Intraoperative Frozen Biopsy of Central Lymph Node in the Management of Papillary Thyroid Microcarcinoma

Dong Hoon Lee¹ · Tae Mi Yoon¹ · Hee Kyung Kim² · Joon Kyoo Lee¹ ·
Ho Cheol Kang² · Sang Chul Lim¹

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Abstract The purpose of this study was to evaluate the usefulness and accuracy of intraoperative frozen section examination in the diagnosis of metastatic central lymph nodes in comparison to the final histopathological findings. A retrospective review was performed to evaluate patients with a preoperative diagnosis of papillary thyroid microcarcinoma (PTMC) and a plan to perform thyroid lobectomy at our Hospital from September 2011 to September 2013. Sixteen patients were identified. Intraoperative frozen section examination diagnosed ten patients as negative malignant cells of the central lymph node and the remaining six patients as metastatic central lymph node. The final histopathological results corresponded with intraoperative frozen section examination. Intraoperative frozen section examination had a sensitivity, specificity and accuracy of 100 % for diagnosing metastatic central lymph nodes of PTMC. Intraoperative frozen section examination of central lymph nodes is a useful and accurate adjunct for determining the operation method in PTMC.

Keywords Papillary thyroid microcarcinoma · Lymph nodes · Frozen sections · Thyroidectomy · Pathology

Introduction

Thyroid microcarcinomas are defined as carcinomas ≤ 1 cm in size [1, 2]. In a large retrospective study, total thyroidectomy was demonstrated to decrease recurrence and improve survival in patients with papillary thyroid cancer (PTC) exceeding 1 cm, but not in patients with PTC ≤ 1 cm [3]. Therefore, thyroid lobectomy may be a sufficient treatment for small (<1 cm), low-risk, unifocal, intrathyroidal papillary carcinomas in the absence of prior head and neck irradiation or radiologically or clinically involved cervical nodal metastasis [4]. However, in cases in which a thyroid lobectomy is performed and the final pathology is reported as regional lymph node metastasis, consideration is then given for a completion thyroidectomy. The rates of complications after completion thyroidectomy are significantly higher in comparison with the primary operation [5–7].

In our institution, to avoid repeated surgery, selective frozen section examination of central lymph nodes (LNs) is done during the thyroid lobectomy. If LN involvement was found, total thyroidectomy is performed. We have considered intraoperative frozen section examination to be a valuable and sufficient technique in the operative management of papillary thyroid microcarcinoma (PTMC). The aim of this study was to evaluate the usefulness and accuracy of intraoperative frozen section examination in the diagnosis of metastatic central LNs in comparison to the final histopathological findings.

Materials and Methods

After obtaining Institutional Review Board approval of Chonnam National University Hwasun Hospital, a retrospective review was performed to evaluate patients with a

✉ Joon Kyoo Lee
joonkyoo@jnu.ac.kr

¹ Department of Otolaryngology-Head and Neck Surgery, Chonnam National University Medical School and Chonnam National University Hwasun Hospital, 160 Ilsimri, Hwasun, Jeonnam 519-809, South Korea

² Department of Internal Medicine, Chonnam National University Medical School and Chonnam National University Hwasun Hospital, Hwasun, Jeonnam, South Korea

Table 1 The frozen section and histopathologic results of 16 cases

Age/sex	Tumor size (mm)	Number of frozen section examination	Frozen section results	Histopathologic results	Operation
48/M	6	2	N, N	N, N	LO
64/F	6	2	N, Y	N, Y	TT
55/F	2.4	2	N, N	N, N	LO
34/F	5	2	N, Y	N, Y	TT
46/M	7	3	N, Y, Y	N, Y, Y	TT
39/F	3	3	N, N, N	N, N, N	LO
39/F	5	6	N, N, N, N, N, N	N, N, N, N, N, N	LO
53/F	5	2	N, N	N, N	LO
58/M	3	3	N, N, N	N, N, N	LO
59/F	4	3	N, N, N	N, N, N	LO
49/F	4	3	N, N, N	N, N, N	LO
52/F	5	4	N, N, N, Y	N, N, N, Y	TT
52/M	4	3	N, N, N	N, N, N	LO
35/F	8	3	N, N, N	N, N, N	LO
51/M	6	3	N, N, Y	N, N, Y	TT
46/F	4	1	Y	Y	TT

M male, *F* female, *N* negative malignant cell, *Y* positive malignant cell, *LO* thyroid lobectomy with ipsilateral central lymph node dissection, *TT* total thyroidectomy with bilateral central lymph node dissection

preoperative diagnosis of PTMC and a plan to perform thyroid lobectomy at the hospital's Department of Otolaryngology-Head and Neck Surgery from September 2011 to September 2013. A preoperative diagnosis of PTMC was made based on thyroid ultrasound and fine needle aspiration cytology (FNAC). We considered that thyroid lobectomy may be sufficient for solitary PTMC with no additional adverse risk factors [4, 8].

Patients who did not undergo intraoperative frozen section examination of central LNs were excluded. Patients undergoing formal central LN dissection for clinical or radiological evidence of nodal metastasis, and patients with extra-capsular or extra-thyroid spread findings by preoperative thyroid ultrasound were also excluded. Sixteen patients were identified based on the medical records. Charts were reviewed to obtain information about patient demographics, preoperative diagnostic workup, surgical procedures, pathologic diagnosis, and postoperative clinical outcomes.

When intraoperative frozen section examination of central LNs revealed the negative of malignant cells, a thyroid lobectomy with ipsilateral central LN dissection was performed. Total thyroidectomy with bilateral central LN dissection was indicated for diagnosed as metastatic central LN by intraoperative frozen section examination. All cases of thyroid tumors and central LNs were confirmed histopathologically. Tumor size was measured by the pathologist from the unfixed, fresh surgical specimen. The largest tumor diameter is reported. In patients with multifocal cancer, the size of the largest tumor was

documented. Pathology reports were reviewed for frozen section and final histopathology results of central LNs. For the statistical analysis, Fisher's exact test was performed using SPSS version 14.0. Statistical significance was defined as a *p* value <0.05.

Results

This group of patients included 5 (31.25 %) males and 11 (68.75 %) females. The age of the patients ranged between 34 and 64 years with a mean of 48.8 ± 8.6 years. The size of PTC varied from 2.4 to 8 mm at the greatest points with the mean diameter 4.8 ± 1.5 mm. The number of frozen section examination of central LNs was from 1 to 6 with a mean of 2.8 ± 1.1 .

Ten of the 16 patients were diagnosed as negative malignant cells of the central LN by intraoperative frozen section examination. In these patients, we performed only thyroid lobectomy with ipsilateral central LN dissection. The remaining six patients were diagnosed with metastatic central LN by intraoperative frozen section examination. Total thyroidectomy with bilateral central LN dissection was performed for these six patients. The final histopathological results completely corresponded with intraoperative frozen section examination. Ten patients had pathologically confirmed a negative malignant cell of central LN. The remaining six patients had a malignant cell of central LN. A summary of the pathologic results is shown in Table 1.

Intraoperative frozen section examination had a diagnostic sensitivity, diagnostic specificity and accuracy of 100 % for diagnosing as metastatic central LNs of PTMC. In addition, seven LNs among 45 frozen section-examined central LNs were diagnosed as metastatic, and all were revealed as metastatic LNs by the final histopathology.

There were no major complications, such as temporary and permanent recurrent laryngeal nerve injury and hypoparathyroidism, resulting from surgical intervention. All patients who had pathologically confirmed malignant central LNs underwent radioiodine therapy. The mean follow-up was 19.9 ± 5.7 months (range 13–28 months). Disease recurrence was not observed in any of the patients.

Discussion

The European Thyroid Cancer Taskforce and the American Thyroid Association state that thyroid lobectomy may be sufficient for solitary well differentiated thyroid microcarcinomas with no additional adverse risk factors [4, 8]. In our institution, we follow this recommendation. However, in patients who have undergone a thyroid lobectomy, if the primary tumor size exceeds 1 cm, the primary tumor extends beyond the thyroid capsule, or regional LN metastasis is present, completion thyroidectomy is required [9].

The purpose of completion thyroidectomy is to remove all thyroid tissue and to prepare for radioiodine therapy [10]. However, it is generally accepted that reoperation carries a higher risk of complications than primary surgery [5–8]. In addition, completion thyroidectomy requires working in a recently operated field with scarring and partial obliteration of tissue planes. The patient must also undergo general anesthesia and endure postoperative pain and recovery for a second operation [11].

Therefore, it is necessary to reduce the chance to undergo completion thyroidectomy, when thyroid lobectomy was performed. We routinely performed the intraoperative frozen section examination of central LNs during thyroid lobectomy. If LN involvement was found, total thyroidectomy was performed. In this study, intraoperative frozen section examination had a diagnostic sensitivity, diagnostic specificity and accuracy of 100 % for diagnosing as metastatic central lymph nodes of PTMC. It was possible to avoid the completion thyroidectomy for six patients. However, it is important to recognize that the final histopathologic results after surgical treatment may in rare cases differ from the results of frozen section examination. A risk arises from a false positive result and the subsequent performance of an unnecessary total thyroidectomy. Despite this, frozen section examination of thyroid lesions remains a highly accurate procedure with a low false

positive rate, and it should not be used as an argument against its routine use [11–13].

Another concern is that waiting for intraoperative frozen section results could potentially prolong the time that the patient is exposed to general anesthesia. To avoid this situation, we begin wound closure when the frozen section is sent to pathology. The wound is explored and irrigated, hemostasis is achieved, photographs of operation field are taken, and the incision is closed in a multi-layer method. Pathology results are routinely sent to us prior to the completion of these steps. If the frozen section examination is positive for malignancy, the procedure is ceased and a total thyroidectomy is performed.

In summary, although the retrospective study and small number of patients in the present study are disadvantages, we presently demonstrate high accuracy, sensitivity and specificity of intraoperative frozen section examination of central LNs in the operative management of PTMC. Additional studies with more cases are needed.

Conclusions

We suggest that intraoperative frozen section examination of central LNs is a useful and accurate adjunct for determining the operation method in PTMC. Therefore, we recommend that intraoperative frozen section examination of central LNs should be part of the operative procedure when a patient diagnosed as PTMC undergoes thyroid lobectomy.

Compliance with Ethical Standards

Conflict of interest All authors declares that we have no conflict of interest and funding.

Human and Animal Rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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