

Heart Failure blog post

Fluid Overload – the overlooked challenge in heart failure

As prosperity around the world increases, we are living much longer, but with an ageing population and increasingly unhealthy lifestyles, we are also facing new challenges and greater healthcare needs. The incidence of heart failure is forecast to continue to rise and despite recent improvements in treatments, there are still many patients living with the condition. The American Heart Association estimates that 6.5 million adults in the US aged 20 and over, are affected by heart failure and that number is expected to rise to 8.0 million adults by 2030.

When we think of a typical heart failure patient, we often think about someone unable to do any strenuous exercise such as walking up the stairs - but this is not what accounts for the majority of hospitalisations for these patients. Fluid overload, also known as congestion, is responsible for 90% of hospitalisations for heart failure patients in the US. Treatment of patients with this condition has not improved significantly over recent years and remains a key challenge.

What is fluid overload in heart failure?

Heart failure is a progressive disease that occurs when the heart is unable to pump enough blood around the body. Symptoms include shortness of breath, tiredness and difficulty exercising. When the heart fails to pump properly, the body often responds by retaining sodium, and then has to retain water to maintain the correct concentration of sodium in the blood stream. The brain and kidneys have developed a powerful ability to quickly and accurately maintain this concentration. Over time considerable amounts of water build up, and accumulate all over the body including in the arms, legs, lungs and abdomen, causing swelling known as oedema.



The increase in fluid volume increases the burden on the weakened heart, worsening the problem clinically. Fluid overload is a key clinical complication in heart failure patients and causes physical, sometimes debilitating, discomfort for patients. One of the key problems is fluid accumulating in the lungs and patients come into the emergency room feeling as if they are drowning. It is the primary driver for heart failure-related hospitalisation, putting enormous pressure on healthcare systems around the globe.

“Diuretic resistance” and limitations of current treatment options

Diuretic drugs (or “water pills”) are the current mainstay of fluid overload therapy, but over time they become less effective in some patients. It is estimated that up to 40% of heart failure patients on intravenous loop diuretics have a poor response to diuretics, or “diuretic resistance”. The impact of this is clear, with 1 in 4 of the US patients hospitalized for heart failure being readmitted to hospital within 30 days of discharge. Furthermore, studies have shown that the impact of diuretics is limited; in the ADHERE acute heart failure registry, over half of the patients were discharged with a weight loss of less than 5lbs – and many had actually gained weight. This suggests that current treatment options have limited benefit and that there is a need for new options to help treat these poorly served patients. In addition to their limited benefit, chronic use of high dose diuretics can lead to even more advanced kidney failure which can result in the need for dialysis.

The alfapump® DSR difference

At Sequana Medical, we are developing the **alfapump** DSR to manage fluid overload in patients for whom diuretics are no longer effective and we can do this in a way that relieves the pressure on the kidneys – potentially allowing the kidneys to restore their diuretic responsiveness. The **alfapump** DSR is built upon our proven **alfapump** platform to deliver a fully implanted system for Direct Sodium Removal (DSR). We believe that our novel and proprietary approach, developed with the patient in mind, could become a best-in-class treatment for diuretic-resistant heart failure patients. The **alfapump** DSR is designed to be a chronic treatment for these patients, keeping them out of hospital, with better control over their fluid balance. The aim is to improve clinical outcomes, deliver a better quality of life for patients and reduce the costs to the healthcare system.

The principle of DSR therapy is simple – we remove sodium from the body and then the brain and kidneys respond to quickly and accurately remove the necessary free water to maintain the correct concentration of sodium in the blood stream, leading to a sustainable reduction in fluid overload. To do this we use the principle of diffusion in the peritoneal cavity in the abdomen. The peritoneal cavity is like the lungs which makes it a great place to get things in and out of the body – it has a large surface area, thin membrane and rich blood supply. We administer a sodium-free solution known as ‘DSR infusate’ into the peritoneal cavity and allow it to dwell there for a specific period. During this time, sodium diffuses from the body (where the concentration of sodium is high) into the DSR infusate (where the concentration is low). The sodium rich DSR infusate is then pumped from the peritoneal cavity to the bladder using the **alfapump** system. The fluid is then naturally urinated away resulting in the removal of sodium from the body. The body responds by eliminating fluid via osmotic ultrafiltration (the movement of water, together with sodium, from the bloodstream to the peritoneal cavity) and/or urination. We believe this non-diuretic approach is truly a potential breakthrough treatment for diuretic resistant heart failure patients.

We’re very proud of our development of the **alfapump** DSR system here at Sequana Medical and know that we are pioneering something special. The **alfapump** DSR system under development is similar to the **alfapump** system that we use to treat liver ascites but with the addition of a port for the administration of the DSR infusate into the peritoneal cavity. We have tremendous experience with the **alfapump** for liver ascites, with over 800 systems implanted and hundreds of patient years of experience.

Promising interim RED DESERT trial results

We are really excited about the interim results from the [RED DESERT clinical study](#), our repeated dose **alfapump** DSR study in diuretic-resistant heart failure patients. This is the first time that we have treated patients repeatedly with our Direct Sodium Removal therapy and we have shown it to be safe and effective. In these first five heart failure patients who were all on high doses of diuretic drugs, we were able to maintain their sodium and fluid balance without the need for any of those diuretics. We believe that this has never been done before. Moreover, by replacing their high dose diuretics with repeated dose **alfapump** DSR therapy, we could restore the patients’ response to much lower doses of diuretic therapy – and this effect lasted for a significant period of time after the DSR therapy ended. This opens up many other opportunities for the **alfapump** DSR where management of the fluid balance plays an important role.

To read the full press release and find out more about the study please visit the Sequana Medical website at www.sequanamedical.com.

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