IMPROVED HEALING OF FOOT WOUNDS FOLLOWING THE APPLICATION OF **CYCLOIDAL VIBRATION THERAPY (VIBRO-PULSE®)** TO PATIENTS ATTENDING A PODIATRY OUTPATIENTS CLINIC

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Introduction

Foot wounds in particular diabetics are some of the most difficult and complex to heal due to vascular disease and neuropathy (1). The non-invasive application to skin of certain frequencies of mechanical vibration energy has shown to increase skin and soft tissue circulation including for diabetics (3,4,5). Vibro-Pulse applies cycloidal vibration to the lower limb resulting in mechanotransduction. Increase in shear, compression, stretch of vascular endothelial cells stimulating eNOS synthase, the production of nitric oxide resulting in vasodilation. 6) This initiates microcirculatory improvement and angiogenic stimulation resulting in the cellular expression of proteins and growth factors. Vibration therapy has been applied to stimulate the healing of a range of wounds including venous leg ulcers and pressure wounds. (7,8)These underlying physiological mechanisms may improve the healing of some diabetic wounds as a result the following are examples we have experienced using Vibro-Pulse on 3 patients with foot wounds.

Method

Patients with slow to heal and difficult to manage foot wounds that met the indications and contraindications for use were chosen. Continuing with their standard treatment a Vibro-Pulse unit was allocated to each patient to self apply at home for 3 x a day for 30 minutes. (fig 1)

Fig 1. Vibro-Pulse

Patient 1

80 year old male, type 2 diabetic for 25 years, history of heart disease, pulmonary fibrosis and renal impairment. **WOUND** – Mixed diabetic left leg heel ulcer duration 3 years 8 months. Angiogram shows no significant distal disease ABPI 1.0. However patient unable to tolerate compression due to high pain levels disturbing sleep. Inadine and Biatain dressings applied twice weekly. Trauma shoe with foam inlay (Indoors) and orthopaedic footwear with total contact inlay (outdoors)

Results

PATIENT 1	**Plantar Heal Duration 3 years 8 months**	
START	**Size cm²**	**Additional comments**
	3.64 cm² (fig2)	High wound pain. Wound sloughy
Week 3	1.8 cm²	51% reduction in wound size pain significantly reduced
Week 6	1.05 cm²	71% reduction in wound size, no pain, healthy granulation
Week 10	0.5 cm² (fig3)	86% reduction in wound size, no pain, healthy granulation
Week 12	0.2 cm²	99% reduction in wound size
Patient continued to use as slight deterioration of wound due to move in to temporary respite care, small 0.2cm sq wound remains static but significantly improved.		

Patient 2

72 year old male, type 2 diabetic, history of peripheral arterial disease which is inoperable to improve blood flow and peripheral neuropathy. **WOUND** – Plantar ulcer over 4th metatarsal head duration 7 months. Treated with Biatain and Tegaderm Matrix dressing applied 3 times a week. Patient has a moulded inlay in his foot wear to off load.

Results

PATIENT 2	**Plantar ulcer over 4th metatarsal head duration 7 months**	
START	**Size cm²**	**Additional comments**
	2.52 cm² (fig2)	Wound depth classed as cavity.
Day 10	1.5 cm²	40% reduction in wound size, wound shallower, wound smaller for first time in months patient pleased.
Day 17	Patient developed infection in foot and admitted for IV antibiotics. Vibro-Pulse stopped due to infection development.	

Patient 3

79 year old male, history of vasculitis, raynauds disease, oedema, monophasic dorsalis pedis pulses. A spinal injury causing foot drop and clawing lesser toes. **WOUND** – toe wounds right 5 inter-digital, left 2,4,5 tissue loss to dorsum of the toes., duration 1 to 2 months prior to attending podiatry. Treated with Inadine and a dry dressing changed 3 times a week and wears open toed sandals and back splints for foot drop.

Results

PATIENT 3	**4 x Toes wounds. Right 5 inter-digital, left 2,4,5 dorsum. Duration 6 to 8 weeks**	
START	**Size cm²**	**Additional comments**
	Left 2,4,5 - total 0.20 cm² Right 5 -1 cm²	Multiple toe wounds. Cyanosis noted of surrounding tissues poor perfusion
Week 2	Left 2 healed 4,5 - total 0.12 cm² Right 5 - 0.5 cm²	48% reduction in wound size. Dramatic improvement in colour cyanosis gone toes are pink improved perfusion
Week 6	Left 5 0.04 cm² which toe Other wounds healed	Virtually 100% healed so Vibro-Pulse stopped.

Fig 2

Patient 1

Start Heal Wound 3 years 8 months duration.

Fig 3

Patient 1

week 10 of Vibro-Pulse 86% reduction in wound size.

Discussion

Effective skin and soft tissue blood flow is vital to heal such as neuro-ischemic foot wounds. However many neuropathic wounds often have good blood supply and as a consequence relieving wound pressure and debridement are as critical as circulation to the extremities.

In these cases we treated two patients with long standing wounds of 7 months and over 3 years duration respectively we saw a rapid improvement in both patients with reduction in wound size of 40% to 50% in the first 2 to 3 weeks. Patient 1 had a significant and quick reduction in pain which improved his sleeping and quality of life. Patient 2 was pleased to see improvement for the first time in months but unfortunately developed an infection and had to cease using the Vibro-Pulse.

Patient 3 was chosen due to the position of the wounds and other co-morbidities that may effect healing (foot drop and oedema). Prior to use there was cynosis of the toes and surrounding tissue observed. After two weeks of Vibro-Pulse there was a dramatic improvement in perfusion and no cynosis observed toes were pink and healthy and wound progressed to heal.

Conclusion

Cycloidal Vibration Therapy (Vibro-Pulse) in conjunction with standard care was effective in improving the healing of these complex foot wounds.

References

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