

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

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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.



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%)



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)

$$\chi^2 (1, 142) = 7.22, p=0.007$$

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