

Enhancing sweat rate using a novel device for the treatment of congestion in heart failure

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Background: Current treatment of fluid retention in heart failure (HF) relies primarily on diuretics. However, adequate decongestion is not achieved in many patients.

Purpose: To study the feasibility and short-term performance of a novel approach to remove fluids and sodium directly from the interstitial compartment by enhancing sweat rate.

Methods: We used a device designed to enhance fluid and salt loss via the eccrine sweat glands. Skin temperature in the lower body was increased to 35–38°, where the slope of the relationship between temperature and sweat production is linear. With this wearable device, the sweat evaporates instantaneously, thus avoiding the awareness of perspiration. The primary efficacy endpoint was the ability to increase skin temperature to the desired range without elevating the core temperature above normal range. A secondary efficacy endpoint was a clinically meaningful hourly sweat output, defined as ≥ 150 mL/h. The primary safety endpoint was any procedure-related adverse events.

Results: We studied 6 normal subjects and 10 HF patients with clinical evidence of congestion and median NT-proBNP of 602 pg/mL [interquartile range 427 to 1719 pg/mL]. Participants underwent 3 treatment sessions of up to 4h. Skin temperature increased to a median of 37.5°C (interquartile range 37.1–37.9°C) with the core temperature remaining unchanged. The median total weight loss during treatment was 219±67 g/h (Figure) with a range of 100–338 g/h. In 77% of cases, the average sweat rate was ≥ 150 mL/h. Systolic (P=0.25) and diastolic (P=0.48) blood pressure and heart rate (P=0.11) remained unchanged during the procedure. There were no significant changes in renal function and no procedure-related adverse events.

Conclusion: Enhancing sweat rate was safe and resulted in a clinically meaningful fluid removal and weight loss. Further evaluation of this concept is warranted.

