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UIV - Ultrasound Internal Volumetry

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### Introduction

The Indirect Tape Volumetry (ITV) is an easy procedure, which however isn't able to evaluate the involvement of the tissue layers in lymphedema.

The Ultrasound Internal Volumetry (UIV) is an indirect measurement method, which computes the volumes of limb compartments.

### Materials and Methods

A tape meter, a dermatographic pen and an echo device are needed. A high resolution  $\geq 10$  MHz linear probe is used, with a "small parts" configuration and a near focalization.

The Ultrasound Internal Volumetry (UIV) measures the volumes of the cutaneous, subcutaneous and musculo-skeletal compartments. Standard limb reference points are used to get more stable measures. The computation follows the cone trunk formula (frustum method), modified and extended to the computation of the internal volumes. In addition, lengths can be related to the height and standardised according to the weight and to the body mass index (BMI) or to the standard length of limb segments. Measured data are managed by the UIV Lymph (Aquarius srl 2011) software, which provides computation and data store facilities.

### Results

Our UIV experience dates to 1 year, mainly with upper limbs examinations of patients who underwent breast surgery owing to mammalian onchological pathology, with/without associated chemotherapy and radiant therapy.

Lower limb pathology, was too an important occasion of clinical application.

UIV, though still in a qualitative observational phase, allows us to detect localised and still subclinic disfunctions often with initial synthoms.

### Discussion

The UIV allows a low-cost lymphedema monitoring, the detection of the involvement of tissue layers, the localization of very initial and subclinic changes. Finally, the reconstruction of an useful pathway for the flow in zones where the extracellular matrix is unchanged.