

INTERNATIONAL TRAUMA LIFE SUPPORT

SIMPLE THORACOSTOMY FOR TRAUMATIC ARREST IN THE PREHOSPITAL SETTING

The guidelines and references contained in this document are current as of the date of publication and in no way replace physician medical oversight.

INTRODUCTION

According to the WHO, fatalities from trauma account for 27% of the world's deaths.¹ Tension pneumothorax is the leading cause of preventable death following thoracic trauma which is directly responsible for more than 20% of all traumatic deaths.^{2,3} The incidence of tension pneumothorax in traumatic arrest varies from study to study, but is thought to be approximately 6-8%.⁴ The UK Trauma Audit and Research Network (TARN) data on frequency of chest injuries in major trauma patients indicate an incidence of tension pneumothorax of 1 in 250 (0.4%) major trauma patients.⁵ Tension pneumothorax can be identifiable by clinicians in the field although field diagnosis is difficult when classic signs of decreased air entry, hyper-resonance, and tracheal shift are not present. It is routinely treated prophylactically in traumatic arrest patients by either bilateral needle decompression or simple thoracostomy. Chest decompression in traumatic arrest can identify a high number of potentially life-ending injuries and should be considered as part of the resuscitation effort of all patients in cardiac arrest from trauma.⁶ Unfortunately, problems with needle decompression (high failure rates, short catheters, kinking catheters, and improper location) makes it a less reliable procedure when compared to simple thoracostomy.^{7,8,9,10,11} As an alternative to needle decompression, the simple thoracostomy, also known as finger thoracostomy, can quickly be performed by prehospital providers to reverse trauma arrest secondary to tension pneumothorax. The simple thoracostomy allows maximum release of air and blood from the pleural cavity, thus allowing full re-expansion of the lung. Multiple studies have shown the safety and efficacy of the procedure in the prehospital setting and has even been associated with a ROSC amongst 24% of patients.^{2,12,13,14,15} Prehospital thoracostomy has been found to be a strong predictor of survival and was significantly associated with increased survival in traumatic arrest.^{2,16} Although relatively new to some ground transport EMS services in the U.S. and UK, simple thoracostomies are a standard treatment to many air medical services in many countries.^{17,18}



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BACKGROUND

Tension pneumothorax is the progressive buildup of air in the pleural space. As air continues to accumulate in the pleural space, pressure or 'tension' develops that pushes the mediastinum toward the unaffected side, displacing the heart, trachea, and large vessels.^{3,19} This ultimately results in a decrease in cardiac output, ventilation, etc. If left untreated, it can result in cardiac arrest. The standard (initial prehospital) treatment for this is a needle thoracostomy (NT).¹⁹ Simple thoracostomy (ST) is another procedure to treat or reverse tension pneumothorax that has been used by many progressive services. Instead of fully placing a chest tube, a quick incision and blunt dissection is made into the chest wall, thus relieving the pleural cavity of any pressure from air or blood.²⁰

CONSIDERATIONS

The simple thoracostomy is a simple, quick, and easily learned procedure that can efficiently be done in cases of traumatic arrest. It is more effective at removing air and blood than needle decompression.⁷ Thoracostomy in traumatic arrest has been found to be statistically significant in increasing the probability of survival.⁴ In one study, it was discovered that there was a small but significant group of patients that ended up surviving because of the procedure.²¹ Current literature also supports its use in the field with respect to diagnostic accuracy, efficacy, and safety of performing the procedure.¹³ In patients with tension pneumothorax, fewer were pronounced dead with thoracostomy vs. needle decompression. There were no cases of lung damage associated with prehospital thoracostomy; the rate of complications is low and shown to be equivalent to that of in-hospital procedures.^{2,22,23} In a 2-year retrospective study, no cases of major bleeding, lung laceration, or infection were recorded from prehospital use.^{15,24} A recent best evidence topic report on prehospital finger thoracostomy in traumatic cardiac arrest patients indicated improved clinical status and safety in performing the procedure in the prehospital environment.²⁵

As for needle decompression, multiple studies have found several points of failure in the procedure. A comprehensive clinical review on complications of needle thoracostomy outline the failure to evacuate the pneumothorax to several factors: inadequate catheter length, misidentification of site, improper placement technique, clot/tissue within the catheter, kinking/compression of catheter, and air leak greater than air evacuation rate by catheter.¹¹ Several other publications support the findings of this review.^{2,8,9,10} Patients flown by air



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medical crews that received chest tubes, were reported to have had failed needle decompression attempts in up to 38% of patients.²³

PROCEDURE

The simple (finger) thoracostomy is the first part of the chest tube procedure. Local anesthesia can be used, but generally is not due to the emergency nature of the procedure.

1. With arm abducted, find and mark the area over the fifth rib at the midaxillary line (within the *triangle of safety*).²⁰
2. Clean the area as best as possible with an antiseptic swabstick.
3. Make a 1-2" (3-5 cm) transverse incision through the skin over the 5th rib at the marked location just anterior to the mid axillary line.
4. With a large forceps, rapidly dissect over the rib and through the intercostal muscles.
5. Push through the pleura and open the forceps.
6. With the forceps open, retract from the chest.
7. Insert finger along the track into the pleural cavity and perform sweep.
8. Assess for release of air or blood.
9. Each wound should be circled with a permanent marker and labeled EMS-R or EMS-L to identify incisions made by EMS in the event of autopsy or criminal investigation.

MEDICAL OVERSIGHT

Medical oversight should review current standards and literature before developing prehospital protocols regarding the procedure. Adequate training and education should take place before deployment. Implementation of this procedure should be monitored and supervised through a quality assurance/improvement program. Data collection and reporting should also take place.

CONCLUSION

ITLS believes that there is sufficient evidence to support the use of simple (finger) thoracostomy in traumatic cardiac arrest. During the immediate resuscitation of the trauma arrest patient, consideration should be given to a bilateral simple thoracostomy. The procedure has been shown to be quick, safe, and more effective than the alternative. Several helicopter emergency medical services have incorporated this procedure in the algorithm and SOP in the management of traumatic cardiac arrest.¹⁷



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Current Thinking

Simple Thoracostomy for Traumatic Arrest in the Prehospital Setting International Trauma Life Support

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Abstract

This is the current thinking of International Trauma Life Support (ITLS) with regard to the usefulness of simple thoracostomy in the management of trauma cardiac arrest patients.

Current Thinking

It is the position of International Trauma Life Support that:

1. There is sufficient evidence to support the use of simple thoracostomy in the prehospital management of the trauma cardiac arrest.
2. Classical management of tension pneumothorax in the prehospital arena is needle decompression, but this is an imprecise technique that may be ineffective and potentially dangerous. Bilateral simple thoracostomies are advocated in the early management of trauma cardiac arrests.
3. There is a potential to widen its use in a patient with tension pneumothorax, particularly if positive pressure ventilation is contemplated; many physician/paramedic-led HEMS services have, in fact, adopted its use.



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