18th International Congress of Anesthesiology, Critical Care and Pain

Beyond the Caudal: Fascial Plane Blocks in Children — Efficacy vs. Safety

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18–20 November 2026 · Tehran, Iran · From Innovation to Resilience

About the Speaker



- Associate Professor of Anesthesia
- Shahid Beheshti University of Medical Sciences
- Interests: Regional anesthesia, local anesthetic toxicity, interventional pain, POCUS

Outline

1. Why look beyond the caudal?
2. Fascial plane blocks: what the evidence shows
3. Safety first: dosing, LAST and the infant
4. Adjuvants and practical block selection
5. Take-home messages

01

The Caudal: Still the Workhorse?

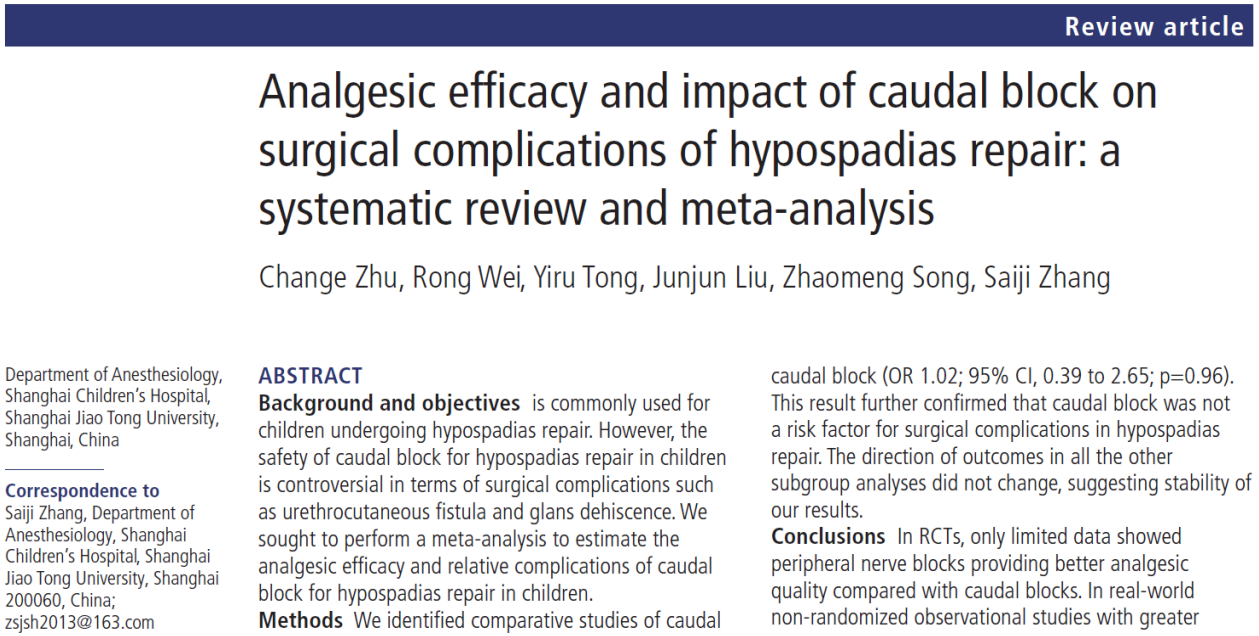


Caudal Block: Strengths and Limitations

- **Most common paediatric block:** >50 years of experience, simple, high success rate
- **Coverage:** surgery below T10; spread is volume-dependent (0.5 → 1 → 1.25 mL/kg)
- **Duration:** single shot lasts only ~4–6 h → early rescue analgesia at home
- **Side effects:** motor block, urinary retention, delayed ambulation
- **Neuraxial risk:** serious complications 0.26% vs 0.04% for peripheral blocks (ADARPEF)

Caudal and Hypospadias: A Settled Controversy?

- 2017 retrospective data linked caudal block with fistula and glans dehiscence
- Later meta-analyses (RAPM 2019; J Pediatr Urol 2024): no significant association
- Major confounders: surgeon, meatal location, repair technique
- Penile/pudendal blocks gave longer analgesia than caudal in RCTs



Review article

Analgesic efficacy and impact of caudal block on surgical complications of hypospadias repair: a systematic review and meta-analysis

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ABSTRACT

Background and objectives is commonly used for children undergoing hypospadias repair. However, the safety of caudal block for hypospadias repair in children is controversial in terms of surgical complications such as urethrocutaneous fistula and glans dehiscence. We sought to perform a meta-analysis to estimate the analgesic efficacy and relative complications of caudal block for hypospadias repair in children.

Methods We identified comparative studies of caudal

caudal block (OR 1.02; 95% CI, 0.39 to 2.65; p=0.96). This result further confirmed that caudal block was not a risk factor for surgical complications in hypospadias repair. The direction of outcomes in all the other subgroup analyses did not change, suggesting stability of our results.

Conclusions In RCTs, only limited data showed peripheral nerve blocks providing better analgesic quality compared with caudal blocks. In real-world non-randomized observational studies with greater

02

Fascial Plane Blocks: What Does the Evidence Show?



Fascial Plane Blocks vs Caudal: Evidence Summary

Comparison	Evidence	Main findings
ESP vs caudal	Meta-analysis: 9 RCTs, n = 507 (Braz J Anesthesiol 2025)	Similar analgesia (time to first rescue, FLACC); less urinary retention (RR 0.12)
QL vs caudal	Meta-analysis: 7 RCTs, n = 444 (Front Pediatr 2025)	Less rescue analgesia within 24 h (RR 0.37); pain scores mostly similar; similar adverse events
ASA 2026 guideline (children)	Practice guideline (Anesthesiology 2026)	Strong: fascial plane blocks for open cardiac/thoracic surgery. Conditional: open hernia repair

Caveat: small single-centre RCTs, high heterogeneity, inconsistent outcomes → moderate-to-low certainty

Practical Block Selection

Surgery	Options	Common volume (ropivacaine 0.2%)
Circumcision, distal hypospadias	Caudal · dorsal penile · pudendal	Caudal 0.5 mL/kg · penile 0.1 mL/kg/side
Inguinal hernia, orchidopexy	Caudal · II/IH · TAP · QL	Caudal 0.75–1 mL/kg · II/IH 0.1–0.2 mL/kg
Umbilical hernia, midline incision	Bilateral rectus sheath	0.1–0.2 mL/kg/side
Appendectomy, lower abdominal	TAP · QL	0.3–0.5 mL/kg/side
Renal surgery, pyeloplasty	QL · ESP · epidural	0.3–0.5 mL/kg/side
Thoracotomy, VATS, Nuss, cardiac	ESP (± catheter) · paravertebral	0.3–0.5 mL/kg/side

Always sum the total mg/kg across all injections — bilateral blocks double the dose

03

Safety: The Infant Is Not a Small Adult



How Safe Is Paediatric Regional Anaesthesia?

>100,000	0	0.76 / 10,000	2.4 / 10,000
blocks analysed in PRAN (>20 centres)	permanent neurological deficits	severe LAST — most cases in infants	transient neurological deficits

Source: Walker BJ et al. Anesthesiology 2018;129:721-32. No additional risk with blocks placed under general anaesthesia.

LAST in Infants: Risk and Prevention

- **Low α1-acid glycoprotein:** higher free fraction of bupivacaine/ropivacaine
- **Immature hepatic clearance:** accumulation with infusions and repeat doses
- **Fascial plane blocks:** large volume + large absorptive surface; bilateral = double dose
- **General anaesthesia masks early CNS signs:** first sign may be arrhythmia or collapse
- **Prevent:** ultrasound, dilute solutions, cumulative mg/kg ceiling, incremental injection, ECG watch
- **Treat:** 20% lipid emulsion 1.5 mL/kg bolus, then 0.25 mL/kg/min

Adjuvants: Longer Blocks, Same Dose

- **Dexmedetomidine (caudal):** longer analgesia, less emergence delirium; neuro-safety data still needed
- **Clonidine 1–2 µg/kg:** prolongs caudal block; caution in neonates and ex-preterm infants (apnoea)
- **IV dexamethasone:** may prolong blocks and reduce rebound pain; perineural use is off-label

× 2.14

longer caudal analgesia with dexmedetomidine (ratio of means; 19 RCTs, n = 1190; moderate certainty). No increase in bradycardia or hypotension.

Source: Reg Anesth Pain Med 2021 — meta-analysis with trial-sequential analysis

Key Message

Fascial plane blocks extend the reach and duration of paediatric regional analgesia — but every millilitre counts: dose by mg/kg, not by volume habit.

Take-Home Messages

1

Caudal still works

Safe and simple for sub-umbilical surgery; limited mainly by duration.

2

Match block to surgery

ESP, QL, TAP and rectus sheath give comparable or longer analgesia with fewer neuraxial side effects.

3

Respect the dose

Infants are at highest LAST risk: sum mg/kg across blocks, use dilute solutions, keep lipid ready.

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Thank You for Your Attention

Questions and Discussion

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