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The effects of underwater exercising on venous return

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Author Comments:	Dear Editor Our "Letter" focuses the recent article from Menegatti and coll entitled "Randomized controlled trial on Dryland and Thermal Aquatic Standardized Exercise Protocol for Chronic Venous Disease" . The Authors report the beneficial effects of water immersion in patients with venous edema. We congratulate the Authors for their important study. However, on the basis of our experience in the same field of investigation, we believe that some points are questionable and need to be clarified to avoid misinterpretations in JVS-V&LD readers. Unfortunately, the limit of 350 words impeded us to describe in greater detail the flaws which we ask to explain. Alberto Caggiati and Giovanni Mosti
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Question	**Response**

The effects of underwater exercising on venous return

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We would like to congratulate Menegatti and coll. who reported the effects of underwater exercising (UE) on leg volume in patients with bilateral "*C3-GSV-CVD*".[1] Even if their results confirm what we recently published[2], there are some crucial points that need to be clarified. In particular:

1.How the Authors explain the very small baseline mean volume (2300mL) in C3 legs? In fact, it is 600mL less than they reported in 2016 [3] and about 1000mL less than we recently measured.[2] In turn, the volume reduction of 400mL after UE is impressively great for so small legs (-17/18%).

2.The long-lasting effects of UE are supposed to be due to "*potential benefits on the venous system*" of not-well-defined solutes and the higher hydrostatic pressure (HP) of thermal water: never demonstrated the former, inconsistent the latter. In fact, the difference of HP exerted at the ankle by thermal and not-thermal water due to their different density is at most 3-4mmHg (approximately 84.4 versus 80.9).

3.Duplex evaluations of GSV caliber and subcutaneous thickness (ST) were performed before the first session of UE and three weeks later. How the Authors replicated the duplex examinations exactly at the same "*assessment points*" to obtain consistent evaluations? Was a "*no-touch technique*"[4] adopted to avoid erroneous measurements?

4.The statistically significant light mean caliber reduction (0.3-0.4mm) in varicose but small GSV (5.4 mm at the upper thigh) cannot be ascribed to the "*pressure exerted by the hydrostatic column*" simply because Duplex was not performed during immersion.

5.Why ST was evaluated at the thigh (where edema is found only in more severe cases[5] and both water and venous pressures are lower) instead of the lower leg and ankle (where the edema is usually concentrated and objectively measured by water volumetry)?

6.An impressive increase of the ankle range-of-motion of about 15°-17° was obtained by a "*very light*" exercise protocol in patients without *"musculo-skeletal and/or rheumatologic disorders"*. Considering that studies in venous patients

based on heavier (daily resistance exercises) and longer (up to 24 weeks) protocols obtained a global increase of 7°-8° these results seem unlikely. Especially the increase of >8° of dorsiflexion, which normal value amounts to only 20°.[6]

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