Perioperative Analgesia for Thyroid and Parathyroid Surgery: A Review of Current Practices

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KEYWORDS

• General anesthesia • Local anesthesia • Nerve block • Thyroid surgery • Parathyroid surgery • Pain control • NSAIDS • ERAS

KEY POINTS

- Perioperative analgesia for endocrine surgery of the head and neck includes general anesthesia, local anesthesia, oral, and multimodality techniques for pain control.
- General anesthesia should avoid long-acting paralytics because of intraoperative recurrent laryngeal nerve monitoring.
- Consider the use of perioperative steroids to reduce postoperative pain in the immediate postoperative period.
- Recognize that local anesthesia includes cervical nerve blocks for patients undergoing surgery.
- Multimodal analgesia, including expedited recovery after surgery algorithms, is key for optimal pain control.

INTRODUCTION

Endocrine surgery of the head and neck includes removal of the thyroid and parathyroid glands with or without central or lateral neck dissection. Paradigm shifts, including increased same-day surgical discharges and heightened scrutiny of hospital bed utilization and associated cost, have influenced perioperative management of patients. Furthermore, the current epidemic surrounding opioid overuse and abuse has focused research and institutional efforts on minimizing opioid use. These factors have led to

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the development of multimodality algorithms aimed at optimizing pain control for outpatient surgery.

This article discusses perioperative analgesia for thyroid and parathyroid surgery during preoperative, intraoperative, and postoperative periods. Multimodality approaches, including expedited recovery after surgery (ERAS), will be addressed. The authors review current evidence regarding pain management and consider best practices regarding analgesia for head and neck endocrine surgical patients.

PERIOPERATIVE AND MULTIMODAL ANALGESIA

Multimodal analgesia (MMA) combines local anesthesia with preoperative, perioperative, and/or postoperative administration of N-acetyl-p-amino-phenol (APAP) derivatives (such as acetaminophen), nonsteroidal antiinflammatory drugs (NSAIDs), ketamine, and/or gamma-amino-butyric-acid (GABA) analogues. A synergistic or cumulative effect may exist with MMA, providing superior analgesia compared with single modality therapy.

The concept of preemptive analgesia to prevent central sensitization, thereby improving postoperative pain management, is demonstrated in multiple studies. This has led to adoption of MMA for pain management, including nonopiate alternatives.[1] Militsakh and colleagues[2] studied an MMA regimen in thyroid and parathyroid surgery patients of preoperative acetaminophen, NSAIDS, and gabapentin, coupled with postoperative acetaminophen and ibuprofen, which demonstrated decreased opioid use without change in bleeding complications. In addition, celecoxib has been heralded as an NSAID that does not increase bleeding risk, due to selective COX-2 inhibition. Although it has been shown to decrease total opioid use when given preoperatively as a single dose in other head and neck surgeries,[3] its specific effect regarding endocrine surgery has not been identified.

The role of perioperative administration of corticosteroids in reducing postoperative pain or temporary recurrent laryngeal nerve palsy is controversial. Early studies demonstrated improvement in voice outcomes with perioperative steroid use.[4] Additional studies have conflicting findings, with some studies demonstrating no change in pain or voice[5] and other studies suggesting improvement in pain control with perioperative steroid use.[6]

INTRAOPERATIVE TECHNIQUES AND AGENTS

General Anesthesia

Thyroid and parathyroid surgery is traditionally completed under general anesthesia for airway security, as well as concern for potential hematoma postoperatively that may complicate emergent intubation.[7,8] Despite this, cases under local anesthesia alone have been reported in resource-limited locations and are feasible.[9] Induction of general anesthesia is completed with multiple anesthetic agents, but typical techniques use an opioid (eg, fentanyl) administered before a sedative-hypnotic agent (eg, propofol) to achieve optimal synergistic effect.[10] Intravenous induction causes less nausea/vomiting than inhalational agents and is thus preferred.[10] Furthermore, dexmedetomidine (Precedex) has been shown to reduce postoperative nausea in patients undergoing general anesthesia and can decrease intraoperative and postoperative pain in patients undergoing nasal surgery.[11] The effects of dexmedetomidine in thyroid and parathyroid surgical patients need further investigation.

Laryngeal Anesthesia

Laryngeal anesthesia is an important concern due to trauma associated with intubation and endotracheal tube presence. The use of intraoperative nerve monitoring has become more prevalent during thyroid or parathyroid surgery,[12] and because monitoring technology requires electromyography, long-term neuromuscular blockade must be avoided. A short-acting neuromuscular blocking agent may be used for induction, but the effect must not persist past this period to allow for accurate nerve monitoring. The placement of endotracheal tube must also be precise to ensure electrodes are contacting each vocal fold. Topical anesthesia to the larynx may prevent laryngospasm associated with endotracheal tube presence.

Postoperative sore throat (POST) secondary to intubation is a known risk to endocrine surgery. Recently, studies have examined the effect of tracheal topical anesthesia on immediate postoperative pain. Use of a smaller-diameter endotracheal tube has been associated with decreased POST between size 7.0 versus 6.0 tubes (51.1% vs 27.1%).[13] Kim and colleagues randomized benzydamine hydrochloride (BH), 10% lidocaine, and normal saline spray on endotracheal tube cuffs in total thyroidectomy patients to evaluate POST. In 87 patients, BH spray reduced the incidence and severity of POST at 12 hours compared with other groups.[14] In addition, the use of nasogastric tubes intraoperatively has strong association with POST (adjusted odds ratio = 0.41, 95% confidence interval: 0.174, 0.965; P = .041).[15]

Local Anesthesia

Cervical nerve blocks and local anesthesia to the incision are effective in managing perioperative pain for thyroid and parathyroid surgery. The injection of lidocaine, bupivacaine, or ropivicaine into the skin before incision is effective in postoperative pain control, decreasing pain scores, and improving overall patient satisfaction.[16] Biery and Pellitteri[17] found that MMA including preincision local wound infiltration with bupivacaine and outpatient ibuprofen/acetaminophen provided sufficient pain control after thyroidectomy and parathyroidectomy in more than 98% of patients.

In addition to subdermal injection at the operative site, bilateral superficial cervical plexus block (BSCPB) seems to improve postoperative pain control.[18] BSCPBs are local anesthetic blocks to the emerging branches of the superficial cervical plexus (lesser occipital, greater auricular, transverse cervical, and supraclavicular nerves). Complication rates with this technique are low with little risk to deeper structures. A recent meta-analysis demonstrated BSCPB offers greater analgesic efficacy after thyroid surgery, with reduction in subjective pain score and longer time to first postoperative dose of narcotic medication compared with narcotics alone.[19] Also, it seems that preoperative block is more efficacious than postoperative.[19]

Pharmacologic treatments

Opioids (oxycodone, hydrocodone, morphine, tramadol) Opioids have long been the mainstay of postoperative analgesia regimens for head and neck endocrine procedures; however, recognition of their addictive potential in combination with monetary and societal cost of addiction has driven a trend toward minimization or elimination of opioid use. The most common opioid prescribed depends on center-specific preferences and includes oxycodone, oxycodone/acetaminophen, hydrocodone/acetaminophen, and tramadol.

Lou and colleagues[20] found 93% of patients undergoing thyroidectomy or parathyroidectomy required 20 or fewer oral morphine equivalents at first postoperative visit. Furthermore, Tharakan and colleagues[21] found 80% of thyroidectomy and parathyroidectomy patients required 15 or less oral morphine equivalents with half of patients

not requiring opioid use at all. Similarly, Sada and colleagues[22] found more than half of parathyroidectomy patients did not require opioids postoperatively whatsoever.

Tramadol is a different opioid with dual mechanisms of action. The reduced *u*-opioid receptor activation as well as the serotonin and norepinephrine reuptake inhibition may create a favorable profile for pain control.[23] Tramadol has been reported to have lower abuse potential than traditional opioids.[24] Multiple studies have found age less than 45 years, maximum pain score postoperatively, and preoperative opioid use were independent predictors of postoperative opioid use.[20–25]

Nonsteroidal antiinflammatory drugs NSAIDS are also considered mainstay in pain management; however, due to concern for bleeding complications, widespread adoption for perioperative use has been slow in surgeries of the head and neck. In a prospective randomized control trial, Nguyen and colleagues[26] concluded that ibuprofen provided equally effective pain control compared with hydrocodone/acetaminophen in outpatient otolaryngology procedures, including thyroidectomy and parathyroidectomy, with decreased opioid requirement. In a comparison of lornoxicam and low-dose tramadol for postthyroidectomy analgesia, Yücel and colleagues[27] found pain scores were lower in the first hour and time to postoperative analgesic use was longer with lornoxicam compared with low-dose tramadol, with higher rates of nausea and vomiting in the tramadol group. Recent studies have also demonstrated reduced opioid consumption associated with single preoperative dose of intravenous (IV) ibuprofen.[28] Despite this, consensus has not been reached.

The intraoperative use of ketorolac (Torodol) for surgery has been widely implemented, but the adoption in head and neck surgeries has been delayed due to concern for increased bleeding risk. Some studies have demonstrated similar analgesic effect when combined with fentanyl and ondansetron compared with opioid alone, as well as lower rates of postoperative nausea, vomiting, and dizziness.[29] Postoperative bleeding after thyroidectomy has been associated with NSAID use postoperatively,[30] although its clinical significance has been debated.[31] Despite their utility, NSAIDS have side effects and must be used with caution in patients with renal insufficiency, gastric ulcers, or history of gastric bypass surgery.

N-acetyl-p-amino-phenol (paracetamol, acetaminophen) IV and oral administration of APAP derivatives have been used for postoperative analgesia after thyroid and parathyroid surgery for years. IV paracetamol was shown to reduce postoperative pain scores, opioid requirement, and incidence of nausea and vomiting, while prolonging time to first analgesic after thyroidectomy.[32] Hong and colleagues[33] found IV paracetamol reduced postoperative pain and rescue analgesic demand after robotic transaxillary thyroidectomy. A Kaiser Permanente study found in 469 thyroid and parathyroid surgeries that postoperative analgesic regimen of oral acetaminophen alone was sufficient to prevent opioid use after discharge in more than 90% of cases (David S. Cohen, 2019, unpublished data).

Gamma-amino-butyric-acid analogs (gabapentin, pregabalin) Gabapentinoids have been postulated to desensitize patients to painful stimuli, thereby reducing the need for other analgesic medication. Hema and colleagues[34] found oral gabapentin was effective as a preventative analgesic in reducing postoperative pain scores, total tramadol consumption, and prolonged time to rescue analgesic after thyroidectomy. Sanders and Dawes[35] demonstrated gabapentin seems to have a beneficial effect on perioperative pain relief and analgesic consumption in head and neck surgeries, including thyroidectomy. Lee and colleagues[36] showed that preoperative oral gabapentin reduced the intensity and incidence of sore throat after thyroid surgery. Despite

this, other studies have suggested that groups receiving a preoperative dose of gabapentin may actually have an increased opioid or APAP consumption.[37] For this reason, additional studies specific to thyroid and parathyroid surgery are needed.

Ketamine

Ketamine has been studied as local wound irrigation and IV infusion for analgesia in many surgeries, including parathyroid and thyroid surgery.[38] According to Abd El-Rahman and colleagues,[39] local wound instillation of ketamine reduced pain scores, total morphine consumption, and time to first analgesic. Kim and colleagues[40] found IV infusion of ketamine intraoperatively reduced postoperative pain associated with axillary approach for thyroidectomy. Similarly, Lee and colleagues[41] noted reduced pain scores compared with placebo after IV ketamine infusion following robotic thyroidectomy.

DISCUSSION

The authors theorize that postoperative pain after thyroid and parathyroid surgery is derived primarily from 3 sources: (1) sore throat from laryngeal or tracheal trauma during intubation or intraoperatively from endotracheal or nasogastric tube presence, (2) posterior neck discomfort from cervical positioning in extended position typical for head and neck endocrine surgeries, and (3) anterior neck pain from the skin incision itself or trauma from dissection, retraction, or muscle division. Studies examining efficacy of postoperative pain regimens do not distinguish between these sources of postoperative pain. Distinguishing the source of discomfort may help improve

Table 1
Summary of analgesia types used for thyroid or parathyroid surgery

Intraoperative anesthesia	
General	IV induction with propofol and IV opioids
NMDA selective antagonists	IV ketamine
NSAIDS	IV ketorolac
Topical laryngeal	Lidocaine, benzydamine hydrochloride
Local injectable	Lidocaine with epinephrine, bupivacaine, or ropivacaine injection, superior cervical nerve block (SCPB)
Pharmacologic treatment	
APAP derivatives	Acetaminophen, paracetamol
Opiates	Oxycodone/acetaminophen, hydrocodone/acetaminophen, morphine, and tramadol
NSAIDs	Celecoxib (COX 2), lornoxicam/meloxicam (COX2 >COX1) ibuprofen, naproxen (COX2 + COX1)
N-acetyl-p-amino-phenol	Paracetamol, acetaminophen
Gamma-amino-butyric-acid analogues	Gabapentin, pregabalin
Multimodal analgesia (MMA)	APAP, NSAIDs, GABA analogues, topical laryngeal anesthesia, and local anesthesia including SCPB

postoperative pain management. For this reason, additional research with specific attention to the cause of pain may help elucidate a more optimal algorithm.

Methods used to decrease laryngeal or oropharyngeal trauma associated with intubation are key to minimizing POST. These practices should include small-sized endotracheal tubes and eliminating routine use of nasogastric tubes or esophageal temperature probes if possible. Avoiding such equipment or practice may reduce postoperative sore throat and warrants additional research.

Neck extension is helpful for exposure to the mediastinum or substernal area for dissection. Care must be taken to support the neck in patients with limited cervical mobility or cervical degenerative joint disease to avoid postoperative pain from traction. Alternative therapies such as cervical kinesio taping[42] and electroacupuncture[43] have shown promising results in reducing postoperative pain and analgesic use after thyroidectomy. Randomized controlled trials are necessary to confirm such findings.

Table 1 is a summary of perioperative analgesia for thyroid and parathyroid surgical patients discussed in this article. In determining the best way to treat postoperative pain, it may be important to identify the source of pain in order to better adopt analgesic or pain management to target that type of pain.

SUMMARY

Undoubtedly, there has been a transition to nonopiate pain control in thyroid and parathyroid surgery. Patients who undergo surgery have been safely discharged the same day, alleviating hospital costs and bed utilization.[44–46] With this trend, there has been increased attention to MMA, including ERAS incorporating NSAIDs, GABA analogues, and local anesthesia techniques such as BSCPB. One major hurdle to broad implementation has been concern for side effects, specifically postoperative bleeding complications such as neck hematoma. Although evidence for clinically significant risk is lacking, additional research is required to determine if an optimal multimodality regime can be discovered without an increase in surgical complications. Postoperative pain after thyroid and parathyroid surgery is derived primarily from 3 sources: (1) sore throat from laryngeal or tracheal trauma during intubation or intraoperatively from endotracheal or nasogastric tube presence, (2) posterior neck discomfort from cervical positioning in extended position typical for head and neck endocrine surgeries, and (3) anterior neck pain from the skin incision itself or trauma from dissection, retraction, or muscle division. Further studies examining efficacy of postoperative pain regimens should distinguish between these sources of postoperative pain.

DISCLOSURE

The authors have nothing to disclose.

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