

# Case study: Using the geko™ device to prevent oedema and promote functional activity following foot surgery

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## Subject

40 year-old female

## Procedure

Right scarf lateral release Akin osteotomy

## Relevant Clinical History

The patient reported a 2-year history of severe pain over the right first metatarsal and was subsequently diagnosed with hallux valgus. The patient reported that the pain had been accompanied by a significant worsening of functional ability over recent months. Conservative treatment had not been successful.

## Relevant Previous Medical History

The patient was a recreational runner before the pain increased and would like to return to jogging. She is a non-smoker with a low weekly intake of alcohol.

## Clinical Presentation

On examination pre-operatively

- The right first metatarsal was significantly swollen and inflamed.
- There was reduced flexion and extension of the first metatarsal, and cosmetic adduction of the first metatarsal was prominent.
- Bruising was observed within the nail bed of the big toe.
- Ankle dorsiflexion was reduced bilaterally.

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

The aim of surgery was to relieve pain and improve the alignment of the big toe. Surgery to correct hallux valgus is a largely successful operation<sup>1</sup>, with a good or very good outcome in 85% of patients<sup>1</sup>. However, the NHS Choices website advises patients that after bunion surgery, the foot and ankle may be swollen for three months or longer post-surgery. Swelling may occur because of the post-operative rehabilitation instructions that are necessary to ensure bone healing, such as partial weight bearing with a heel wedge shoe and walking with the aid of elbow crutches. This prevents the foot and ankle muscle pumps from working as normal, and leads to a frequent tendency towards swelling. In addition to swelling, impaired wound healing<sup>1</sup> may also occur in 2-4% of patients.

The geko™ device was therefore chosen as a treatment modality to help accelerate the reduction of oedema and also to increase blood flow. 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 70% of the blood flow achieved with maximal effort dorsiflexion movements<sup>3</sup>.

### **Results**





The geko™ device was well tolerated by the patient and at the 4-day follow up the patient was judged by the surgeon in charge to be progressing “extremely well”.


Swelling had reduced significantly since the operation, and there was reduction in pain VAS from 8/10 to 1/10 in the four-day period after the operation. The wound was healing well with a lower level of bruising than expected. At 4 days postoperatively there was an increased range of motion (ROM) and assistive range of motion (AROM) of the 1<sup>st</sup> metatarsal. Please see *Figure 1* for full results.

### **Conclusions**

This case study illustrates that the geko™ device may be useful in helping to reduce swelling in patients recovering from foot surgery. The patient and surgeon involved were both impressed by the results of using the geko™ device and subjectively thought that it was beneficial. Further research is of course required in order to confirm the efficacy of the device in this patient group but this initial case study is extremely encouraging.

Figure 1

Day	geko™ use	Symptoms	Photos
Day 0 Pre-operative (1 hour prior to surgery)	Patient did not use the geko™ device pre op	Patient presented with <ul style="list-style-type: none"> <li>• Swelling</li> <li>• Stiffness</li> <li>• Inflammation</li> <li>• Pain VAS 6/10</li> <li>• Cosmetic adduction</li> <li>• Reduced ROM of 1<sup>st</sup> Metatarsal</li> </ul>	
Day 1 Post-operative (1 hour after surgery)  The patient was partial weight bearing with a heel wedge shoe and walked with elbow crutches.	The geko™ device was applied to the patient in recovery 1-hour post op.  No activity was taken during this time of using the device	<ul style="list-style-type: none"> <li>• Swelling on (R) instep, medial and lateral malleolus and (R) ankle</li> <li>• Cosmetic change to 1<sup>st</sup> metatarsal</li> <li>• The big toe was straightened by breaking it and applying 2 screws</li> <li>• (R) Bunion removed</li> <li>• Pain VAS 8/10</li> </ul>	
Day 2 24 hours post operation  The patient was partial weight bearing with a heel wedge shoe and walked with elbow crutches.	The geko™ device was worn for 22 hours from the recovery room post op.  Limited activity was undertaken during this time. The patient walked a maximum of 10-15 metres to use the bathroom.	<ul style="list-style-type: none"> <li>• Swelling decreased</li> <li>• Reduction in pain VAS 5/10</li> <li>• Active ROM decreased of 1<sup>st</sup> metatarsal due to stitches along the 1<sup>st</sup> met and the arch of the Foot</li> <li>• Patient feels tired but no adverse effects from surgery</li> </ul>	
Day 3  The patient was partial weight bearing with a heel wedge shoe and walked with elbow crutches.	The geko™ device was worn continuously following the last visit.  The patient is more mobile and now walking up to 30 metres at a time	<ul style="list-style-type: none"> <li>• Swelling decreased</li> <li>• Reduction in pain VAS 3/10</li> <li>• Patient has PROM of flexion and extension of the 1<sup>st</sup> metatarsal</li> <li>• Confidence has increased using the heel wedge shoe which patient reports from a reduction in pain going through the forefoot.</li> </ul>	

<p>Day 4</p> <p>The patient was partial weight bearing with a heel wedge shoe and walked with elbow crutches.</p>	<p>The geko™ device was worn continuously following the last visit.</p>	<ul style="list-style-type: none"> <li>• Swelling decreased</li> <li>• Reduction in pain VAS 1/10</li> <li>• Reduction in bruising</li> <li>• Increased ROM, AROM of the 1<sup>st</sup> Metatarsal.</li> </ul>	
<p>Day 10</p>	<p>The geko™ was worn for 4 hours per day since previous visit.</p>	<ul style="list-style-type: none"> <li>• Sutures removed</li> <li>• Increase AROM</li> <li>• Full PROM</li> <li>• No swelling L=R</li> <li>• No crutches</li> <li>• Wedge heel shoe still in place for 6/52</li> <li>• Patient pain increased to 4/10</li> <li>• Reduction in wearing the geko device for a period of 4 hours a day</li> <li>• Follow up in 4/52 time</li> <li>• Re dressed with a sterile dressing</li> </ul>	

## References

1. Wülker N, Mittag F: The treatment of hallux valgus. Dtsch Arztebl Int 2012; 109(49): 857–68. DOI: 10.3238/arztebl.2012.0857
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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