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REGIONAL LYMPH NODE METASTASIS IN THE EARLY STAGE OF THYROID CANCER WITH SPECIAL REFERENCE TO THE DISSECTION METHOD

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ABSTRACT

For the purpose of studying the appropriate surgical treatment for thyroid cancer in the early stage, extended modified neck dissection was carried out to examine node metastasis bilaterally in 22 patients considered preoperatively to be in this stage. These patients presented with only one movable unilateral nodule in the thyroid with no clinical evidence of nodal involvement. At the time of operation, as many vital structures as possible were preserved intact, resulting in a favorable postoperative course with no remarkable sequelae except for Horner's syndrome in one case. Since it was impossible to preserve the blood supply to the parathyroid glands as a consequence of adequate dissection of the tracheoesophageal nodes, they were totally removed and autotransplantated into the major pectoral muscle. As many as 20 patients (90.9%) had node metastases somewhere in the neck, of which 12 (54.5%) were bilateral. Some 224 (13.0%) out of the 1719 nodes dissected proved to contain metastases. In each case nodal involvement was found to be scattered over the entire neck region except for the contralateral submandibular nodes. The incidence of metastases in the inferior jugular nodes, para- and pretracheal group of the upper mediastinal nodes was 68.2%, 50.0% and 45.5%, respectively, implying the necessity of mediastinotomy where possible for better results. Node metastases were also found in 31.8% of patients ipsilaterally as well as in 13.6% of patients contralaterally in the tracheoesophageal groove, where is the most critical point in the operation. The metastatic incidence of nodes overlying the thyroid cartilage and ipsilateral superior jugular nodes was as high as 36.4% and 50.0%, respectively.

These results suggest that the thyroid cancer has already widely metastasized over the entire neck region at the time when the patient is diagnosed as having thyroid cancer, even if it is considered clinically to be in the early stage. Based upon these results, bilateral modified neck dissection, with mediastinotomy where possible, is considered the surgical treatment of choice for thyroid cancer. This operative method can be undertaken, according to our limited experience, without any remarkable complications or deleterious sequelae.

Key Words Thyroid Cancer, Node Metastasis, Extended Modified Neck Dissection, Parathyroid Autotransplantation

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INTRODUCTION

For the operation of early stage thyroid cancer, some disagreement remains as to what kind of node dissection is the most favorable type of treatment. Some authors recommend no dissection,[1] if there is no grossly involved lymphadenopathy at the time of operation, because of favorable postoperative survival without node dissection and because of the likelihood of deleterious sequelae following such maneuvers. Others advocate aggressive radical neck dissection [2] even if there is no palpable node elsewhere. The extent of dissection also varies more or less according to the surgeon's basic thinking.

It is a well known fact, however, that many patients with symptoms of only a single freely movable nodule who have been surgically treated for thyroid cancer suffer later from a local recurrence which originates in the involved nodes. Certainly, thyroid cancer grows very slowly, and this appears to be true for recurrent disease as well. Therefore, it is much more serious for a patient to have an overt metastasis over an extended period of time, always fearing possible lethal suffocation in the foreseeable future. Reoperation upon these local recurrences is no easy matter, and there is no promise of a favorable prognosis compared to the adequately dissected primary case.

To our knowledge, no report on the nodal involvement of the overall neck region ipsilaterally as well as contralaterally is now available when extended neck dissection is considered unnecessary for early stage thyroid cancer. Thus, there have been no precise data as to how extensive the cervial node dissection should be in order to effect a complete cure. That is why the authors performed extended modified neck dissection in 22 cases of early stage thyroid cancer in order to examine fully the node status and to determine the most appropriate method of treatment.

MATERIALS AND METHODS

This study was comprised of 22 patients with thyroid cancer who were diagnosed preoperatively as being in the $T_1N_0M_0$ stage according to the UICC classification, namely, as having a freely movable single nodule localized in one lobe without any evidence of regional lymph node involvement nor distant metastasis. These patients accounted for 26.2.% of 84 consecutive patients with thyroid cancer treated surgically at the Second Department of Surgery, Nagoya University Hospital, from July 1, 1979, to August 31, 1982. Their ages ranged from 19 to 63 years with a median age of 42.0 years (Table 1). In all cases, the tumors were diagnosed histologically as papillary carcinoma.

Hemi- or subtotal thyroidectomy alone was carried out first, routinely to ascertain the presence of malignancy on frozen section examination. After the histological diagnosis of thyroid cancer, removal of the remaining thyroid gland and four parathyroid glands was performed, except for cases 1 and 12, who had undergone subtotal thyroidectomy. Although it is possible to preserve the arterial blood supply to the uninvolved-side parathyroid glands from the inferior thyroid artery,[3] veins which enter directly into the surrounding fatty tissue cannot be theoretically preserved because of the complete dissection of this fat pad which follows. Removal of all four glands was followed by autotransplantation of one or two contralateral glands into the major pectoral muscle according to the method reported by Wells *et al.*[4]

Subsequently, extended modified neck dissection was carried out preserving the vital structures except for the infrahyoid and omohyoid muscle. The sternocleidmastoid muscle was not transected in order to avoid undesirable postoperative muscle atrophy. The regional

lymph node groups dissected were as follows; the nodes overlying the thyroid cartilage (I), the pretracheal (II) and paratracheal group (III) of the upper anterior mediastinal nodes, the tracheoesophageal nodes (IV), the superior (V) and inferior jugular nodes (VI), the lateral cervical nodes (VII), and the submandibular nodes (VIII). Relevant organs such as the recurrent laryngeal nerve, the internal and external branch of the superior laryngeal nerve, the cervical sympathetic group, phrenic nerve, vagus nerve, spinal accessory nerve, middle and posterior branch of the supraclavicular sensory nerve, hypoglossal nerve, great auricular nerve, and internal and external jugular veins were carefully preserved. The current procedure for modified neck dissection was more conservative than the original method reported by Marchetta *et al*[5]. The thoracic duct was ligated at the point of either the thoracic inlet or just behind the aortic arch. Mediastinotomy was performed in 9 cases to dissect the upper anterior mediastinal nodes as completely as possible (Table 1).

Postoperative courses were uneventful except for the episodes indicated in Table 1. Not a single tracheotomy was requried after surgery, nor were there any deleterious complications except for permanent hypocalcemia in the first 8 cases where no parathyroid gland autotransplantation was carried out.

Table 1. Details of the 22 cases in the present report. The number of positive and dissected nodes is the sum for the eight node groups in each case, respectively. Hypocalcemia as a complication following total parathyroidectomy is not shown in this table (see text).

Case No.	Name	Age	Sex	Mediastinotomy	Positive / Dissected Nodes	Complications*
1	T. I.	20	f		1/64	
2	S. T.	33	m		29/50	
3	T. E.	25	f	+	17/41	
4	S. U.	39	f	+	9/95	
5	K. K.	52	f	+	9/34	hoarseness
6	F. S.	52	f	+	15/70	mediastinitis
7	M. M.	43	f		7/73	
8	E. K.	52	f		4/40	
9	M. O.	55	f		8/86	Horner's syndrome
10	T. F.	45	f	+	5/57	difficulty in breathing
11	F. K.	63	f		18/77	
12	M. B.	19	f		5/67	
13	T. O.	37	f		17/40	
14	T. O.	62	f		1/71	difficulty in breathing
15	M. N.	22	f		44/65	
16	M. I.	31	f		8/75	
17	H. H.	33	f		4/79	
18	T. M.	41	f	+	2/157	pneumonia
19	T. H.	51	f	+	0/123	drug eruption
20	S. U.	58	f		7/61	
21	K. A.	34	f	+	0/192	
22	T. U.	56	f	+	14/102	
mean		42.0			10.2/78.1	

* These symptoms became manifest only temporarily, and healed without any sequelae except for Horner's sydrome in case 9.

Table 2. Distribution of metastasis in regional lymph nodes. A node group which contains at least one metastatic node is depicted as (+). Incidence of metastasis in an individual node group is shown as a percentage of the 22 cases at the bottom of this table.

		Ipsilateral nodes								Contralateral nodes					
		I	II	III	IV	V	VI	VII	VIII	III	IV	V	VI	VII	VIII
Case No.	1	+													
	2	+	+	+	+	+	+	+		+	+		+		
	3	+		+	+	+	+	+		+		+	+		
	4	+	+	+		+		+		+					
	5		+			+	+	+		+					
	6			+		+	+				+				
	7			+						+			+		
	8		+				+			+					
	9		+		+		+								
	10		+				+								
	11	+	+	+	+	+	+				+	+	+		
	12				+	+				+					
	13	+	+	+		+	+		+						
	14												+		
	15	+	+	+		+	+			+		+	+	+	
	16		+	+	+		+								
	17			+		+	+								
	18						+								
	19														
	20					+	+					+		+	
	21														
	22	+		+	+		+								
Number of patients with metastasis		8	10	11	7	11	15	4	1	8	3	4	6	2	0
Incidenc of metastasis (%)		36.4	45.5	50.0	31.8	50.0	68.2	18.2	4.5	36.4	13.6	18.2	27.3	9.1	0

Table 3 Total number of examined nodes and percent metastasis in each respective node group.

	I	II	III	IV	V	VI	VII	VIII
					Ipsilateral nodes			
Positive node /dissected node	13/23	18/71	33/97	21/42	38/232	44/237	5/190	1/60
Percent meta.	56.5	25.4	34.0	50.0	16.4	18.6	2.6	1.7
					Contralateral nodes			
Positive node /dissected node			24/140	5/32	10/174	8/220	4/150	0/51
Percent meta.			17.1	15.6	5.7	3.6	2.7	0
Total				224/1719 (13.0%)				

RESULTS

As shown in Table 2, 20 (90.9%) out of 22 cases had metastases in the regional lymph nodes in spite of there being no evidence of palpable lymphadenopathy preoperatively. The area which contained metastatic nodes occupied the entire neck except for the contralateral submandibular region. Practically, as many as 12 cases (54.5%) had nodal involvement bilaterally.

The ipsilateral inferior and superior jugular nodes were the most prevalent sites for metastasis in view of the absolute number of involved nodes, averaging 2.0 and 1.7 nodes per capita, respectively (Table 3). However, the incidence of metastasis to an individual node group (i.e., the incidence of at least one involved node) was remarkably high in the upper mediastinal nodes, although the numbers were not so numerous (Table 2). As many as 10 cases (45.5%) and 11 cases (50.0%) had metastases in the pretracheal and ipsilateral paratracheal group, respectively, and 8 cases (36.4%) in the contralateral paratracheal group of the upper anterior mediastinal nodes as well.

It was also notable that the ratio of metastasis to the nodes overlying the thyroid cartilage and ipsilateral tracheoesophageal nodes was especially high (56.5% and 50.0%, respectively), although the number was also relatively few (Table 3).

Of the forty-two nodes examined and found to be embedded below the brachiocephalic vein in the anterior mediastinum, there was no evidence of metastasis.

DISCUSSION

It is widely accepted that well-differentiated thyroid cancer in the early stage has a relatively favorable prognosis, in spite of the widespread metastases to regional lymph node and although the prognosis varies somewhat depending on the age and sex.[6] It is also a well known fact that well differentiated thyroid cancer, especially in young patients (less than 40 years old), remains within the node capsule without further development for a surprisingly long time.[7] Thus, extended modified lymph node dissection has usually been set aside in favor of unilateral dissection in cases where palpable lymphadenopathy or node proved to be metastasis on frozen section. Certainly, the recurrence rate thus far reported in patients who were considered to have no gross involvement at the time of operation is fairly low, (i.e., ranging from 4.0 to 23.0% at 5 or 15 years after operation.[8,9,10]) compared to the outcome in older patients (above 50 years of age).

Our results show a remarkably high incidence of regional nodal involvement contralaterally as well as ipsilaterally, regardless of whether the contralateral lobe contained secondaries, even in the early stage of thyroid cancer. These results mean that in the vast majority of cases the thyroid cancer has already become widely spread by the time the cancer has developed into a palpable mass. A predisposition to bilaterality of nodal involvement has not been generally reported to date. We assume that this prevalence of bilaterality is acceptable, when the anatomical problem of the thyroid gland lying in the center of the neck is taken into consideration.

Despite the excellent survival rate in young patients, the outcome in those surviving to around 50 years old remains to be defined. No age-matched reliable data are available at present.[11] Thus, it is still unresolved as to whether secondaries in the nodes do not develop further or show the deleterious biological activity peculiar to old patients once they have survived up to 50 years of age. The latter might be the case, if it is true that the secondaries in the nodes survive over an extended period. A possible evolution from the remnant papillary

cancer to anaplastic cancer [12] is also a matter to be kept in mind.

Although opinion differs as to the extent of neck dissection, those against neck dissection cite the possible deterioration of vital function and the cosmetic problems involved. On the other hand, there is general agreement that an appropriate cervical node dissection provides better logn-term results in terms of recurrence as well as mortality than a less radical operation.[13] Hutter[14] reported that if palpable lymph nodes appear later to indicate growing metastases, a cervical lymph node dissection at that time does not impair the good prognosis. However, reoperation upon the neck secondaries cannot be carried out so easily[6] in clinical practice because of intimate adhesion of vital structures to one another. Therefore, it promises nothing exceptional in terms of a cure.

As mentioned previously, the most prevalent sites for metastases were the pre- and paratracheal group of the upper anterior mediastinal nodes and the inferior jugular nodes, involving the possible necessity of mediastinotomy where feasible. These results are compatible with the concept of McClintock *et al*,[15] who held that lymph drainage along the innominate vein plays an important role in the node metastasis of thyroid cancer. In practice, suffocation due to the enlargement of the upper anterior mediastinal nodes induced by metastases is the most likely cause of death from thyroid cancer.[16,17]

Block[18] reported that mediastinal metastasis from thyroid cancer was nearly always restricted to the upper anterior mediastinum, and thus was accessible through a cervical incision. In our experience, however, nodes were occasionally found to involve metastasis at the level immediately superior to the innominate vein on either side of the trachea. The authors therefore prefer a sternum-splitting approach in order to insure complete removal of involved nodes.

The mean number of dissected nodes in the current series was 80.4 per capita, which suggests the feasibility of *en block* removal of nodes, irrespective of the degree of preservation of a great variety of vital structures. Noguchi *et al.*[10] reported nodal involvement in around 90% of cases with papillary cancer. The majority (57%) of these affected nodes were less than 3 mm in diameter, suggesting that regional node dissection should be carried out in every case, irrespective of the presence or absence of enlargement of the nodes at the time of operation.

The surprisingly high percentage of metastasis to ipsilateral tracheoesophageal nodes, albeit less marked in the absolute number, ranks highest among the respective node groups (Table 3). The 15.6% metastasis to contralateral tracheoesophageal nodes is also the highest next to that of the paratracheal group of the upper anterior mediastinal nodes among the noninvolved-side node groups. From the standpoint of poor surgical accessibility during the second operation, it appears reasonable to dissect the bilateral tracheoesophageal grooves adequately during the primary operation.

For these reasons, the present authors conclude that modified neck dissection covering the whole regional node area bilaterally, even though time consuming, is the most preferable form of treatment. Sternotomy also should be performed without hesitation, where practicable, whenever good results can be expected. Extended modified neck dissection preserving a great deal of vital structures, but not extensive ablative eradication, does not necessarily carry the risk of morbidity when performed meticulously by experienced hands. This may well be possible without any serious drawbacks in either function or appearance.

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