The Clinical Course of Tuberculous Pericarditis in Immunocompetent Hosts Based on Serial Echocardiography

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BACKGROUND

![Graph showing event-free survival with different etiologies.](image)

- **Idiopathic/Viral Etiology**
- **Specific Etiology**

Log rank $p < 0.001$

**Patients at risk:**
- **Idiopathic/viral:**
  - 416
  - 394
  - 387
  - 380
  - 372
  - 366
  - 354
  - 338
  - 320
  - 298
  - 275
- **Specific etiology:**
  - 84
  - 79
  - 70
  - 54
  - 47
  - 40
  - 32
  - 20
  - 8
  - 8
  - 8

*Indian Heart J 68(2016) 316-324*
Are initially presenting constrictive pericarditis irreversible in tuberculous pericarditis?

The role of corticosteroid for the evolution to constrictive pericarditis in immunocompetent patients with tuberculous pericarditis
AIM OF THIS STUDY

- To investigate clinical course of tuberculous pericarditis
- To analyze the change of echocardiographic parameters for constrictive pericarditis
METHODS

- Retrospective cohort study
  - TTE at baseline, 1, 3 and 6 months follow up

- Study population
  - January 2010 to January 2017
  - Consecutive patients with newly diagnosed tuberculous pericarditis
  - Immunocompetent patients
METHODS

- Diagnostic criteria for tuberculous pericarditis
  - Definite diagnosis
    - Identification of *Mycobacterium tuberculosis* in pericardial fluid or tissue
  - Probable diagnosis
    - Lymphocytic pericardial exudate with elevated adenosine deaminase levels, interferon-gamma
    - Caseous granulomas in the pericardium.
METHODS

- **Data collection**
  - Review of medical records at the time of diagnosis
    - Baseline demographics, comorbidities, date of diagnosis, presenting symptoms and signs, laboratory finding
    - Transthoracic echocardiography at 0, 1, 3 and 6 months
  - Treatment: standard treatment (HREZ 2 + HRE 4)
    - Prolonged treatment (HREZ > 6 months)
    - Corticosteroid
    - Therapeutic drainage (PCC vs surgical)
METHODS

- **Study variables in echocardiography**
  - Effusion vs Effusive constriction vs Constriction
  - The presence of effusion
    - The nature and amount, the presence of tamponade
  - Pericardial thickening
METHODS

- Study variables in echocardiography
  - The presence of constriction
    - Ventricular interdependence during respiration
    - Septal bouncing
    - Respiratory variation of mitral flow and tricuspid flow
    - Expiratory diastolic flow reversal of hepatic vein
    - Dilatation of Inferior vena cava or the presence of plethora
    - Septal and lateral mitral annulus early diastolic velocity
      (septal e’ and lateral e’)


## Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>n=50</th>
<th>n=50</th>
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</thead>
<tbody>
<tr>
<td><strong>Male, n(%)</strong></td>
<td>24 (48.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Age, mean±SD</strong></td>
<td>63.94 ± 14.23</td>
<td></td>
</tr>
<tr>
<td><strong>Body surface area, m², mean±SD</strong></td>
<td>1.64 ± 0.17</td>
<td></td>
</tr>
<tr>
<td><strong>Comorbidities, n(%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>18 (36.0)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>3 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>6 (12.0)</td>
<td></td>
</tr>
<tr>
<td><strong>History of pulmonary tuberculosis, n(%)</strong></td>
<td>7 (14.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Extracardiac tuberculosis, n(%)</strong></td>
<td>14 (28.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Initial symptoms, n(%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyspnea</td>
<td>33 (66.0)</td>
<td></td>
</tr>
<tr>
<td>Chest pain</td>
<td>11 (22.0)</td>
<td></td>
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<tr>
<td>Fever</td>
<td>13 (26.0)</td>
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**Diagnostic criteria**
- Definite tuberculous pericarditis: 10 (20.0)
- Probable tuberculous pericarditis: 40 (80.0)

**Anti-tuberculosis drug, n(%)**
- Standard treatment: 28 (56.0)
- Prolonged treatment: 22 (44.0)
- Adjunctive corticosteroid therapy: 44 (88.0)

**Drainage of pericardial effusion, n(%)**
- Percutaneous pericardiocentesis: 11 (22.0)
- Surgical drainage: 16 (32.0)

*: 6-month four-drug standard treatment of tuberculosis
## Laboratory Test and Initial Echocardiography

<table>
<thead>
<tr>
<th>Test</th>
<th>n=50</th>
<th>Initial Echocardiographic diagnosis, n(%)</th>
<th>n=50</th>
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</thead>
<tbody>
<tr>
<td><strong>WBC</strong> (x10³/μL)</td>
<td>6.43 ± 2.67</td>
<td>Pericardial effusion without complication</td>
<td>28 (58.0)</td>
</tr>
<tr>
<td><strong>RBC</strong> (x10³/μL)</td>
<td>11.78 ± 1.54</td>
<td>Pericardial effusion with tamponade</td>
<td>7 (14.0)</td>
</tr>
<tr>
<td><strong>C-reactive protein, Quantitative (mg/dL)</strong></td>
<td>3.62 (6.62)</td>
<td>Effusive constriction</td>
<td>10 (20.0)</td>
</tr>
<tr>
<td><strong>Troponin I (ng/ml)</strong></td>
<td>0.006 (0.008)</td>
<td>Constriction without effusion</td>
<td>12 (24.0)</td>
</tr>
<tr>
<td><strong>CK-MB (ng/ml)</strong></td>
<td>0.73 (1.42)</td>
<td></td>
<td></td>
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<tr>
<td><strong>NT-proBNP (pg/ml)</strong></td>
<td>344.8 (761.6)</td>
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### Pericardial effusion analysis (n=32)

<table>
<thead>
<tr>
<th>Type</th>
<th>n(%)</th>
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<tbody>
<tr>
<td>Lymphocyte dominant</td>
<td>21 (65.6)</td>
</tr>
<tr>
<td>Adenosine deaminase</td>
<td>71.4 ± 32.8</td>
</tr>
<tr>
<td>INF-γ, n(%)</td>
<td>11 (34.4)</td>
</tr>
</tbody>
</table>

### Amount of pericardial effusion(n=39)

<table>
<thead>
<tr>
<th>Type</th>
<th>n(%)</th>
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<tbody>
<tr>
<td>Scanty</td>
<td>4 (10.3)</td>
</tr>
<tr>
<td>Small</td>
<td>5 (12.8)</td>
</tr>
<tr>
<td>Moderate</td>
<td>11 (28.2)</td>
</tr>
<tr>
<td>Large</td>
<td>19 (48.7)</td>
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</tbody>
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*: mean ± SD  
*: median(IQR)  
\*: pericardial INF-γ was conducted in only 14 patients  
I: interferon
gamma  

Clinical Course of Tuberculosis Pericarditis

Baseline
+(22)

1 month
M(3) - (11) + (8) M(3) - (28)

3 months
-(3) - (11) - (3) M(1) + (4) - (3) M(1) - (19) + (1) - (3) + (1)

6 months
-(3) - (10) + (1) - (3) + (1) - (2) + (2) - (3) - (1) - (19) - (1) - (3) + (1)

+(n): Number of patients with constriction
-(n): Number of patients without constriction
M(n): Missing data
Initial TTE in Effusion
Initial TTE in Effusive Constrictive Pericarditis
Initial TTE in Constrictive Pericarditis

Septal e'

Lateral e'
Echocardiographic Parameters Over Time

- Constriction
- Septal bouncing
- Ventricular interdependence
- HV reversal flow
- Pericardial thickening
- IVC plethora
- Septal e'/lateral e'>1

Proportion

Months

Proportion
The Resolution of Constrictive Pericarditis

Baseline → 1 month → 6 months
The Resolution of Constrictive Pericarditis

Baseline  →  1 month  →  6 months
The Resolution of Constrictive Pericarditis

Baseline → 1 month → 6 months

- Septal e'
- Lateral e'
- Diastolic HV flow reversal
SUMMARY & CONCLUSION

- Even if the CP was already present initially in tuberculous pericarditis, 82% patients fully recovered in immunocompetent hosts.
  - The residual CP occurred in only 10%.

- According to serial echocardiography in constrictive pericarditis.
  - Ventricular interdependence → the earliest parameter of improvement
  - Septal bouncing and pericardial thickening → remained at the latest

- Physicians should consider more active steroid therapy and expects to resolve of CP, although there is CP in the first diagnostic TTE.