

# Reporting limb edema: Importance of including paired measurements of affected and control limbs

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## BACKGROUND/GOALS

Outcome assessments of treatments for limb edema depend on reporting progressive changes in affected limb volumes. A useful method for unilateral edema is to compare treated limbs with contralateral "normal" limbs for reference. In this way treatment progression can be expressed as changes in percentage edema (%edema) based on measurements made on both limbs prior to treatment and progressively until treatment ends. However, some clinics only measure normal limbs once (prior to treatment) and determine changes in edema with reference to this initial measurement. Our goal was to compare outcomes that would be reported using these two different approaches.

## METHODS

Bilateral limb volumes were measured (tape measure) and tracked with limb volume software\* in arms of 80 post-mastectomy women (unilateral lymphedema) and in 55 persons with unilateral leg edema. All women had received 10 complex decongestive physiotherapy (CDP) treatments. An example of the limb volume tracking procedure is illustrated in figures 1-4. The impact of using only one control limb volume (start value) to determine %edema at treatment end was determined by comparing its result with that of using control limb measures at treatment start and at treatment end (Figures 5-6). To further investigate possible differences in predicted efficacy of therapy associated with the single measurement method, the %change in %edema was determined for both approaches and under- or overestimation of therapeutic outcomes determined (Figures 7-8)

\*Limb Volumes Professional®,  
www.limbvolumes.org

## EXAMPLE OF LIMB VOLUME TRACKING\*

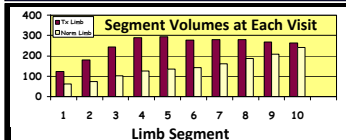


Figure 1.  
Arm segment volumes (ml) on a patient's initial visit

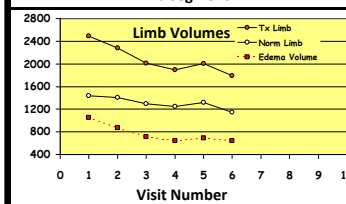


Figure 2.  
Seg volumes used to auto-determine total limb volumes (ml) and edema volume for each visit

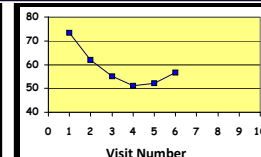


Figure 3.  
Percentage edema is auto-determined and tracked over the course of the patient's therapy.

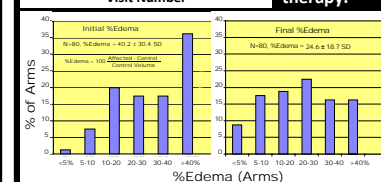


Figure 4.  
Initial & Final %Edema for group of 80 unilateral arm lymphedema women

## MAIN RESEARCH FINDINGS

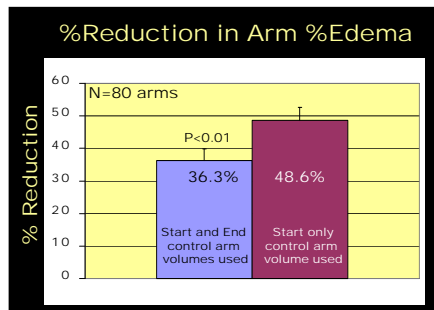


Figure 5

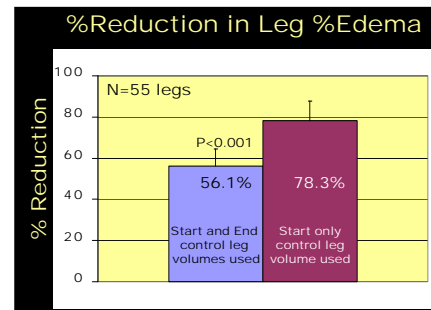


Figure 6

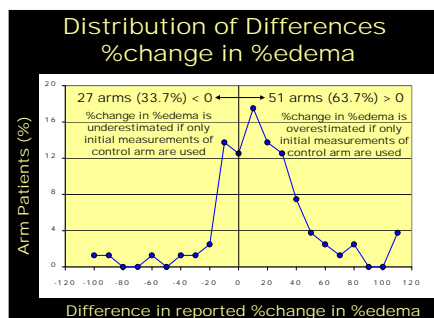


Figure 7

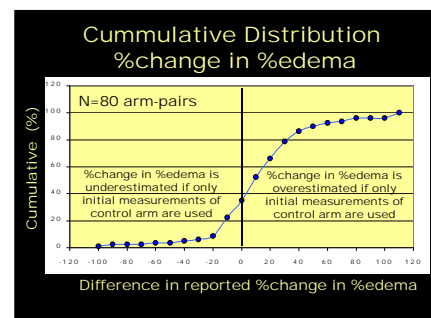


Figure 8

## RESULTS

When only initial control limb volumes were used as reference, the reduction in arm %edema was overestimated at  $48.6\% \pm 4.1$  as compared to  $36.6\% \pm 3.6$ ,  $p<0.01$  if control limbs were included for each %edema determination (Figure 5).

Similar overestimation patterns were found for leg measurements, with corresponding reductions in %edema of  $78.3\% \pm 9.4$  vs.  $56.1\% \pm 8.5$ ,  $p<0.001$  (Figure 6).

The distribution of the differences varies in a manner as shown in Figures 7-8 for the unilateral arm lymphedema women studied.

## CONCLUSIONS

Results suggest that significant and unpredictable reporting errors arise if multiple control limb measurements are not included during the course of therapy.

The exclusion of such measurements has the effect of distorting the efficacy of therapy. Such distortions impact perceptions of patient, therapist and physician.

Since inclusion of control limb measures consumes little additional time in view of the automated calculation possibilities now available, it would seem prudent to follow this dual-limb measurement procedure as a matter of good standard practice.

## REFERENCES

1. Casley-Smith JR. Measuring and representing peripheral oedema and its alterations. *Lymphology*. 1994;27:56-70
2. Weissleder H, Schuchhardt C, eds. *Lymphedema Diagnosis and Therapy*. 3<sup>rd</sup> ed. Cologne, Germany; Viavital Verlag GmbH; 2001.