Network Guideline for Resuscitative Thoracotomy (Adults and Paediatrics)

This Guideline is in accordance with the National Trauma Peer Review Measures - ODN T14-1C-111  TU T14-2B-310  Adult MTC T14-2B-116  Paediatric MTC T14-2B-214
**Purpose of Document**

It is possible to have a successful outcome from cardiac arrest following penetrating trauma to the chest if the patient has a cardiac tamponade and a definitive procedure carried out quickly i.e within 10 minutes of loss of cardiac output. This guideline is to be used for the Emergency Department management of all patients in the South Yorkshire Major Trauma Operational Delivery Network with penetrating wounds to chest or adjacent areas that meet these criteria. This includes the adult and paediatric Major Trauma Centres (MTCs) and all the constituent Trauma Units (TUs).

**Required Action**

All relevant staff should ensure they are fully aware of, and operate in line with the up-to-date policy. Service Clinical Leads should ensure their MDTs are familiar with the policy and act in accordance.

**Action Required by/Audience**

- Sheffield Children’s NHSFT Paediatric MTC Trauma Lead
- Sheffield Teaching Hospitals NHFT Adult MTC Trauma Lead
- TU Trauma Leads (Barnsley, Chesterfield, Doncaster, Rotherham)
- MTC and TU Emergency Department Staff (Barnsley, Chesterfield, Doncaster, Rotherham, Northern General, Sheffield Children’s)
- South Yorkshire Clinical Audit and Advisory Group Members (Pre-hospital/RESUS/Acute)

**Circulation**

- Trusts Chief Executives
- Trusts Medical Directors
- Trusts Directors of Operations
- Trusts General Managers responsible for Trauma Services
- Trusts Lead Cardiothoracic Surgeon
- Operational Delivery Networks’ Strategy Board
- South Yorkshire Clinical Audit and Advisory Group (Pre-hospital/RESUS/Acute)

**Authors**

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**Date agreed by**

SY MT ODN CAAG: 04 Dec 2015

**Version Number**

V3.0

**Date Signed off by ODNs’ Board**

28 Jan 2016

**Policy Review Date**

Apr 2018 (or sooner if national policy requires)

Please note that from Jun 2017 all ODN Clinical Guidelines, Protocols and Policies will be available on the ODN website for downloading.
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(Adults and Paediatrics)

Background

It is possible to have a successful outcome from cardiac arrest following penetrating trauma to the chest if the patient has a cardiac tamponade and a definitive procedure carried out quickly ie within 10 minutes of loss of cardiac output. This guideline is to be used for the Emergency Department management of all patients in the South Yorkshire Major Trauma Operational Delivery Network with penetrating wounds to chest or adjacent areas that meet these criteria. This includes the adult and paediatric Major Trauma Centres (MTCs) and all the constituent Trauma Units (TUs).

Before commencing a procedure such as Resuscitative Thoracotomy, stop and ask ‘and then what?’.

Assuming a restoration of circulation (eg by relieving a cardiac tamponade) or the finding of an injury that is quickly amenable to treatment then restoration of circulation (eg placing a finger in a myocardial wound) then formal exploration, definitive repair and closure will be required. Consider how, where and when this is going to happen. If any of these present significant problems then the procedure should not be commenced.

Indications

Penetrating chest/epigastric trauma associated with cardiac arrest (any rhythm) within last 10 minutes

Contraindications

Loss of cardiac output at scene or for more than 10 minutes
Blunt thoracic injuries with no witnessed cardiac activity
Multiple blunt trauma
Severe head injury
Any patient who has a cardiac output including hypotensive patients

Equipment

Simple thoracotomy equipment (as shown below) should be kept in one dedicated area of the ED resuscitation room. It should be made up of scalpels, 2/0 sutures, heavy duty scissors, clamps.

A formal surgical thoracotomy tray can alternatively be kept or accessed via theatres very quickly. Internal defibrillation paddles should be available also and kept with or near the above equipment in the resuscitation room.
Preparation

Consider preparation for a clam shell thoracotomy in ANY pre-alert that mentions penetrating wound to neck/chest/upper abdomen:

- Activate trauma team
- Ensure ED consultant is aware
- Ensure Cardio-thoracic / surgical SpR is attending as appropriate to location
- Locate thoracotomy tray
- Pre alert blood bank
- Send for O negative blood from blood bank fridge
- Consider pre-alerting cardiothoracic services early if they are not available at your ED

Decision to Proceed to Resuscitative Thoracotomy

This decision is to be made by the ED trauma team leader and the most senior surgeon available. If the cardio-thoracic/surgical SpR cannot attend in person, there should be discussion with the cardio-thoracic/surgical consultant on call.

Technique


Landmarks are as shown:

- Position the patient supine
- Prepare for intubation & ventilation and IV access if not already obtained but do not delay the thoracotomy procedure for these to occur
- Do NOT perform full surgical asepsis
- Perform bilateral 2-3cm thoracostomies in the midaxillary line of the 5th intercostal spaces
- Connect the two via a deep skin incision as above
- It is possible to cut through the sternum or xiphoid with heavy duty scissors in children
- Once the initial clam shell has been performed, open up the chest and lift up /'tent' the pericardium
• Make a large longitudinal midline incision with scissors, up to the aortic root. This avoids the laterally placed phrenic nerves and fully exposes the heart
• Evacuate all clot and blood present in the pericardium
• Inspect heart rapidly for wounds

If the heart begins to beat spontaneously:
Close any wounds rapidly, bleeding is likely to be profuse, use arterial clamps on local bleeding points eg internal mammary artery

If heart is beating but with reduced output:
Close wounds, internal massage and inotropes

If heart is in asystole:
Attempt to restart heart by ‘flicking’ the pericardium, internal massage.

Wound management:
- Small wounds – finger / gauze occlusion
- Large wounds – consider foley catheter, suturing pericardium as a last resort
- Multiple wounds – very unlikely to survive, consider terminating resuscitation.

Internal massage – 2 handed technique, one behind heart. Milk blood up from apex. Do not allow heart to become vertically positioned as great vessels will become kinked. Defibrillate if shockable rhythm with internal paddles

**Potential Benefits:**

The primary aims of emergency thoracotomy are:
- Release of cardiac tamponade
- Release of tension pneumothorax
- Control of haemorrhage
- Allow access for internal cardiac massage

Secondary manoeuvres include pressure on/cross-clamping of the descending thoracic aorta.
Definitive Surgery

Any restoration of cardiac output will necessitate further definitive surgical intervention. At the adult MTC these services are on-site, for the TUs this will necessitate a transfer to the adult MTC, for children this will involve transfer immediately to Leeds General Infirmary ED. (Pre-alert of the LGI Trauma Team will allow them to notify the Cardio-thoracic team). Refer to the Major Trauma ODN secondary transfer pathways for adults or paediatrics as appropriate.

References: