

# PRACTICAL ASPECTS OF TRACKING AND DOCUMENTING LIMB VOLUME CHANGES

N Sims and HN Mayrovitz, College Medical Sciences, NSU Davie Florida 33328

## BACKGROUND/RATIONAL

Compression therapy is the recognized treatment of choice for chronic venous insufficiency, venous stasis ulcers, and lymphedema. The effectiveness of compression therapy can best be documented by determining limb volume and its changes over time. Water displacement, circumferential measurements, and photoelectric scanners are all used to estimate limb volume; however, circumferential measurement is the most practical method in most clinical settings.

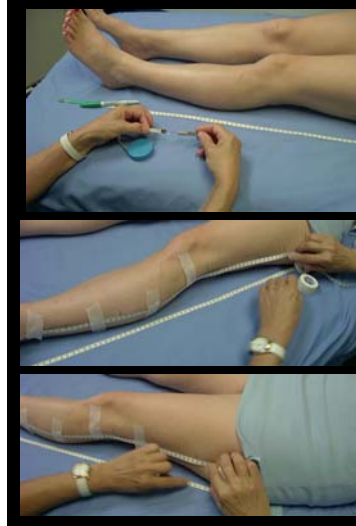
It is a common practice to document changes in circumference at selected sites without calculating limb volume. This practice gives limited and misleading information about limb volume and the effectiveness of treatment. It is necessary to measure the entire limb to determine if the edema is being cleared or merely moved to more proximal or distal locations. In cases of single limb edema, measuring both limbs and comparing volumes can give us important information about the amount of edema present and its change with treatment.

This presentation of a detailed, systematic measuring protocol addresses the initial measurement procedure, as well as the accuracy of repeat measurements. Although it is possible to manually calculate volume using mathematic formulas, computer programs designed to calculate volumes and graph results save time and simplify record keeping.

## REFERENCES

1. Casley-Smith JR. Measuring and representing peripheral oedema and its alterations. *Lymphology*. 1994;27:56-70
2. Saunderson AP, et. al. Upper-extremity volume measurements in women with lymphedema: A comparison of measurements obtained via water displacement with geometrically determined volume. *Physical Therapy*. 2002;82:1201-1212
3. Phillips, TJ Current approaches to venous ulcers and compression. *Dermatol Surg*. 2001;27:611-621.

## STEP 1 PREPARATION



1. You will need a measuring board or tape marked with centimeters on a flat surface, a washable marking pen, and a tape measure. Tape measures with a spring attachment (Gulik) help keep tape measure tension consistent.
2. Position the patient in a supine position on a firm, flat surface. The arm should be relaxed with a slight bend to the elbow. The ankle should flexed 90°.
3. It is important to keep the board or tape on the flat surface while marking the intervals to be measured. Holding the tape against the limb will result in inaccurate follow-up measurements. Following the curve of this normal leg resulted in a 2-centimeter difference. On an edematous limb, this discrepancy will be even greater. When repeating measurements, the interval marks will be at a different level.

## STEP 2 THE STARTING POINT



Measure and record the distance from the nail bed of the middle finger to styloid process of the wrist, or from the sole of the foot to the middle of the lateral malleolus. Remember to keep the ankle flexed. This is the starting point for your circumferential measurements.

## STEP 3 LIMB LENGTH



The highest arm measurement is at the axillary crease. Placing a stiff paper at the axilla and putting the arm against the side determines this level. A similar procedure is done at the groin. Any circumference higher than this will be at an angle and will be inaccurate.

## STEP 4 MARKING INTERVALS



## STEP 5 MEASURING



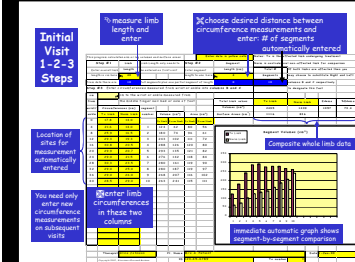
From the starting point, measure the desired intervals for circumferential measurements (girth) and mark with a washable marker. (White-Out can be used on very dark skin)



Measure girths at marked intervals. Keep tape at a right angle to limb length. Place tape with interval mark in tapes middle. Use firm tension. There may be an indentation of loose skin but a spring attachment keeps tension consistent.

## STEP 6 CALCULATING LIMB VOLUME

Circumferential measurements are used in math formulas to determine the volume of a truncated cone. This geometry resembles a human limb for calculation purposes. Calculations by hand is tedious and time consuming, and prone to math errors. Fortunately computer programs\* are available that are easy to use and produce graphs showing volume change over time.



Documentation of these changes allows the therapist to adjust treatment as necessary, and provide concrete evidence of the effectiveness of treatment to physicians, insurance providers, and patients. Therapists have reported that patients are more satisfied and more compliant with their treatment when they can see results in an easily understood graphic form.

