

# Analysis of the advantages of peritoneal dialysis in the treatment of chronic refractory heart failure

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**H**eat failure (HF) is a growing health problem in developed countries, and it is the terminal phase for many diseases. The prevalence of this condition in Spain is estimated to reach 6% in people over the age of 40 years old, increasing to 16% in people over 75.<sup>1</sup> HF is also associated with high comorbidities. This condition has been calculated to cause over 80,000 hospitalisations per year in our country, and it is the primary cause of hospitalisations in patients over 65 years old and responsible for 5% of all hospital admissions.<sup>2</sup> Lastly, HF is associated with high mortality rates. It is considered to be the third highest cause of cardiovascular deaths, behind ischemic heart disease and heart attacks.<sup>3</sup>

HF is a progressive condition and can become lethal, even in patients that receive good treatment. The condition is characterised by a vicious circle which magnifies the symptoms of the condition and makes them continue indefinitely. The sympathetic neurohumoral and renin-angiotensin-aldosterone systems are activated as a consequence of renal hypoperfusion due to reduced cardiac output in patients with HF. This leads to renal vasoconstriction and an increase in water and sodium reabsorption in the proximal tubule. As such, it reduces the amount of water and sodium in the distal tubule, which diminishes the ability of the kidney to stimulate diuresis of the atrial natriuretic peptide and increases sensitivity to aldosterone.<sup>4</sup> This mechanism explains the resistance to the action of diuretics that occurs in patients with advanced HF. Consequently, the accumulation of water worsens HF and reduces cardiac output due to an increase in diastolic volume of the right ventricle.

Given this volume overload, any action taken to diminish overhydration will be beneficial for the patient. Some of the possible advantages are improved cardiac output (as a result of the Frank-Starling mechanism), as well as an increase in left ventricle and respiratory capacity.<sup>5</sup>

In a recent review by Montejo et al.,<sup>6</sup> they presented the various therapies available for the treatment of this severe disease: pharmacological treatment, ultrafiltration using an extracorporeal blood circuit and peritoneal dialysis (PD). Almost at the same time, our group published our work with chronic diuretic treatment of patients with refractory HF using peritoneal dialysis.<sup>7</sup> This study included a large number of patients, the most numerous from the “icodextrin era.” Some important considerations to be taken into account for this study are the following:

## FUNCTIONAL CLASS IMPROVEMENT

With the use of PD, all patients experienced a functional improvement, as evaluated using the New York Heart Association scale (NYHA); 65% of cases experienced a reduction of 2 levels, and the rest improved by one level. This improvement was produced without significant changes in the ejection fraction of the left ventricle (as measured by echocardiography), although there was a major decrease in systolic pressure in the pulmonary artery. No changes were observed in haematocrit or in kidney function.

## AFTER HOSPITALIZATION

One of the most salient aspects of patients in advanced stages of HF is the need for frequent hospitalizations, occasionally in intensive care units. The large majority of them are due to fluid overload, and only 5% of cases are due to reduced cardiac output.<sup>8</sup> The use of PD in diuretic treatment of patients with refractory HF results in a very

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marked decrease in hospitalization rates, which are reduced from 62 to 11 days/patient/year.

## MORTALITY

One worrying piece of data for patients with refractory HF is the high mortality observed in this group. We should point out that this study was performed with severely ill patients (Charlson index of 7.1; range: 4–10). Given the presence of both a poor cardiac situation and an elevated comorbidity rate, these patients were not expected to survive more than a year. In patients with refractory HF given conservative treatments (with various diuretic regimes) the published mean survival rate at 6 months is 50%, and at one year is barely above 25%.<sup>9</sup> In light of this bleak panorama, any measures we can take to improve the prognosis of these patients are welcome. The use of PD in our patients improved survival up to 82% at 12 months of treatment and 52% at 2 years. This information is crucially important, given that until now no improvement in survival was observed in studies using other types of treatment for this disease, such as tolvaptan,<sup>10</sup> nesiritide,<sup>11</sup> and extracorporeal ultrafiltration techniques.<sup>12</sup>

## QUALITY OF LIFE

Few studies have evaluated the evolution of quality of life with the various treatments proposed for refractory HF. We evaluated quality of life in our patients using Euroqol 5D and SF-36 questionnaires. The use of PD is associated with an improved health as perceived by the patient ( $0.430 \pm 0.221$  versus  $0.673 \pm 0.093$ ;  $p < 0.01$ ), a result also reflected in the results of the visual analogue scale, which passed from  $4.5 \pm 20.3$  to  $57.8 \pm 25.8$ ;  $p = 0.002$ . With regard to the SF-36 questionnaire, improvement was observed in all fields (reaching statistical significance in all except for general health,  $p = 0.079$ ) and in the two component summaries. The health-related quality of life (HRQOL) survey taken before treatment was much lower than scores obtained from the general public (scores under 45), but reached values similar to those of the general populace after 6 months of treatment (scores over 45), except for in the field of general health. The prevalence of depression as defined by a mental summary score at or below 42 reached 73% before using this technique and was reduced to only 9% after just 6 months on this type of ultrafiltration. With regard to the effect size of the treatment, almost all of the SF-36 categories and values from the EQ-5D were greatly affected, except for the categories of general health, mental health, and the mental summary component, which were moderately affected; this all indicates a very relevant significance derived from this therapeutic method.

## COST-EFFECTIVENESS STUDIES

The sum of the costs borne by the patient in PD programs reaches €16,440, which is lower than the cost of supporting a conservative diuretic treatment (€27,551;  $p = 0.095$ ). Taking into account all expenditures, the cost of personnel and hospitalizations were lower in the PD group. In contrast, the cost of consumables, lab tests, and imaging tests were lower in the other group. PD was associated with greater usefulness than the conservative treatment (0.673 compared to 0.430;  $p < 0.01$ ) regarding cost utility analysis. If we also take into account the lower cost implied by PD, the cost-utility analysis shows that the PD method has a cost of €23,305/quality-adjusted life year (QALY), whereas the conservative treatment has a cost of €81,053/QALY. Therefore, PD is the dominant strategy in terms of cost-utility, with a difference of €46.237 per QALY in favour of PD.

One limitation that must be taken into account for this study is that the sample size, although it is the largest yet published on the use of icodextrin, is only 17 patients. Performing a study with a larger sample size would provide greater weight to the results obtained and could confirm those produced in our study. Given the reduced number of patients that are treated in this manner at any given hospital, such a study would have to be a multi-centre effort. In our region, the increasing coverage of the results obtained with this type of treatment has motivated a greater number of patients to benefit from it. Currently, 28 patients have passed through our unit, confirming and improving the results so far described (unpublished data), including survival through longer follow-up periods.

Given these results, we consider PD to be an adequate diuretic treatment option for patients with refractory HF, given that it produces functional improvements, reduces hospitalisation rates and mortality, improves quality of life, and all of these results are produced at a reduced cost as compared to conventional treatments. It also provides a comfortable treatment technique for the patient that, in the majority of cases, consists of a single nocturnal exchange of icodextrin. The centres that treat heart failure should offer this treatment method to applicable patients in order to provide them with these benefits at a reduced health cost.

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