Outcomes after Protein-Losing Enteropathy in Univentricular Hearts: a Multicenter Study.


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Protein-Losing Enteropathy after Fontan surgery

**Background**
- **Rare**: between 1 and 10% after Fontan
- **High mortality**: 12 to 54% five years after diagnosis
- **High morbidity**: heavy medication, repeat admissions

**Study objectives**
- Clinical features, hemodynamics, diagnosis and therapeutic strategies
- Efficiency of the different therapeutic strategies
Methods

Study

- Retrospective observational study carried out in sixteen Pediatric Cardiology Centres in France
- 1988 - 2014
Patients' selection

- **Inclusion** of patients diagnosed with **Protein Losing Enteropathy** after a univentricular surgical strategy

- **Serum albumin level < 30 g/l** due to intestinal protein loss
Patients' characteristics

- **Thirty-five** patients (M/F ratio 0.9)
- **Left** dominant ventricle anatomy **51%**
- **Age** at diagnosis: **9.7 y [2.6 – 41.5]**
- **Delay** of **3.7 y [0.3 – 28.4]** between surgery and diagnosis
Univentricular heart palliation

- **Age at surgery**: 5 y [1.3 – 14.4]
- **mPAP > 15 mmHg** before surgery: 38% patients (n=10)
- **Fenestration**: 20% (n=7)

ECC: extracardiac connection; APA: atrio-pulmonary anastomosis; ICC: intracardiac conduit, AVA: atrio-ventricular anastomosis
Diagnosis of Protein Losing Enteropathy

- **Clinical features**: Effusions (93%), diarrhoea (43%), infections (34%)

- **Biology**: Median serum albumin level 20 g/l [9 – 31] (< 25 g/l in 79%)

- **Haemodynamics**:
  - Median CVP: 14 mmHg [7 – 25]
  - CVP > 12 mmHg: 64% (n=16)
  - Ventricular dysfunction: 23% (n=8)

CVP: central venous pressure
**Results**

**Treatments**

**Medical Treatments**
- Dietary measures (n=35, 100%)
- Exclusive parenteral nutrition (n=6, 17%)
- Albumin infusions (n=26, 74%)
- Immunoglobulin infusions (n=16, 46%)
- Sildenafil and/or Bosentan (n=17, 49%)
- Octreotid (n=4, 11%)
- Heparin (n=17, 49%)
- Corticoids (n=15, 43%)
- Exercise training program (n=7, 20%)

**Interventional or Surgical**
- Fenestration (n=4, 11%)
- Stent/balloon dilation or plasty (n=11, 31%)
- Collaterals closure (n=4, 11%)
- RV-PA closure (n=3, 9%)
- Transcatheter Melody® valve (n=2, 6%)
- Arrhythmia ablation (n=1, 3%)
- Conversion (n=1, 11%)
- Diaphragmatic plication (n=2, 6%)

Considered as efficient when serum albumin level > 30 g/l during 3 months in a row

Efficient in 8 patients (47%)

Efficient in 7 patients (47%)

Efficient in 1 patient (n=2)

Efficient in 1 patient (n=3)
Orthotopic Heart Transplantation (OHT)

- 5 patients (14%) with a delay of 7.6 years [2.1 – 21.7] between diagnosis and OHT

- 1 recovery (20%)
- 4 deaths (80%)
  - 1 early and 3 late deaths
- 3 invasive infections (60%)
Outcome according to treatment strategy

Medical Treatment
n=16, 46%
- Recovery in 2 patients
- OHT in 2
- Death in 1

Combined treatment (medical and percutaneous/surgical treatment)
n=19, 54%
- Recovery in 4 patients
- OHT in 3
- Death in 7
Global outcome

35 patients

27 survivors

8 deaths

7 patients with relief of PLE (26 %)
- n=1: OHT
- n=2: medical strategy
- n=4: surgical/percutaneous strategy

20 patients with no improvement (74 %)
- n=4: OHT
- n=4: surgical/percutaneous strategy
Survival probability at 5 and 10 years after diagnosis

- 89.7% CI 95% ± 11.3%
- 68.7% CI 95% ± 22.7%
« Death » or « death or OHT »: risk factors analysis (Cox model)

Patient's characteristics:
- sex \( p=0.862/0.837 \)*
- ventricular morphology \( p=0.830/0.754 \)*

Surgery:
- age \( p=0.979/0.752 \)*
- ventricular dysfunction \( p=0.641/0.551 \)*
- mPAP \( p=0.270/0.397 \)*
- mPAP > 15 mmHg \( p=0.287/0.457 \)*
- mean left atrial pressure \( p=0.779/0.779 \)*
- valvular insufficiency \( p=0.917/0.744 \)*

Results
- type of surgical montage \( p=0.669/0.623 \)*
- fenestration \( p=0.485/0.416 \)*
- hospital stay \( p=0.790/0.920 \)*

Diagnosis of PLE:
- age \( p=0.711/0.937 \)*
- surgery to diagnosis delay \( p=0.693/0.790 \)*
- serum albumin level \( p=0.160/0.234 \)*
- fenestration closure \( p=0.280/0.264 \)*
- ventricular dysfunction \( p=0.574/0.764 \)*
- valvular insufficiency \( p=0.957/0.957 \)*
- CVP \( p=0.694/0.543 \)*
- mPAP \( p=0.869/0.944 \)*
- EDVP \( p=0.676/0.676 \)*

No risk factor identified for « death » nor for « death or OHT »

* 1st result = « death » (n=8) vs « no death » / 2nd result = « death or OHT » (n=9) vs « no death nor OHT »
Conclusion

- **Improvement of survival of PLE**: 89%
  
  46 to 59% 5-years survival *Feldt 1996, Mertens 1998* to 88% *John 2014*

- **Most effective treatment strategy** appears to be corticoids and heparin → synergistic effect?

- **OHT as last therapeutic option** has a guarded prognosis in this study: 80% mortality

  Higher hospital and late mortality rate due to infectious complications

  BUT: 77% of recovery in early survivors. 5-year survival of 46% in PLE group vs 84% in non-PLE group *Michielon (EJCTS 2014)*
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