Introduction

Cycloidal vibration is a low frequency (25 to 300 Hz) low amplitude oscillating action that projects in three planes, along, across and radially from the vibration generator. These fluctuations in each direction ranging from a minimum to maximum level, at any one time the action in each of the directions will be at a different point in its cycle when at a maximum along the surface, the wavefront normal to the surface may be at a minimum. This “out of plane” oscillation produces a 3 dimensional Cycloidal vibration movement.

Cycloidal vibration therapy (VIBRO-PULSE®) when applied to human subjects has demonstrated an increase in fluid turnover in skin tissue measured by dermascan ultrasound (1). Reduction in lower limb limb cellulitis (2,3,4). In a randomised controlled lymphoedema, venous leg ulceration and lower dermascans ultrasound (1). Reduction in lower limb increase in fluid turnover in skin tissue measured by.

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Cycloidal vibration has been shown to increase lymphatic vessel diameter (5,6). The three dimensional oscillation action of cycloidal vibration is probably capable of stimulating the smooth muscles in the lymph vessel walls increasing activity of the lymphangions resulting in increased lymph flow and vessel dilatation.

The lymph flow and lymph vessel dilatation was observed for a 10 minute control / rest period. After the rest period the underside of the reclined skin was submitted to cycloidal vibration at a set speed of 28 Hz for 10 minutes.

Method

This animal study was approved by the University ethical Committee and involved 30 hairless mice (ICR/ICR) aged 6 weeks. The mice were divided into 2 groups of 15: Group I received 10 minutes of cycloidal vibration and group II received 30 minutes vibration (3). The method used was transmission microscopy in vivo. The mice were submitted to a total anesthesia with urethane 25% subdermal injection.

A longitudinal incision was made along the Linea Alba of the abdominal skin. The animal was placed prone under anesthesia with Urethane 25% subdermal injection. Ethical Commission and involved 30 hairless mice (65 M/IOPS NMRI VRO 30G and 50 S/SOPF SWISS NU/NU FE 20G). This animal study was approved by the University.

The effect of mechanical forces (vibration and external compression) on the dermal content of the upper dermis and epidermis assessed by high frequency ultrasound. J Tiss Viab 11(2): 97-101. Acknowledgment: Sponsored with a research grant from Vibrant Medical Ltd. UK.

The lymph flow and lymph vessel dilatation was observed for a 10 minute control / rest period. After the rest period the underside of the reclined skin was submitted to cycloidal vibration at a set speed of 28 Hz for 10 minutes.

Any change in lymph flow or lymph vessel dilation at a set speed of 28 Hz for 10 minutes.

Results

The lymph flow and lymph vessel dilatation was observed for a 10 minute control / rest period. After the rest period the underside of the reclined skin was submitted to cycloidal vibration at a set speed of 28 Hz for 10 minutes.

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Any change in lymph flow or lymph vessel dilatation was observed and photographed.

Conclusions

Lymphatics are thin walled vessels that carry lymph fluid. As fluid leaks from the vascular system it is evacuated the waste products from the wound. Changes in lymphatic flow are an important function in the reduction of oedema and in the process of wound healing. Increase in lymph flow helps to evacuate the waste products from the wound faster and therefore has a clinical consequence in wound healing.

Lymph movement is due to the smooth muscle activity in the Turr’i-Haase (30% of the vessel wall) and by undirectional valves that drive lymphatic vessels into a series of compartments, called lymphwork. These exhibit contractions that actively pump lymph fluid in response to higher lymph pressures they increase in frequency and strength and as its increased flow it decreases frequency and strength of contraction. These two processes help maintain interstitial fluid balance (5,6).

The three dimensional oscillation action of cycloidal vibration is probably capable of stimulating the smooth muscles in the lymph vessel walls increasing activity of the lymphangions resulting in increased lymph flow and vessel dilatation.

It was observed that the dilatation and the increased lymph flow induced no increased permeability of the lymph vessels. This demonstrates that the fragile microcirculation lymph vessels observed were not damaged as a result of being submitted to cycloidal vibration. We also noted an influence on the arterial and venous circulation but this will be the subject of a further study.

Conclusion

This investigation has shown that there is an increase in lymph flow when the microcirculation in general and the lymph system in particular are submitted to cycloidal vibration.

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