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# Conservative thyroidectomy for papillary thyroid microcarcinoma

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ABSTRACT

*Objective:* According to American Thyroid Association (ATA) guideline, thyroid lobectomy is recommended for the management of papillary thyroid microcarcinomas (PTMC) with a diameter lesser than 1 cm. However, this procedure is associated with a risk of potential complications such as vocal cord palsy. Thus, we considered the applicability of conservative thyroidectomy, involving partial removal of the thyroid cancer lesion, not the entire ipsilateral thyroid lobe.

*Methods:* A retrospective analysis of all PTMC patients who underwent conservative thyroidectomy at Konkuk University Hospital between August 2008 and February 2014 was performed. Oncologic results of these patients along with the incidence of postoperative complications were evaluated. Seventy-nine patients who underwent conservative thyroidectomy for the treatment of PTMC were enrolled in the present study.

*Results:* Four of the 79 patients (5.0%) showed recurrence, 2 local (2.5%) and 2 regional (2.5%), respectively. All of these patients consequently underwent surgery alone and were salvaged. Temporary postoperative complications such as vocal cord palsy and hypocalcemia developed in 1 and 1 case, respectively, but completely recovered over time.

*Conclusions:* Conservative thyroidectomy is an oncologically and functionally safe procedure for surgical treatment of PTMC and can be considered as an alternative to thyroid lobectomy for the surgical management of PTMC.

## 1. Introduction

Papillary thyroid carcinoma (PTC) is one of the most common endocrine malignancy, accounting for about 80 to 90% of all thyroid cancers [1–3]. The long-term prognosis of this cancer is excellent with a 10-year survival rate of up to 98% [3–5], With the advent of ultrasonography, smaller carcinomas such as papillary thyroid microcarcinoma(PTMC), that are < 1 cm in diameter, can be detected easily.

American Thyroid Association (ATA) released guidelines for the management of adult patients with thyroid nodules and differentiated thyroid cancer in 2015 [1]. According to these guidelines, only close observation is sufficient for thyroid nodules smaller than 1 cm and that have no other high risk factors (irregular margin, microcalcifications, taller than wide shape, rim calcification with small and extrusive soft tissue component). However, if surgery is chosen for patients with PTMC without extrathyroidal extension, thyroid lobectomy alone is recommended as the surgical treatment of choice [1]. In a meta-analysis of PTMC patient, thyroid lobectomy was associated with a recurrence rate of 5.7%–10% and a mortality rate of 0%–1.1% [6].

Observation without surgical treatment negates the risk of complications associated with thyroid surgery (including decrease of thyroid function, vocal cord palsy due to recurrent laryngeal nerve (RLN) injury, and loss of calcium regulation due to parathyroid damage). However, the possibility of extrathyroidal extension due to cancer progression and metastasis to other lymph nodes are potential disadvantages. The advantages and disadvantages of thyroid lobectomy are exactly the opposite. Thus, it was hypothesized that the disadvantages of this approach could be reduced if the surgical extent is minimized while ensuring comparable oncologic outcomes. For example, in cases wherein only the lower thyroid gland is affected, a partial resection instead of resection of the ipsilateral thyroid lobe would reduce the risk of vocal cord palsy, as it would not be necessary to operate the Berry's ligament, which is most vulnerable site of RLN injury. With this background, we designed a novel procedure, namely conservative thyroidectomy, which is less extensive than thyroid lobectomy and evaluated the oncologic and functional outcomes of this procedure in PTMC.

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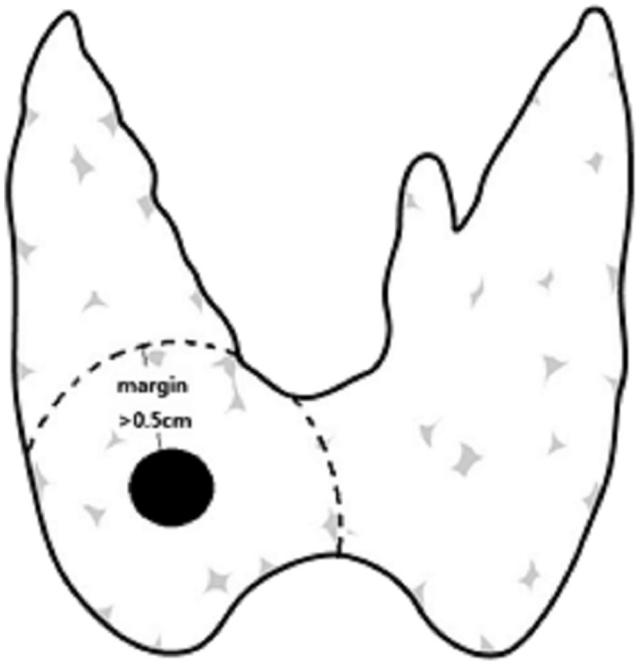


**Fig. 1.** Partial thyroidectomy was defined as partial resection of the thyroid nodule with a margin of 5 mm or more.

## 2. Material and methods

A retrospective analysis of consecutive 79 PTMC patients who underwent conservative thyroidectomy in Konkuk University Hospital between August 2008 and February 2014 was performed. Institutional review board approval was obtained for this study. The outcomes were compared to those of previous studies that analyzed the treatment results of thyroid lobectomy. Patients whose pathological results were consistent with follicular, medullary, and anaplastic carcinoma with a tumor size > 1 cm were excluded. Patients with follow-up of < 24 months without recurrence were excluded.

Conservative thyroidectomy was defined as partial resection of the cancerous portion of thyroid gland, with a safety margin of approximately 5 mm (Fig. 1). We performed the conservative thyroidectomy with a safety margin of approximately 5 mm on the cases of tumors in upper pole, lower pole and anterior portion. The case of tumor in deep portion or tumor adjacent to recurrent laryngeal nerve and difficult to make sure safety margin was excluded. Also, the enrolled patients had no suspicious preoperative cervical lymph node metastases. Safety margin was confirmed not by pathologically but clinically during surgery.

The oncologic parameters, such as tumor recurrence rate, recurrence patterns, and predisposing factors of tumor recurrence, in patients who underwent conservative thyroidectomy were evaluated. The outcome of salvage operation in recurrence cases was also evaluated. Two otorhinolaryngology-head & neck surgery department surgeons were participated. In addition, we examined postoperative complications, including vocal cord paralysis and hypocalcemia.

Statistical analyses were performed using IBM SPSS ver.24.0 (IBM corp., Armonk, NY, USA). Predictive factors of tumor recurrence were evaluated by univariate analysis using Fisher exact test. *P* value under 0.05 was considered statistically significant.

## 3. Results

### 3.1. Patient demographics

A total of 1940 patients underwent thyroid surgery between August 2008 and February 2014. Of the 1940 patients, 79 patients who were diagnosed with PTMC and underwent consequent conservative thyroidectomy were enrolled. Of these 79 patients, 55 patients underwent simultaneous elective central neck dissection. The average age of the patients was 52 ± 10.39 years (range: 23–74 years). Patients were followed-up for a median of 56.37 months (range 25–100 months). There were 66 female patients (83.5%) and 13 male patients (16.5%). Clinico-pathological characteristics of the study population are depicted in Table 1.

**Table 1**
Demographics and clinical characteristics and recurrence rate of each operation groups.

| Characteristic | Conservative thyroidectomy (no. = 79) |
|---|---|
| Age(years) | 52 ± 10.39(23–74) |
| ≤39 | 10(12.7%) |
| 40–49 | 22(27.8%) |
| ≥50 | 47(59.5%) |
| Sex | |
| Female | 66(83.5%) |
| Male | 13(16.5%) |
| Lymph node metastasis | |
| Absence | 59(74.7%) |
| Presence | 20(25.3%) |
| No. of lymph nodes, mean(range) | 7.9(1–17) |
| Positive lymph nodes, mean (range) | 2.15(1–5) |
| Mean follow up period (months) | 56.37 ± 15.50(25–100) |
| Recurrence | 4(5.06%) |
| Primary recur | 2(2.53%) |
| Nodal recur | 2(2.53%) |

No., Number.

### 3.2. Recurrence rate and its' predictive factor of conservative thyroidectomy

Recurrence was noted in 4 patients during the postoperative period denoting a recurrence rate of 5.0%. Of these, 2 patients (2.5%) had recurrence on the ipsilateral lymph node while in the rest 2 patients (2.5%), the remaining thyroid tissue (1 with ipsilateral remnant thyroid tissue recurrence and 1 with contralateral thyroid lobe recurrence) was affected (Table 1). Thus, only 1 patient (1.3%) who underwent conservative thyroidectomy had local recurrence within ipsilateral operated thyroid remnant tissue. Other specific characteristics of these 4 patients are summarized in Table 2. There were no significant correlations between recurrence rate and its' risk factors, such as lymph node metastasis ($p = 0.068$), tumor bilaterality ($p = 1.000$), BRAFV600E mutation ($p = 1.000$), capsular invasion ($p = 1.000$), lymphovascular invasion ($p = 1.000$), resection margin ($p = 0.496$), and lymph node operation ($p = 0.551$) (Table 3).

### 3.3. Postoperative complications of conservative thyroidectomy

Temporary vocal cord palsy was noted in 1 patients (1.3%). The patient who experienced vocal cord palsy was a 65-year-old female patient who underwent left conservative thyroidectomy with central node dissection. She complained of hoarseness the day after surgery, and had left vocal cord palsy. However, this patient also recovered from vocal cord palsy after 4 months. Hypocalcemia was noted in a 67-year-old woman who underwent bilateral conservative thyroidectomy for bilateral PTMC. The patient complained of numbness immediately after surgery. Mild hypocalcemia was noted in the follow-up laboratory study. However, the hypocalcemic symptoms completely resolved one month postoperatively.

## 4. Discussion

The two important aims of cancer surgery are excellent cure rate

**Table 2**
Characteristics of recurred patients.

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 |
|---|---|---|---|---|
| Gender | Female | Female | Male | Female |
| Age(year) | 53 | 61 | 67 | 55 |
| FNAB | Papillary carcinoma | Papillary carcinoma | Suspicious papillary carcinoma | Papillary carcinoma |
| BRAF mutation | Not performed | No | Not performed | No |
| Resection margin | Free | Free | Free | Free |
| Lymph node dissection | Not performed | CND | CND | CND |
| Presence of lymph node metastasis | – | Yes | Yes | Yes |
| Pathologic stage | pT1a | pT1a | pT1a | pT1a |
| Period before recurrence(months) | 8 | 22 | 38 | 15 |
| Location of recurrence | Residual thyroid tissue (ipsilateral) | Lateral neck lymph node (ipsilateral) | Lateral neck lymph node (ipsilateral) | Residual thyroid tissue (contralateral) |
| Salvage operation | Lt. thyroid Lobectomy | Rt. Selective Neck dissection | Rt. Selective Neck dissection | Conservative thyroidectomy |
| Final incidence | No recurrence | No recurrence | No recurrence | No recurrence |
| Follow up period(months) | 100 | 58 | 52 | 60 |

**Table 3**
Factors that affect recurrence rate.

| Factors | Cases no (%). | *p* value |
|---|---|---|
| Lymph node metastasis | | |
| Yes | 3/20(15) | |
| No | 1/59(1.69) | 0.068 |
| Bilaterality | | |
| Yes | 0/5(0.00) | |
| No | 4/74(5.56) | 1.000 |
| BRAF | | |
| Yes | 0/6(0.00) | |
| No | 4/73(5.48) | 1.000 |
| Capsular invasion | | |
| Yes | 0/10(0.00) | |
| No | 4/69(5.80) | 1.000 |
| Lymphovascular invasion | | |
| Yes | 0/2(0.00) | |
| No | 4/77(5.19) | 1.000 |
| Resection margin | | |
| Free | 3/70(4.29) | |
| Involved | 1/9(1.11) | 0.496 |
| Lymph node operation | | |
| Performed | 3/55(5.08) | |
| Not performed | 1/24(5.00) | 0.551 |

No., Number.

and minimal postoperative complications. A number of studies have evaluated oncologic outcomes of thyroid lobectomy for PTMC. Hay et al. evaluated the outcomes of lobectomy procedures in PTMC patients over a period of 60 years (1945–2004) [7]. Recurrence was noted in 12 of the 125 patients (9.6%) who underwent thyroid unilateral lobectomy. They also conducted a cohort study of all surgeries (total thyroidectomy, subtotal thyroidectomy, thyroid lobectomy) performed for PTMC during the period. Although, the recurrence rate of each surgical procedure was differentiated, they did not specify about node surgery or mortality in each of these cases. He et al. also published a study of patients who underwent surgery for PTMC in Jinan Military General Hospital during 1998–2010 [8]. All patients underwent lymph node surgery, and recurrence was detected in 5 of 48 (10.4%) thyroid lobectomy patients. Two patients had recurrence in the remaining thyroid tissue, whereas the other three had recurrences in the lymph node. All patients who had recurrence were salvaged after further surgical treatment, and the mortality due to thyroid cancer was 0%.

Lee et al. published a study of patients who underwent surgery for PTC during 1986–2006 [9]. They performed a cohort study to evaluate the outcomes of each type of surgical treatment on tumor size < 0.5 cm and > 0.5 cm. Of the patients with a tumor < 0.5 cm in diameter, 506 had undergone thyroid lobectomy, with lymph node surgery performed concurrently in 52 patients. Of these 506 patients, 29 had recurrence (5.7%), and eventually 6 died of thyroid cancer. There was no mention of recurrence site or salvage operation. Overall, these previous studies about the outcome of thyroid lobectomy revealed a recurrence rate of 5.7% to 10.4% in patients with tumor < 1 cm in diameter (Table 4) [7–10]. The recurrence rate of 5.0% following conservative thyroidectomy in the present study was comparable to that in other previous reports on thyroid lobectomy.

Several studies have also evaluated the incidence of complications after thyroid surgery. Sayaka et al. revealed that the incidence of hypocalcemia and transient vocal cord palsy after thyroid lobectomy was 0 (0%) and 5 (4.17%), respectively [11]. Three patients (2.5%) were detected with permanent vocal cord palsy. He et al. also reported on the incidence of complications in thyroid surgery [8]. However, there was no mention of hypocalcemia, and there was no comparison of the incidence of vocal cord palsy between the surgical procedures. Transient unilateral vocal cord palsy was noted in 1.8% of all patients who underwent thyroid surgery (total thyroidectomy and thyroid lobectomy), whereas none of them experienced permanent palsy. Lee et al. also reported the incidence of vocal cord palsy following total thyroidectomy and thyroid lobectomy [9]. Two of the 512 patients who underwent thyroid lobectomy had vocal cord palsy; but there were no comments on whether they were transient or permanent. In our present study, 1 patients (1.2%) developed temporary vocal cord palsy and hypocalcemia, respectively. However, all of these patients recovered within 5 months, suggesting that conservative thyroidectomy may be a functionally safe procedure in PTMC.

We did not perform completion thyroidectomy and adjuvant

**Table 4**
Recurrence rate of thyroid lobectomy in previous study.

| Study | Period of study | No. | Recurrence cases (%) | Mortality cases (%) | Follow-up (years) |
|---|---|---|---|---|---|
| Hay et al. (2008) | 1945–2004 | 125 | 12(9.6) | | 17.2(0.1–54) |
| He et al. (2012) | 1998–2010 | 48 | 5(10.4) | 0 | 9(0.5–13.5) |
| Pedrazzini et al. (2012) | 1968–2007 | 54 | 5(9.2) | 0 | 12(5–35) |
| Lee et al. (2013) | 1986–2006 | 506 | 29(5.7) | 6(1.1) | 11.8(5–26) |
| This study | 2008–2014 | 79 | 4(5.06) | 0 | 4.7(2–8.3) |

No., Number.

radioactive iodine (RAI) ablation for the 4 patients who showed recurrence. The reason why we did not perform adjuvant RAI ablation in these patients the role of RAI ablation in PTMC patients with neck metastasis is still controversial. Hay et al. published neither more extensive surgery nor RAI ablation reduced the recurrence rates compared with unilateral lobectomy [7]. Wendy Sacks et al. reported that PTMC patients with recurrence do not demonstrate survival or disease-free survival benefit from postoperative RAI treatment [12]. Yale D. Podnos et al. published that RAI only affects a survival advantage in older patients with large primary tumors involving the lymph nodes and with distant spread [13]. Additionally, recent studies reported various side effects associated with RAI ablation therapy [14]. For these reasons, we did not apply adjuvant RAI ablation to patients with recurrence after conservative thyroidectomy. Moreover, the present study showed that all 4 patients showed no evidence of disease after revision thyroidectomy alone, avoiding further RAI treatment.

Our study has one limitation. In this study, the minimum period was 25 months and it is relatively short and small patients compared with other studies. However, in many clinical studies of head and neck cancer including thyroid cancer, the minimum follow up period was commonly 2 years. Our study has a clinical significance regarding conservative thyroidectomy as novel procedure even though its follow up period was relatively short. Thus, more randomized and controlled prospective trials in the future involving a larger sample of patients followed-up for a longer duration over 5 years are needed to strengthen our results.

## 5. Conclusion

Conservative thyroidectomy is a novel surgical procedure that may be oncologically and functionally safe for the management of PTMC. It can be considered an alternative to thyroid lobectomy for PTMC.

## Declaration of interest

None.

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## Disclosure statement

None.

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