Rôle de la Dialyse Péritonéale dans le traitement de l’insuffance cardiaque réfractaire

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AGC Nefrología
Hospital Universitario Central de Asturias, Espagne

Chantilly, 25 avril 2019
1. Ultrafiltration péritonéale
   Pourquoi?
   À qui?
   Comment?
   Quand?

2. Ultrafiltration péritonéale
   Expériences
Heart failure (HF) affects 1% of Spanish population over 40 years, but 16% of those aged over 75 years.  

Cortina, Am J Cardiol, 2001

It accounts for around 80,000 hospital admissions per year and it is the leading cause of hospitalization in people aged over 65 years.  

Instituto Nacional de Estadística, 2019

It is the third most common cause of mortality, responsible for 4% of deaths in men and 8% in women in 2010.  

Rodríguez-Artaejo, Rev Esp Cardiol, 2004

Hospitalization rate has increased by 50% between 2001 and 2010 in Spain  

Ministerio de Sanidad. Conjunto Mínimo Básico de Datos (CMBD)  
http://icmbd.mspsi.es /icmbd
In France

- Prevalence: 1,130,000 people
  1.8% French population
- Hospital admissions: 200,000 annually
- Deaths: 70,000 annually

Société Française de Cardiologie, 2017
93% of hospitalized patients have fluid retention

42% of them are discharged without weight loss or even gain

25% of patients readmitted develop resistance to diuretics  
ADHERE, Am Heart J, 2005

Less than 10% of patients diagnosed of stable chronic heart failure have a GFR > 90 ml/min, and many of them have CKD stages 2 or 3  
De Silva, Eur Heart J, 2006

The association HF + CKD increases mortality  
Smith, J Am Coll Cardiol, 2006
Reduced cardiac output

Volume overload

Resist. ANP

↑ sensitivity aldosterone

↓ distal sodium and water delivery

RAAS, sympathetic activation

Decreased renal perfusion

Renal vasoconstriction

↑ prox tubule sodium and water reabsorption
# Pourquoi?

## Cardiorenal syndrome

<table>
<thead>
<tr>
<th></th>
<th>Chronic</th>
<th>Acute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiorenal</strong></td>
<td><img src="image" alt="Type II CRS" /></td>
<td><img src="image" alt="Type I CRS" /></td>
</tr>
<tr>
<td><strong>Renocardiac</strong></td>
<td><img src="image" alt="Type IV CRS" /></td>
<td><img src="image" alt="Type III CRS" /></td>
</tr>
</tbody>
</table>

*Source: House, AJKD, 2010*
Venous congestion acts as an independent and fundamental hemodynamic and inflammatory stimulus for the development and progression of acute descompensated HF:

- Venous endothelial activation in response to stretching associated with venous congestion:
  - TNFα
  - Endotelin 1
  - IL-6
  - Angiotensin II

Colombo, Rev Esp Cardiol, 2010
Pourquoi?

- Kidney
  reduces organ perfusion and increases Na retention
  reduce renal sodium excretion (TNFα)

- Heart
  subendocardial ischemia
  left ventricular remodelling
  impairment of cardiac venous drainage from
  coronary veins
  lower threshold for arrhythmias
  decrease in cardiac output

Colombo, Rev Esp Cardiol, 2010
Heart Failure

Mariell Jessup, M.D., and Susan Brozena, M.D.

2003
Mechanisms of refractoriness:
- intestinal edema lowers diuretic absorption
- reduced renal perfusion
- RAAS, sympathetic activation
- noncompliance with diet

13% of patients become refractory to diuretics. These patients consume 50% of heart failure care costs based on their hospitalization rates (4xICU).

Muntwyler, Eur Heart J, 2002

One-year survival is around 25%.

Jessup, NEJM, 2003
## Recommendations regarding renal replacement therapy in patients with acute heart failure

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrafiltration may be considered for patients with refractory congestion, who failed to respond to diuretic-based strategies.</td>
<td>IIB</td>
<td>B</td>
<td>578–580</td>
</tr>
<tr>
<td>Renal replacement therapy should be considered in patients with refractory volume overload and acute kidney injury.</td>
<td>IIA</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

*Class of recommendation.

*Level of evidence.

*Reference(s) supporting recommendations.
Ultrafiltration Versus Intravenous Diuretics for Patients Hospitalized for Acute Decompensated Heart Failure
Maria Rosa Costanzo J Am Coll Cardiol, 2007; 49:675-683
Decrease pulmonary and peripheral edema

Improvement of pulmonary function

↓ pulmonary artery systolic pressure (PASP)

Redirection of neurohumoral systems to a more physiological situation, in which diuretics again become effective

Promotes elimination of proinflammatory cytokines
# Circuit extracorporeal

<table>
<thead>
<tr>
<th>Study design and protocol</th>
<th>IU features</th>
<th>Creatinine before IU (mg/dL)</th>
<th>Creatinine after IU (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bart et al, 2005[^55]</td>
<td>• RCT, IU as an adjunct to diuretic therapy</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>• Single, early 8-hour IU + usual care (diuretic therapy) vs usual care alone</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Additional IU allowed only after 24 h from enrollment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costanza et al, 2005[^34]</td>
<td>• Case series</td>
<td>2.12</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>• 19 patients with diuretic-resistant ADHF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Single IU session per patient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liang et al, 2006[^37]</td>
<td>• Case series</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>• 11 patients with ADHF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IU number at the discretion of the attending physicians (1-5 IU per patient)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dohle et al, 2006[^38]</td>
<td>• Case series</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>• 19 patients with ADHF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IU discontinued at the discretion of the attending physicians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costanza et al, 2007[^42]</td>
<td>• RCT, multicenter</td>
<td>1.5</td>
<td>Trend to creatinine increase in the IU group</td>
</tr>
<tr>
<td></td>
<td>• 200 patients with ADHF (100 on IU and 100 on diuretic therapy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IU within the first 24 h of admission</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IU duration and rate at the discretion of the attending physicians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jaski et al, 2008[^39]</td>
<td>• Case series</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>• 100 overloaded patients with CHF</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• One or more IU per patient (mean 2.1 ± 1.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rogers et al, 2008[^46]</td>
<td>• RCT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Single IU within 24 h from admission</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• 19 patients with ADHF (10 on IU and 9 on diuretic therapy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Urine output, GFR (by iothalamate), and RBF (by para-aminohippurate)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[^33]: GFR 37 mL/min. GFR decreased by 3.4 and 3.6 mL/min in IU and diuretic therapy, respectively.
200 patients
- hospitalized for decompensated HF
- were randomized to ultrafiltration or intravenous diuretics

the ultrafiltration group (at 90 days):
- greater net fluid loss
- greater weight loss
- had fewer patients rehospitalized for HF
- no differences in renal function or mortality
188 patients
- hospitalized for decompensated HF
- were randomized to ultrafiltration or intravenous diuretics
- end-point: change from baseline in the serum creatinine level and body weight, assessed at 96 h (after random)

Patients in the ultrafiltration group (followed for 60 days):
- worse evolution of renal function at 96 h and 60 days; more of them needed renal replacement therapies
- no significant difference in weight loss
- a higher percentage of patients had a serious adverse events
Reconsidering Ultrafiltration in the Acute Cardiorenal Syndrome

W.H. Wilson Tang, M.D.

In this well-designed and well-executed study, ultrafiltration did not result in greater weight loss or improved renal function as compared with pharmacologic therapy and was associated with a similar rate of death or rehospitalization for acute decompensated heart failure. The use of an elaborate drug algorithm inducing azotemia. It is important to remember that the ultimate goal is to relieve congestion safely and not to show how promptly the excess volume can be removed. Therefore, future studies... perhaps slow and steady may ultimately win the race after all.
Why did it happen:

- Fluid removal from intravascular compartment in a situation of heart failure promotes hypotension and tachycardia (poor hemodynamic tolerance)
- ↑ synthesis of vasodilator molecules (NO)
- ↓ synthesis of ADH
- possible complement activation by hemodialysis membranes
- arrhythmias
And also:

- Vascular access (complications)
- Risks of heparinization
- The need for adequate infrastructure and staff
- Trips from home to hospital
In acute heart failure, in addition of any degree of renal failure: extracorporeal ultrafiltration

In chronic heart failure: peritoneal ultrafiltration
PUF should be proposed to:

- HF stage D (refractory HF despite optimized treatment, as rated by the ACC/AHA)

- congestion symptoms at rest or during basic activities of daily living, even when close to the euvolemia; NYHA 3-4

- frequent visits to hospitals for intravenous diuretic or vasoactive drugs

- some degree of impairment in renal function

- no contraindication for ultrafiltration or PD
Peritoneal ultrafiltration schedules:

<table>
<thead>
<tr>
<th>Modality</th>
<th>Nº exchanges</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPD</td>
<td>1 daily</td>
<td>Dextrose/Icodextrin</td>
</tr>
<tr>
<td>CAPD</td>
<td>2-3 daily</td>
<td>Dextrose/Icodextrin</td>
</tr>
<tr>
<td>APD</td>
<td>3-4 weekly</td>
<td>Dextrose/Icodextrin</td>
</tr>
</tbody>
</table>
Comment?

Simulated UF profiles

Graph adapted from the combination of the following publications:
Icodextrin

- colloid osmotic agent (glucose polymer of a molecular weight of 17,000 Da), derived from maltodextrin

- only absorbed by lymphatics

- maintain UF in long dwell exchanges without the inconvenience of glucose

- causes UF through small pores without significant sieving of sodium

- suitable for long-term daily exchange, which is very useful for treating patients with refractory heart failure to diuretics
Follow-up:

- cardiologist / nephrologist

- every 3 months:
  - physical examination, bioimpedance
  - laboratory (including CRP, BNP, TSH, PTH, 25D...)

- every 6/12 months: (optional)
  - EKG
  - Chest x-ray
  - abdominal US
  - echocardiogram
  - 6-MWT
  - Holter ECG, AMBP
  - BCM
  - quality of life test
Quand?
Continuos peritoneal irrigation in the treatment of intractable edema of cardiac origin”.


Tratamiento de la insuficiencia cardiaca refractaria a la terapéutica convencional, mediante diálisis peritoneal.

Alarcón Zurita, Rev Clín Esp 1975
**Table 1**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Patients (n)</th>
<th>Cr at baseline (mL/min)</th>
<th>Symptom improvement (n)</th>
<th>Mean duration of PD (months)</th>
<th>Deaths (n)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robson et al., 1983 (32)</td>
<td>3</td>
<td>1.7</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>CAPD; recurrent peritonitis with termination of treatment in all 3</td>
</tr>
<tr>
<td>Kim et al., 1985 (33)</td>
<td>4</td>
<td>5.8</td>
<td>4</td>
<td>15</td>
<td>1</td>
<td>No decrease in hospitalization</td>
</tr>
<tr>
<td>McKinnie et al., 1985 (34)</td>
<td>1</td>
<td>2.2</td>
<td>1</td>
<td>24</td>
<td>1</td>
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<tr>
<td>Rubin and Ball, 1986 (35)</td>
<td>8</td>
<td>4.8</td>
<td>3</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Konig et al., 1991 (36)</td>
<td>13</td>
<td>2.7</td>
<td>13</td>
<td>9</td>
<td>9</td>
<td>CAPD; demonstrated survival benefit; 4/16 non uremic patients came out of PD, 3 permanently</td>
</tr>
<tr>
<td>Stegmayr et al., 1995 (37)</td>
<td>16</td>
<td>7/16</td>
<td>10.7</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryckelynck et al., 1997 (38)</td>
<td>16</td>
<td>3/16</td>
<td>16</td>
<td>15.6</td>
<td>7</td>
<td>Selected patient after CVVH; required only 1–3 exchanges NIPD</td>
</tr>
<tr>
<td>Tormey et al., 1996 (39)</td>
<td>3/5</td>
<td>ESRD</td>
<td>3</td>
<td>15</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Oritz et al., 2003 (40)</td>
<td>3</td>
<td>2.18</td>
<td>3</td>
<td>11</td>
<td>2</td>
<td>Automated PD 8 h x 3 times weekly; improvement in cardiac work index; survival benefit</td>
</tr>
<tr>
<td>Gotloib et al., 2005 (41)</td>
<td>20</td>
<td>14.8</td>
<td>20</td>
<td>19.8</td>
<td>6</td>
<td>CAPD</td>
</tr>
<tr>
<td>Kagan and Rapoport, 2005 (42)</td>
<td>8</td>
<td>4/8</td>
<td>8</td>
<td>20.3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Cr = creatinine; PD = peritoneal dialysis; ESRD = end-stage renal disease; CVVH = continuous venovenous hemofiltration; NIPD = nightly intermittent peritoneal dialysis; GFR = glomerular filtration rate.
Better preservation of residual renal function

Slow and steady UF

Greater hemodynamic stability

Better clearance of medium-sized molecules

Minor systemic inflammation

No need for vascular access and anticoagulation

Treatment at home

Cheaper than extracorporeal UF

Fincher, Adv Peit Dial, 1989
Efficacy of peritoneal ultrafiltration in the treatment of refractory congestive heart failure: a cohort study

Silvio V. Bertoli, Claudio Musetti, Daniele Ciurlino, Carlo Basile, Emilio Galli, Giovanni Gambaro, Gianmaria Iadarola, Carlo Guastoni, Antonio Carlini, Federica Faschiolo, Maurizio Borzumati, Maurizio Gallieni, and Farina Stefania

PERITONEAL DIALYSIS REDUCES THE NUMBER OF HOSPITALIZATION DAYS IN HEART FAILURE PATIENTS REFRACTORY TO DIURETICS

Peritoneal dialysis and is well tolerated by heart failure patients

Cécile Courivaud, Amir Kazory, Thomas Crépin, Raymond Azar, Catherine Bresson-Vautrin

Can we treat fluid overload with fluid? Role of peritoneal dialysis in management of heart failure

Cécile Courivaud1 and Amir Kazory2*
Efficacy of peritoneal ultrafiltration in the treatment of refractory congestive heart failure

Jose E. Sánchez¹, Teresa Ortega², Carmen Rodríguez¹, Beatriz Díaz-Molina³, Maria Martín³, Carmen García-Cueto³, Pedro Vidau¹, Emilio Gago¹ and Francisco Ortega¹

¹Nephrology Service, ²Health Outcomes Research Unit and ³Cardiology Service, Hospital Universitario Central de Asturias, Oviedo, Spain
Methods

Observational study
14 years: Dic’04 – Dic’18
Follow-up: 23 ± 16 months (6–66)

Study population
85 patients with refractory heart failure
Optimal treatment (drugs and devices)
> 3 months in PD
### Caractéristiques de base du patient

<table>
<thead>
<tr>
<th></th>
<th>patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>85</td>
</tr>
<tr>
<td>Age (years)</td>
<td>69 ± 10</td>
</tr>
<tr>
<td>Sex (%men)</td>
<td>72</td>
</tr>
<tr>
<td>DM (%)</td>
<td>38</td>
</tr>
<tr>
<td>Charlson Index</td>
<td>7,3 ± 1,8</td>
</tr>
</tbody>
</table>
L’étiologie de l’IC

12 heart transplant patients

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valvular</td>
<td>39%</td>
</tr>
<tr>
<td>Ischemic</td>
<td>31%</td>
</tr>
<tr>
<td>Idiop. DM</td>
<td>26%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
</tr>
</tbody>
</table>
Intervention urgente

28 patients: extracorporeal UF

dispnea – ALE
generalized edema
recent increase > 5 Kg weight

8 ± 5 sessions
172 ± 20 minutes
↓ 15,2 ± 3,1 Kg
Le protocole de DP

Initial treatment

- Icodextrin
- CAPD
- APD

1 exchanges
2 exchanges
3 exchanges
Efficacité du traitement

Hydric losses

Residual diuresis

UF

0 500 1000 1500 2000 2500 ml
Diurétiques

<table>
<thead>
<tr>
<th>Furosem.</th>
<th>Spironolact.</th>
<th>Torasem.</th>
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</thead>
<tbody>
<tr>
<td>104</td>
<td>34</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>31</td>
<td>5</td>
</tr>
</tbody>
</table>

mg/day

94 92 47 50 8 7 %

P 0.812
Évolution du poids

weight (Kg)

before 6 m 12 m 18 m 24 m

68 70 72 71 70

NS
### L’échelle de la NYHA: grade fonctionnel

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>No limitation of physical activity</td>
</tr>
<tr>
<td>Class II</td>
<td>Slight limitation of physical activity</td>
</tr>
<tr>
<td>Class III</td>
<td>Marked limitation of physical activity.</td>
</tr>
<tr>
<td>Class IV</td>
<td>Unable to carry out any physical activity without discomfort.</td>
</tr>
</tbody>
</table>
L’échelle de la NYHA: grade fonctionnel

NYHA functional class

$P < 0.001$
L’échelle de la NYHA: grade fonctionnel

improvement (number of degrees)

1

2

3

0 20 40 60 80

4

30

66
Évolution fraction d’éjection

ejection fraction (%)

![Graph showing the change in ejection fraction before and after 12 months. The ejection fraction before is 37%, and after 12 months, it is 39%. The p-value is 0.633.](image)
pulmonary artery systolic pressure (PASP) in mm Hg

Évolution PSAP

before

12 m

48

26

↓ 48%

P 0.008
Changements échocardiographiques

left ventricular telediastolic diameter

(135±47 vs 66±13 mm)

P < 0.001

Improvement in LV remodeling is associated with better survival
Évolution fonction rénale

clearance of creatinine (ml/min)

![Bar chart showing clearance of creatinine over time.](chart.png)

- Before: 39 ml/min
- 6 months: 43 ml/min
- 12 months: 41 ml/min
- 18 months: 40 ml/min
- 24 months: 35 ml/min

P 0.218
L'anémie

hematocrit (

![Chart showing hematocrit levels over time](chart.png)

- Before: 37%
- 6 m: 38%
- 12 m: 40%
- 18 m: 38%
- 24 m: 39%

P 0.717
L’infection péritonéale

peritonitis/patient/year

*PD Unit Registry, 2018

\[ P = 0.010 \]
Le taux d’hospitalisation

hospitalization days/years at risk

P 0.001

↓ 87%
Évolution

Exitus: 66 CV events
2 cancer
1 sepsis

Functional class improvement

85

69

14

2
Mean Survival: 25 months
Qualité de vie

- Euroquol 5D:
  - 5 dimensions, 3 levels each
  - visual analog scale (0-100)

- SF 36 quality of life questionnaire:
  - 36 questions
  - physical and mental component summary
Qualité de vie

Euroquol 5D

perceived health status

visual analog scale

P 0.001

P 0.002
Qualité de vie

SF 36

ES
P
GP

before
after
Qualité de vie

depression
MCS < 43

%

before
after

73
12

P < 0.001
Methods:

- analysis of the first 17 patients
- economic analysis was based on differential costs
- costs:
  - consultations
  - hospitalizations
  - PD technique
- cost-utility result: €/QALYs
## Analyse coût efficience

<table>
<thead>
<tr>
<th></th>
<th>Diu</th>
<th>DP</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost pt/year (€)</strong></td>
<td>11295</td>
<td>11524</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Utility (QALY/year)</strong></td>
<td>0.2127</td>
<td>0.6809</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Cost-utility (€/QALY)</strong></td>
<td>53104</td>
<td>16924</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*If we had done euros/SV would be even greater the difference*
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<td>Follow-up (months)</td>
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<td>DM (%)</td>
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<tr>
<td>Charlson Index</td>
</tr>
<tr>
<td>Functional class</td>
</tr>
<tr>
<td>Modality</td>
</tr>
</tbody>
</table>

“control” group
Autres études

quality of life

physical activity

functional class

hospitalization
Autres études

Original article

Continuous Ambulatory Peritoneal Dialysis and Clinical Outcomes in Patients With Refractory Congestive Heart Failure

Julio Núñez, Miguel González, Gema Miñana, Rafael García-Ramón, Juan Sanchis, Vicent Bodí, Eduardo Núñez, María Jesús Puchades, Patricia Palau, Pilar Merlos, Beatriz Mascarell, and Alfonso Miguel
Peritoneal dialysis relieves clinical symptoms and is well tolerated in patients with refractory heart failure and chronic kidney disease

Michael Koch\textsuperscript{1,2}, Burkhard Haastert\textsuperscript{3}, Matthias Kohnle\textsuperscript{1}, Lars Christian Rump\textsuperscript{2}, Malte Kelm\textsuperscript{3}, Rudolf Trapp\textsuperscript{1}, and Sendogan Aker\textsuperscript{1*}

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<td>Follow-up (months)</td>
</tr>
<tr>
<td>DM (%)</td>
</tr>
<tr>
<td>Renal function (ml/min)</td>
</tr>
<tr>
<td>Functional class</td>
</tr>
<tr>
<td>Modality</td>
</tr>
</tbody>
</table>
### Functional class improvement

**Table 2** Comparison of New York Heart Association (NYHA) stage at the start of peritoneal dialysis and after 6 months, including deaths after 6 months

<table>
<thead>
<tr>
<th>NYHA stage at start</th>
<th>Clinical course after 6 months (%)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 6 missing)</td>
<td>Death</td>
<td>NYHA IV</td>
<td>NYHA III</td>
<td>NYHA II</td>
<td>NYHA I</td>
</tr>
<tr>
<td>Stage III (n = 58; 2 missing)</td>
<td>14 (25.0)</td>
<td>0</td>
<td>3 (5.4)</td>
<td>27 (48.2)</td>
<td>12 (21.4)</td>
</tr>
<tr>
<td>Stage IV (n = 60; 4 missing)</td>
<td>18 (32.1)</td>
<td>0</td>
<td>3 (5.4)</td>
<td>33 (58.9)</td>
<td>2 (3.6)</td>
</tr>
</tbody>
</table>

**Mean Survival:**
- 58% after 1 year
- 31% after 2 years
Autres études

Italian multicentric study: 10 hospitals

<table>
<thead>
<tr>
<th>patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>DM (%)</td>
</tr>
<tr>
<td>Charlson Index</td>
</tr>
<tr>
<td>Functional class</td>
</tr>
<tr>
<td>Modality</td>
</tr>
</tbody>
</table>
Autres études

Functional class

LVEF

2 years

hospitalization

survival
12 elderly CKD patients (stages 3-5) with refractory HF
- 81 ± 6 years
- NYHA 3-4
- sGFR: 11 ± 8 ml/min
- more than 3 admissions the previous year
- follow-up: 26 months (6-62 months)
Inicidal schedule: 3 weekly exchanges (dextrose 1,5%)

Final schedule: 14.6 ± 4.7 weekly exchanges (any)
Use of peritoneal ultrafiltration in the elderly refractory congestive heart failure patients

Çağlar Ruhi · Hüseyin Koçak · Asuman Yavuz

6 patients
- 73 ± 5 years
- NYHA 3 or 4
- a single nocturnal Icodextrin exchange

Results
- There were no hospital admissions (follow-up 6-36 months)
- UF 850 ml with preserved RF
- Functional improvement: 1–2 NYHA classes
- correction of hyponatremia
Retrospective study, 126 patients, 2 hospitals

- 72 ± 11 years
- sGFR: 33 ± 15.1 ml/min/1.73 m
- EF 38% ± 19% (8 – 87%)
Results

- During the first year, patients with a LVEF of 30% or less experienced improvement in cardiac function (30% ± 10% vs 20% ± 6%)
- Reduction in the number of days of hospitalization
- One-year survival rate: 58%
Peritoneal Dialysis in Patients with Refractory Congestive Heart Failure: A Systematic Review

Renhua Lu, María-Jimena Muciño-Bermejo

21 studies: 673 patients

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Studies, n</th>
<th>Studies used, %</th>
<th>Weights used, %</th>
<th>Pre-PD</th>
<th>Post-PD</th>
<th>Δ</th>
<th>p value</th>
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</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>12</td>
<td>57.14</td>
<td>58.89</td>
<td>73.37</td>
<td>69.71</td>
<td>-3.66</td>
<td>0.0006</td>
</tr>
<tr>
<td>Diuretics (mg/day)</td>
<td>5</td>
<td>23.81</td>
<td>25.56</td>
<td>246.28</td>
<td>252.60</td>
<td>6.33</td>
<td>0.7387</td>
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<tr>
<td>GFR (ml/min)</td>
<td>8</td>
<td>38.10</td>
<td>40.56</td>
<td>29.93</td>
<td>24.90</td>
<td>-5.03</td>
<td>0.0118</td>
</tr>
<tr>
<td>GFR, only non-CKD5D (ml/min)</td>
<td>6</td>
<td>20.57</td>
<td>30.56</td>
<td>24.89</td>
<td>21.00</td>
<td>-3.89</td>
<td>0.1065</td>
</tr>
<tr>
<td>LVEF (%)</td>
<td>13</td>
<td>61.90</td>
<td>63.33</td>
<td>34.78</td>
<td>38.86</td>
<td>4.08</td>
<td>0.0013</td>
</tr>
<tr>
<td>NYHA</td>
<td>15</td>
<td>71.43</td>
<td>70.55</td>
<td>3.53</td>
<td>2.17</td>
<td>-1.37</td>
<td>0.0000</td>
</tr>
<tr>
<td>Hospital days/year</td>
<td>14</td>
<td>66.67</td>
<td>67.78</td>
<td>6.30</td>
<td>1.22</td>
<td>-5.08</td>
<td>0.0001</td>
</tr>
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</table>
Can we treat fluid overload with fluid? Role of peritoneal dialysis in management of heart failure

Cécile Courivaud\textsuperscript{1} and Amir Kazory\textsuperscript{2*}

**Conclusion**

Based on the existing data on the role of PD therapy for refractory HF, the biological and clinical ‘plausibility’ of this strategy is now established, and the fact that it is a safe and efficacious method for improving patients’ cardiac function, symptoms, and quality of life is ascertained. As such, PD therapy should be considered for patients in whom other less invasive management strategies have not been successful. Future focus should be on designing...
L’utilisation de l’ultrafiltration péritonéale pour traiter les patients atteints d’IC réfractaire:
(résultats publiées sur 673 sujets au cours des dernières années):

- amélioration clinique et fonctionnelle
- correction de l’hyponatrémie
- amélioration de la qualité de la vie
- diminution des taux d’hospitalisation
- sans effets indésirable lié à la technique
- à moindre coût par rapport aux traitements conventionnels

Messages à emporter
### Messages à emporter

**La survie pourrait augmenter des comparaisons**

<table>
<thead>
<tr>
<th></th>
<th>6m</th>
<th>12m</th>
<th>18m</th>
<th>24m</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50%</td>
<td>26%</td>
<td>100%</td>
<td>85%</td>
<td>87%</td>
</tr>
<tr>
<td></td>
<td>58%</td>
<td>68%</td>
<td>71%</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>58%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources:
- Jessup, NEJM 2003
- Ruhi, Int Urol Nephrol 2012
- Bertoli, PDI 2013
- Sánchez, NDT 2010
- Núñez, Eur J Heart Fail 2012
- Koch, Eur J Heart Fail 2012
- Courivaud, PDI, 2013
Mercie

The silence beach, Principality of Asturias, Spain