Supplementary

Appendix 1 Institutional Enhanced Recovery After Surgery Protocol for Minimally Invasive Repair of Pectus Excavatum (Modified for Publication)

Pain Protocol for Minimally Invasive Pectus Excavatum Repair (MIRPE) with CLONIDINE

Goals:
1. Provide effective postoperative analgesia
2. Reduce opioid side effects through opioid-sparing plan
3. Early ambulation, discharge on Hospital Day 1 or 2

Preoperatively:
Preoperative visit with perioperative pain education
Cognitive behavioral pain management skills

Positioning:
Supine, arms tucked

Lung Isolation:
Double lumen endotracheal tube to allow alternating between left and right lung isolation
- ❖ This minimizes risk of lung contact with the cryoprobe

Intraoperatively:
Single dose of IV methadone at start of case, dose: 0.1 mg/kg, maximum 5 mg
Acetaminophen IV
Cryoablation T3-T7 bilaterally
Thoracoscopic intercostal nerve blocks: (50mcg clonidine mixed in 50cc of 0.25% bupivacaine) T3-T7 bilaterally
Ketorolac IV at end of case after discussion with surgeon
Foley removed at end of case

Day 0
1. Acetaminophen IV every 4 hours ATC for 4 doses then switch to PO ATC as soon as taking enteral diet
2. Diazepam IV every 6 hours prn for spasms
3. Morphine IV prn (avoid patient-controlled analgesia (PCA) unless there are issues with pain control)
5. Start 24 hours of ketorolac as long as:
   a. Patient is adequately transfused/perfused/hydrated with post op UOP is >1ml/kg/hour.
   b. No contraindications of including liver/kidney disease, gastritis, bleeding disorder
6. Anti-emetics (Ondansetron) prn
7. Maintenance IVF (to be stopped when tolerating enteral diet)

Day 1+
1. When tolerating enteral diet: discontinue IV morphine and begin short-acting oral opioids (oxycodone typically). If started postoperatively for pain control, PCA should be stopped in the early morning on POD #1 unless patient is having nausea or vomiting.
2. Change IV Diazepam to PO prn.
3. Change IV ketorolac to PO ibuprofen scheduled.
4. Change IV acetaminophen to PO scheduled.

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Discharge criteria:

1. Tolerating diet and medications enterally
2. Pain controlled on PO regimen
3. Ambulating
4. Return of bowel function is not required for discharge.

Usual discharge pain medications include acetaminophen and ibuprofen. Additional medications include bowel regimen, and depending on inpatient needs – opioids / diazepam. Number of opioid doses written should be based on inpatient needs (typically zero to 5 doses).

❖ IV = intravenous; ATC = Around-the-Clock; PO = per os or by mouth; prn = pro re nata or as needed; POD = Post Operative Day; PCA = patient-controlled analgesia; IVF = intravenous fluids

Surgical considerations

Incisions - Under 6th rib bilaterally (3-4cm), under 9th rib bilaterally (5mm), along R sternum (5 mm)

Cryoablation at posterior axillary line before branching of lateral cutaneous branch,

Cryoablation at T3-7 bilaterally, -70C for 2 min each site (Cryoablation numbness onset 10-24h)

Interocostal nerve block of T3-T7 bilaterally using Deflux needle thoracoscopically (3-4cc of 0.25% bupivacaine) targeting nerve medial to cryoablation site

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