INFLUENCE OF CYCLOIDAL VIBRATION (VIBRO-PULSE®) ON LYMPHATIC FLOW AND CHANGES OBSERVED IN LYMPHATIC VESSELS.

Introduction
Cycloidal vibration is a low frequency (25 to 300) Hz, low amplitude oscillating action that projects in three planes, along, traverse and radially from the vibration generator. These fluctuations in each direction, rising from a minimum to maximum level, at 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 minimum vertical to the surface will be at a minimum. This “out of phase” 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 oedema when used as a treatment for lymphoedema, venous leg ulceration and lower limb cellulitis (2,3,4). In a randomised controlled trial for the treatment of lower limb cellulitis, an increase in fluid turnover in skin tissue measured by dermascan ultrasound (1). Reduction in lower limb oedema was observed when the microcirculation lymph vessels observed were not damaged as a result of being submitted to cycloidal vibration. We also noticed an influence on the arterial and venous circulation but the subject of a future study.

Methods
Method
A longitudinal incision was made along the Linea Alba of the abdominal skin. The skin was peeled and supported under a costal UPF microsurgery microscope and the skin was retracted over a transparent probe (Volpi Intralux 6000) illuminated from below using the under side of the reclined skin.

Fig. 1. 3. Merritt J, Piller N, Carati C, Bridger B “Home Clinical trial of cycloid vibration massage for reduce lower limb cellulitis treatment times?” Journal of Wound Care 16(4): 166-169

Materials
Anesthesia with Urethane 25 % subdermal injection. The method used was transillumination microscopy in vivo. The mice were submitted to a total anaesthesia with Urethane 25 % subdermal injection. A longitudinal incision was made along the Linea Alba of the abdominal skin. The skin was peeled and supported under a costal UPF microsurgery microscope and the skin was retracted over a transparent probe (Volpi Intralux 6000) illuminated from below using the under side of the reclined skin.

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The lymphatic vessels were visualized by means of a Patent Blue V injection into the inguinal lymph node of the animal. A cold light source (Volpi Intralux 6000) illuminated the underside of the reclined skin.

The lymph and lymph vessel dilatation was observed for a 10 minute control / rest period. After the rest period the undersides of the reclined skin was submitted to cycloidal vibration at a set speed of 250 Hz for 10 minutes. Any change in lymph flow or lymph vessel dilatation was observed and photographed

Results
When submitted to 10 minutes of Cycloidal vibration from rest a significant increase in lymph flow was highlighted. The highlighted lymph vessels in 23 (70%) of the 33 mice tested was observed. Approximately dilatation of the lymph vessel diameter was observed in 30 % of the mice.

Conclusion
Lymphatics are thin walled vessels that carry lymph fluid. An fluid leaks from the vascular system it is returned to general circulation via the lymphatics. Changes in lymph 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 quicker and therefore has a clinical consequence in second healing. Lymph movement is due to the smooth muscle activity in the Tunica media (middle layer) of the vessel wall and by internal valves that divide lymphatic vessels into series of compartments, called lymphangions. These exhibit contractions that actively pump lymph fluid. In response to higher lymph pressures they increase in frequency and strength and to increased flow they increase frequency and strength of contraction. These two responses help maintain interstitial fluid balance (4,5).

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

It was observed that the dilatation and increased lymph flow reduced the 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 noticed an influence on the arterial and venous circulation but the subject of a further study.

Acknowledgement
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.

References
1. 1) Ryan T J, Thoolen M, Yang Y (2001) 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 oedema when used as a treatment for lymphoedema, venous leg ulceration and lower limb cellulitis (2,3,4). In a randomised controlled trial for the treatment of lower limb cellulitis, an increase in fluid turnover in skin tissue measured by dermascan ultrasound (1). Reduction in lower limb oedema was observed when the microcirculation lymph vessels observed were not damaged as a result of being submitted to cycloidal vibration. We also noticed an influence on the arterial and venous circulation but the subject of a further study.


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