

## **Case study: Using the geko™ device to increase blood flow and prevent oedema following lower limb reconstruction by the Ilizarov method**

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### **Subject**

52 year old male.

### **Procedure**

Right lower limb reconstruction by the Ilizarov method.

### **Relevant Clinical History**

The patient presented with deformity of the lower leg, ankle and foot requesting amputation because he couldn't suffer the pain of trying to walk and was constantly falling over. Previously he had broken his leg at the age of 26 playing football requiring surgery, a muscle graft was taken from his stomach and he was placed in plaster. Since then his foot and ankle gradually became more painful. He has a history of ankle sprains whilst walking unaided and thus suffered severe laxity causing frequent falls.

The patient underwent a 7 hour surgical reconstruction of the lower leg using a large Ilizarov frame consisting of 28 pins and four spheres. The tibia was broken mid shaft, with two further breaks in the forefoot and ankle.

### **Rationale for treating with the geko™ device**

Ilizarov frames provide a versatile fixation system for the management of bony deformities, fractures and their complications. The frames give stability, soft tissue preservation, adjustability and functionality allowing bone to realise its full osteogenic potential.

Ilizarov outlined the following principles of the treatment of fractures <sup>1</sup>

- Preservation of the blood supply
- Preservation of the osteogenic tissue
- Complete anatomic reduction
- Stable fixation
- Functional activity of the muscles and joints
- Early patient mobilization

He stated that by providing bone and other tissues with ideal conditions for healing and without compromising an already injured limb further we should see faster healing time and speedier recovery.<sup>1</sup> Although laborious, when successful, the Ilizarov method is of dramatic benefit to the patient. For example, patients with limb length discrepancies or limb deformities can find life very difficult, both physically and psychologically, as well as it having detrimental consequences on other parts of the body, especially joints. For other patients, the Ilizarov method offers an alternative to amputation.

The geko™ device was chosen as a treatment modality to increase blood flow and help accelerate the reduction of post-operative oedema. This is because Neuromuscular Electro-stimulation (NMES) has been found to be effective at increasing venous flow and reducing oedema in the lower limb. The geko™ device has also been used successfully to heal wounds<sup>2</sup>. The small size and portability of the geko™ device means that it is ideal for providing treatment to patients continuously throughout the day whilst they are active and at rest. The geko™ device is effective at providing up to 60% of the blood flow achieved with maximal effort dorsiflexion movements<sup>3</sup>.

### **The geko™ device**

The geko™ device was fitted in recovery and worn for 24 hours per day for 10 consecutive days.

### **Results**

Post-operatively there were no signs of swelling in the operated leg and the patient felt the geko™ device had helped to reduce his pain. The patient was able to sleep whilst wearing the device without any difficulty.

### **Pre-op Day 0**



## Post-op Day 10



## Conclusions

The geko™ device offers patients a drug-free treatment option to simply increase blood circulation in the lower limb and prevent swelling following limb reconstruction. This is important because excess fluids impede oxygen delivery and wound healing. This patient has undergone a complex surgical procedure and has made a good recovery which has been helped by the geko™ device. Early observational use of the geko™ device has shown great promise and its health benefits following other orthopedic procedures deserve further investigation.

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## References

1. Ilizarov, S., & Rozbruch, S. R. (2007). Limb Lengthening and Reconstruction Surgery. New York: Informa Healthcare USA Inc. Page 9
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3. Tucker AT, Maass A, Bain DS, Chen L-H, Azzam M, Dawson H, Johnston A: Augmentation of venous, arterial and microvascular blood supply in the leg by isometric neuromuscular stimulation via the peroneal nerve. Int J Angiol. 2010 Spring; 19(1): e31–e37. PMID: PMC2949997

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