

CT 1

CT 가 가 ,

CT 가 가 ,

59 . 59 (Level VI)
, 21 136 level (Level II - V)
. CT 가 , , CT 가 ,

CT 가 ,

: 59 31 (53%)
59 30 , 136 level 44 level 가

CT , , ,

27% 93%, 100% 93%, 100% 87%, 57% 97%, 63% 93%
. CT (n=19), (n=14), (n=8)
가

, CT 25 level 6 level (24%)

: 가 CT

(papillary carcinoma) 44 - 80% 가

(1, 2),

(3). 가

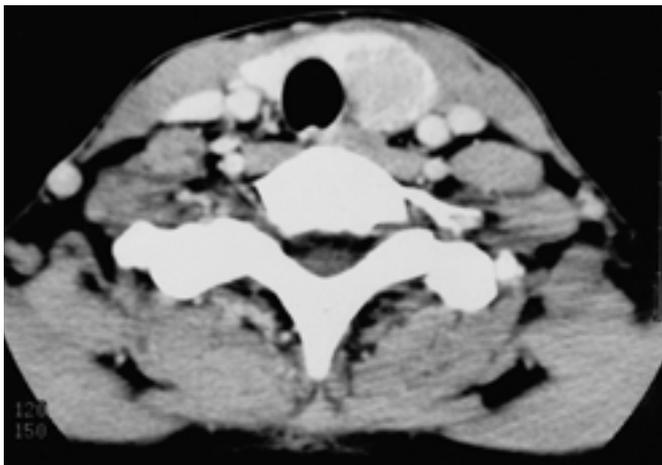
. Cady (4) 가 CT 가 가 ,

가 , Harwood (5) CT 가

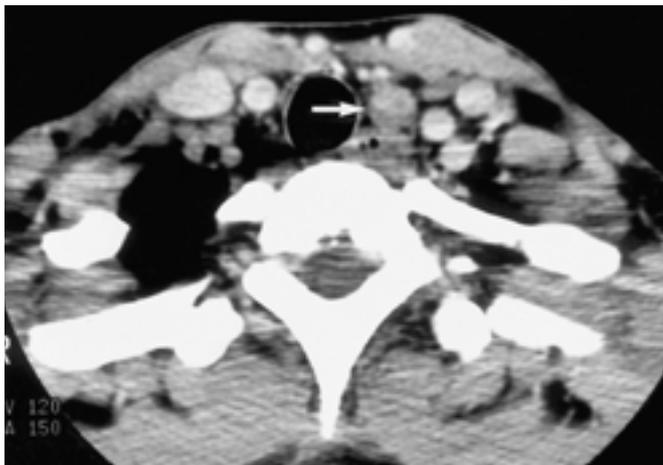
1 1999 2001 8 8 2001 9 5 1996 5 1999 4 CT (thyroidectomy) (neck dissection)

59 가 11 , II - VI (6, 7).
 가 48 , 8 69 42 . Level II ([hyoid bone])
 59 46 , (follicular (submandibular gland)
 carcinoma) 10 , H rthle 1 , (medullary
 carcinoma) 1 , (anaplastic carcinoma)
 1 . 26 , 21 ,
 11 , (isthmus)
 가 1 . 59 38
 (total thyroidectomy) , 21
 (partial thyroidectomy)
 , 11 (subtotal thy -
 roidectomy) , 10 (uni -
 lateral thyroid lobectomy)
 Level VI (primary echelon lymph
 node) (central dissection)
 , 21 Level II - V (secondary ech -
 elon lymph node) (lateral dissection)
 . 8 ,
 13 136 level
 CT HiSpeed Advantage (GE Medical Systems,
 Milwaukee, Wis, U.S.A.)
 3 - 5 mm
 CT
 CT 80 mL
 (Omnipaque 300; Nycomed, Cork, Ireland)
 power injector (MCT Plus; Medrad, Pittsburgh, Penn,
 U.S.A.) 2.5 mL/sec
 20
 CT level Level

CT
 (8). CT
 (jugulodi -
 gastric node) 1.5 cm ,
 1.0 cm 가 (8).
 ,
 CT 2 (3).
 CT
 CT (diagnostic perfor -
 mance) 가 , CT
 , AJCC (American Joint Committee on
 Cancer) (9)
 N1a, ,
 N1b
 CT



A



B

Fig 1. A 23-year-old woman with papillary thyroid carcinoma and metastasis to ipsilateral primary echelon lymph node.
A. Contrast-enhanced axial CT scan shows a 2-cm ill-margined, well-enhancing soft tissue mass in the left lobe of the thyroid gland.
B. Contrast-enhanced axial CT scan caudal to A shows a 1-cm round, moderately well-enhancing, paratracheal (Level VI) lymph node (arrow) in the left neck.

59
 31 (53%) , 29 ,
 1 , 1 .
 59
 30 (51%) , 8
 CT (Table 1). 8 7
 CT , 4 1 cm
 (Figs. 1, 2A)
 가 1 (Fig. 2A). CT
 . 59
 CT (sensitivity) 27%, (specificity)
 100%, (positive predictive value) 100%,

(negative predictive value) 57%, (accu-
 racy) 63% .
 21
 136 level 18 (31%)
 44 level 가 ,
 Level V 18 가 , Level IV 11 , Level
 III 11 , Level II 4 가 . 18
 17 가
 , 1 가 . CT 18
 44
 level 41 level (93%)
 (Table 2).
 17 40 level
 CT 가 (Figs. 2B, C, D), 1 4
 level 가 CT

Table 1. Results of CT and Histologic Findings of Primary Echelon Lymph Nodes Resected in 59 Patients during Central Neck Dissection

Nodal Metastasis Determined at CT	No. of Patients with Nodal Metastasis Determined at Histology	
	Positive	Negative
Positive	8	0
Negative	22	29

- Sensitivity = 27%; Specificity = 100%; Positive predictive value = 100%; Negative predictive value = 57%; Accuracy = 63%.

Table 2. Results of CT and Histologic Findings of 136 Levels of Secondary Echelon Lymph Node Resected in 21 Patients during Lateral Neck Dissection

Nodal Metastasis Determined at CT	No. of Levels of Nodal Metastasis Determined at Histology	
	Positive	Negative
Positive	41	6
Negative	3	86

- Sensitivity = 93%; Specificity = 93%; Positive predictive value = 87%; Negative predictive value = 97%; Accuracy = 93%.

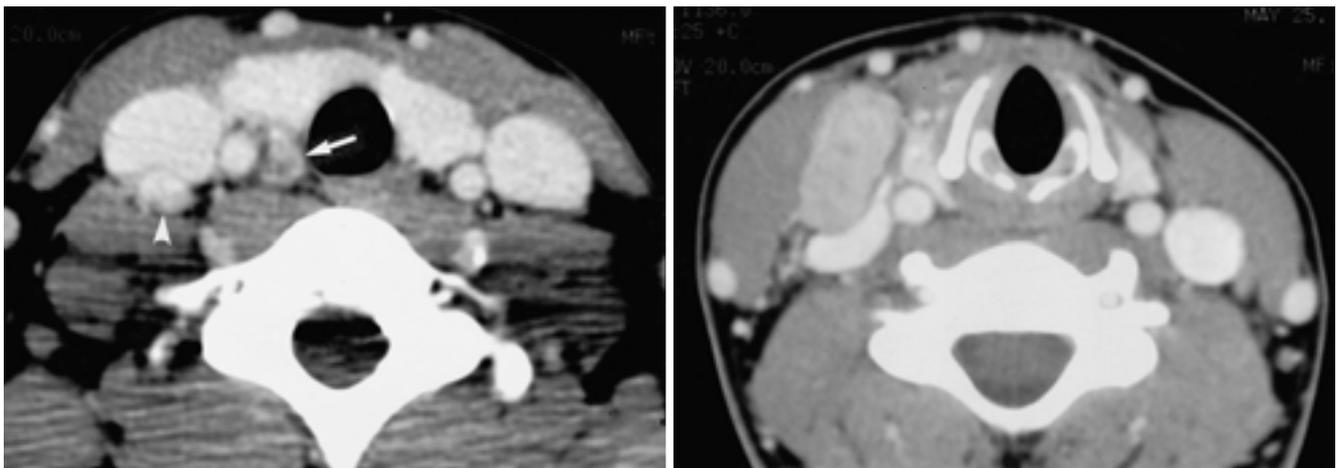


Fig. 2. A 22-year-old woman with papillary thyroid carcinoma and metastasis to both primary and secondary echelon lymph nodes.

A. Contrast-enhanced axial CT scan shows a 1-cm well-enhancing lymph node (arrow) at the right paratracheal area (Level VI). It contains areas of low attenuation, suggestive of cystic or necrotic change. Also noted is an ipsilateral, ovoid, highly-enhancing lymph node (arrowhead) between internal jugular vein and anterior scalene muscle.

B. Contrast-enhanced axial CT scan superior to A shows a 2.8-cm ellipsoid, well-enhancing lymph node along the right midjugular chain (Level III).

CT

1 level 3 level 3).

가 3 CT 6 level 18

(Table 2). 136 , N1b가 7 AJCC CT N1a가 11

level CT 93%, 87%, 97%,

93%, 87%, 97%,

CT (n=19),

(n=14), (n=8) 1

, CT (10 - 12).

25 level 19 level (76%) 가 , 가

6 level (24%) 가 , 가

(Table (4), 1978 Harwood



Fig. 3. A 22-year-old woman with papillary thyroid carcinoma and metastasis to multiple, bilateral secondary echelon lymph nodes. Contrast-enhanced axial CT scan shows bilateral, multiple, well-enhancing lymph nodes at the high internal jugular and spinal accessory chains, some of which contains calcifications and cystic or necrotic changes.

(5) 가 (32% vs 14%)

(11, 13 - 16).

가 가 가 44 -

80% (1, 2), 2 - 10%

, 50%, 80%

(17 - 19).

가 46 , 10 29 (63%) 1

가 가 , 가 1

(paratracheal node) (jugular node)

(1, 20). Miralli (20) 119

72 (60.5%)

가 , (Level VI) 60

(83.3%), (midjugular node,

Level III) 44 (61.1%),

(supraclavicular node, Level IV V

Table 3. Summary of Positive Secondary Echelon Lymph Nodes at CT According to Various CT Criteria

CT Criteria of Metastatic Lymph Nodes	No. of Positive Lymph Nodes at CT According to Level Classification				
	Level II	Level III	Level IV	Level V	Total
Enhancement	3 (1)	13 (3)	9	17 (2)	42 (6)
Large size	1	4	9	5	19
Cystic or necrotic changes	0	1	3	10	14
Calcification	0	3	2	3	8

- Numbers in parentheses indicate numbers of false-positive cases seen at CT.

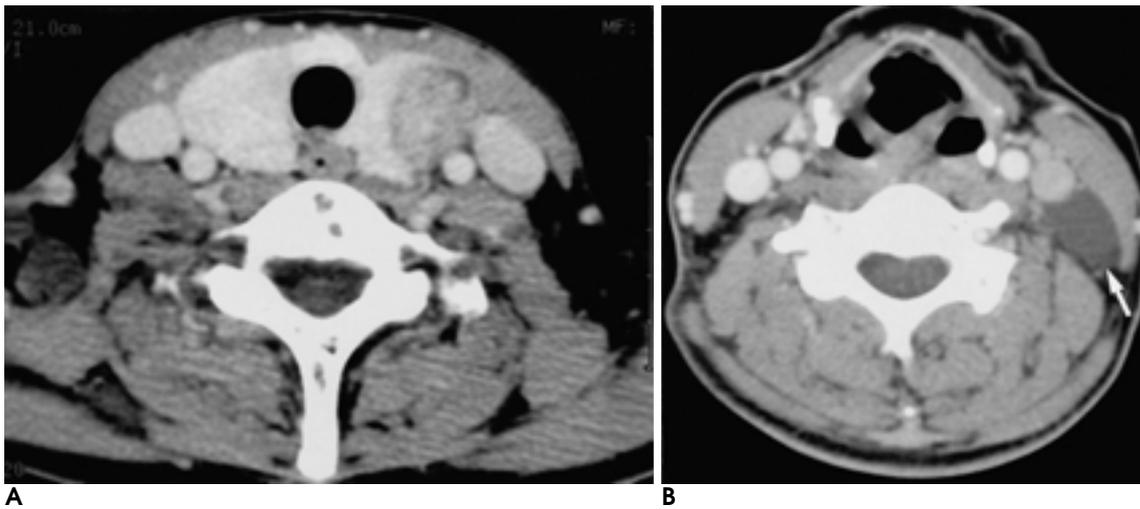


Fig. 4. A 44-year-old woman with papillary thyroid carcinoma and cystic metastasis to ipsilateral secondary echelon lymph node .
A. Contrast-enhanced axial CT scan shows a 2.4-cm poorly margined, relatively well-enhancing soft tissue mass in the left lobe of the thyroid gland.
B. Contrast-enhanced axial CT scan superior to A shows a 2.2-cm oblong, purely cystic lymph node without a definable wall (arrow) along the ipsilateral spinal accessory chain.

) 26 (36.1%), 25 가
 (34.7%), (subdigastric node, CT
 Level II) 20 (27.8%), 가
 12 (16.7%), , ,
 5 (6.9%) 2 (2.8%) CT
 (53%) 59 31 7.5 - 31% (22, 23).
 Level VI 가 30 (51%) , CT 100%
 27%
 Level V가 18 가 , Level III IV가 11 CT
 , Level II가 4 .
 (lymph node mapping) 136 level CT
 Level II - IV Level V (8), CT 93% 가 44 level
 Miralli (20) Level V 3 level
 Level II - IV . CT 6 level
 Level , CT
 Som (21) 가 , CT
 CT 1.5
 Gimm (1) 29 5 (17%), Miralli (20) 가
 72 11 (15%) , (8). 가
 31 1 (3%) (25) (24)
 가 .

CT 30
 4 , 44 level 19 level
 Som (3) (3, 26 - 28).
 20 - 40 가
 (benign cyst) (27, 28)
 가 (3).
 (psammoma body) 25 -
 40% , ,
 가 (29, 30). CT (Figs. 3, 4) 14 level, (Fig.
 3) 8 level 가
 CT (3).
 , angioim-
 munoblastic lymphadenopathy with dysproteinemia, angio-
 lymphoid hyperplasia with eosinophilia (Kimura disease),
 Kaposi sarcoma, angiofollicular hyperplasia (Castleman dis-
 ease) (choriocarcinoma),
 (melanoma), (renal cell carcinoma)
 (3),
 8). CT (3).
 42 level 25 level
 , , 25 level
 19 level (76%) 6
 level (24%)
 CT 가

1. Gimm O, Rath FW, Dralle H. Pattern of lymph node metastases in papillary thyroid carcinoma. *Br J Surg* 1998;85:252-254
2. Noguchi S, Noguchi A, Murakami N. Papillary carcinoma of the thyroid. I. Developing pattern of metastasis. *Cancer* 1970;26:1053-1060
3. Som PM, Brandwein M, Lidov M, Lawson W, Biller HF. The varied presentations of papillary thyroid carcinoma cervical nodal disease: CT and MR findings. *AJNR Am J Neuroradiol* 1994;15:1123-1128
4. Cady B, Sedgwick CE, Meissner WA, Bookwalter JR, Romagosa V, Werber J. Changing clinical, pathologic, therapeutic, and survival patterns in differentiated thyroid carcinoma. *Ann Surg* 1976;184:541-553
5. Harwood J, Clark OH, Dunphy JE. Significance of lymph node metastasis in differentiated thyroid cancer. *Am J Surg* 1978;136:107-112
6. Shah JP, Stiang E, Spiro RH, Vikiam B. Neck dissection: Current status and future possibilities. *Clin Bull* 1981;11:25-33
7. van den Brekel MWM, Castelijns JA, Snow GB. Imaging of cervical lymphadenopathy. *Neuroimaging Clin North Am* 1996;6:417-434
8. Som PM. Nodal and non-nodal neck masses. I. Imaging cervical lymph nodes. In Som PM, Curtin HD, Holliday RA. *Syllabus: a special course in head and neck radiology*. Oak Brook: RSNA Publications, 1996:65-74
9. Fleming ID, Cooper JS, Henson DE, et al. *AJCC Cancer staging manual*. 5th ed. American Joint Committee on Cancer. Philadelphia: Lippincott-Raven, 1997:59-64
10. Bellantone R, Lombardi CP, Boscherini M, et al. Prognostic factors in differentiated thyroid carcinoma: a multivariate analysis of 234 consecutive patients. *J Surg Oncol* 1998;68:237-241
11. Scheumann GFW, Gimm O, Wegener G, Hundeshagen H, Dralle H. Prognostic significance and surgical management of locoregional lymph node metastases in papillary thyroid cancer. *World J Surg* 1994;18:559-568
12. Hay ID, Grant CS, Taylor WF, McConahey WM. Ipsilateral lobectomy versus bilateral lobar resection in papillary thyroid carcinoma: A retrospective analysis of surgical outcome using a novel prognostic scoring system. *Surgery* 1987;102:1088-1095
13. Mazzaferri EL, Jhiang SM. Long-term impact of initial surgical and medical therapy on papillary and follicular thyroid cancer. *Am J Med* 1994;97:418-428
14. Simon D, Goretzki PE, Witte J, Roher HD. Incidence of regional recurrence guiding radicality in differentiated thyroid carcinoma. *World J Surg* 1996;20:860-866
15. McHenry CR, Rosen IB, Walfish PG. Prospective management of nodal metastases in differentiated thyroid cancer. *Am J Surg* 1991;162:353-356
16. Sellers M, Beenken S, Blankenship A, et al. Prognostic significance of cervical lymph node metastases in differentiated thyroid cancer. *Am J Surg* 1992;164:578-581
17. Yousem DM, Scheff AM. *Thyroid and parathyroid*. In Som PM, Curtin HD. *Head and Neck Imaging*. St. Louis: Mosby-Year Book, 1996:952-975
18. Takashima S, Sone S, Takayama F, et al. Papillary thyroid carcinoma: MR diagnosis of lymph node metastasis. *AJNR Am J Neuroradiol* 1998;19:509-513
19. Miralli E, Sagan C, Hamy A, et al. Predictive factors for node in-

Lymph Node Metastases in Thyroid Carcinomas: CT Diagnosis¹

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Purpose: To determine the usefulness of CT for diagnosing metastases to primary and secondary echelon lymph nodes (LNs) and to investigate various CT findings of metastatic LNs in thyroid carcinomas.

Materials and Methods: We retrospectively reviewed the CT and histologic findings in 59 patients with thyroid carcinomas who had undergone thyroidectomy and neck dissection. Primary echelon LNs (Level VI) were removed by central neck dissection in all patients, and in 21, a total of 136 levels of secondary echelon LNs (Level II-V) were excised away by lateral neck dissection. CT criteria of metastatic LNs included large size, significant homogeneous enhancement, calcification, and cystic change. We evaluated the ability of CT to detect primary and secondary echelon LN metastasis and tried to determine which CT features were useful for the diagnosis of LN metastasis.

Results: Histologically, LN metastasis was found in 31 (53%) of 59 patients, including 30 with metastasis to primary echelon LNs. Of the 136 levels of secondary echelon LNs resected in 21 patients, 44 were found at histology to harbor metastatic foci. The sensitivities, specificities, positive and negative predictive values, and accuracies of CT in the diagnosis of metastasis to primary and secondary echelon LNs, respectively, were 27% and 93%, 100% and 93%, 100% and 87%, 57% and 97%, and 63% and 93%. While all secondary echelon LNs with at least one of the following CT criteria - large size (n = 19), cystic or necrotic change (n = 14), or calcifications (n = 8) - were histologically proven to be metastatic, six (24%) of 25 such LNs with a sole sign of significant enhancement at CT were found to be due to reactive lymphadenopathy.

Conclusion: Although CT was unable to detect metastasis to primary echelon LNs, it was useful in the detection of secondary echelon LN involvement. Large size, cystic change, and calcification are considered highly reliable signs of metastatic LNs.

Index words : Lymphatic system, CT
Thyroid, CT
Thyroid, neoplasms

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