Total Thyroidectomy With and Without Selective Central Compartment Dissection

A Comparison of Complication Rates

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Objective: To compare the postoperative complications between patients who underwent total thyroidectomy (TT) with central compartment lymph node dissection (CLND) and those who underwent only TT.

Design: Retrospective medical chart review.

Setting: Academic tertiary center.

Patients: The CLND group consisted of 122 patients with a preoperative or an intraoperative diagnosis of papillary thyroid cancer who underwent TT with CLND. The TT group consisted of 134 patients who underwent TT without CLND for either benign disease or indeterminate nodules. Final pathologic analysis demonstrated that 61 of the patients in the TT group had malignant disease.

Main Outcome Measures: Incidence of vocal cord paresis, transient and permanent hypocalcemia, seroma, hematoma, and chyle leak.

Results: One patient in each group (0.7%) had permanent hypocalcemia. The incidence of transient hypocalcemia in the CLND group was 13.1% (n=16) compared with 25.4% (n=34) in the TT group. Vocal cord paresis occurred in 5 patients in the CLND group, all with complete resolution. In the TT group, there were 4 cases of temporary paresis and 6 of complete paralysis, 5 of which resolved and 1 of which was permanent. There was no hematoma or seroma in either group. One patient in the CLND group developed a chyle leak, which resolved in 3 days with conservative management.

Conclusions: Adding CLND to TT does not increase postoperative hypocalcemia or vocal cord paralysis. These results suggest that in the hands of experienced thyroid oncologic surgeons, elective selective CLND can be performed safely for papillary thyroid cancer and should be considered in higher-risk patients to potentially reduce the risk of reoperation in the central compartment.


While it is generally accepted that therapeutic central compartment lymph node dissection (CLND) is indicated for papillary thyroid cancer with grossly evident metastatic lymph nodes in the central compartment, the indications for elective CLND for N0 disease remain highly controversial. Proponents justify performing it to potentially reduce the risk of recurrence in the central compartment. Both prospective and retrospective cohort studies have shown that operation for recurrence in the central compartment is associated with higher rates of permanent hypoparathyroidism (2.6%-8.3%) as well as recurrent laryngeal nerve paralysis (3.9%-25%), either from injury or from intentional sacrifice.1-3 Also, more accurate staging information can be obtained after CLND, which may influence subsequent adjuvant treatment and cancer surveillance protocol. According to the 2002 American Joint Committee on Cancer staging system, patients with cancer who are older than 45 years with T1 and T2 tumors are upstaged to stage III if metastasis is found in the central compartment nodes.4 Therefore, if CLND is not performed in these patients, they may be understaged.

Opponents of elective CLND argue that the risk of a higher rate of postoperative hypocalcemia with a minimal impact on survival does not justify performing it. While multiple case series have reported on the complication rates of CLND,5-7 very few studies have actually compared complication rates between total thyroidectomy (TT) with and without central neck dissection performed by the same surgeon or group of surgeons.

The aim of this study was to determine whether there are more postoperative complications in patients who undergo TT with CLND than in patients who...
Of the 134 patients in the TT group, 61 were ultimately diagnosed as having thyroid cancer (papillary, follicular, or Hürthle cell) on the final pathology report. In the CLND group, pretracheal and paratracheal compartment dissection was performed in all patients, while unilateral paratracheal compartment dissection was performed in 108 patients and bilateral dissection was performed in 14 patients. There was no mortality, postoperative hematoma, or infection in either group. On the first postoperative day, 1 patient in the CLND group developed a chyle leak, which was treated with a nonfat diet, with resolution in 4 days. The incidence of vocal cord paralysis and hypocalcemia is shown in the Table. The observations made by the resident or the nurse practitioner, the examination was repeated by the senior author. Interestingly, we observed 100% correlation between attaining large motor unit potentials with stimulation at the end of the case and normal vocal cord mobility.

Calcium levels were measured the morning after surgery (12-22 hours after the end of the procedure). Some of the patients also had intact parathyroid hormone (PTH) levels checked between 2 and 4 hours after surgery. All patients with postoperative calcium levels lower than 8.5 mg/dL (to convert to millimoles per liter, multiply by 0.25) and/or PTH levels lower than 5 pg/mL were considered hypocalcemic. Calcium and calcitriol therapy was initiated if the postoperative PTH level was lower than 5 pg/mL based on our experience that 98% of these patients develop hypocalcemia. If the PTH level was between 5 and 10 pg/dL and the calcium level the following morning was higher than 8.5 mg/dL, no therapy was initiated; if the calcium level was less than 8.5 mg/dL, oral calcium therapy was initiated, and the calcium level was remeasured every 6 hours until it was greater than 8.5 mg/dL. If the postoperative PTH level was higher than 10 pg/dL but the calcium level was lower than 8.5 mg/dL, we did not start supplementation therapy and remeasured the calcium level every 6 hours. If the subsequent calcium levels in this group showed a declining trend, calcium therapy was started. Hypoparathyroidism was considered permanent if after 3 months the patient’s therapy could not be tapered completely or down to the normal preoperative dose. Vocal cord paralysis was considered permanent if the paralysis persisted longer than 1 year. Two-tailed P values were calculated using the Fisher exact test, with α for significance set at .05.

A list of all patients undergoing TT for benign or malignant disease at our academic tertiary care university medical center during the period from July 2, 2004, to December 30, 2007, was obtained from the clinical practice database. The study was conducted in accordance with the guidelines of the medical center’s institutional review board for research. Patients were excluded from the study if they had a completion thyroidectomy, a concurrent parathyroidectomy, hyperthyroidism, or a subtotal thyroidectomy. The same senior surgeon (M.S.) supervised all the procedures. Data were collected regarding pathologic findings, degree of recurrent laryngeal nerve injury, postoperative calcium and parathyroid hormone levels, other perioperative complications, and mortality.

A total of 256 patients met the criteria for inclusion: 134 patients (111 women and 23 men) underwent TT alone for non-toxic multinodular goiter and/or indeterminate thyroid nodule(s), and 122 (102 women and 20 men) underwent TT with CLND because of a preoperative or an intraoperative diagnosis of papillary thyroid cancer. Our practice during this period was to perform therapeutic CLND, usually bilateral, if grossly enlarged, malignant-appearing nodes were found intraoperatively or on preoperative ultrasonography; we performed elective pretracheal and ipsilateral paratracheal CLND for N0 disease, regardless of T stage.

Central compartment dissection was performed by en bloc removal of contents in pretracheal and prelaryngeal compartments and at least 1 paratracheal compartment, usually the ipsilateral. Paratracheal compartment dissection was accomplished by en bloc removal of the contents between the carotid arteries laterally and the tracheal wall medially and inferiorly down to the sternoclavicular joint on the right or the carotid artery on the left. Pretracheal compartment dissection consisted of en bloc removal of contents anterior to the trachea inferiorly to the sternal notch or innominate artery. During surgery, utmost effort was given to preserving the parathyroid glands. The superior parathyroid glands were typically preserved. Every attempt was made to identify and preserve the inferior parathyroid gland, especially during CLND. Once identified, it was carefully dissected together with its blood supply and reflected laterally or inferiorly on the vascular pedicle before en bloc removal of the paratracheal contents. Any removed or devascularized parathyroid gland was reimplanted into the sternocleidomastoid muscle at the end of the case.

Transient hypocalcemia 16 (13.1) 34 (25.4) .02
Permanent paralysis 0 1 (0.7)
Permanent hypocalcemia 16 (13.1) 34 (25.4) .02
Permanent hypocalcemia 1 (0.8) 1 (0.7) >.99

<table>
<thead>
<tr>
<th>Complication</th>
<th>Group 1: TT + CLND (n=122)</th>
<th>Group 2: TT Only (n=134)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary asymptomatic paresis</td>
<td>5 (4.1)</td>
<td>4 (3.0)</td>
<td>.50</td>
</tr>
<tr>
<td>Temporary paralysis</td>
<td>0</td>
<td>6 (4.5)</td>
<td>.03</td>
</tr>
<tr>
<td>Permanent paralysis</td>
<td>0</td>
<td>1 (0.7)</td>
<td>&gt;.99</td>
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</table>

Abbreviations: CLND, central compartment lymph node dissection; TT, total thyroidectomy.

RESULTS
incidence of permanent recurrent laryngeal nerve paralysis was similar between the 2 groups but higher in the TT group ($P = .03$). Transient hypocalcemia also occurred more frequently in the TT group ($P = .02$), but the incidence of permanent hypocalcemia was the same in both groups. In the CLND group, the incidence of transient hypocalcemia was 19% when bilateral central compartment dissection was performed, and it was 12% when unilateral paratracheal compartment dissection was performed. The number of patients with bilateral dissection was too small to determine statistical significance between these 2 subgroups.

**COMMENT**

While therapeutic CLND in the presence of radiographically or grossly evident metastatic nodes in the central compartment is generally accepted for treatment of papillary thyroid cancer, the indications for elective CLND are still undefined. The 2009 American Thyroid Association Guidelines Recommendation No. 27 states: “(a) Therapeutic central-compartment (level VI) neck dissection for patients with clinically involved central or lateral neck lymph nodes should accompany total thyroidectomy to provide clearance of disease from the central neck. (b) Prophylactic central-compartment neck dissection (ipsilateral or bilateral) may be performed in patients with papillary thyroid carcinoma with clinically uninvolved central neck lymph nodes, especially for advanced primary tumors (T3 or T4).”

Evidence to support this recommendation is somewhat limited by the number, quality, or consistency of the individual studies. Many of the previously reported studies on outcome of CLND did not specifically compare complication rates with those of total thyroidectomy alone; rather, the outcome data was compared with historical data. In some of the studies, surgical procedures were performed by many different surgeons, which can result in variability in surgical technique. This study eliminates such variability because the procedures were performed by the same group of surgeons within the same period. We recognize that 2 of the major limitations in analyzing the complication rates of CLND are that, unlike lateral neck dissection, the boundaries of CLND have not been standardized and the extent of dissection varies from surgeon to surgeon. We attempted to standardize CLND in our series and performed the same type of dissection in all patients, as described in the “Methods” section.

The results from our study indicate that the complication rates for TT are similar to those reported in the literature. Furthermore, adding selective CLND consisting of en bloc dissection of paratracheal, prelaryngeal, and unilateral paratracheal compartments does not increase the risk of postoperative vocal cord paralysis or hypocalcemia. Other studies have similarly shown that the incidence of recurrent laryngeal nerve paralysis did not increase by adding CLND. A few studies reported high incidences of postoperative transient hypocalcemia with CLND (the incidence in 1 study was as high as 70%), and permanent hypocalcemia ranged from 0.9% to 5%. It should be noted that these results were based on comprehensive bilateral paratracheal node dissection. Two recent studies reported a much lower incidence of hypocalcemia with unilateral CLND: Lee et al reported 48% transient hypocalcemia and 0% permanent hypocalcemia in 25 patients, and Sywak et al reported 18% transient hypocalcemia and 1.8% permanent hypocalcemia in 56 patients. The low rate of hypocalcemia in our cohort is in agreement with that of Lee et al and Sywak et al. Interestingly, our results showed a lower incidence of transient hypocalcemia in the CLND group compared with the TT group (13% vs 25%). The reason for this outcome is unclear.

It has been a widely held belief that the potential morbidity of permanent hypocalcemia does not justify elective CLND for papillary thyroid cancer. Opponents of CLND base their argument on the results of previous studies showing that regional nodal metastasis has no significant impact on survival. However, a more recent large population-based study that demonstrated an increased mortality rate with regional lymph node metastases has challenged this long-standing belief. A few recent studies have attempted to assess whether comprehensive bilateral CLND has an impact on disease outcome. Tisell et al prospectively studied surgical and disease outcomes in 195 Swedish patients with papillary thyroid cancer who underwent TT and CLND and compared them with contemporaneous outcomes in other Scandinavian populations (Norway and Finland). Death due to thyroid cancer occurred in 1.6% of Tisell and colleagues’ cohort, a rate that is significantly lower than the 8.4% to 11.1% that had been reported in historical cohorts, implying that long-term survival may be improved by adding bilateral CLND. Two large series also found decreased recurrence in the central neck area after CLND.

If aggressive bilateral CLND is not justified because of the risk of permanent hypocalcemia, can we consider ipsilateral CLND? Can it reduce regional nodal recurrence with lower morbidity? Two relatively recent studies by Lee et al and Sywak et al showed that elective ipsilateral CLND in “high-risk” patients may reduce recurrence based on postoperative thyroglobulin levels. In Sywak and colleagues’ study of patients with papillary thyroid cancer with N0 neck disease, postablation thyroglobulin levels were lower in patients who underwent unilateral CLND during initial TT than in those who underwent TT alone. The study by Lee and colleagues showed that similarly low thyroglobulin levels were attained with unilateral CLND when compared with bilateral CLND. White et al performed an analysis of various studies on the role of CLND for papillary thyroid cancer and concluded that systematic compartment-oriented CLND may decrease the recurrence of papillary thyroid cancer and likely improves disease-specific survival (grade C recommendation). It is unlikely that we will reach a uniform consensus on the controversy regarding the need for elective CLND. However, elective selective CLND rather than bilateral comprehensive dissection seems reasonable for tumors with a “higher risk” of metastasis in light of the fact that there is no increased morbidity compared with TT alone, and the oncologic outcome appears similar to that of bilateral...
Furthermore, the risk to the contralateral CLND is very low in the absence of ipsilateral metastasis. At the present time, identification of this population of high-risk patients can be based only on prior retrospective studies about who is at risk. Patients with large, locally advanced tumors, patients with multifocal primary tumors, and patients who are older than 45 years have a higher risk of nodal metastasis. It is possible that molecular markers will help identify these patients in the future.

In patients with clinically N0 disease, the ideal goal would be to virtually eliminate tumor burden in the central compartment with the first surgical procedure in order to reduce the risk of reoperation in that compartment. However, it is also critical that surgery be accomplished without added morbidity to the patient. This can be achieved by performing more selective CLND, as the risk of permanent hypoparathyroidism is lower with unilateral dissection. Meticulous parathyroid preservation is important to minimize the potential morbidity of permanent hypocalcemia. Devascularized parathyroid gland(s) should be reimplanted. Also, if paratracheal node dissection is to be performed, it is even more important that it be performed in an en bloc fashion rather than by individual node picking. Surgeons should also be aware that the more inferior the dissection extends into the deep paratracheal space, the greater the risk of encountering accessory lymphatic channels containing chyle. The usual precautions for minimizing chyle leak should be undertaken if such channels are encountered during the paratracheal dissection.

In conclusion, selective CLND consisting of en bloc removal of pretracheal, prelaryngeal, and unilateral paratracheal compartments does not result in increased rates of laryngeal nerve paralysis or hypocalcemia (permanent or temporary). Therefore, at the time of initial TT, elective unilateral CLND may be considered for N0 papillary thyroid carcinomas with a higher risk of nodal metastasis. Provided that appropriate surgical expertise is available. It is also important to recognize that while not performing elective CLND may increase the chance of regional nodal recurrence, not performing CLND may actually be safer for the patient in less experienced surgical hands.

Submitted for Publication: July 30, 2009; final revision received January 1, 2010; accepted January 27, 2010.

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Author Contributions: Dr Shindo had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Shindo. Acquisition of data: Stern. Analysis and interpretation of data: Shindo and Stern. Drafting of the manuscript: Stern. Critical revision of the manuscript for important intellectual content: Shindo. Statistical analysis: Shindo and Stern. Administrative, technical, and material support: Shindo and Stern. Study supervision: Shindo.

Financial Disclosure: None reported.

Previous Presentation: This study was presented in part at the Seventh International Conference on Head and Neck Cancer; July 19–23, 2008; San Francisco, California.

Additional Contributions: Yee Cheng Low assisted in the data collection.

REFERENCES