

Pain Management for the Nuss Procedure: Comparing Intercostal Nerve Cryoablation, Erector Spinae Block, Thoracic Epidural, and Patient Controlled Analgesia

Introduction

- Pectus excavatum is characterized by the failure of the anterior chest wall cartilage to grow properly, leading to the development of a sunken or caved-in sternum.¹
- The Nuss procedure is the preferred minimally invasive surgical method to correct pectus excavatum. A curved bar is fed through the anterior mediastinum to elevate the sternum, correcting the depression in the chest, and removing the compression of the heart and lungs.²
- The Nuss procedure can leave patients with significant levels of pain.³ However, there is a lack of consensus on the most ideal pain management plan.
- Intercostal nerve cryoablation (INC) is a relatively new modality that involves freezing the nerves during surgery to prevent pain during recovery. Research suggests that INC can reduce patient reported pain scores, length of stay (LOS), and opioid use.³

Objectives

- Our hypothesis is that using INC for the Nuss procedure will decrease opioid use, pain scores, and LOS when compared with erector spinae plane block (ESP), thoracic epidural, and patient-controlled analgesia (PCA).
- The results of this study will allow us to re-evaluate perioperative pain management in Nuss procedure patients.

Methods

- Retrospective chart review of patients who underwent the Nuss procedure at Nemours Children's Hospital in Orlando, FL (n=108).
- Four analgesic groups:
 - ESP (n=19)
 - Thoracic epidural (n=41)
 - PCA (n=18)
 - INC (n=30)
- Primary outcomes:
 - Opioid medication use (converted to MME)
 - Numerical pain ratings
 - Length of stay
- Statistically significant findings (p<0.05) were analyzed with ANOVA and post-hoc Tukey tests using IBM SPSS Statistics 28.

Results

Table 1. Summary of average LOS, cumulative opioid use, and overall pain rating among all four analgesic groups.

	ESP	Thoracic epidural	PCA	INC
Average length of stay (days)	3.3	4.7	3.7	2.9
Average cumulative opioid use (MME)	66.9	117.0	172.1	50.4
Average overall pain rating	4.5	3.4	4.1	3.4

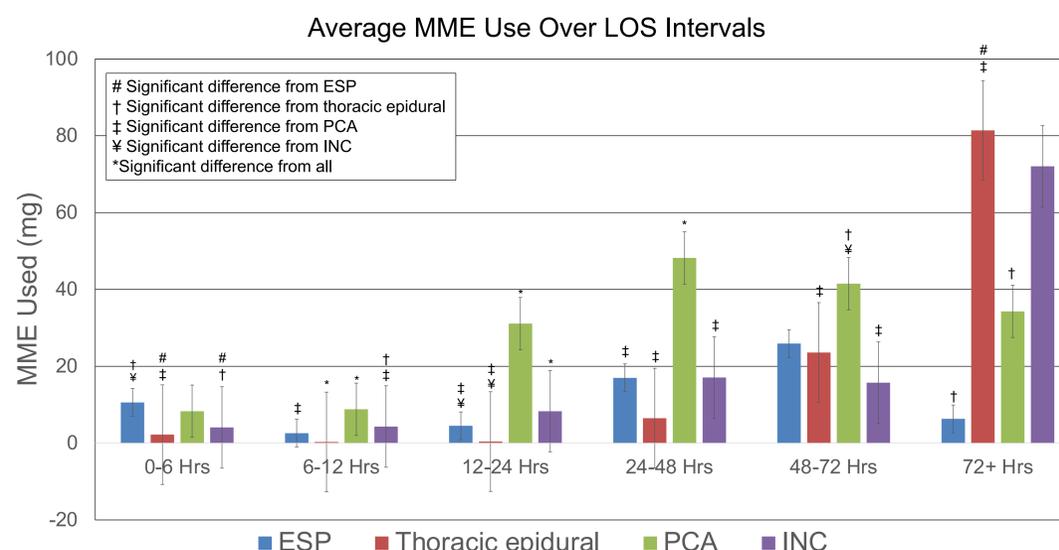


Figure 1. Average MME use among all four analgesic groups from 0 through 72+ hours post-operatively.

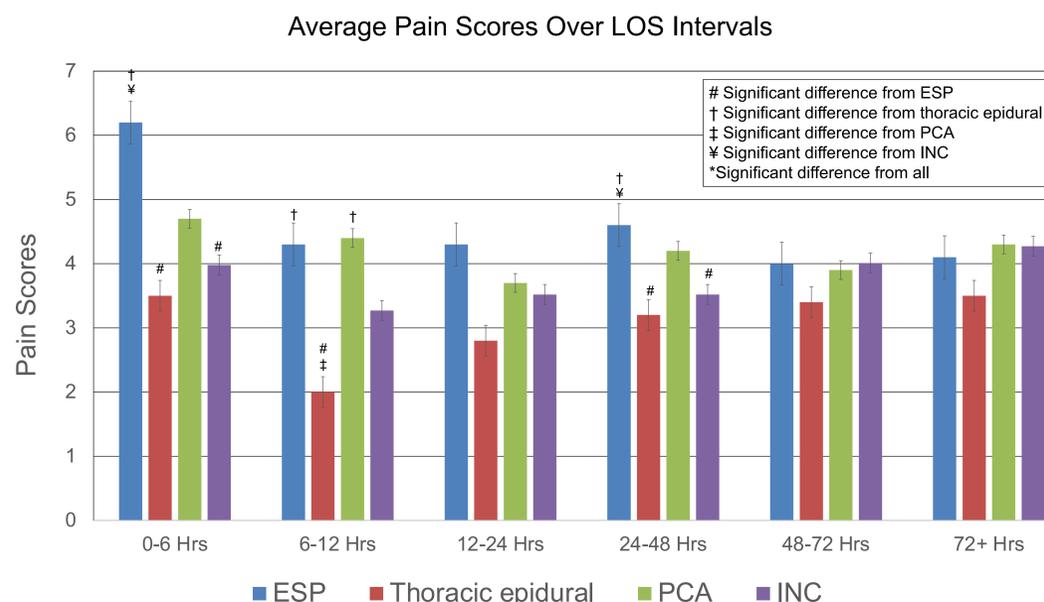


Figure 2. Average pain scores among all four analgesic groups from 0 through 72+ hours post-operatively.

Results

- Average LOS was significantly decreased in the INC group (2.9 days, p<.05) compared to both the thoracic epidural group (4.7 days, p<.05) and the PCA group (3.7 days, p<.05).
- Average LOS was decreased in the INC group compared to the ESP group, but not by a significant margin.
- Average cumulative opioid use was significantly decreased in the INC group (50.4 MME) compared to the thoracic epidural group (117 MME, p<.05) and PCA group (172.1 MME, p<.05).
- Average cumulative opioid use was decreased in the INC group compared to the ESP group, but not by a significant margin.
- INC decreased average overall pain when compared to other groups, but not by a significant margin.

Discussion

- Similar to findings reported by Keller et al., utilization of INC demonstrates a promising modality of pain management for the Nuss procedure.⁴

Limitations

- Limitations include retrospective design and small sample size. Prospective randomized studies should be performed to better assess the impact of INC on outcomes for the Nuss procedure.

Conclusions

- This study supports the use of INC over thoracic epidural, ESP block, and PCA to reduce opioid consumption and LOS for the postoperative pain management in the Nuss procedure.

References:

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