To Cradle or Not to Cradle: Can the Use of a Lumbar Puncture Cradle Increase Lumbar Puncture (LP) Success Rates?

Sevag Tachejian, MD, Adrienne L. Davis, MD, MSc, Natasha Collia, MD
Division of Pediatric Emergency Medicine, The Hospital for Sick Children

BACKGROUND

- Lumbar puncture (LP) success rates are low (50-80%), while traumatic taps occur in 30-50%.
- Missed LPs have multiple implications for patients & the healthcare system.
- The seated position has been shown in some studies to ↑ LP success rates.

STUDY AIMS

- To evaluate the use of a LP cradle on first-pass success rates of neonatal and infant LPs compared to lateral decubitus (primary).
- Secondary aims were to compare overall LP success rate for > 1 attempt and traumatic LP rates with and without the cradle.

METHODOLOGY

DESIGN, SETTING, AND POPULATION

- Single-center retrospective cohort study between January 2020 and October 2024.
- Inclusion: Term and corrected preterm infants ≥ 37 weeks and ≤ 3 months requiring an LP for septic workup.
- Exclusion: unstable, requiring opening pressure, sedation or ultrasound guidance, or lacking procedure note.

DATA COLLECTION PROCEDURE

- The Hospital's electronic health record (EPIC) and its report search engine used to identify eligible participants.
- LPs using the cradle identified through procedure notes → stratified random sampling technique was used to select the non-exposed cohort.
- Collected patient demographic characteristics, CSF analysis, acuity level, proceduralist training level, use of local anesthetics and time of shift.

PRIMARY OUTCOME

- Comparison of first-pass success, defined as: obtention of CSF with red blood cell (RBC) count <10,000 cells/µL on first attempt.

SECONDARY OUTCOME

- Comparison of overall success, defined as: obtention of CSF with RBC <10,000 cells/µL with any number of attempts.
- Comparison of traumatic LP, which was defined as: CSF biochemical analysis showing >400 RBCs/µL AND procedure note with mention of "bloody" CSF appearance.

SAMPLE SIZE

- 71 per group to detect a 20% absolute increase in first-pass success rate with the cradle, using a power of 80% and a 5% two-sided alpha.

SickKids® UNIVERSITY OF TORONTO

The use of a novel **lumbar puncture cradle**, compared to the lateral decubitus method, resulted in an absolute **increase of 22% of first-pass lumbar puncture success** (63% vs 41%) and an absolute **decrease of 23% of traumatic lumbar punctures** (36% vs 59%)

SMöLTAP®
Infant Spinal Tap Solutions

RESULTS

	Cradle (n=71)	Lateral Decubitus (n=71)	Difference
Age in days (mean, SD)	28 (18.5)	25 (21.6)	3.1 days
Male sex	46/71 (65%)	36/71 (51%)	14%
History of prematurity	7/71 (10%)	5/71 (7%)	3%
Night shift lumbar puncture	37/71 (52%)	35/71 (49%)	3%
CTAS1 triage priority	5/71 (7%)	1/71 (1%)	6%
Performed by junior resident	10/71 (14%)	13/71 (18%)	4%
Use of local anesthetic	21/69 (30%)	43/71 (61%)	31%

PRIMARY OUTCOME

	Cradle	Lateral Decubitus	Difference (95% CI)
First-pass success	**45/71 (63%)**	**29/71 (41%)**	**22% (5.6-36.8)**

χ^2 (1, 142) = 7.22, p=0.007

In the mixed effects logistic regression, cradle use remained significantly associated with first pass success after adjusting for: patient age, history of prematurity, CTAS acuity, use of local anesthetic, nightshift status (all fixed effects), and training level (random effect): OR 2.16, 95% CI 1.04-4.47.

SECONDARY OUTCOME

	Cradle	Lateral Decubitus	Difference (95% CI)
Overall success rate	57/71 (80%)	50/71 (70%)	10% (-4.3-23.8)
Traumatic puncture rate (>400 RBCs/µL, "Bloody")	25/69 (36%)	41/70 (59%)	23% (6.6-37.8)

CONCLUSIONS

- The LP cradle is a promising new tool to increase first-pass success and decrease traumatic rates of LPs in patients ≤ 3 months of age compared to lateral decubitus
- A larger multi-site prospective study is warranted to evaluate the effectiveness of the cradle compared to the sitting position alone