

The Addition of Clonidine to Ropivacaine in Rectus Sheath Blocks for Pediatric Patients Undergoing Laparoscopic Appendectomy: A Double Blinded Prospective Study

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INTRODUCTION

- Laparoscopic appendectomy is one of the most frequently performed emergency surgeries in children. Although the technique is minimally invasive, it is still associated with significant pain and anxiety [1].
- To overcome the limitations of local anesthetics, adjuvant medications have been added to nerve blocks to improve pain control. Clonidine, an α 2 receptor agonist, is one such medication, and some studies have shown a weak trend in favor of clonidine prolonging nerve block analgesia [2-5].

AIMS/HYPOTHESIS

- The aims of this study were to:
 - determine if the combination of ropivacaine plus clonidine was superior in prolonging periumbilical numbness compared to ropivacaine alone;
 - evaluate the hemodynamic effects of clonidine addition;
 - advance the understanding of clonidine's effect on perioperative analgesia, anxiolysis and sedation.
- The hypothesis was that ropivacaine combined with clonidine in ultrasound (US) guided rectus sheath blocks is a more complete pain control approach than ropivacaine alone.

METHODS

- This was a double blinded prospective study. Fifty patients undergoing laparoscopic appendectomy were enrolled and randomized into ropivacaine only (RO) or ropivacaine/clonidine (R+C) groups.
- All patients received US guided bilateral rectus sheath blocks prior the start of surgery. Medications were divided into two injections and prepared by pharmacy. The RO group received ropivacaine 0.5% (20 ml) and normal saline, the R+C group received ropivacaine 0.5% (20 ml) and clonidine (2mcg/kg).
- Duration of periumbilical numbness (via blunt needle) and Numeric Pain Rating Scale scores were assessed every two hours until resolution of numbness. Sedation and anxiety were assessed using University of Michigan Sedation Scale (UMSS) and the State-Trait Anxiety Inventory for Children (STAIC). Perioperative analgesic consumption was also recorded. Patient, parent and nurse satisfaction were evaluated at the final assessment point for each patient.
- Heart rate (HR), systolic blood pressure (SBP) and mean arterial pressure (MAP) values were monitored perioperatively and documented if less than 50 beats per minute, 70 and 40 mmHg respectively.
- Descriptive statistics were presented as mean \pm SD or median and IQR as appropriate. Two sample T-Test or Wilcoxon-Mann-Whitney test were performed to determine differences between groups.

Table 1: Patient Demographics

	Ropivacaine only (RO) n=24	Ropivacaine and Clonidine (R+C) n=26	p-value
Age (years)	13.0	13.0	0.860
Gender (Female)	54%	46%	0.571
Weight (kg)	56.3	53.9	0.346
Height (cm)	160.0	160.0	0.939
BMI	22.8	20.3	0.166
Preop STAIC	33.0	39.0	0.280
ASA			1.000
1	9%	8%	
1E	70%	73%	
2	9%	8%	
2E	13%	12%	

Median Value or Frequency (%)

RESULTS

- There were no significant differences in patient demographics between the groups.
- The median duration of periumbilical numbness was greater in the R+C group (823.5 versus 540.0 minutes), but this difference was not significant (p = 0.451).
- There were no differences in perioperative pain scores, total morphine equivalent consumption or patient, parent or nurse satisfaction scores.
- There were no differences in postoperative anxiety scores, PACU sedation, or hemodynamic complications.

Table 2
Duration of Periumbilical Numbness

	Ropivacaine only (RO) n=24	Ropivacaine and Clonidine (R+C) n=26	p-value
Duration of Numbness (minutes)	540.00 (360.00, 1015.00) 762.71 (504.45)	823.50 (509.50, 1080.00) 844.35 (394.70)	0.451

Top line: Median (Q1, Q3), Bottom line: Mean (SD)

Figure 1: Percent of Patients with Periumbilical Numbness as a Function of Time

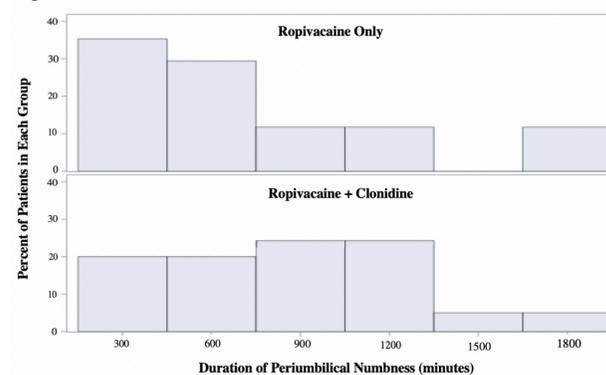


Table 3
Perioperative Characteristics Following Rectus Sheath Blockade

	Ropivacaine only (RO) n=24	Ropivacaine and Clonidine (R+C) n=26	p-value
Numbness at Discharge (Yes)	29%	42%	0.334
PACU Sedation Level (0, 1, 2)	19%, 76%, 5%	18%, 77%, 5%	1.000
Postop STAIC	30.0	29.0	0.565
Perioperative Hemodynamics			
HR < 50 bpm	0%	0%	
SBP < 70 mmHg	0%	0%	
MAP < 40 mmHg	0%	0%	
Patient Satisfaction	9 (8, 10)	9 (8, 10)	0.891
Parent Satisfaction	9 (8, 10)	8 (8, 10)	0.937
Nurse Satisfaction	10 (10, 10)	10 (9, 10)	0.734
Total Morphine Equivalents (mg/kg)	0.22 (0.15, 0.36)	0.20 (0.17, 0.24)	0.647

Median Value (Q1, Q3) or Frequency (%), UMSS: University of Michigan Sedation Scale, STAIC: State-Trait Anxiety Inventory for Children
Opioids converted into total morphine equivalents included morphine, fentanyl, hydromorphone and oxycodone.

DISCUSSION

- Our results suggest that clonidine does not significantly increase the duration of periumbilical numbness or reduce pain scores in patients receiving bilateral rectal sheath blocks for laparoscopic appendectomy.
- Clonidine was not associated with reduced morphine equivalent consumption, increased PACU sedation or lower STAIC anxiety scores, arguing against an analgesic or anxiolytic effect when administered as an adjuvant in truncal nerve blockade. Furthermore, patient, parent and nurse satisfaction did not differ between groups.
- Despite these negative findings, the addition of clonidine appeared to be safe and without clinically significant cardiovascular adverse events (critical HR, SBP or MAP deviations).
- Limitations:
 - periumbilical numbness was evaluated by subjective assessment via blunt tip needles
 - assessments of periumbilical numbness after discharge were less accurate as most parents deferred waking their children from sleep to evaluate
 - sample size may have been too small and unpowered to detect a significant difference between groups

Table 4: Patient Reported Pain Scores from Arrival to PACU to Resolution of Periumbilical Numbness

Pain Scores ^r	Ropivacaine only (RO) Mean (SD) n=24	Ropivacaine plus Clonidine (R+C) Mean (SD) n=26	Difference in Mean Pain Scores* OR (95% CI)	p-value
Time 1	1.79 (2.78)	1.20 (2.55)	0.549 (0.161, 1.865)	0.3362
Time 2	1.05 (2.04)	1.63 (2.76)	1.778 (0.502, 6.293)	0.3725
Time 3	3.26 (3.18)	1.74 (2.36)	0.374 (0.122, 1.145)	0.0849
Time 4	2.43 (2.95)	2.28 (2.49)	0.904 (0.261, 3.138)	0.8739
Time 5	2.44 (2.60)	1.87 (1.88)	0.668 (0.154, 2.901)	0.5901
Time 6	1.83 (2.04)	1.50 (1.65)	0.605 (0.091, 4.009)	0.6027

^rNPRS scores assessed every two hours from time of nerve block procedure *With RO as a reference group and using ordinal logistic regression

CONCLUSION

- This is the first study to investigate whether the addition of clonidine to ropivacaine prolongs the duration of rectus sheath blockade and the effect of clonidine on perioperative analgesia, anxiolysis and sedation in patients undergoing laparoscopic appendectomy.
- The addition of clonidine was safe but did not significantly increase the duration of periumbilical numbness or reduce perioperative analgesic consumption or anxiety. Our results argue against an analgesic or anxiolytic effect when administered as an adjuvant in rectus sheath nerve blocks.

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