

# Cardiac Tamponade: Emergency Management

Subject:	Emergency management of cardiac tamponade
Policy Number	N/A
Ratified By:	Clinical Guidelines Committee
Date Ratified:	December 2015
Version:	1.0
Policy Executive Owner:	Clinical Director, Medicine, Frailty and Networked Service ICSU
Designation of Author:	Consultant Cardiologist
Name of Assurance Committee:	As above
Date Issued:	December 2015
Review Date:	3 years hence
Target Audience:	Emergency Department, Medicine, Surgery
Key Words:	Cardiac Tamponade, Pericardiocentesis

## Version Control Sheet

Version	Date	Author	Status	Comment
1.0	Dec 2015	Dr David Brull (Consultant)  Dr Akish Luintel (Cardiology Registrar)	Live	New guideline.  Rationale: This guideline has been written as part of the coordinated response to a recent serious incident.  This guideline is based on current best practice utilising our links to the Barts Heart Centre where all our Tertiary Cardiology is sent

➤ **Clinical signs of Tamponade – Management algorithm**

**Clinical Signs of Tamponade**

1. Tachycardia, tachypnoea
2. Raised JVP, Hypotension & quiet heart sounds (Beck's Triad)
3. Pulsus Paradoxus
4. Kussmaul's Sign
5. Hepatomegaly
6. Pericardial rub

**Medical Emergency: Organise URGENT Echo  
Bleep Cardiology on 3038/3096 in hours**

**Out of hours Call Bart's Heart Centre:**

<b>Barts Heart Electrophysiology SpR</b>	<b>07810 878 450</b>
<b>Cardiology SpR Interventional</b>	<b>07833 237 316</b>
<b>Bart's Heart Switchboard</b>	<b>0207 377 7000</b>

**Management of Tamponade**

(Monitor in Intensive Care or Coronary Care)

**Transfer to Barts for Emergency Pericardiocentesis**

Treat on-site if patient peri-arrest

**Supportive Management** (as required)

**Do not delay pericardiocentesis**

Volume expansion

Oxygen

Inotropes

Positive pressure ventilation should be avoided

## ➤ Criteria for use

This is a guideline for the emergency management of patients presenting with cardiac tamponade.

## ➤ Background/ introduction

Cardiac tamponade is a clinical syndrome caused by the accumulation of fluid in the pericardial space, resulting in reduced ventricular filling and subsequent haemodynamic compromise. The **condition is a medical emergency**, the complications of which include pulmonary oedema, shock, and death.

**Once a clinical diagnosis of tamponade is suspected patients require urgent echocardiography then senior Cardiology review in order to assess the need for emergency pericardiocentesis.**

**Patients with suspected tamponade should undergo echocardiography without delay.**

**Within normal working hours please call the Whittington Cardiology Team for urgent advice (bleep 3096 or bleep 3038)**

**After hours support is provided at the Barts Heart Centre contact tel:**

**On-call Interventional SpR 07833 237 316**

**On-call Barts Heart Electrophysiology SpR 07810 878 450**

## ➤ Diagnosis

Although echocardiography provides useful information, cardiac tamponade is a clinical diagnosis. **Prompt diagnosis is key to reducing the mortality risk in patients with tamponade.**

Symptoms vary depending on the acuteness of presentation and on the underlying cause. Patients with acute tamponade present with dyspnoea, tachycardia and tachypnea. Cold and clammy extremities due to hypoperfusion are common.

Comprehensive review of a patient's history helps identify the probable aetiology. The following may be noted:

- **Patients with systemic or malignant disease** present with weight loss, fatigue, or anorexia
- Chest pain may be the presenting symptom in patients with **pericarditis or myocardial infarction**

- Musculoskeletal pain or fever may be present in patients with **connective tissue disease**
- A history of **renal failure** can lead to uremia as the cause of pericardial effusion
- Careful review of a patient's medications may indicate **drug-related lupus**
- **Recent cardiovascular surgery, coronary intervention, or trauma** can lead to the rapid accumulation of pericardial fluid and tamponade
- **Recent pacemaker lead implantation or central venous catheter insertion** can lead to the rapid accumulation of pericardial fluid and tamponade
- Consider **HIV-related** pericardial effusion and tamponade if the patient has a history of intravenous (IV) drug abuse or opportunistic infections
- Enquire about **chest wall radiation** - ie for lung, mediastinal, or oesophageal cancer
- Enquire about symptoms of night sweats, fever and weight loss, suggestive of **tuberculosis**

## ➤ Clinical management

### Physical Examination

The clinical features associated with tamponade are highly variable based on the speed of onset and on the underlying cause. The presence of **Beck's triad, pulsus paradoxus or Kussmaul's sign** (described below) are highly suggestive of tamponade.

Tachycardia, tachypnoea, and hepatomegaly are observed in more than 50% of patients. Diminished heart sounds and a pericardial friction rub are present in approximately 30%. Some patients may present with dizziness, drowsiness, or palpitations. Cold, clammy skin and a low volume pulse due to hypotension are also observed in many patients.

### Beck's triad

Beck's Triad is a complex of physical findings: **raised jugular venous pressure (JVP), hypotension, and quiet heart sounds** due to a rapid accumulation of pericardial fluid.

### Pulsus paradoxus

Pulsus paradoxus is an exaggeration >12 mm Hg of the normal inspiratory decrease in systemic blood pressure.

To measure pulsus paradoxus, patients lie semi-recumbent breathing quietly. A blood pressure cuff is inflated > 20mm Hg above systolic pressure and deflated until the first Korotkoff sound is heard only during expiration.

At this pressure reading, if the cuff is not further deflated and a pulsus paradoxus is present, the first Korotkoff sound is not audible during inspiration. As the cuff is further deflated, the point at which the first Korotkoff sound is audible during both inspiration and expiration is recorded. If the difference between the first and second measurement is greater than 12 mm Hg, an abnormal pulsus paradoxus is present.

The paradox is that while listening to the heart sounds during inspiration, the pulse weakens or may not be palpated with certain heartbeats, while S<sub>1</sub> is heard with all heartbeats.

### **Kussmaul's sign**

Described as a paradoxical increase in venous distention and pressure during inspiration. Kussmaul's sign is usually observed in patients with constrictive pericarditis, but it is observed in tamponade.

### **Pulse Oximetry**

Respiratory variability in pulse-oximetry waveform is noted in patients with pulsus paradoxus. This finding should raise the suspicion of haemodynamic compromise. This is particularly useful aiding diagnosis for patients in atrial fibrillation.

**The physical signs of pulsus paradoxus and Kussmaul's sign may be easier to interpret in patients with intra-arterial lines, central venous pressure monitoring and pulse oximetry.**

### **Echocardiographic features of tamponade**

- An echo-free space around left ventricle and behind the left atrium
- Early diastolic collapse of the right ventricular free wall
- Late diastolic compression/collapse of the right atrium
- Swinging of the heart within the pericardium
- Inferior vena cava dilatation with minimal or no collapse during inspiration
- A greater than 40% relative inspiratory augmentation of right-side flow
- A greater than 25% relative decrease in inspiratory flow across the mitral valve

### **Further Investigation**

Although tamponade is a clinical diagnosis, further assessment of the patient's condition and diagnosis of the underlying cause of tamponade can be obtained through blood tests and imaging. The following aid in the assessment of patients with cardiac tamponade:

- **Troponin T:** levels are elevated in acute coronary syndrome, myocarditis and cardiac trauma
- **Renal profile and blood count:** useful in the diagnosis of uraemia and infectious diseases associated with pericarditis
- **Coagulation:** prothrombin time and activated partial thromboplastin time are useful for determining bleeding risk during interventions, such as pericardial drainage
- **Antinuclear antibodies, Erythrocyte sedimentation rate (ESR), rheumatoid factor**
- **HIV testing**
- **Group and Save**

## **Electrocardiography (ECG)**

A number of features may be present on ECG in tamponade:

- Sinus tachycardia
- Low-voltage QRS complexes
- Electrical alternans
- PR segment depression

Electrical alternans is the alternation of QRS complexes, usually in a 2:1 ratio on ECG caused by movement of the heart in the pericardial space. This may also be observed in patients with acute coronary syndrome, pulmonary embolism, and tachyarrhythmia.

## **Important Considerations**

Tamponade is a medical emergency. Patients require monitoring in Coronary Care or ITU.

### **Consider supportive therapy in all patients:**

- Oxygen (to maintain normal O<sub>2</sub> saturations)
- Volume expansion to help maintain blood pressure (via large bore IV access)
- Inotropic drugs (eg Dobutamine can be useful because they increase cardiac output without increasing systemic vascular resistance)

Positive-pressure mechanical ventilation is best avoided because it may decrease venous return and aggravate symptoms of tamponade.

## **Treatment: Pericardiocentesis**

**Once a diagnosis of tamponade is made patients may need emergency pericardiocentesis.**

**Within normal working hours please call the Whittington Cardiology Team (Bleep 3096 or bleep 3038)**

**After hours cover is provided at the Barts Heart Centre contact tel:**

**On-call Interventional SpR 07833 237 316**

**On-call Barts Heart Electrophysiology SpR 07810 878 450**

Removal of pericardial fluid is the definitive therapy for tamponade. This is a life-saving bedside procedure usually performed under echo guidance. Pericardiocentesis should only be performed by trained staff unless the patient is in pulseless electrical activity (PEA) cardiac arrest.

The subxiphoid approach is extrapleural and is safest for blind pericardiocentesis. A 16- or 18-gauge needle is inserted at an angle of 30-45° to the skin, near the left xiphoid angle, aiming towards the left shoulder.

When performed as an emergency, this procedure is associated with a reported mortality rate of approximately up to 5% and a complication rate of up to 15%.

## ➤ **References**

Maisch B, Seferović PM, Ristić AD, Erbel R, Rienmüller R, Adler Y, et al. Guidelines on the Diagnosis and Management of Pericardial Diseases Executive Summary. *European Heart Journal*. 2004;25(7):587-610.

*European Heart Journal* Apr 2004, 25 (7) 587-610; DOI: 10.1016/j.ehj.2004.02.002 On behalf of the European society of cardiology

Spodick DH. Acute cardiac tamponade. *N Engl J Med* 2003; 349:684.

## ➤ **Compliance monitoring**

As part of the SI monitoring process.

## Appendix A

### Plan for Dissemination and implementation plan of new Procedural Documents

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

Acknowledgement: University Hospitals of Leicester NHS Trust

<b>Title of document:</b>	<b>Emergency Management of Cardiac Tamponade</b>		
<b>Date finalised:</b>	<b>December 2015</b>	<b>Dissemination lead: Print name and contact details</b>	<b>Dr D Brull (via Cencom)</b>
<b>Previous document already being used?</b>	<b>No</b> (Please delete as appropriate)		
<b>If yes, in what format and where?</b>			
<b>Proposed action to retrieve out-of-date copies of the document:</b>			
<b>To be disseminated to:</b>	<b>How will it be disseminated/implemen ted, who will do it and when?</b>	<b>Paper or Electronic</b>	<b>Comments</b>
<b>All staff</b>	<b>Via intranet uploading</b>	<b>E</b>	
<b>Is a training programme required?</b>	<b>No</b>		
<b>Who is responsible for the training programme?</b>	<b>N/A</b>		

## Appendix B

### Equality Impact Assessment Tool

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

<b>Impact (= relevance)</b> 1 Low 2 Medium 3 High	<b>Evidence for impact assessment (monitoring, statistics, consultation, research, etc)</b>	<b>Evidential gaps (what info do you need but don't have)</b>	<b>Action to take to fill evidential gap</b>	<b>Other issues</b>
<b>Race</b>	1			
<b>Disability</b>	1			
<b>Gender</b>	1			
<b>Age</b>	1			
<b>Sexual Orientation</b>	1			
<b>Religion and belief</b>	1			

Once the initial screening has been completed, a full assessment is only required if:

- The impact is potentially discriminatory under equality or anti-discrimination legislation
- Any of the key equality groups are identified as being potentially disadvantaged or negatively impacted by the policy or service
- The impact is assessed to be of high significance.

If you have identified a potential discriminatory impact of this procedural document, please refer it to relevant Head of Department, together with any suggestions as to the action required to avoid/reduce this impact.