

# LYMPH MOVEMENT ACCOMPANYING SEQUENTIAL COMPRESSION THERAPY ASSESSED BY LYMPHOSCINTIGRAPHY IN A PATIENT WITH LOWER EXTREMITY LYMPHEDEMA

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## INTRODUCTION

A major aspect in the treatment of patients with lymphedema is the promotion of effective movement of accumulated lymph fluid out of the affected region. One well accepted measure of the rate of lymph movement is derived from the observed transit or clearance of an injected radionuclide using the method of lymphoscintigraphy.<sup>1-4</sup> The goal of this case study was to utilize lymphoscintigraphy to evaluate the impact of a 2-phase lymph preparation and drainage device (Flexitouch<sup>®</sup>) on the movement of lymph fluid in a patient with long-standing lower extremity lymphedema.

## PATIENT

The patient is a 51 year old female who was in a traffic accident in 1976 that resulted in paralysis of both legs. She had a skin graft in 1978 and developed a heel ulcer in 1984. She had lower extremity bilateral swelling that was originally diagnosed as lymphedema. This diagnosis was confirmed in October of 2002 when she underwent bilateral lymphoscintigraphy that showed absence of isotope appearance by 60 minutes at the inguinal nodes. She had no sensation in her feet but could walk using braces and two canes. The ulcer on her left heel was still present; it had failed to heal despite various treatments. In June of 2004 this ulcer was still present and she volunteered to participate in a protocol in which the Flexitouch system would be used in an effort to improve the lymphatic flow in her lower extremities.

## PROTOCOL OVERVIEW

A baseline bilateral lower extremity lymphoscintigraphy assessment was done. (A) This consisted of the injection of 1 to 1.2 millicuries of technetium-99 filtered sulfur colloid in four divided doses using 250 to 300 microcuries in a volume of 0.2 ml in each of four tuberculin syringes. Injections were made intradermally and subcutaneously in alternating interdigital web spaces beginning with the left foot and then the right foot between digits one and two and then repeating between the left foot and the right foot between digits two and three. No local anesthetic was used as patient has no sensation in her feet. Immediately after the injection of the radioactive material dynamic imaging was initiated using a GE Discovery VH camera at a rate of 15 seconds per frame for 30 minutes, then 30 seconds per frame for 30 minutes, followed by planar images at 60 minutes of lower extremities and pelvis in three levels. Planar images were obtained at 30 minute intervals. The arrival time of the radioactive material at the inguinal nodes was visualized.

After an interval of 44 days (B) another lymphoscintigraphy assessment was done. During these 44 days the patient did not receive any unusual treatment. However, at this assessment the patient was fitted with a Flexitouch System garment on the entire right lower extremity, including the lower abdomen, prior to beginning the evaluation. The Flexitouch system was not activated until immediately after the four intradermal/subcutaneous injections were given. Visualization of the radioactive material was done in manner similar to that of the baseline evaluation. For 28 days following the second assessment the patient continued to use the Flexitouch system as directed. At the end of the four weeks of Flexitouch therapy a final follow-up lymphoscintigraphy assessment was done (C) in manner similar to the previous two. During the last lymphoscintigraphy, the patient did not wear the Flexitouch device.

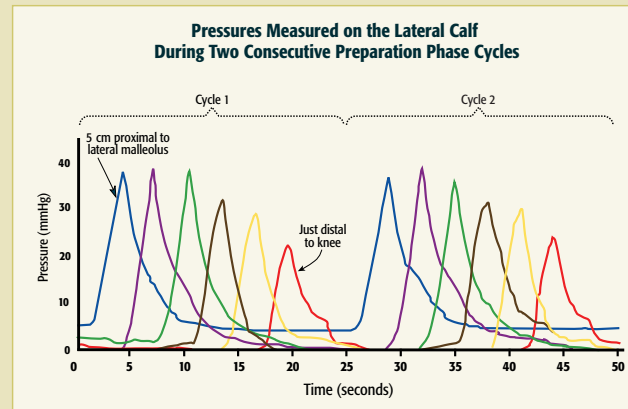
## ANALYSIS METHOD

The *a priori* method chosen for the assessment of a possible beneficial impact of the Flexitouch system was the determination of the arrival time of the radioactive tracer material at the inguinal lymph nodes. It was hypothesized that use of the Flexitouch system would reduce the transit time for the tracer to flow from the foot injection site to the visualized inguinal nodes.

## METHOD OF THERAPY

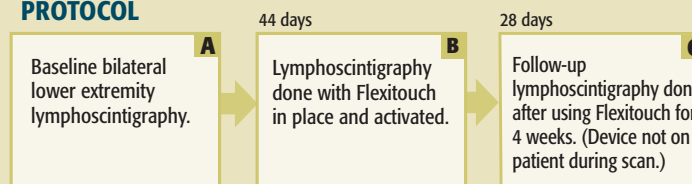
The device consists of four segments (foot, calf, thigh and trunk), each with up to 8 separate chambers 1.5 to 1.75 inches in width. A treatment session starts with a preparation phase that is followed by a drainage phase.

During the preparation phase, the trunk region is treated first (29 cycles), then the thigh (14 cycles), then the calf (23 cycles) and finally the foot (29 cycles). During each cycle, the chambers within a segment are activated in sequential and back and forth patterns from the most distal to the most proximal. During the drainage phase, chambers are activated sequentially starting with the toe and progressing to the waist. This sequence, foot-calf-thigh-trunk is repeated 25 times.



The graph above illustrates two sequential preparation cycles in the calf region. Each color in the graph represents the inflation and deflation of separate chambers.<sup>5</sup>

## PROTOCOL



## RESULTS AND DISCUSSION

In a normal lymphatic system a typical arrival time following exercise may range from 3 to 8 minutes. The lymphatic transport in this patient is greatly compromised. This fact is well illustrated in **Figure A** that shows a baseline image taken 95 minutes after the initial foot injections. Both right and left pathways are significantly compromised with the right being somewhat worse than the left.

A notable change in this situation is apparent associated with the first use of the Flexitouch system during the second lymphoscintigraphy assessment session. This change is well illustrated in **Figure B** where it can be seen that the initial arrival time of the radioactive tracer on the right has been reduced to about 31 minutes with several inguinal nodes being well seen. The first appearance of the radiotracer on the left is delayed as compared to the right but is still 20 minutes earlier than during the baseline assessment. It appears that since the Flexitouch system was applied on the right side for this session, its beneficial effect was most evident on the right side.

Sustained use of the Flexitouch system during the next 28 days was done by the patient. As shown in **Figure C** this sustained therapy resulted in a near balance between right and left sides with respect to tracer arrival time, with both right and left being much reduced from the baseline pre-Flexitouch therapy.

## CONCLUSION

Within the limits of a single case study the present results provide very encouraging data suggestive of a potentially important role of the Flexitouch two-phase, automated system in the long term management of lymphedema.

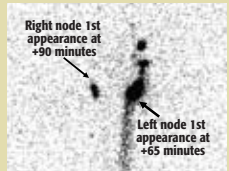
## Acknowledgement

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## References

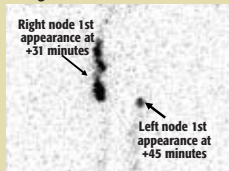
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Figure A: Baseline Assessment



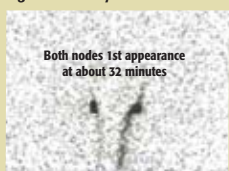
Inguinal image at +95 minutes

Figure B: First Flexitouch Use



Inguinal image at +48 minutes

Figure C: 28 Days of Flexitouch Use



Inguinal image at +41 minutes