Paravertebral Catheters vs. Single Injections: A 16-Year Comparative Analysis of Intraoperative Complications in 1,898 Patients

Taylor Duffy[1], Grace Washney[1], Tyler Augi[1], Simon Rodriguez[1], Breanna Lewis[1], Nicolas Aycardi[1], Mihaela Visoiu, MD[2]

[1] University of Pittsburgh School of Medicine, Pittsburgh, PA

[2] UPMC Children's Hospital of Pittsburgh, Department of Anesthesiology and Perioperative Medicine, Pittsburgh, PA



University of Pittsburgh School of Medicine

UPMC CHILDREN'S HOSPITAL OF PITTSBURGH

INTRODUCTION & OBJECTIVE

Continuous catheters may extend paravertebral analgesia but require additional procedural steps. Whether documented block-related events differ between continuous-catheter and injection-only techniques remains uncertain.[1]

Objective: Compare the frequency and type of documented block-related events between continuous-catheter and injection-only paravertebral blocks performed over 16 years at a tertiary children's hospital.

METHODS

- Retrospective review of paravertebral blocks performed from January 2010 through August 2025
- Continuous-catheter group: one or more paravertebral catheters
- Injection-only group: one or more injections without catheter placement
- Eighteen patients who received both techniques were excluded
- Primary outcome: frequency and type of documented block-related events
- Groups compared using Fisher's exact test

PATIENT CHARACTERISTICS

Characteristic	Catheter	Injection only
Patients, n (%)	1,336 (70.4)	562 (29.6)
Age, years: mean ± SD	12.34 ± 6.73	14.56 ± 6.07
Age: minimum–maximum	1 day–55 years	2 days–52 years
Female, n (%)	564 (42.3)	259 (46.1)
Weight, kg: mean ± SD	44.16 ± 25.14	57.36 ± 25.04
Weight, kg: min–max	2.05–161	2.8–157.5
ASA III–V, n (%)	516 (38.6)	118 (21.0)

Overall cohort: 1,898 patients, including 310 (16.3%) aged ≥18 years.

MAIN FINDINGS

Complications occurred in **1.5% of catheter recipients** and **0.9% of injection-only recipients**

The difference was not statistically significant (p=0.38)

PROCEDURAL CHARACTERISTICS

Characteristic	Catheter	Injection only
Catheters/injections, total n (mean per patient)	1,998 (1.49)	1,842 (3.28)
Bilateral, n (%)	662 (49.5)	428 (76.2)
Block before surgery, n (%)	969 (73.0)	470 (83.9)
Ultrasound guidance, n (%)	1,166 (87.6)	317 (56.7)
Approach: landmark-based, n (%)	126 (9.6)	132 (23.7)
Approach: lateral, n (%)	1,120 (85.0)	312 (56.1)
Approach: sagittal, n (%)	9 (0.7)	1 (0.2)
Loss of resistance, n (%)	8 (0.6)	91 (16.4)
Approach unknown, n (%)	52 (4.0)	20 (3.6)
Attempts, mean ± SD	1.32 ± 0.77	1.27 ± 0.59
Block time, min: mean ± SD	18.64 ± 9.72	10.25 ± 6.22

Compared with injection-only blocks, catheter procedures:

- More frequently used ultrasound guidance: **87.6% vs 56.7%**
- Were less often bilateral: **49.5% vs 76.2%**
- Required more time for placement: **18.64 vs 10.25 minutes**
- More often used a lateral approach: **85.0% vs 56.1%**

BLOCK-RELATED COMPLICATIONS

Complication	Catheter	Injection only
Any reported complication, n (%)	20 (1.5)	5 (0.9)
Recognized intravascular placement, n (%)	4 (0.3)	4 (0.7)
Pneumothorax, n (%)	2 (0.1)	0
Suspected subarachnoid placement, n (%)[2]	2 (0.1)	0
Intrapleural placement, n (%)	8 (0.6)	0
Unable to access paravertebral space, n (%)	1 (0.1)	1 (0.2)
Catheter in surgical field, n (%)	1 (0.1)	N/A
Catheter fracture, n (%)	2 (0.1)	N/A

- Injection-only complications were predominantly intravascular needle placements identified before local-anesthetic administration, without clinical sequelae.

SELECTED CATHETER COMPLICATIONS

Pneumothorax, n=2

- 22-month-old, 11-kg; gastric pull-up: Ultrasound-guided paravertebral blockade at right T6 and left T8. Developed right tension pneumothorax on POD1, requiring intubation and pigtail chest tube placement.
- 14-year-old, 58-kg; Nuss procedure: bilateral T5 catheter placement without ultrasound guidance. Right pneumothorax was recognized intraoperatively and treated with chest tube placement.

Catheter fracture, n=2

- 3-year-old, 13 kg: Approximately 2-cm fragment remained unlocalized.[3]
- 2-day-old, 3 kg: 7-mm fragment identified at T9 one month later; no documented complications at 17-month follow-up.[4]

REFERENCES

1. Boretsky K, Visoiu M, Bigeleisen P. Ultrasound-guided approach to the paravertebral space for catheter insertion in infants and children. Paediatr Anaesth. 2013;23:1193–1198.
2. Visoiu M. Usefulness of beta-2-transferrin to detect an unforeseen complication following paravertebral nerve block. J Clin Anesth. 2014;26:336–338.
3. Visoiu M, Malek MM. of a broken thoracic paravertebral catheter in a pediatric patient. J Clin Anesth. 2021;73:110Management361.
4. Cheema R, Visoiu M. Retained catheter fragment after continuous paravertebral block placement for thoracoscopic repair of tracheoesophageal fistula of a neonate: a case report. Children. 2026;13:733.