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# Outpatient Thyroidectomy:

## Is it Safe?

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## BACKGROUND

Thyroidectomy has traditionally been considered an inpatient procedure owing to concerns over the potential life-threatening consequences of a postoperative cervical hematoma. However, recent years have seen an increase in the volume of outpatient thyroidectomy because high-volume thyroid surgeons are frequently discharging patients on the same day or the morning after surgery.[1,2] Although outpatient thyroidectomy is becoming increasingly common, there remains considerable controversy over whether the best interests of patients are truly being served by anything less than a full inpatient admission after thyroid surgery.[3] Advocates for outpatient thyroidectomy point to low complication rates, decreased costs, and improved patient satisfaction as justifications for avoiding admission in carefully selected patients. Opponents of outpatient thyroid surgery generally cite concerns over missed hematomas as well as difficulty managing hypocalcemia as reasons for keeping patients in the hospital long enough to ensure that discharge is safe. Additionally, it is not entirely clear how to identify patients who can undergo outpatient thyroidectomy safely versus those who would benefit from additional supervision in the inpatient setting.

The American Thyroid Association (ATA) recently attempted to address the controversy over outpatient thyroidectomy by issuing a position paper that reviewed the evidence demonstrating safety and attempted to establish criteria for proper patient selection.[3] The final recommendation is that “outpatient thyroidectomy may be undertaken safely in a carefully selected patient population provided that certain precautionary measures are taken.”[3] The present article expands on the ATA recommendations and attempts to offer practical advice for surgeons who wish to begin an outpatient thyroidectomy practice.

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## DEFINITION OF OUTPATIENT THYROIDECTOMY

One issue that has complicated analysis of outcomes for outpatient thyroidectomy is that the actual definition of "outpatient" surgery has been somewhat variable. Some groups categorize a thyroidectomy as an outpatient procedure only if performed at an ambulatory surgery center with discharge occurring the same day as surgery.[4–7] Others classify a patient admitted for a 23-hour observation period as an outpatient because the hospital does not categorize this as a full admission.[8] When analyzing national trends in outpatient thyroidectomy, it is important to remember that many data-sets lack the ability to distinguish between these 2 definitions of outpatient surgery. A certain degree of caution is required when interpreting studies using datasets that merge same-day surgery and 23-hour observation. For the sake of completeness, we discuss data from papers using either definition, but we note (Table 1) which approach was taken in the individual studies.

## BENEFITS OF OUTPATIENT THYROIDECTOMY

### Cost

One of the main considerations prompting surgeons to perform outpatient thyroidectomy is the potential cost savings of avoiding a full inpatient admission. Mowschenson and colleagues[4] showed a $900 reduction in charges for outpatient versus inpatient thyroid surgery, whereas Terris and colleagues[9] showed charges of $10,288 for inpatient compared with $7814 for outpatient thyroidectomy. Although the 2 studies involve analysis of charges rather than actual costs, it does seem reasonable that fewer hospital resources are needed to care for a shorter rather than a longer stay. Because both studies defined outpatient surgery as a same-day discharge, it is less clear whether a 23-hour observation leads to substantially lower cost for the hospital or the patient. Stack and colleagues[8] evaluated both mean and median charges for a full inpatient admission compared with any stay less than 24 hours and found no difference in median charges, although analysis of mean charges did favor the outpatient approach.

### Patient Satisfaction

Another argument for the value of outpatient thyroidectomy is that patients will be happier if they are able to avoid admission and can recover in the comfort of their own home. Although the notion that most individuals would rather be at home than in the hospital has considerable face validity, the supporting evidence is somewhat limited. Mowschenson and colleagues[4] surveyed patients undergoing outpatient thyroidectomy and found that 65% were satisfied with their care. As a control, they also surveyed patients undergoing laparoscopic cholecystectomy and found that 68% were satisfied. The authors concluded that outpatient thyroid surgery was just as acceptable to patients as other outpatient surgeries. Samson and colleagues[10] conducted a randomized trial of inpatient versus outpatient thyroid surgery in the Philippines as well as a separate analysis of patients treated after the trial. They found that 798 of 809 outpatients (99%) were "very pleased" with their care compared with only 25 of 369 (7%) in the inpatient group. Although it seems that the majority of patients who undergo outpatient thyroidectomy are reasonably satisfied with the experience, it is important to remember that a subset of patients are uncomfortable with the

idea of going home right after having surgery. These individuals may gain more reassurance and ultimately be more satisfied with their perioperative experience by a full admission, even in the absence of any complications.

### Other Benefits

In addition to cost savings and patient satisfaction, some have advocated for outpatient thyroidectomy as a way to minimize potential iatrogenic complications, including exposure to multidrug-resistant organisms and other nosocomial infections.[3] It does seem reasonable that shorter hospital stays result in less time exposed to hospital-based organisms, but the value of shortening that exposure time from 24 to 6 hours is not entirely clear. Other potential iatrogenic injuries include venous thrombosis or infection from maintaining peripheral intravenous lines as well as allergic reactions or other complications from medications administered in the hospital. Again, there is little evidence to quantify the benefits of outpatient over inpatient surgery with regard to avoiding iatrogenic complications, but it at least represents a theoretic benefit.

## RISKS OF OUTPATIENT THYROIDECTOMY

### Hematoma

The primary argument against performing thyroidectomy as an outpatient procedure is concern over missing a cervical hematoma that could lead to airway compromise and death. One of the original series of outpatient thyroidectomy was presented at the American Association of Endocrine Surgeons meeting in 1995 and one of the participants questioned whether the data should even have been presented at the meeting because “the true costs of observation in a safe setting are minimal; it would take a lot of patient days to match even one million-dollar lawsuit” if a patient were to die after developing a hematoma.[4] Anxiety over hematomas stems from several factors: the variable incidence reported in the literature, the potential for hematomas to develop hours to days after surgery, and the inability to accurately identify patients at high risk for hematomas.

The true incidence of postoperative hematoma is difficult to estimate given the absence of a universally accepted definition and variation in how the complication is identified. Additionally, because it is a relatively rare complication, smaller published series may have artificially low rates because the sample size is too small for reliable estimates. Larger series based on registries or administrative data may also underestimate the true incidence of hematoma because diagnostic codes are likely to be used only when some intervention is required. Given those limitations, Table 1 shows the proportion of patients with hematomas in the most consistently cited studies on thyroid surgery. The incidence of cervical hematoma is generally around 1% or less. However, the reported rates are mostly from surgeons with considerable experience in endocrine surgery and may not accurately reflect the true risk for every patient. Larger national registries, that include both high- and low-volume surgeons, tend to show higher rates of hematoma as well as a considerable difference in outcomes between high- and low-volume surgeons. Godballe and colleagues[11] examined 5490 patients using a national registry and found an overall hematoma rate of 4.2%, but when they analyzed the data at the level of the individual surgeon, rates ranged

from 1.9% to 14.3%. Thomusch and colleagues[12] used a different national registry to analyze 7266 patients undergoing unilateral and bilateral thyroidectomy. They found that 2.7% of patients developed hematomas, but that the rate was 5.4% in hospitals performing fewer than 50 operations per year compared with 2.1% in hospitals performing 150 or more cases. Other large multiinstitutional cohort studies include work by Bergenfelz and colleagues,[13] where 3660 patients underwent thyroid surgery with 2.1% developing hematomas, and Rosato and colleagues[14] who looked at a cohort of 14,934 and found hematomas in 1.2% of patients. Although these large cohort studies tend to identify a higher incidence of hematoma compared with smaller institutional studies, 1 notable exception is the work of Stack and colleagues,[8] who used the University Health Collaborative data to assess 38,362 outpatient thyroidectomies and identified hematomas in only 13 patients (0.03%). The authors acknowledge, however, that the mechanism of data collection for their study likely means that this estimate is a significant underestimate of the true incidence and should be interpreted cautiously.

Another concern about hematomas is that the time interval from surgery to development of symptoms is unpredictable. Burkey and colleagues[15] studied 13,817 thyroidectomies and parathyroidectomies with 42 patients (0.3%) developing hematomas. The mean time for developing a hematoma was 17 hours and the range extended from 10 minutes to 5 days postoperatively. Notably, 18 hematomas developed within 6 hours of surgery, an additional 16 occurred between 7 and 24 hours, and only 8 developed after 24 hours. Other studies have also shown that hematomas can develop both early and late in the postoperative recovery. Bergamaschi and colleagues[16] found that hematomas developed anywhere from 15 minutes to 15 days after surgery with a median time of 240 minutes to detection. Godballe and colleagues[11] identified hematomas occurring up to 105 hours postoperatively with a median time of 3 hours and 97% developing within 24 hours of surgery. Lang and colleagues[17] found hematomas occurring at a median of 3 hours postoperatively with 73% discovered within 6 hours of surgery and the remaining 27% within 24 hours. Leyre and colleagues[18] saw 70 hematomas in 6830 patients with 53% occurring within 6 hours, 37% discovered 7 to 24 hours after surgery, and an additional 10% after 24 hours. Promberger and colleagues[19] reported that the vast majority of hematomas occurred within 24 hours, but 2.4% did still occur after that time. Overall, as shown in Table 1, the vast majority of hematomas occur within the first 24 hours after surgery, although a small percentage still develop after this time.

Because some hematomas develop after either a 6-hour or a 23-hour period of observation, it is unclear what the optimal time for observation after an outpatient thyroidectomy ought to be. Surgeons who prefer an overnight observation rather than a 6-hour stay at an outpatient center point out that a significant percentage of hematomas may be missed if observation is limited to only 6 hours. Surgeons arguing for performing thyroidectomy solely on an inpatient basis use a similar argument and note that even an overnight observation period still risks missing some early hematomas. Given that some studies show hematomas developing more than 1 week after surgery, it is clear that no duration of hospital stay will totally eliminate the possibility of a missed hematoma. Consequently, there needs to be some threshold of acceptable risk where discharge becomes reasonable; however, this threshold is quite difficult to define.

An important factor to consider when determining the balance between hematoma risk and duration of hospital stay is that not all hematomas are created equal. Some are clearly life threatening and require immediate intervention at the bedside or in the operating room, whereas others can be treated adequately with aspiration or even just observed. It seems logical that clinically significant and life-threatening hematomas would tend to develop earlier, whereas slower bleeding would tend to manifest later. If this assumption were true, then a period of observation after surgery would minimize the risk to the patient by identifying the bleeding most likely to be life threatening. Hematomas that developed after this time could then be identified by patients or family members while at home and they could return to the hospital or emergency room in time for effective treatment without a significant mortality risk. Unfortunately, it is difficult to verify this assumption based on retrospective data because the majority of hematomas that are identified tend to be symptomatic and low-grade bleeding may be missed entirely. It is also difficult to discern how quickly these hematomas developed and the urgency of their operative management. If they were not taken to the operating room until 24 hours after surgery, it is difficult to know if the hematoma was evident earlier, but not large enough or symptomatic enough to warrant operative management until later. It should also be pointed out that many of the hematomas developing after 24 hours are found in patients taking anticoagulation. The fact that these patients develop bleeding complications from surgery is not entirely surprising and should probably not invalidate the notion of outpatient surgery for those with normal coagulation profiles.

It might be possible to alleviate some concern over missing hematomas if there were an accurate way to distinguish patients who are at high or low risk of developing this complication. If hematoma risk could be determined before leaving the operating room, then surgeons might feel more comfortable discharging low-risk patients and keeping high-risk individuals for a longer period of observation. Several groups have attempted to identify predictors that could be used for risk stratification and have had mixed success in this endeavor because hematomas are such a rare event. Bergenfelz and colleagues[13] found that being older or male conferred a higher risk of hematoma, and Godballe and colleagues[11] had similar results, but added malignancy, use of drain, bilateral operations, and presence of a consultant as surgeon to the list of risk factors. Lang and colleagues[17] identified reoperative surgery and nodule size as predictors for developing hematoma requiring intervention, but found that male gender was associated with hematomas that did not require intervention. Leyre and colleagues[18] saw an association between hematoma and male gender or preoperative symptoms of dyspnea, although they were unable to find any factors that could predict the timing of hematoma. Promberger and colleagues[19] found a relationship between hematoma risk and several factors, including age, male gender, bilateral surgery, extent of resection, and reoperative surgery. Although these factors have been associated with a slightly greater risk of hematoma formation, the risk in most of these groups remains very low. None of these studies assessed the discrimination of their models or the ability to sort low-from high-risk patients, so the usefulness of the findings is somewhat limited, aside from providing a gestalt feeling about which patients might benefit from a longer period of postoperative observation. To place the conversation over bleeding risk in context, the probability of developing a hematoma after thyroid surgery is comparable to the risk after

laparoscopic cholecystectomy.[20] The latter procedure is performed routinely on an outpatient basis with little controversy or discussion of requiring inpatient admission.

### Hypoparathyroidism

Debate over bleeding and hematomas tends to dominate the discussion about the role of outpatient thyroidectomy, but there are other complications of the operation that also raise concern. Another complication that can cause difficulties in the postoperative management of thyroid surgery is hypoparathyroidism. Depending on the criteria used to diagnose hypoparathyroidism, it may occur in more than one-third of patients undergoing total or completion thyroidectomy.[21] Management with oral calcium supplementation is generally successful but some patients end up being readmitted for intravenous calcium in refractory cases. Considerable disagreement exists regarding the best approach to postoperative hypoparathyroidism with some groups routinely discharging all patients on calcium with or without calcitriol, whereas others take a more selective approach based on either parathyroid hormone (PTH) and/or calcium measured after the operation.[21,22] No combination of laboratory tests has proven to be 100% sensitive or specific for identifying patients with severe hypoparathyroidism, but our group and others have established protocols based on postoperative PTH levels that have proven largely successful in avoiding readmission for symptomatic hypocalcemia.[23,24] Because calcium levels tends to reach a nadir 2 to 3 days after surgery, it is unclear whether further observation in the hospital offers any benefit in the management of hypoparathyroidism because most patients would be at home by that point regardless of whether their operation was performed on an inpatient or an outpatient basis.

### Recurrent Laryngeal Nerve Injury

This rare but significant complication generates considerable anxiety from patients but it is not clear whether any practical differences in either detection or management occur based on whether surgery is performed as an inpatient or outpatient. Especially with the use of recurrent laryngeal nerve monitors, surgeons are increasingly able to identify the possibility of nerve injury intraoperatively and can instruct patients appropriately immediately after surgery.

## APPROPRIATE PATIENT SELECTION FOR OUTPATIENT THYROIDECTOMY

One area of agreement for both advocates and opponents of outpatient thyroidectomy is that not all patients are ideally suited for outpatient thyroid surgery. Careful patient selection is, therefore, a key element to avoiding complications and other problems with outpatient surgery. Unfortunately, selection criteria have not been tested rigorously and represent the opinions of individual authors or groups of experts. Patient preference is certainly an important factor, but other considerations involve both medical and social factors. In Box 1, we summarize information from the available studies to present a checklist that may be used to assess whether patients are reasonable candidates for outpatient thyroidectomy.

**Box 1**

**Checklist for outpatient thyroidectomy**

**Social support**

- Reliable adult support at home for 324 hours
- Transportation home

**Access to care and communication**

- Lives within driving distance of medical facility
- Access to telephone
- No language barrier
- No medical condition that impairs communication

**Medical**

- No prohibitive comorbidities
- Not taking anticoagulation
- No previous problems with anesthesia

Champault and colleagues[25] only performed outpatient thyroidectomy on patients if they had someone to stay with and observe them overnight, lived within 50 km of the hospital and did not have any of the following medical risk factors: American Society of Anesthesiology score of 3 or greater, taking anticoagulation, obstructive sleep apnea, age 75 years or greater, toxic adenoma, indeterminate fine needle aspiration biopsy, and prior neck surgery. Mazeh and colleagues[5] were more liberal in the use of same-day surgery and their only exclusions were patient preference, comorbid conditions that required monitoring, concomitant lymph node dissection, and prior neck surgery. Seybt and colleagues[6] considered patients to be reasonable candidates for outpatient surgery unless they lacked the autonomy to make medical decisions, lacked social support including having an adult to observe them immediately after surgery, were on anticoagulation, had a drain placed in the operating room, or underwent a concomitant neck procedure. Spanknebel and colleagues[7] included patients unless they were taking anticoagulation, had a language barrier or medical condition that hindered communication with the surgical team, lived far away from medical care, lived alone or had no one to observe and assist after surgery, or if the surgery was difficult and the surgeon felt the patient would be better served by a full admission. Terris and colleagues[9] also excluded patients with significant comorbidity, concomitant procedures, or placement of drains. Finally, Trottier and colleagues[26] insisted that potential outpatients either lived in the same city as the hospital performing surgery or were willing to stay at a hotel or other venue within 1 hour of the hospital, and that the case was finished by 1 PM to allow sufficient time for observation. For total thyroidectomies, they also made sure that they were the first case of the day to allow for adequate observation time.

The range of selection criteria used in these studies reflects concerns over the medical fitness to handle surgery and the risk of bleeding. They also recognize that social support and the ability to communicate with the surgical team are important elements of successful outpatient surgery. From a medical standpoint, most groups made an effort to avoid outpatient thyroidectomy in patients with significant comorbidity or age that might increase the risk of complications. For most groups, use of any anticoagulation that increased bleeding risk was also a contraindication for outpatient surgery. Unfortunately, the exact threshold of age and comorbidity that constitutes prohibitive risk is somewhat subjective. Most surgeons would admit the proverbial patient “who would have trouble with a haircut,” but clearly not all candidates for outpatient surgery need to be capable of running a marathon either. In the absence of specific guidelines for which comorbid conditions or ages constitute an absolute contraindication to outpatient thyroid surgery, it is up to the individual surgeon to assess patients and have an honest discussion about the potential risks of surgery.

There is also a significant social component required for successful outpatient thyroidectomy. Because patients will be tired and less than fully alert after surgery, it is important to have mechanisms in place to monitor them for the development of complications, and a capacity for notifying the surgical team when there is concern on the part of the patient or family. Several studies very appropriately insisted on adult supervision for at least the 24-hour period after the operation, and this role could be filled by spouses, family members, or friends who are willing to assist. Having someone physically available for assistance would seem to be a fairly straightforward requirement for safe surgery, because a rapidly developing hematoma could render the patients unable to help themselves. Similarly, it is important to make sure patients not only have a ride home arranged before completing the surgery, but that they have access to reliable transportation back to the hospital should a hematoma develop.

Some surgical groups insisted not only that patients have adequate social support for safe monitoring, but also offered outpatient thyroidectomy only to individuals who lived within close proximity to the hospital or were willing to stay at a hotel or other accommodation near the hospital for 24 hours after the operation. The argument for staying near the hospital is that returning in the event of a complication becomes more challenging the further the patient gets from the surgical team. Although this idea makes sense, there is no clear guideline regarding what constitutes an acceptable distance for the safe treatment of complications.

In addition to assessing the distance to the hospital, it is equally important to ensure that the patient has the ability to communicate effectively with the surgical team in the event that a complication occurs. Access to a phone as well as the absence of a language barrier or medical condition that impairs communication are important for rapidly identifying and appropriately triaging complications. At the same time, it is vital to make sure patients adequately understand the potential complications of thyroid surgery, how they manifest, and how to address problems that develop. Providing both written and verbal instructions to patients is important to reinforce the message and the written instructions should clearly illustrate warning signs of hematoma and hypocalcemia along with phone numbers where the surgeon can be reached (Box 2).

**Box 2**

**Instructions for outpatient thyroid surgery**

**Postoperative instructions**

### Contacting Your Surgeon

You can reach your surgeon at the following number: (999) 999-9999 If you are unable to reach your surgeon at this number, please call the hospital at (999) 999-9999 and ask for the surgeon on call to discuss your condition.

**Complications and symptoms you need to watch for**

### Bleeding in Your Neck

Some bruising is normal but you should not have rapid or excess bruising and this may be owing to bleeding in your neck. This is rare, but if you are panicked owing to trouble breathing, sudden swelling in your throat, or are unable to swallow, call 911 immediately.

### Low Calcium

If you develop numbness and tingling in your face, lips, fingertips, or toes take four 500-mg tablets of calcium carbonate (TUMS). The symptoms should go away in 15 to 30 minutes. If the symptoms persist, at 30 minutes you can repeat this. If the symptoms do still do not go away, call your doctor.

### Infection

If you have a temperature above 100.4°F by mouth for 2 readings taken 4 hours apart, increased redness and/or warmth at the incision site, puslike drainage, or pain not relieved by pain pills, there may be an infection in your neck. Please call your doctor.

Careful patient selection is certainly important for outpatient surgery, but the extent of the planned procedure is also a key element in deciding whether to admit or discharge the patient. In particular, performing lymph node dissection represents a more comprehensive surgery that can potentially increase the risk of bleeding as well as lymphatic leak. The vast majority of studies evaluating complication risk after thyroidectomy (either inpatient or outpatient) focused solely on thyroid resection and did not include patients undergoing either central or lateral neck dissection. Rosenbaum and colleagues,[27] Stack and colleagues,[8] and Mowschenson and colleagues[4] did include lymph node dissection and the hematoma rate in these studies was not significantly different from the other groups in Table 1. That being said, a surgeon who is attempting outpatient thyroidectomy for the first time may be better served by starting with simpler surgeries first and only adding more complex operations and patients after a greater level of comfort has been reached.

A final component of building a successful outpatient thyroidectomy practice is preparing patients for the possibility of admission when the plan is for same-day discharge. Even the most straightforward surgery can be complicated by postoperative nausea, inadequate pain control, or difficulty maintaining adequate oxygenation or blood pressure. It is also difficult to predict what will be found at the time of the operation, which may influence surgeon comfort level with doing a case as an outpatient procedure. Having the conversation before

the day of surgery can help patients to understand that the final discharge plan is flexible and contingent on what actually happens at the time of surgery. This planning may decrease unhappiness from patients who end up spending the night in the hospital instead of their own bed as expected.

## TECHNIQUES TO IMPROVE SUCCESS OF OUTPATIENT THYROIDECTOMY

Several techniques have been used to promote recovery and facilitate the use of outpatient thyroidectomy. These include the use of local rather than general anesthesia, dexamethasone to reduce nausea, intraoperative nerve monitoring, and the use of postoperative PTH testing to identify patients at risk for hypocalcemia.

### Anesthesia Techniques and Antinausea Medication

In an effort to expedite recovery and avoid the side effects of general anesthesia, several groups have successfully performed thyroid surgery under local anesthesia. Inabnet and colleagues[28] published their experience with adopting local anesthesia for both unilateral and bilateral thyroidectomy and found that 88% of patients in the local anesthesia group were able to avoid inpatient admission, whereas only 45% of the general anesthesia cohort were successfully treated as outpatients. They also found that mean operative time was decreased from 101 to 71 minutes, although the mean thyroid weight in the local anesthesia group was less than 50% of the weight for the general anesthesia group. Snyder and colleagues[29] conducted a randomized trial comparing local with general anesthesia for thyroidectomy. The authors did not find a difference in operating time, but the overall total time spent in the postanesthesia care unit and surgical recovery area was nearly 1 hour less in the local anesthesia group. Although one of the presumed benefits of local anesthesia is decreased nausea and vomiting compared with general anesthesia, the authors did not find a difference in either nausea or vomiting within 24 hours of surgery.

Another study showed that the choice of anesthetic agent can significantly affect the rate of postoperative nausea and vomiting. Vari and colleagues[30] compared patient outcomes after the use of sevoflurane compared with propofol for maintenance of anesthesia and found that women had nearly a 30% reduction in nausea and vomiting when propofol rather than sevoflurane was used. This difference was not replicated in men; 47% in the sevoflurane group and 50% of the propofol group experienced postoperative nausea or vomiting. The use of antiemetic agents was also higher overall for patients receiving sevoflurane compared with propofol, and the only hematoma occurred in a patient after sevoflurane was used. A similar study by Sonner and colleagues[31] showed a 20% reduction in postoperative nausea and vomiting when patients received propofol compared with isoflurane for anesthesia maintenance. Once again, the benefit was limited to women, who experienced an approximately 30% decrease in nausea and vomiting.

Many medications are given to patients to try to minimize postoperative nausea because postoperative vomiting can not only delay discharge, but can increase cervical pressure and contribute to hematoma formation. Bononi and colleagues[32] conducted a randomized trial of 562 patients comparing the use of ondansetron versus ondansetron plus dexamethasone for high-risk cases. They found that the incidence of postoperative vomiting was reduced by a

strategy combining ondansetron with dexamethasone, although the hematoma rate was equally low in both groups.

### Nerve Monitoring

Intraoperative nerve monitoring is a potentially useful adjunct to facilitate safe outpatient surgery. The use of nerve monitors may not decrease the incidence of nerve injury, but it does provide a useful assessment of nerve function throughout the case. If the nerve signal is intact after the operation is complete, one can be reasonably comfortable that no injury has occurred. Conversely, signal loss can alert the surgeon to the possibility of nerve injury and patients can then be assessed postoperatively and either undergo further workup with a laryngoscopy or swallow evaluation, or at least be educated on techniques to minimize aspiration risk. Patients with suspected nerve injury could also be admitted overnight for further observation before discharge the next day to better assess the implications of nerve injury and determine the need for additional intervention. Regardless of how surgeons choose to use the information obtained from nerve monitoring, it can be used to adapt the discharge plan to minimize risk to the patient and avoid discovering complications only after discharge.

### Postoperative Parathyroid Hormone

An unfortunate complication of total thyroidectomy is the risk of hypoparathyroidism with subsequent symptoms from hypocalcemia. Considerable effort has been devoted to predicting the risk of postoperative hypoparathyroidism so that patients who are at high risk can receive calcium with or without calcitriol after surgery. Several groups have attempted to use postoperative PTH levels to predict the risk of symptomatic hypocalcemia because PTH is a reflection of parathyroid function.[21] We developed a protocol that used a 4-hour postoperative PTH to stratify the risk for developing symptomatic hypocalcemia.[23,24] Patients in the highest risk group (PTH <10) were discharged with both calcitriol and calcium supplementation, moderate risk patients (PTH 10–20) received calcium alone, and all Graves' disease patients received calcium routinely. The protocol resulted in only 3.9% of patients having symptomatic hypocalcemia and only 0.1% of patients being readmitted. We have subsequently modified our protocol to use PTH levels drawn in the postanesthesia care unit immediately after surgery with similar results. We have also increased the dose of calcitriol given to patients with PTH levels that are less than 5 and have been able to further decrease the incidence of symptomatic hypocalcemia. For institutions without access to PTH testing, routine supplementation with calcium and calcitriol may be a cost-effective strategy to decrease symptoms and readmissions.

## SUMMARY

Outpatient thyroid surgery is likely to remain controversial for the immediate future given concerns over the potential consequences of a neck hematoma. However, when performed by an experienced surgeon with adequate infrastructure and good patient selection, it should be possible to offer a safe outpatient operation with excellent patient satisfaction. Ongoing efforts to better define what constitutes a high-risk patient should continue to improve patient selection and minimize risk.

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**KEY POINTS**

- Safely performing outpatient thyroid surgery requires careful patient selection and preparation.
- It is important to identify both social and medical factors that place patients at higher risk for complications.
- Communication with patients is a key element of success because they must be able to identify postoperative complications and contact the surgical team.
- Choice of anesthetic agent and other medications can help to reduce postoperative nausea and vomiting to facilitate early discharge.

**Table 1**

Studies assessing risk of postoperative cervical hematoma

| Author | Total n | Hematoma (%) | Timing of Hematoma (Range) | Predictors | Mortality (%) | Exclusion for Outpatient |
|---|---|---|---|---|---|---|
| Bergamaschi et al,[16] 1998 | 1163 | 1.6 | 15 min–15 d | NR | 0.08 | NR |
| Bergenfelz et al,[13] 2008 | 3660 | 2.1 | NR | Age, male | 0 | NR |
| Bononi et al,[32] 2010 | 562 | 0.53 | <24 h–4 d | NR | 0 | NR |
| Burkey et al,[15] 2001 | 13,817 | 0.3 | 10 min–5 d | None found | 0 | NR |
| Champault et al,[25] 2009 | 95 | 1 | 2 h | NR | 0 | ASA ≥3, anticoagulation, OSA, >75 years old, >50 km from hospital, no phone, no one to stay with patient, toxic adenoma, indeterminate FNA, completion surgery |
| Chang et al,[33] 2011 | 1935 | 0.98 | NR | NR | 0.05 | NR |
| Godballe et al,[11] 2009 | 5490 | 4.2 | 0–5 d | Age 50, male, drain, malignancy, consultant as surgeon, bilateral procedure | 0 | NR |
| Hessman,[34] 2011 | 148 | 1.3 | 3 and 5 d | NR | 0 | None |
| Inabnet et al,[28] 2008 | 224 | 1 | 1 h | NR | 0 | NR |
| Lang et al,[17] 2012 | 3086 | 0.7 | <6–24 h | Reoperation, nodule size, male | 0 | NR |
| Leyre et al,[18] 2008 | 6830 | 1 | <6–>24 h | Male, preoperative dyspnea | 0 | NR |
| Mazeh et al,[5] 2012 | 608 | 1 | 3–<24 h | NR | 0 | Patient preference, comorbidity needing monitoring, lymph node dissection, reoperation |
| Mowschenson et al,[4] 1995 | 100 | 0 | NR | NR | 0 | None |
| Promberger et al,[19] 2012 | 30,142 | 1.7 | <1–>24 h | Age, male, bilateral, extent of resection, reoperation | 0.01 | NR |
| Rosato et al,[14] 2004 | 14,934 | 1.2 | NR | NR | 0 | NR |
| Rosenbaum et al,[27] 2008 | 1050 | 0.6 | <4 h–7 d | NR | 0 | NR |
| Samson et al,[10] 1997 | 1178 | 0 | NR | NR | 0.08 | Elderly, comorbidity |
| Seybt et al,[6] 2010 | 418: 208 OP, 201 IP | 0.24 | 20 d | NR | 0 | Comorbidity, anticoagulation or need for drain, concomitant procedures, lack of autonomy or social support |
| Snyder et al,[29] 2006 | 58 | 3.4 | 30 min–5 d | NR | 0 | NR |

| Author | Total n | Hematoma (%) | Timing of Hematoma (Range) | Predictors | Mortality (%) | Exclusion for Outpatient |
|---|---|---|---|---|---|---|
| Snyder et al,[29] 2006 | 1242 | 0.4 | 2 h–2 d | NR | 0.3 | Lymph node dissection, sternotomy, other procedures normally on inpatient basis |
| Spanknebel et al,[7] 2005 | 1025 | 0.5 | <6 h | NR | 0 | Anticoagulation, language barrier/ cannot communicate, live in remote regions, living alone, difficult/extensive procedure, preference |
| Stack et al,[8] 2013 | 38,362 | 0.03 | NR | NR | 0 | NR |
| Terris et al,[9] 2007 | 91: 52 OP, 26 observation, 13 IP | 1.1 | 8 d | NR | 0 | Comorbidity, concomitant procedure, preference, drains |
| Thomusch et al,[12] 2000 | 7266 | 2.7 | NR | NR | 0.04 | NR |
| Trottier et al,[26] 2009 | 232 | 0.4 | 2 d | NR | 0 | Lives in city or will stay within 1 h, adult around ×48 h, or done by 1 PM, total thyroidectomy as first procedure of the day only |
| Rios-Zambudio et al,[35] 2004 | 301 | 0.97 | NR | NR | 0 | NR |

*Abbreviations:* ASA, American Society of Anesthesiology; FNA, fine needle aspiration; IP, inpatient; NR, not reported; OP, outpatient; OR, operating room; OSA, obstructive sleep apnea.