LARVAL THERAPY: Treatment of last resort OR DIAGNOSTIC INTERVENTION?

Introduction
We must never forget or underestimate the devastating impact losing a limb has on a patient. We must strive to ensure all avenues are explored to reveal the true extent of tissue damage and to determine if a limb is salvageable.

Many of the patients presenting to our hospital vascular service have a combination of Peripheral Vascular Disease (PVD) and Diabetes, which increases the risk of complications that may lead to amputation. The evidence for the use of Larvae as a diagnostic tool is limited. To determine the extent of tissue damage sharp debridement is often used as the principle method prior to decisions about amputation. The mode of action of larvae is less invasive than conventional surgical debridement. The ability of larval therapy to selectively debride wounds whilst simultaneously reducing bioburden to reveal viable tissue, is crucial for its use as a diagnostic tool. (1)

The following case studies examine two patients, both of whom have PVD and Diabetes. In each case larval therapy will be evaluated as a method of supporting decision making with regard to amputation or limb salvage.

Method
A case study approach was used to evaluate the clinical outcomes of two patients when larval therapy was used as a diagnostic tool. Two cycles (4 days each) of treatment were used for each patient. Case study 1 used larvae in a BioBag. Case study 2 used free range larvae. Patients were chosen pragmatically based on difficulty to accurately assess the extent of wound necrosis.

Results
The larvae in each case study effectively debrided the devitalised tissue to reveal the extent of damage to the individual foot. In case study 1, the patient still had full function of his foot and now has viable tissue to commence healing. The clinical decision to amputate in case study 2 was as a result of reduced foot function and irreversible exposure of internal vessels with aggressive infection and decay of osseous tissue.

Discussion
The action of larvae in wounds is multifaceted including debridement, disinfection and stimulation of healing and biofilm inhibition and eradication. (2) These are all key factors in the decision making process, and whether to proceed to amputation. Debridement was effective in both case studies and revealed the true extent of tissue necrosis. Larval debridement is selective because of the secretion of proteolytic enzymes; only devitalised soft tissue is removed. (3) In both case studies the likelihood for amputation was high, though larvae therapy provided a definitive picture of limb viability.

The ability of larvae to reduce bioburden in a wound bed was of value in these two instances. Both patients had wounds with features of clinical infection (malodour, purulent exudate, spreading erythema). With impaired arterial function the ability of systemic antibiotics to reach the wound bed was compromised. Larval therapy has been shown to destroy both individual micro-organisms and disrupt more complex biofilms. (4) In the context of diagnostic use, it allows assessment of wound environment with a low bioburden which may affect further treatment decisions. There is some evidence to suggest that the same enzymes responsible for debridement and disinfection can stimulate a more effective healing response (5) which may have particular importance in Case study 1 where limb salvage was deemed possible.

When considering larval therapy as a diagnostic tool, patients may be more willing to accept the therapy in order to have a definitive view of their healing potential. In the context of sharp debridement and potential amputation, the 'ick' factor of larval therapy may be reduced when compared with products to promote autolytic debridement. The time taken to provide effective debridement also allows for the time required to prepare patients psychologically for the potential outcomes, which may involve limb loss.

Conclusion
The use of larval therapy does not necessarily result in limb salvage but aids the decision making process about appropriate definitive treatment plans. In these cases it has given the clinical team a clear impression of the viability of the limb.

The use of larvae as a diagnostic tool is not clearly identified in the guidelines for larval debridement therapy. (6) In these case studies, the usefulness of this therapy as a clinical decision-making tool has been demonstrated. There is a need to further research the use of larvae as a diagnostic tool. Instead a treatment of last resort, Larvae could be considered as a primary debridement choice when on a potential pathway to amputation.

References
3 Nigam Y. (2013) Evidence for larval debridement therapy in wound cleansing and healing. Wounds UK 9(4)suppl
6 All Wales Tissue Viability Nurse Forum (2013). All Wales Guidance for the use of Larval Debridement Therapy. AWTVN

Case study 1:
84 year old male. Type 2 diabetes, chronic kidney disease, Coronary artery bypass graft. Left 2nd toe amputation. Left Femoral-tibial artery bypass graft with PTFE. The patient was an emergency admission with an acutely ischaemic leg ulcer, following an occluded femoral tibial bypass graft and proceeded to a trans-tibial amputation. He also presented with an 8cm circular wound to the dorsum of his right foot, probably caused by pressure from an ill-fitting shoe. However due to his peripheral vascular disease the viability of the tissue was questionable. Larvae were used to debride the wound to determine if the tissue damage was extensive or if any deep infection was present. Two cycles of larvae in a biobag were used to debride. It was imperative to determine if his right foot was salvageable as he would be facing the prospect of becoming a bilateral amputee. The larvae revealed healthy granulation tissue and visible tendon, which was thought to have potential to heal.

Case study 2:
52 year old male. Type 1 diabetes, chronic kidney disease, ischaemic heart disease, coronary artery bypass graft. The patient was admitted to hospital with a large ulcer to the sole of his right foot with had exposed tendon that appeared dehydrated with a 1cm area of necrotic tissue with a sloughy wound bed. The patient also had a 8cm ulcer to the dorsal aspect of the same foot distal to 5th toe phalange. Two pots of free range maggots were applied to the foot. Two cycles of larvae revealed the true extent of tissue damage. Necrotic osseous tissue was noted to the dorsal aspect wound and a deeply devitalised tendon to the sole of the foot. The decision that there was not enough viable tissue to reconstruct the foot and ensure functional foot remained. Therefore the patient and the vascular surgeon accepted that his foot was not salvageable and a trans-tibial amputation was performed. The patient was content that every opportunity was given to him to salvage his limb and felt more prepared for an amputation.