

Thyroidectomy Under Local Anesthesia

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Abstract Thyroidectomy under local anesthesia was common historically. With improvements in general anesthesia, local anesthesia techniques are now restricted to patients deemed too ill to undergo general anesthesia or to those who live in extremely resource-poor locations. In the last few decades there has been renewed interest in thyroidectomy under local anesthesia, and the few published series reveal morbidity outcomes are equivalent to those for thyroidectomy under general anesthesia. Limited data on the cost of the procedure indicate thyroidectomy under local anesthesia is cost-effective.

Keywords Thyroidectomy · Local anesthesia · Thyroid surgery · Cervical plexus block · Regional anesthesia · Outcomes

Introduction

“I like operating under local anesthesia; the patients are safe, the distress is negligible, the recurrent

laryngeal nerve may be guarded, post-operative vomiting does not occur, pints of fluid may be given by the mouth. And from the moment the operation is over the patient is happy enough to smile, and free from the unpleasant sequelae of general anesthesia.” [1].
T.P. Dunhill, M.D., February 13, 1912

As Thomas Peel Dunhill noted 101 years ago at the Joint Meeting with the Medical Section and Section of Anaesthetics, thyroid surgery performed under local anesthesia has several advantages. Historically, thyroid surgery was performed under local anesthesia for indications ranging from toxic goiter to solitary nodules [2]. Emil Theodor Kocher, a noted pioneer of thyroid surgery, also was an early advocate of tailored anesthetic methods. One of his few thyroid mortalities was attributed to use of chloroform anesthesia; after this complication, he used only local anesthesia with cocaine [3]. As anesthetic methods were refined and general anesthesia became safer, local anesthesia for thyroidectomy became restricted to patients with contraindications to general anesthesia or to patients living in medically resource-sparse locations [4].

As surgical technique improved, many patients who underwent limited and straightforward thyroid resections did not require an overnight hospital stay [5]. This was accompanied by a shift toward minimally invasive surgery, and interest in the use of local anesthesia and/or regional blocks was renewed. Paul LoGerfo was a notable pioneer of the technique for thyroid and parathyroid surgery under cervical block. He was also an articulate advocate for the procedure, performing more than 1,000 thyroidectomies by use of this approach and publishing many of the seminal articles that defined the procedure. His and others' early studies showed that local and regional thyroidectomy techniques were safe, effective, and well-tolerated by

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patients [6–8*]; similar techniques also were noted to be successful in parathyroid surgery [9–11]. Local anesthetic techniques even have been reported for video-assisted thyroidectomy [12].

Procedural Details

Patient Selection and Preoperative Evaluation

Patient selection is an important component of any procedure, and thyroidectomy under locoregional anesthesia is no exception. Patients who are unable to communicate (language barriers, dementia) or who are not cooperative are poor candidates. Other contraindications include large goiter, previous neck surgery, sleep apnea, coagulopathy, severe claustrophobia or anxiety, morbid obesity, preoperative recurrent laryngeal nerve paralysis, retro-esophageal or retro-tracheal goiter, need for sternotomy, concomitant cervical lymphadenopathy, known or suspected locally-invasive cancer, patient preference for general anesthesia, and allergy to local anesthesia. However, some studies have revealed that indications may be extended with increased surgeon and anesthesiologist experience [13]. The surgeon and anesthesiologist must also be prepared to convert to general anesthesia at any time during the procedure, and to do so in a controlled and safe fashion. Reasons for conversion from cervical plexus block to general anesthesia include unexpected intraoperative pathology, patient discomfort, and toxic reaction to lidocaine [14].

Local Anesthesia and Cervical Plexus Block

Thyroidectomy under local and regional anesthesia (cervical plexus block) typically is accompanied by mild intravenous sedation. Generally, local anesthesia without cervical plexus block is limited to central thyroid resections, for example isthmusectomy. Although more extensive thyroid resections can be performed under strict local anesthesia, adjuvant cervical plexus blocks facilitate deeper dissection and reduce the need for repeated injections of local anesthetic during the operation [15].

The superficial cervical plexus innervates the skin of the anterolateral neck through anterior primary rami of C2 through C4 and emerges as four distinct nerves from the posterior border of the sternocleidomastoid muscle; the transverse branches of the plexus primarily innervate the thyroid gland parenchyma [16]. Several surface anatomy landmarks are also helpful for estimating the location of injection at the posterior border of the sternocleidomastoid muscle: the mastoid process, the tubercle of C6, and the posterior border of the clavicular head of the

sternocleidomastoid muscle. A line extending from the mastoid to C6 may be drawn; the site of needle insertion (and the location of the emergence of the branches of the superficial cervical plexus) is the midpoint of this line.

The target depth of the cervical block is the tissue between the investing fascia (just deep to the sternocleidomastoid muscle) and the deep cervical fascia, which envelops the vertebral column and cervical nerve roots. The pretracheal fascia contains the thyroid gland and the recurrent and superior laryngeal nerves (Fig. 1).

The specific local anesthetic agent depends on the preference of the surgeon and anesthesiologist, and the expected duration of the procedure. Alone or in combination, lidocaine and bupivacaine are excellent choices; such combinations of short and longer-acting anesthetic agents can be supplemented with epinephrine (1:100,000 or 1:200,000) to prolong the duration of the anesthetic [13, 15, 17]. The cervical nerve block may be executed by the anesthesiologist or surgeon before the patient enters the operating room, or by the surgeon just before making the incision. The block should be performed as a sterile procedure [8*]. Injection can be uncomfortable, and sedation anesthesia at the time of nerve block placement may be advantageous to avoid further patient anxiety.

The patient is positioned in a semi-Fowler position with the head in slight extension and the arms tucked and padded properly at the sides. A fan blowing room air gently across the patient's face may minimize the sensation of claustrophobia. The head should be rotated away from the side being injected. Infiltration of local anesthetic along the anterior border of the sternocleidomastoid muscle, and a local field block in the area of planned incision, typically result in excellent analgesia (Figs. 2, 3, and 4) [17]. Alternatively, infiltration superiorly, medially, and inferiorly at the point of emergence of the superficial cervical plexus, approximated by the convergence of the external jugular vein and the posterior border of the sternocleidomastoid muscle, may be performed [18]. Although surgical dissection for a thyroid lobectomy is usually limited to the side of interest, a bilateral block is performed for both thyroid lobectomy and total thyroidectomy, because many of the nerve endings cross midline and extend to the contralateral side [15]. The surgery and anesthesia teams must be cautious when performing a bilateral cervical block, because infiltration of local anesthesia may cause transient paralysis of the recurrent laryngeal nerve(s). After the block has been placed on one side, the voice should be tested to confirm that the recurrent laryngeal nerve has not been paralyzed before proceeding on the contralateral side, because inadvertent anesthesia of both recurrent laryngeal nerves could put the patient at risk of a lost airway. Often, the superior poles of the thyroid gland are more difficult areas to anesthetize, and the surgeon should be prepared to further infiltrate this area after exposure of the

Fig. 1 Cross-section of the neck at the C4 vertebral level, showing the deep, intermediate, and superficial block sites. (Reprinted from Pandit et al. [23], by permission of Oxford University Press.)

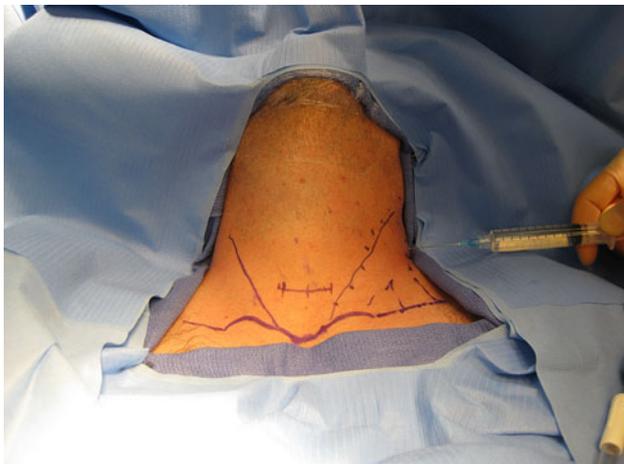
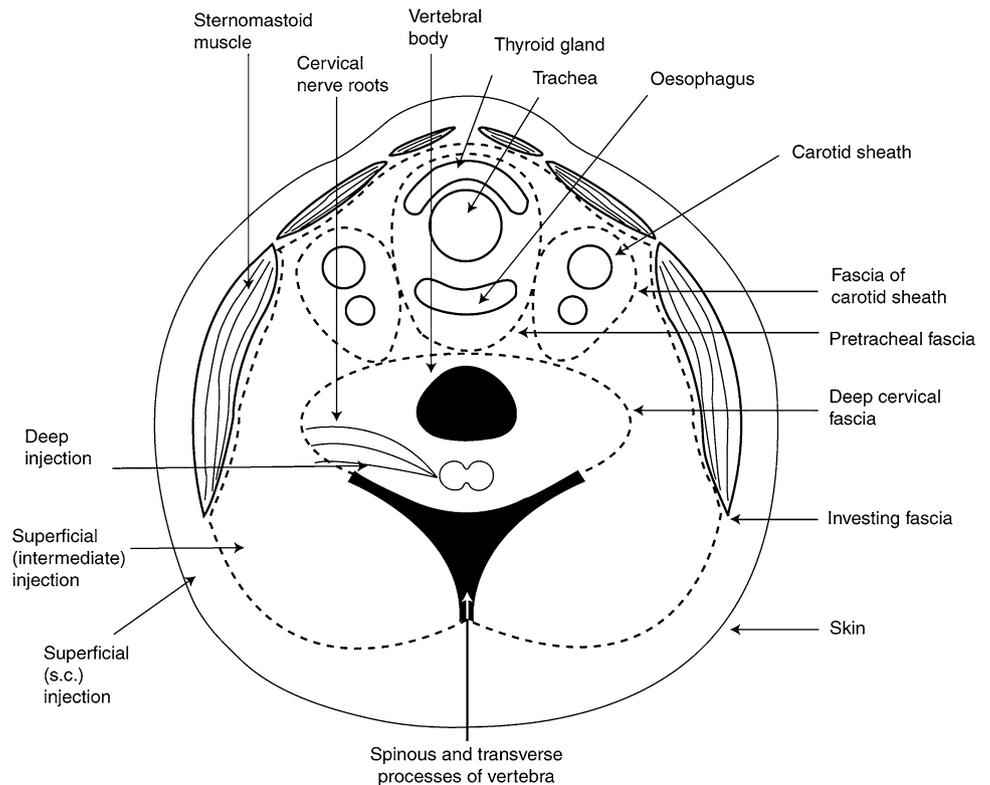


Fig. 2 Areas of injection for superficial cervical block. Local anesthetic is injected posterior and deep to the sternocleidomastoid muscle at the approximate midpoint of a vertical line drawn from the mastoid to the level of C6 (*needle*). (Courtesy of Sanziana Roman, MD.)



Fig. 3 Areas of injection for superficial cervical block. Additional local anesthetic is infiltrated along the anterior border of the sternocleidomastoid muscle (*dotted line*). (Courtesy of Sanziana Roman, MD.)

gland and before ligation of the superior pole vessels [19]. The surgeon should also be aware that although cervical block provides anesthesia, the sensation of pressure cannot be blocked. It is also important to remember that tracheal manipulation may induce coughing.

In general, light, conscious sedation is the objective of anesthesia for the procedure, and this requires careful attention by the anesthesiology team. Over-sedation can lead to an

uncooperative patient, respiratory depression, airway compromise, and the need for conversion to general anesthesia.

Advantages of Local and Regional Anesthesia

Local anesthesia often is reserved for those deemed too medically frail for general anesthesia. Reduction of the rare but serious complications of general anesthesia—myocardial



Fig. 4 Areas of injection for superficial cervical block. Finally, local anesthetic is injected in the area of the planned incision. (Courtesy of Sanziana Roman, MD.)

infarction, cerebrovascular accident, and death—is a major advantage. In the particular cases of singers and public speakers, another benefit may be the avoidance of endotracheal intubation, because this has been reported to cause vocal cord changes in up to 5 % of patients [8•]. In addition, although typically not serious or severe, avoidance of other potential side effects of general anesthesia, including nausea, vomiting, headache, visual problems, disorientation, pharyngitis, myalgia, shivering, dizziness, and drowsiness, is attractive to both patients and physicians.

In an early report on the technique LoGerfo discussed a series of 203 consecutive thyroidectomies performed under local and regional anesthesia in the outpatient setting. This study showed the procedure was safe, with low morbidity; there were no readmissions to the hospital, and patient satisfaction was high [8•]. Subsequently, this series of patients grew to well over 1,000 patients. Spanknebel et al. [13] reported 3.3 % conversion to general anesthesia, 1 % incidence of recurrent laryngeal nerve injury (unrelated to anesthetic technique), 0.5 % incidence of postoperative wound hematomas requiring reoperation, and one case of permanent hypoparathyroidism.

It is logical there would be a cost benefit to procedures performed under superficial cervical nerve block. Although data are limited, it appears that thyroidectomy under local anesthesia is cost-effective [4, 20, 21•]. Spanknebel et al. reported cost data for a cohort of patients undergoing thyroidectomy by surgeons with a focus in endocrine surgery and demonstrated an appreciable difference in average total cost for local anesthesia (\$2,974) versus general anesthesia (\$4,412). General anesthesia cases were associated with significantly increased mean operating room times compared with local anesthesia cases (180 vs. 120 min, respectively) [21•], although it should be noted

that these data may be biased because of the large number of procedures performed under local anesthesia.

Disadvantages of Local and Regional Anesthesia

General anesthesia has several advantages for the surgeon, anesthesiologist, and patient. The surgeon has a motionless surgical field, and the anesthesiologist has a secure airway. Patient benefits include analgesia and amnesia, usually resulting in a comfortable operative experience. In addition, a study by Suri et al. in 2010 culled data from a questionnaire to assess several of the frequently cited advantages of superficial cervical plexus block for thyroid and parathyroid surgery. The study found no demonstrable advantage of local over general anesthesia for thyroid patients in timing of pain, overall pain medication use, narcotic pain medication use, duration of postoperative pain, incidence of nausea or vomiting, voice hoarseness, dysphagia, return of energy levels, or return to work [18]. Superficial cervical block should not be used for complex cases, for example large goiters and invasive cancers.

Complications associated with bilateral superficial cervical block include injection into the internal jugular vein or carotid artery, direct infusion into the thyroid veins resulting in local anesthetic toxicity, injection into the parenchyma of the thyroid gland leading to a localized hematoma, and infiltration of the vagus nerve leading to transient paralysis of the vocal cord(s) and potential airway loss, and the need for conversion to general anesthesia [15].

Outcomes

Most of the available literature indicates that thyroidectomy under local anesthesia and superficial cervical block is both safe and effective. Spanknebel et al. [13] reported a series of 1,025 cases of thyroidectomy using local anesthesia over a 16-year period. The authors noted hospital stay was shorter, and the incidence of postoperative complications was observed to be similar to thyroidectomy under general anesthesia. A follow-up to this study examined the outcomes and cost of local anesthesia versus general anesthesia for thyroidectomy, and found that morbidity was similar, but that actual total costs were 48 % higher for thyroid surgery performed under general anesthesia compared with thyroidectomy under local anesthesia [21•]. Mamede et al. reported on a smaller series of patients (21 general anesthesia, 21 superficial cervical plexus block) undergoing hemithyroidectomy. The authors found that local anesthesia was associated with longer surgery time, but with significantly reduced costs and incidence of laryngotracheal injury resulting from introducing the laryngoscope and/or anesthesia probe. No difference was noted in hospital stay or

patient satisfaction [20]. Snyder et al. also reported no difference in demographics, postoperative complications, hospital admissions, or patient satisfaction. However, on average, patients in the general anesthesia group tended to spend more time postoperatively in the outpatient surgery center than patients in the group that received local anesthesia; these differences were not statistically significant [22].

Conclusions

In summary, both partial and total thyroidectomy under superficial cervical plexus block have been demonstrated to be safe and effective, with the incidence of complications comparable with that for thyroid resection under general anesthesia. Limited data on the cost of the procedures indicate that local anesthetic techniques are cost-effective. Despite these advantages, thyroidectomy under local anesthesia remains the exception rather than the standard at most centers; this may be because of surgeon or patient preference.

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Compliance with Ethics Guidelines

Conflict of Interest Stacey A. Milan, Leslie S. Wu, and Julie Ann Sosa declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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