

Thoracostomy Tubes versus Percutaneous Catheters in the Management of Traumatic Hemothorax

A selected review of the literature

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June 14, 2022

INTRODUCTION

The mainstay of traumatic hemothorax management is drainage of the thoracic space, typically by way of a thoracostomy tube (CT). However, there are other tools and techniques at our disposal.

Percutaneous placement of smaller bore (14F) pigtail catheters (PC) is an option and may offer several advantages over CTs – better procedural tolerance, greater long term comfort, smaller incision – and their non-inferiority for pneumothorax and effusion management is supported in certain clinical contexts. Concerning hemothoraces, however, prevailing attitudes continue to prefer CTs over PCs.

This preference is based on the assumption that, as Poiseuille's law states, blood is more effectively drained by a larger bore tube. By investigating to what degree this assumption is supported in the literature, we aim to provide some guidance on treatment options for patients presenting with traumatic hemothoraces.

THE QUESTION

Among adult patients who have suffered traumatic hemothorax or hemopneumothorax, is placement of a pigtail catheter non-inferior to insertion of a chest tube with respect to resolution of injury or need for additional intervention?

METHODS

- Targeted search of PubMed based on core PICO components, in consultation with a health sciences librarian at NJM Library.
- Results filtered by RCT, clinical trial, SRMA, and chosen for analysis based on study type, design, relevance to intervention and outcome, and date of publication.
- 4 articles chosen for analysis: 2 RCTs, 1 observational study, 1 SRMA.
- Appraised for: internal/external validity, significance, authors' conclusions in context.

Studies appraised

1. Kulvatunyou et al. The small (14 Fr) percutaneous catheter (P-CAT) versus large (28-32 Fr) open chest tube for traumatic hemothorax: A multicenter randomized clinical trial. *J Trauma Acute Care Surg.* 2021.
2. Bauman et al 2021. 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 J Surg.* 2021.
3. Bauman et al 2018. 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 J Surg.* 2018
4. Patel et al: Management of simple and retained hemothorax. A practice management guideline from the Eastern Association for the Surgery of Trauma: Hemothorax Management Guideline. *Am J Surg.* 2021

RESULTS / APPRAISAL

Kulvatunyou et al 2021 - the P-CAT trial
RCT - 120 pts randomized to PC or CT
1° outcome: fail rate - rHTX at 30 days

Results: PC fail rate 11%; CT fail rate 13% (p 0.74)

Conclusion: PCs are non-inferior to CTs for HTX drainage

Limitations: Small study, underpowered, pre-set non-inferiority margin not necessarily valid, specific trauma population

Bauman et al 2021
RCT - 43 pts randomized to PC or CT
1° outcome: fail rate at 30 days

Results: PC fail rate 10%; CT fail rate 17%

Conclusions: PC's non-inferior to CTs for HTX drainage

Limitations: Single centre, small study, narrow population, possibly invalid inferiority margin

Bauman et al 2018
Prospective observational – outcomes of PCs vs CTs in HTX pts over 7 yrs
496 pts (CT: 307; PC: 189)
1° outcome: fail rate

Results: PC fail rate 21% overall (39% emergency), CT fail rate 24% overall (27% emergency)

Conclusions: PC non-inferior to CT for HTX, endorse usage "in all settings".

Limitations: Single centre, unbalanced groups (PC preferentially older, blunt trauma, non-emergent), study type, provider/selection bias, no non-inferiority margin.

Patel et al 2021
SRMA – 4 articles, 2 pro-obs, 1 RCT, 1 retro-obs
Outcomes: rHTX, need for additional intervention

Results: RR for rHTX: 0.87
RR need for further intervention: 0.45 favouring PC

Conclusions: "Conditionally recommend" PC over CT for equivalence in rHTX risk, and lower risk of further intervention.

Limitations: Small # studies, heterogeneity, imprecision, do not include subsequent RCTs, risk of bias in individual studies, narrow population.



Source: CoreEm

RECOMMENDATION

For traumatic hemothorax requiring drainage in ALL CONTEXTS, emergent and non-emergent: chest tubes recommended over percutaneous pigtail catheters

Evidence to date does support non-inferiority of PCs in the stable blunt trauma patient, and may be considered in this context. However, **significant research pitfalls** limit wholesale endorsement of its use in all settings.

More research on PC use in emergent contexts, as well as increased familiarity and skills in US among providers is likely to impact this recommendation in the future