic foot ulcer.

PHYSIOTHERAPY ASSESSMENT

She was conscious, oriented and appeared to be well nourished. The left foot ulcer was irregular and red colour. The foot was swollen, and great toe was loss. The wound edges were dark grey, indicating an evolving necrosis of the stumb site. Palpation revealed pitting edema, feeling pulse in the right doralispedis and tenderness around the stumb.

Sensory examination is normal. Range of motion on the right foot revealed painful ankle and midtarsal joint movements. Motor power is decrease in strength of the right leg muscles. Ankle brachial index of the right side was 0.67 and the left side 0.85. The patient was not used any total contact orthosis or casts or splints.

INVESTIGATIONS

The patient hemoglobin was 9.2 gm/dl and white blood cell count was 24,900 cells/cumm. The differential count showed a segmental neutrophills 85%, eosinophills 0.2%, Lymphocytes 11%, Monocytes 0.2%. Bleeding time was 1 min 30 second and clotting time 4 minute 30 seconds. ESR is 120 mm 1st hour. HBsAg and HIV 1 and 2 were negative. The patient fasting blood glucose was 132 mg/dl, urine sugar is nil and post lunch sugar level was 114 mg/dl. Her blood pressure was 130/70 mmHg. Pulse rate 82 per/minute. Her serum urea was 38 mg/dl, serum creatinine 1.2 mg/dl. The ECG was normal. The Ankle brachial index (ABI) was 0.8 in both feet. X-ray foot was normal. There was no osteomyelitus. The wound size was in the left foot ulcer measuring 7cm x3.4 cm. We advised by regular dressings which included cleaning of the lesion with normal saline.

TREATMENT PROTOCOL

Ultrasound therapy (US) was treated after 20 days of post surgery. The treatment protocol was set to 3MHZ frequency, continuous mode, intensity 0.8 W/cm², treatment time 10 minutes per/session, duration of treatment 1-12 weeks ⁽⁷⁾.



Figure: 1 & 2
Before Treatment



Figure: 3 After 12 weeks of
Ultrasound therapy

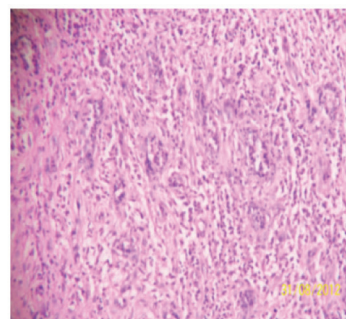


Fig: 4 Histopathology sections from the
ulcer show granulation tissue.

Initially normal saline water cleansing and regular dressing was provided to the affected wound. During this period, the wound beds were approximately 80% granulation tissues increased and decrease of non-inviable tissue were observed (Fig1.2).

DISCUSSION

Ultrasound therapy was first introduced as therapeutic modality in year 1950. The principal aim of ultrasound therapy is removing necrotic tissue and enhances the formation of granulation tissue^(3, 6). This is first study conducted in CAIMS General Hospital, Karimnagar to evaluate its effectiveness in the treatment of diabetic foot ulcer. In our patient initially presented with infect, non-healing wound, with size of 7.0 cm X 3.4 cm (Fig: 1).The results of this study indicated that there was a significant improvement in diabetic foot ulcer. Laboratory investigations of HBA1c%, WBC, CRP, Random glucose level also that the diabetes was under control as it is an important factor for healing of the diabetic foot ulcer.

Lowe A et al (2001) report showed that the ultrasound therapy increases intracellular calcium and permeability of

cell membrane which lead to faster tissue healing at intensities of 0.5 to 0.75 W/cm² with frequency 3 MHz, intensity 0.5 w/cm², duration of 5 minutes per session and for three weeks can promote healing of diabetic foot ulcers⁽⁸⁾. After treatment of histopathological report showing that multiple section from biopsy taken from ulcer shows abundant granulation tissue extensive collagen deposition and proliferation of new blood vessels. The wound contracture taking place. Hence there is good healing of diabetic foot ulcer.

Our case report showed that ultrasound therapy applied at continuous mode, frequency 3 MHz, intensity 0.8 w/cm², duration of 10 minutes per session and for total 12 weeks of ultrasound therapy has been shown to produce a greater reduction in wound size. Several limitations to this study showed to be noted.

CONCLUSION

Ultrasound therapy treatment is significantly showing to stimulate granulation tissue, blood flow, decreased infection, wound bed depth and promoting wound healing. Ultrasound therapy, a positive impact on patient care outcomes.

Conflict of Interest: None declared.

Source of Support: Nil.

Acknowledgments

We wish to thank Dr. Bhoom Reddy, MS (Gen. Surgeon), Sri.C.Lakshmi Narasimha Rao, BE, MBA, Chairman, Dr. V. Suryanarayana Reddy, MS Director, CAIMS, Karimnagar for encouraging us to publish this case report.

REFERENCES

1. Kavros SJ, Miller JL, Hanna SW. Treatment of Ischemic wounds with non-contact, low frequency ultrasound: The mayo clinic experience, 2004-2006. *Adv Skin Wound Care* 2007; 20: 221-6.
2. Hess CL, Haward MS, Attinger CE. A review of mechanical adjuncts in wound healing: Hydro therapy, ultrasound, negative pressure therapy, hyperbaric oxygen, and electro stimulation. *Ann Plast surg* 2003; 51: 210-8.
3. Kavros SJ, Miller JL, Hanna SW. Treatment of Ischemic wounds with non-contact, low frequency ultrasound: The mayo clinic experience, 2004-2006. *Adv Skin Wound Care* 2007; 20: 221-6.
4. Hess CL, Haward MS, Attinger CE. A review of mechanical adjuncts in wound healing: Hydro therapy, ultrasound, negative pressure therapy, hyperbaric oxygen, and electro stimulation. *Ann Plast surg* 2003; 51: 210-8.
5. Unger PG. Low frequency, non-contact, nonthermal ultrasound therapy: a review of the literature. *Ostomy wound Mange* 2008; 54: 57-60.
6. Ennis WJ, Foremann P, Mozen N et al. Ultrasound therapy for recalcitrant diabetic foot ulcers: results of a randomized, double-blind, controlled, multicenter study. *Ostomy Wound Mange* 2005; 51: 24-39.
7. Kavros SJ, Lidel DA, Boon AJ, Miller JL, Hobbs JA, Andrews KL. Expedited wound healing with non-contact, low frequency ultrasound therapy in chronic wounds: A Retrospective analysis. *Adv Skin Wound care* 2008; 21: 416-23.
8. Lowe AM, Walker, Cowan R (2001). Therapeutic Ultrasound and wound healing closure. *Arch Phys. Med Reh.*, 82;1507-1511.