



SMALL-BORE PIGTAIL CATHETERS (PC) ARE AS EFFECTIVE AS LARGE-BORE SURGICAL CHEST TUBES (ST) IN PATIENTS WITH TRAUMATIC HEMOTHORAX (HTX) AND HEMOPNEUMOTHORAX (HPTX)



THE CLINICAL QUESTION

Is a 14 Fr pigtail catheter inserted with a Seldinger technique (PC) as good as a 28-32 Fr surgical chest tube (ST) for the management of traumatic hemothorax (HTX) and hemopneumothorax (HPTX)?

Hypothesis: A PC is not inferior to a ST in the management of HTX and HPTX.

STUDY CONCLUSION

A PC is as effective as a ST in the management of HTX and HPTX with no significant difference in failure rates. Moreover, the patients who had a PC placed reported a better insertion experience.



STUDY BACKGROUND



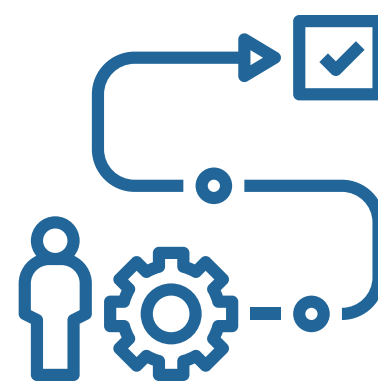
Data regarding the use of PCs to drain blood in patients with traumatic HTX or HPTX is limited. Previously published literature is observational in nature.

The placement of a ST in patients with thoracic trauma is common. It is an invasive procedure, with complications including but not limited to perforation of intrathoracic organ, hemothorax, diaphragmatic laceration, and Horner's syndrome.

If a PC is just as effective as a ST, it may serve as a safer, more tolerable treatment option for patients with traumatic HTX or HPTX.

CURRENT PRACTICE

There is limited data on the effectiveness of PC to drain traumatic HTX. Few observational or retrospective studies were done that showed that PCs are safe and effective in draining the blood from the pleural cavity in patients with traumatic HTX or HPTX. There are no consensus recommendations or guidelines to suggest which is the chest tube of choice for managing these patients.



STUDY DESIGN

Type of trial: Randomized controlled trials. Not blinded

N: 103 patients were screened, 43 were enrolled

Study groups: Patients who are above the age of 18 years and suffered traumatic HTX/HPTX requiring drainage

Settings: Banner-University of Arizona Medical Center, a level I trauma center

Enrollment: All patients who met the inclusion criteria were enrolled from the period of 07/2015 to 01/2018

Treatment period: At the time of the tube insertion through the whole hospital stay and total tube days

Follow up: Only during inpatient stay Primary outcome: Failure rate for the drainage catheter that is defined as retained HTX or recurrent PTX requiring additional intervention

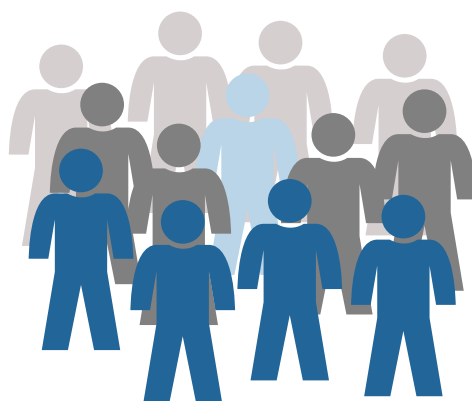


POPULATION

Inclusion criteria:

- Patients who are 18 years of age who suffered traumatic HTX/HPTX requiring drainage
- HTX component was substantial enough for drainage based on chest X-ray (CXR) or CT scan. (Hemithorax blood volumes

300 mL according to CT volumetric calculation or the presence of a large amount of fluid on CXR or ultrasonography



Exclusion criteria:

- Traumatic patients with pneumothorax alone
- Emergency placement of the catheter due to hemodynamic instability
- Patients who are unable to give consent
- If the catheter was placed in the operating room when the patient was under anesthesia
- The patient declined enrollment

Baseline characteristics:

- Age mean age+ SD: (PC 62+13 vs ST 55+18)
- Gender: Males (PC 85% vs ST 96%)
- Mechanism of injury (blunt versus penetrating): (PC 95% vs ST 74%)
- Number of rib fractures: (PC 5 vs ST 4)
- Presence of flail chest: (PC 9 vs ST 0)
- Injury Severity Score (ISS) mean + SD: (PC 17.5+6.6 vs ST 15.8+5.9)
- Chest Abbreviated Injury Scale score (c-AIS): (PC 3.5 vs ST 4)
- Number of days from the time of injury when the tube was inserted: (PC 2.5 vs ST 1)

There was no difference in the baseline characteristic between both groups with P value > 0.05

INTERVENTIONS



Parallel Assignment. Two arms:

Pigtail catheter arm vs Chest tube arm. Forty-three (43) patients were enrolled in the study. (PC n=20, CT n=23)

OUTCOMES

Primary outcomes

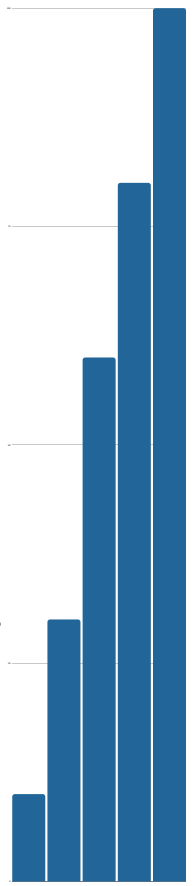
Failure rate for the drainage catheter that is defined as retained HTX or recurrent PTX requiring additional intervention

Secondary outcomes

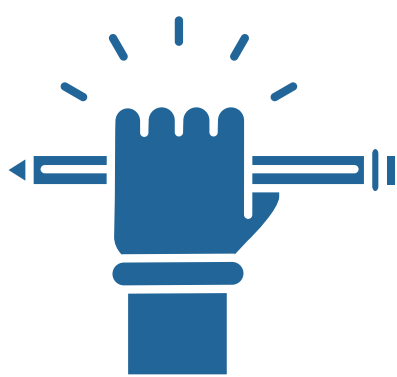
- Initial output (IO)
- Tube days
- Insertion perception experience (IPE) score on a scale of 1-5 (1 = tolerable experience, 5 = worst experience)

Adverse events

None



STUDY STRENGTHS



- Randomized control study
- Matching the baseline characteristics
- Eight trauma surgeons routinely crossover for the management of patients with traumatic HTX/HPTX and this decreases the operator bias

FUNDING

No source of funding was utilized for this study



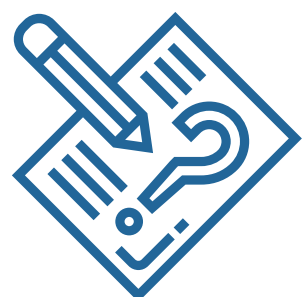
STUDY LIMITATIONS



- Not blinded
- Single-center study
- Small sample size and only inpatient follow up
- No standardization on the failure definition in the primary outcome
- The comparative effectiveness of PCs versus STs cannot be extrapolated to the emergency placement setting as both tubes were inserted in a delayed fashion
- The IPE scale was not validated in the previous literature
- Not all of the included patients had CT scans, thus increasing the risk of operator bias based on the operator ability to assess the volume of blood in the hemithorax before placing the tube for drainage
- No standardization was done regarding intravenous analgesia or local anesthetics used during insertion. This might affect the IPE score
- Tube management was not standardized because there is no consensus in the current literature

RESEARCH QUESTION

Can we 14 F pigtail catheters be used for the management of traumatic hemothorax and hemopneumothorax?



TAKE HOME MESSAGE



14Fr small bore pigtail catheters work as well as large-bore surgical chest tubes (28-32F) in the management of acute/ early traumatic hemothorax and hemopneumothorax. They are associated with less pain and better insertion experience for the patients. However, further randomized and larger controlled studies with outpatient follow up should be done to validate this statement. Note that VATS was still reserved in the study for retained hemothoraces and the role of PC has not been studied in patients with chronic/old hemothorax.

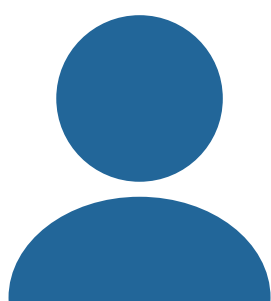
ARTICLE CITATION

Bauman ZM, Kulvatunyou N, Joseph B, Gries L, O’Keeffe T, Tang AL, et al. Randomized clinical trial of 14-French (14f) pigtail catheters versus 28–32F chest tubes in the management of patients with traumatic hemothorax and Hemopneumothorax. World Journal of Surgery. 2021;45(3):880–6.



SUGGESTED READING

1. Inaba K, Lustenberger T, Recinos G, Georgiou C, Velmahos GC, Brown C, et al. Does size matter? A prospective analysis of 28–32 versus 36–40 French chest tube size in trauma. Journal of Trauma and Acute Care Surgery. 2012;72(2):422–7.
 2. Bauman ZM, Kulvatunyou N, Joseph B, Jain A, Friese RS, Gries L, et al. A prospective study of 7-year experience using percutaneous 14-French pigtail catheters for traumatic hemothorax/Hemopneumothorax at a level-1 trauma center: Size still does not matter. World Journal of Surgery. 2017;42(1):107–13.
 3. Maezawa T, Yanai M, Huh JY, Ariyoshi K. Effectiveness and safety of small-bore tube thoracostomy (≤ 20 fr) for chest trauma patients: A retrospective observational study. The American Journal of Emergency Medicine. 2020;38(12):2658–60.
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