

IRISH ASSOCIATION FOR EMERGENCY MEDICINE



IAEM Clinical Guideline

Management of patients with tension pneumothorax in the emergency department

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DISCLAIMER

IAEM recognises that patients, their situations, Emergency Departments and staff all vary. These guidelines cannot cover all clinical scenarios. The ultimate responsibility for the interpretation and application of these guidelines, the use of current information and a patient's overall care and wellbeing resides with the treating clinician.

GLOSSARY OF TERMS

ED Emergency Department

Management of patients with tension pneumothorax in the emergency department

INTRODUCTION

Undiagnosed tension pneumothorax is a readily treatable cause of cardiac arrest. Tension pneumothorax is a clinical diagnosis and should not require a chest X-ray to diagnose. This is a respiratory emergency and mandates prompt decompression.

Air is drawn into the pleural space with each inspiration and there is no escape of air during expiration. Pressure builds up in the intrapleural space such that the mediastinum is pushed over into the contralateral hemithorax along with compression of the great veins. The patient will progress to obstructive shock and further deteriorate to a cardiorespiratory arrest (PEA arrest typically) if not emergently treated by needle thoracocentesis.

CLINICAL FEATURES

Severe dyspnoea, tachypnoea, tachycardia, hypotension, trachea deviation, subcutaneous emphysema, sudden increase in airway pressure, distended neck veins, hyper-resonance and decreased air entry on the affected side.

There may be a history of penetrating trauma, iatrogenic following invasive procedures (for example attempts at central venous catheter insertion), positive pressure ventilation or airways disease.

PARAMETERS

Target audience:

This guideline is intended for all ED staff managing patients with a tension pneumothorax.

Patient population:

The target patient population is patients with suspected tension pneumothorax.

AIM

To provide an evidence based guideline on the management of ED patients with tension pneumothorax.

MANAGEMENT

Needle thoracocentesis

Insert a large-bore (14-16G) cannula into the 2nd intercostal space in the mid clavicular line on the side of the suspected pneumothorax. There should be an immediate release of air and an improvement in the clinical parameters. Prepare chest drain for insertion.

Note: a significant proportion of patients have chest wall thickness which makes needle decompression with a standard length 14-gauge cannula ineffective. A mid axillary approach 5th intercostal space for needle thoracocentesis should be considered in patients where the 2nd intercostal space mid clavicular line approach did not work due to body habitus or pectoral muscle bulk may limit access to the pleural space.

Chest tube insertion

A chest tube must then be placed in the 5th intercostal space on the side of the confirmed tension pneumothorax using the Seldinger type when possible. Make sure the underwater drain seal apparatus is oscillating and bubbling.

Note: the drain must be reviewed if there is any deterioration in the clinical status of the patient as there is the potential to re-tension if the tubing becomes dislodged or blocked.

Chest X-ray

A chest X-ray should be performed after the procedure to confirm position and placement of the tube.

SPECIAL CONSIDERATIONS

Management of tension pneumothorax in a traumatic cardiac arrest

To decompress the chest in a traumatic cardiac arrest, perform bilateral thoracostomies in the 5th intercostal space in the mid axillary lines. In the presence of positive pressure ventilation, thoracostomies are likely to be more effective than needle thoracocentesis and quicker than inserting a chest tube (see tension pneumothorax). Finger thoracostomy is the first stage of an standard open chest drain insertion, by making a hole with a scalpel and forceps and placing a finger into the thorax to feel for lung. This will allow release of any air or blood causing pneumo/haemothorax. The added benefit is the thoracostomy can be 're-fingered' in the case of repeated tension.

REFERENCES AND BIBLIOGRAPHY

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- O' Sullivan, I. Tension pneumothorax. 15/09/13 [Available at: http://emed.ie/Trauma/Chest/Tension_Pneumothorax.php Last accessed 29/11/2018]
- Roberts DJ, Leigh-Smith S, Faris PD, Blackmore C, Ball CG, Robertson HL, Dixon E, James MT, Kirkpatrick AW, Kortbeek JB, Stelfox HT. Clinical Presentation of Patients With Tension Pneumothorax: A Systematic Review. *Ann Surg.* 2015 Jun;261(6):1068-78.
- Truhlář A, Deakin CD, Soar J, Khalifa GE, Alfonzo A, Bierens JJ, Brattebø G, Brugger H, Dunning J, Hunyadi-Antičević S, Koster RW, Lockey DJ, Lott C, Paal P, Perkins GD, Sandroni C, Thies KC, Zideman DA, Nolan JP; Cardiac arrest in special circumstances section Collaborators. European Resuscitation Council Guidelines for Resuscitation 2015: Section 4. Cardiac arrest in special circumstances. *Resuscitation.* 2015 Oct;95:148-201.
- Major trauma: assessment and initial management. NICE guideline [NG39]. February 2016.
- Lockey DJ, Lyon RM, Davies GE. Development of a simple algorithm to guide the effective management of traumatic cardiac arrest. *Resuscitation.* 2013 Jun;84(6):738-42.
- Leigh-Smith S, Harris T. Tension pneumothorax-time for a re-think? *Emerg Med J.* 2005 Jan; 22(1): 8–16.

Appendices

Appendix 1: Evidentiary Table

Reference (include title, author, journal title, year of publication, volume, issue and page)	Method	Evidence level (I-V)	Summary of recommendations from this reference
Brims, F. Tension pneumothorax – time to change the old mantra? November 26, 2014. [Available at: https://lifeinthefastlane.com/tension-pneumothorax-time-change-old-mantra/ Last accessed 29/11/2018]	Website blog	V	This article discusses an alternative approaches for needle decompression.
O' Sullivan, I. Tension pneumothorax. 15/09/13 [Available at: http://emed.ie/Trauma/Chest/Tension_Pneumothorax.php Last accessed 29/11/2018]	Clinical guideline published by Cork Emergency Medicine	V	This guideline highlights the clinical features and management of a tension pneumothorax.
Leigh-Smith S, Harris T. Tension pneumothorax- time for a re-think? Emerg Med J. 2005 Jan; 22(1): 8–16.	Review Article	V	This review examines the present understanding of tension pneumothorax and produces recommendations for improving the diagnostic and treatment decision process.
Roberts DJ, Leigh-Smith S, Faris PD, Blackmore C, Ball CG, Robertson HL, Dixon E, James MT, Kirkpatrick AW, Kortbeek JB, Stelfox HT. Clinical Presentation of Patients With Tension Pneumothorax: A Systematic Review. Ann Surg. 2015 Jun;261(6):1068-78.	Systematic Review	III-2	This systematic review highlights a number of reported differences in clinical presentation depending on the ventilatory status of the patient. The review also highlight how clinicians reportedly diagnose and manage these patients in practice.

Appendix 2: Evidentiary Table (Continued)

Reference (include title, author, journal title, year of publication, volume, issue and page)	Method	Evidence level (I-V)	Summary of recommendations from this reference
Truhlář A, Deakin CD, Soar J, Khalifa GE, Alfonzo A, Bierens JJ, Brattebø G, Brugger H, Dunning J, Hunyadi-Antičević S, Koster RW, Lockey DJ, Lott C, Paal P, Perkins GD, Sandroni C, Thies KC, Zideman DA, Nolan JP; Cardiac arrest in special circumstances section Collaborators. European Resuscitation Council Guidelines for Resuscitation 2015: Section 4. Cardiac arrest in special circumstances. Resuscitation. 2015 Oct;95:148-201.	Review Article	V	The European Resuscitation Council Guidelines reviews the clinical presentation and management of tension pneumothorax as a cause of a traumatic and non traumatic cardiac arrest.
Major trauma: assessment and initial management. NICE guideline [NG39]. February 2016.	Review Article	V	This guideline covers the rapid identification and early management of major trauma.
Barton ED. Tension pneumothorax. Curr Opin Pulm Med. 1999 Jul;5(4):269-74. Review.	Review Article	V	This review examines the pathophysiology and the signs and symptoms of tension pneumothorax.
Lockey DJ, Lyon RM, Davies GE. Development of a simple algorithm to guide the effective management of traumatic cardiac arrest. Resuscitation. 2013 Jun;84(6):738-42.	Review Article/ Expert opinion	V	This article presents an English language literature on traumatic cardiac and proposes a treatment algorithm based on expert opinion.

Appendix 3: The Hierarchy of Evidence

The Hierarchy of evidence is based on the National Health and Medical Research Council (2000) and Oxford Centre for Evidence-based Medicine Levels of Evidence (May 2001).

I Evidence obtained from a systematic review of all relevant randomised control trials.

II Evidence obtained from at least one properly designed randomised control trial.

III-1 Evidence obtained from well-designed pseudo-randomised controlled trials (alternative allocation or some other method).

III-2 Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case control studies or interrupted time series with a control group.

III-3 Evidence obtained from comparative studies with historical control, two or more single–arm studies or interrupted time series without a parallel control group.

IV Evidence obtained from case-series, either post-test or pre-test and post test.

V Expert opinion without critical appraisal, or based on physiology, bench research or historically based clinical principles.

Clinical guidelines are based on reviews of the best available evidence. **Level 1 evidence represents the gold standard for intervention studies**; however it is not available for all areas of practice and for some guidelines it may be appropriate to utilise results from studies with lower levels of evidence. Some clinical guidelines may also be informed by experts in the field, locally (hospital/institution) and internationally (Journal articles) (expert opinion) etc. This NHMRC Hierarchy can be used to grade evidence. Please record details on the evidence table and return to Hospital Clinical Guidelines Committee with guideline draft. The Evidence table can be filled out electronically or printed and used as a hard copy.