Reliability of the Inverse Water Volumetry method to measure the volume of the upper limb

Martinus A Beek1*, Alexander te Slaa1, Lijckle van der Laan1, Paul GH Mulder2, Harm JT Rutten3,4, Adri C Voogd5,6, Ernest JT Luiten1, Paul D Gobardhan1

1Department of Surgery, Amphia Hospital, Molengracht 21, 4818 CK Breda, the Netherlands
2Amphia Academy, Amphia hospital, Breda, the Netherlands
3Department of Surgery, Catharina Hospital, Eindhoven, the Netherlands
4Department of Surgery, Maastricht University, Maastricht, the Netherlands
5Department of Epidemiology, Faculty of Health Medicine and Life Sciences, Research Institute Growth and Development (GROW), Maastricht University, Maastricht, the Netherlands
6Research Department, Comprehensive Cancer Centre the Netherlands, location Eindhoven, The Netherlands

Corresponding author; Tel.: +31 76 5955440; fax: +31 76 5953279.
E-mail addresses: maarten_beek@hotmail.com (M.A. Beek).

Running title: The IWV-apparatus is a reliable method to measure arm volume

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Abstract
Background: Lymphedema of the upper extremity is a common side effect of lymph node dissection or irradiation of the axilla. Several techniques are being applied in order to examine the presence and severity of lymphedema. Measurement of circumference of the upper extremity is most frequently performed. An alternative is the water-displacement method. The aim of this study was to determine the reliability and the reproducibility of the “Inverse Water Volumetry apparatus” (IWV-apparatus) for the measurement of arm volumes.
Patients and methods: The IWV-apparatus is based on the water-displacement method. Measurements were performed by three breast cancer nurse practitioners on ten healthy volunteers in three weekly sessions.
Results: The intra class correlation coefficient defined as the ratio of the subject component to the total variance equals 0.99. The reliability index is calculated as 0.14 kg. This indicates that only changes in a patient's arm volume measurement of more than 0.14 kg would represent a true change in arm volume, which is about 6% of the mean arm volume of 2.3 kg.
Conclusion: The IWV-apparatus proved to be a reliable and reproducible method to measure arm volume.