

# Misconceptions and Facts about Pericardial Effusion and Tamponade

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## ABSTRACT

Several common misconceptions can make the clinical diagnosis of subacute pericardial tamponade challenging. Widely known physical findings of pericardial tamponade lack sensitivity and specificity. Interpretation of echocardiographic signs requires good understanding of pathophysiology. Over-reliance on echocardiography may result in over-utilization of pericardial drainage procedures. Awareness of these misconceptions with an integrative approach to both clinical and imaging data will help clinicians to assess the hemodynamic impact of pericardial effusion and the need for drainage.

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## MISCONCEPTION #1: PATIENTS WITH PERICARDIAL TAMPONADE ARE HYPOTENSIVE

### Facts

This statement is true for acute (surgical) pericardial tamponade, for example, a wall perforation during a percutaneous cardiac procedure. However, hypotension is rather uncommon in patients with subacute (medical) tamponade who accumulate pericardial effusion within days to weeks.<sup>1-3</sup>

To the contrary, many patients with subacute pericardial tamponade are actually hypertensive on admission. In studies of pericardial tamponade, the mean systolic blood pressure ranged from 127 mm Hg to 144 mm Hg.<sup>3,4</sup> According to a recent review, hypertensive tamponade is seen in 27% to 43% of patients.<sup>4</sup> Tamponade and hypertension are more likely to be associated with advanced renal disease and pre-existing hypertension and less likely with systemic malignancy.<sup>4</sup> Hypertensive pericardial tamponade

probably results from activation of the sympathetic nervous system and high levels of circulating catecholamines in response to hemodynamic stress.<sup>5</sup> Systolic blood pressure commonly decreases in these patients after pericardial effusion drainage, and treating the hypertensive response without draining the effusion can be dangerous.<sup>4,6</sup>

## MISCONCEPTION #2: PERICARDIAL TAMPONADE IS A CLINICAL DIAGNOSIS

### Facts

Although it is often taught that pericardial tamponade is a "clinical diagnosis," the existing evidence suggests that it is a difficult diagnosis to make on mere clinical grounds. Dyspnea is the most common symptom of subacute pericardial tamponade, but it is very nonspecific.<sup>1</sup> Other clinical findings of pericardial tamponade such as tachycardia, jugular venous distention, pulsus paradoxus, and diminished heart sounds lack both sensitivity and specificity.<sup>1</sup> Tachycardia is common in hospitalized patients for many reasons and it could be blunted by medications such as beta-blockers. In a systematic review, the jugular venous distention had a pooled sensitivity of 76%.<sup>1</sup> Assessment of jugular venous distention is limited by the experience of the observer; it could be difficult in some patients, even for experienced clinicians.<sup>7,8</sup> Besides, jugular venous distention may be associated with other etiologies such as pulmonary hypertension and congestive heart failure. While

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pulsus paradoxus is considered to be the cornerstone of the clinical diagnosis of pericardial tamponade, a wide variation in the incidence of pulsus paradoxus has been reported in these patients, ranging from 12% to 75%.<sup>9</sup> According to one study, approximately 20% of tamponade patients had “low-pressure” cardiac tamponade defined as low intrapericardial pressure and low postdrainage right atrial pressure.<sup>10</sup> In “low-pressure” tamponade patients, the incidence of jugular venous distention was 22% and pulsus paradoxus was reported in only 7% of patients.<sup>10</sup>

### **MISCONCEPTION #3: PULSUS PARADOXUS DENOTES A PARADOXICAL DECREASE IN BLOOD PRESSURE WITH INSPIRATION**

#### **Facts**

Pulsus paradoxus (the term introduced by Kussmaul in 1878)<sup>11</sup> is not a “paradoxical” phenomenon but an exaggeration of the physiologic decrease in systolic arterial pressure with inspiration. Under normal conditions, the decrease in blood pressure is < 10 mm Hg, and it is explained by phasic variation in the filling of the right- and left-sided cardiac chambers related to intrathoracic pressure changes with respiration. With tamponade, the accumulating pericardial effusion restricts cardiac filling and makes the respiratory variation in the right and left ventricular filling more pronounced and interdependent.<sup>12</sup> Of note, pulsus paradoxus is measured by manual sphygmomanometer as the difference between intermittent and persistent Korotkoff sounds during normal respiration, not with deep breathing!<sup>13</sup> Besides limited sensitivity for pericardial tamponade, pulsus paradoxus is not very specific. A myriad of conditions have been reported to be associated with pulsus paradoxus; a short list includes asthma, right ventricular infarction, severe hypovolemia, constrictive pericarditis, restrictive cardiomyopathy, pneumothorax, chronic obstructive lung disease, and pulmonary embolism. Some of these conditions also can cause jugular venous distention and tachycardia, common associated findings of pericardial tamponade.

### **MISCONCEPTION #4: THE ECHOCARDIOGRAM IS VIRTUALLY DIAGNOSTIC FOR CARDIAC TAMPONADE**

#### **Facts**

Echocardiogram is a very important diagnostic tool for pericardial tamponade, but it is not free of pitfalls.

Echocardiogram allows for diagnosing the presence of effusion, reporting the size of the effusion, and assessing its hemodynamic significance. Chamber collapse (usually right atrium and right ventricle) documented by echocardiography indicates that the intrapericardial pressure transiently exceeds intracardiac pressure.<sup>14</sup> Right ventricular collapse is more specific but less sensitive for pericardial tamponade compared with right atrial collapse.<sup>14</sup> Although theoretically a very attractive concept, the interpretation should be made with caution. Transient buckling of the right atrium is commonly seen in patients with pericardial effusion and it is not specific.<sup>15</sup> A more sustained collapse of the right atrium lasting at least one third of the cardiac cycle appears to be more specific.<sup>15</sup> More importantly, a study by Merce et al showed that 34% of patients with pericardial effusion but without clinical features of pericardial tamponade have at least one chamber collapse on echocardiography.<sup>16</sup> Therefore, in patients with pericardial effusion who have chamber collapse, one should carefully document respiratory flow variation across valves as a sign of ventricular interdependence. Moreover, inferior vena cava size and collapsibility should be documented as a sign of increased right-sided filling pressures. These echocardiographic signs, when present, increase the specificity of diagnosis.<sup>17</sup> In contrast, there is a list of conditions that decrease the accuracy of echocardiographic assessment such as elevated end-diastolic pressures, atrial septal defects, etc.<sup>13</sup> Finally, the size of pericardial effusion seems to be an important but frequently underappreciated part of the echocardiographic assessment. In one study of hospitalized patients with pericardial effusion, the size of the effusion was the only independent predictor of adverse in-hospital outcomes in a multivariate model, but not chamber collapse or inferior vena cava plethora.<sup>18</sup>

The diagnosis may be particularly difficult in patients with pulmonary hypertension and right ventricular failure because they commonly accumulate pericardial effusion.<sup>19</sup> Pericardial effusion in these patients is a marker of adverse outcomes.<sup>20,21</sup> Common clinical findings of pericardial tamponade such as tachycardia and jugular venous distention may not be helpful in differential diagnosis for shortness of breath and progressive right-sided heart failure. Collapse of the left-sided cardiac chambers has been described as an important clue to the presence of cardiac tamponade in these settings.<sup>22,23</sup> Conversely, the typical echocardiographic findings of tamponade such as right atrial and ventricular collapse can be masked by elevated right-sided filling pressures,<sup>12</sup> and a poor outcome has been reported with routine draining of pericardial effusion in these patients.<sup>24</sup>

### **CLINICAL SIGNIFICANCE**

- Subacute pericardial tamponade is a difficult diagnosis to make on mere clinical grounds because widely known signs of pericardial tamponade lack sensitivity and specificity.
- More than one third of patients with pericardial effusion without clinical features of pericardial tamponade have at least one chamber collapse on echocardiography.
- Integrative approach with careful consideration of both clinical and imaging data can help to assess the hemodynamic impact of the pericardial effusion and the need for drainage.

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