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A National Study on Biopsy-Confirmed Thyroid Diseases Among Koreans: An Analysis of 7758 Cases*

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In order to determine the incidence and to understand recent trend of thyroid neoplasm and other thyroid diseases among Korean, a nation-wide collection of biopsy-confirmed and surgically removed thyroid lesions from 30 pathology laboratories of university and general hospitals was made over a 3-year-period from 1986 to 1988. These tumors and tumor-like lesions of the thyroid were classified according to the WHO classification. Results of this study were compared with those of the previous in Korea and other countries. Among the 7758 collected cases from 7449 patients, adenomatous goiter was the most common, comprising 2681 cases (34.6%), followed by follicular adenoma, 1868 cases (24.1%) and papillary carcinoma, 1474 cases (19%). Neoplastic condition comprised 48.8% (3786 cases). Of malignant tumors, papillary carcinoma was the most frequent accounting for 79.8%. The female to male ratio was 7.5:1 with female predominance. This female predominance was noted in all but two thyroid diseases. Medullary carcinoma showed equal distribution in both sexes, and two cases of malignant lymphoma developed in males. Thyroid diseases were common at the 3rd to 6th decades with peak incidence at the 4th decade. The right lobe of the thyroid was more frequently involved than the left lobe (1.6:1). The diagnoses were made largely on the surgically excised specimen (85.3%). Multiplicity of the lesions revealed single lesion in 64%, multiple and diffuse lesion in 36% of cases investigated. Average size of the lesion was in the range of 1-5 cm in diameter (62%).

Key Words: *Thyroid, Tumors, Tumor-like lesions, Incidence, Pathologic characteristics, Korean*

INTRODUCTION

The incidence of thyroid diseases among Koreans has not been well studied. Various studies for palpable thyroid nodules or thyroid neoplasia had been independently made in various institutions (Choi et al., 1986; Hur et al., 1980; Park et al., 1982; Park et al., 1983; Suh, 1983; Woo et al., 1981; Yim et al., 1973). However, a national study covering materials from university and large-sized general hospitals throughout the country had not been performed. Moreover, most studies for thyroid diseases were largely limited to that of thyroid neoplasia or thyroid malignancy rather than pathologically verified whole thyroid lesions. This nation-wide epidemiologic study of thyroid diseases including neoplasia and tumor-like lesions collected from biopsy files in pathology laboratories of university and general hospitals was made for the first time in Korea in auspices of Korean Academy of Medical Science. This study offered the basic statistics and characteristics of histologically confirmed thyroid diseases in Korea.

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MATERIALS & METHODS

A total of 7758 cases of thyroid tumors and tumor-like lesions diagnosed at pathology laboratories of university and general hospitals throught nation during the recent period of 3 years from January 1986 to December 1988 was collected. The 7758 cases were obtained from 7449 patients with a variety of thyroid abnormalities. The institutions participated in the study were listed in table 1, which revealed numbers of cases submitted from each institution during the period. The institutions are located throughout the country and are 500 bed-size or larger general hospitals. Classification of thyroid tumors was based on the WHO classification (Hedinger and Sobin, 1974) (Table 2). Following items were requested to each institution. Inquiry included patient's name, age and sex, the date of operation, type of procedure procuring specimen, location, multiplicity and size of the lesion, and histologic diagnoses. Pathologic diagnoses were based upon histologic examination either by biopsy specimen or by excisional material. The diagnosis originally rendered in each institution participated were analyzed without further reviewing. All data obtained were analyzed using personal computer.

RESULTS

Annual Distribution (Fig. 1)

There was relatively even annual distribution of cases during the study period.

Table 1. Institutions Participated and Number of Cases Submitted (Alphabetical order)

Institution and Location (Chairman/Director)	Cases
Busan Natl Univ. Hosp., Busan (Suh, Kang Suk)	905
Catholic Med.College St. Mary's Hosp., Seoul (Kim, Sun Moo)	168
Chonnam Natl Univ. Hosp., Kwangju (Cho, Kyu Hyuk)	162
Chosun Univ. Hosp., Kwangju (Park, Kyu Ho)	66
Chunbuk Natl Univ. Hosp., Chunju (Kim, Sang Ho)	125
Chungang Univ. Hosp., Seoul (Park, Yong Wook)	75
Chungnam Natl Univ. Hosp., Taejun (Kang, Dae Yong)	323
Eulgi General Hosp., Seoul (Lee, Hea Kyung)	36
Hallym Univ. Hosp., Seoul (Suh, Yeon Lim)	58
Hanyang Univ. Hosp., Seoul (Lee, Jung Dal)	179
Inje Univ. Paik Hosp., Seoul (Ko, Il Hyang)	167
Inje Univ. Paik Hosp., Busan (Hong, Sook Hee)	134
Keimyung Univ. Dongsan Med. Center, Taeku (Chung, Jae Hong)	159
Korea Univ. Med. Center, Seoul (Paik, Seung Yong)	337
Korean Cancer Center Hosp., Seoul (Chang, Ja Joon)	529
Koryo General Hosp., Seoul (Kim, Myung Sook)	75
Kosin Med. College & Gospel Hosp., Busan (Huh, Man Ha)	94
Kyungbuk Natl Univ. Hosp., Taeku (Seo, In Soo)	642
Kyunghee Univ. Hosp., Seoul (Yang, Moon Ho)	150
Kyungsang Natl Univ. Hosp., Jinju (Park, Cheol Keun)	97
Masan Koryo General Hosp., Masan (Kim, Byung Hun)	379
National Medical Center, Seoul (Suh, Jung il)	161
Patima Hosp., Taeku (Moon, See Kwang)	54
Presbyterian Medical Center, Chunju (Chung, Dong Kyu)	417
Seoul Natl Univ. Hosp., Seoul (Kim, Yong Il)	752
Soonchunhyang Univ. Hosp., Seoul (Lee, Dong Hwa)	81
St. Benedict Hosp., Busan (Chi, Jung Hee)	46
Wonkwang Univ. Hosp., Iri (Choi, Chan)	74
Yonsei Univ. Med, Center (Choi, In Joon)	919
Youngnam Univ. Hosp., Taeku (Lee, Tae Sook)	85
Total (30 institutions)	7449

Table 2. Classification of Thyroid Tumors and Tumor-like Lesions

I. Epithelial tumors
  A. Benign
    1. Follicular adenoma
    2. Others
  B. Malignant
    1. Follicular carcinoma
    2. Papillary carcinoma
    3. Squamous cell carcinoma
    4. Undifferentiated (anaplastic) carcinoma
      a. Spindle cell type
      b. Giant cell type
      c. Small cell type
    5. Medullary carcinoma
    6. Others
II. Non-epithelial tumors
  A. Benign
  B. Malignant
    1. Fibrosarcoma
    2. Others
III. Miscellaneous Tumors
    1. Carcinosarcoma
    2. Malignant hemangioendothelioma
    3. Malignant lymphoma
    4. Teratoma
IV. Secondary tumors
V. Unclassified tumors
VI. Tumor-like lesions
    1. Adenomatous goiter
    2. Diffuse hyperplasia
    3. Chronic lymphocytic thyroiditis
    4. Hashimoto's thyroiditis
    5. Subacute thyroiditis
    6. Riedel's thyroiditis
    7. Others

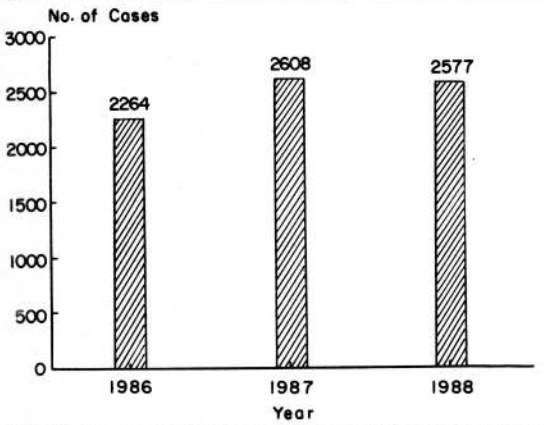

Fig. 1: Annual distribution of cases submitted for the study.

INCIDENCE (Table 3, Fig. 2)

There were 7758 cases obtained from 7449 patients. Two hundred ninetynine patients had two thyroid diseases and five had triple diagnoses. Of total thyroid diseases, adenomatous goiter was the most common, comprising 34.6% (2681 cases). Follicular adenoma and papillary carcinoma followed, each comprised 24% and 19%, respectively. Other thyroid diseases in order of frequency were diffuse hyperplasia (9.3%), Hashimoto's thyroiditis (4.2%), follicular carcinoma (3.8%), cystic disease (1.3%), chronic lymphocytic thyroiditis (1%). Among neoplastic diseases, both follicular adenoma and papillary carcinoma comprised near 90%. In remaining neoplasia, follicular carcinoma comprised 7.7%. Undifferentiated carcinoma, medullary carcinoma, squamous cell carcinoma, and others consisted of less than 1%. Comparison of neoplastic and non-neoplastic diseases with the results of previous studies in Korea is listed in Tables 4 and 5.

Neoplastic diseases

A total number of neoplasia was 3786 cases, comprising 48.8% of the total thyroid biopsies. Malignant neoplasia in the thyroid was 1859 cases, comprising 24%. It showed relatively equal distribution between benign and malignant neoplasia. Of malignant neoplasia, non-epithelial and secondary tumors were rare, comprised 0.6%. Two cases of malignant lymphoma and 6 cases of metastatic tumors were included. Papillary carcinoma was the most common malignant neoplasm, comprised 79.3%, followed by follicular carcinoma, 15.6%. Other malignant neoplasia included undifferentiated carcinoma in 1.7% (32 cases), medullary carcionoma in 1.2% (22 cases), and squamous cell carcinoma in 0.5% (10 cases). In benign neoplastic lesions, follicular adenoma comprised 97% (1868 cases). Other included Hürthle cell adenoma and adenoma not further specified.

Tumor-like lesions

A total number of 3972 cases was classified as tumor-like lesions, comprised 51.2% of total thyroid diseases, of which adenomatous goiter comprised 67.5%. It was

Table 3. Frequency of Thyroid Diseases

	No. of cases	Percent (%)
Benign	1927	24.8
Follicular adenoma	1868	24.1
Others	59	0.7
Malignant	1847	23.8
Follicular carcinoma	291	3.8
Papillary carcinoma	1474	19.0
Squamous cell carcinoma	10	0.1
Undifferentiated carcinoma	32	0.4
Medullary carcinoma	22	0.30
Others	18	0.2
Non-epithelial tumors	4	0.05
Malignant lymphoma	2	0.03
Secondary tumors	6	0.08
Tumor-like lesions	3972	51.2
Adenomatous goiter	2681	34.6
Diffuse hyperplasia	719	9.3
Chronic lymphocytic thyroiditis	81	1.0
Hashimoto's thyroiditis	323	4.2
Subacute thyroiditis	58	0.7
Riedel's thyroiditis	9	0.1
Others	102	1.3
Total	7758	100.0

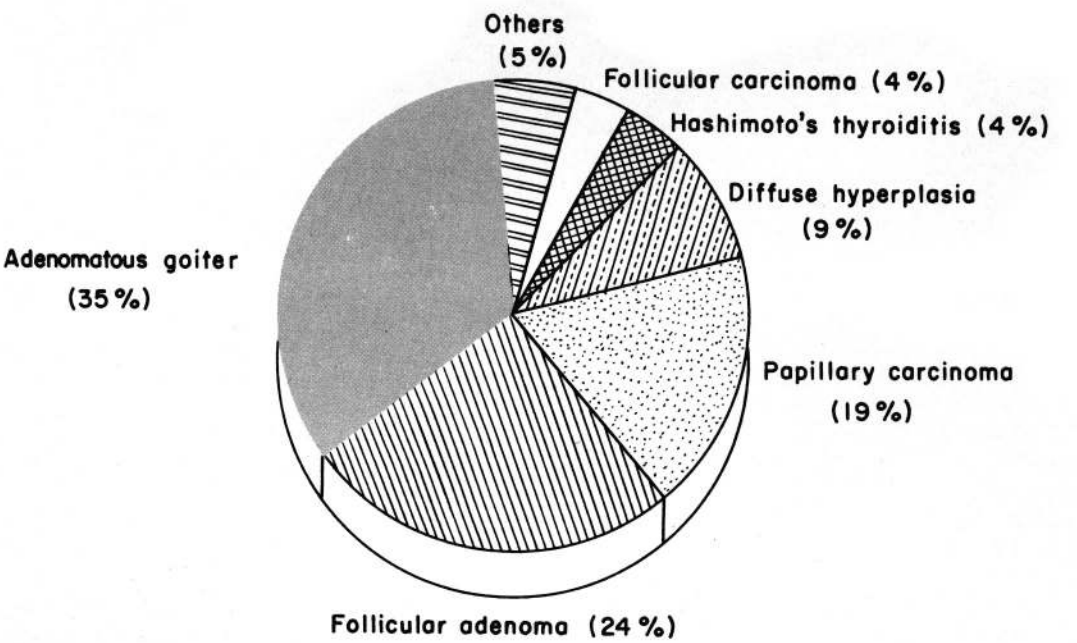

Fig. 2: Incidence of major thyroid diseases.

Table 4. Comparison of relative frequency of thyroid diseases with various studies

	Woo et al (283 cases) (1981)	Park et al (1095 cases) (1983)	Kim et al (140 cases) (1985)	Present series (7758 cases) (1989)
Follicular adenoma	49.1	19.3	55.0	24.1
Other adenoma	2.5	0.6	—	0.7
Follicular carcinoma	5.7	4.8	5.7	3.8
Papillary carcinoma	13.4	23.7	16.4	19.0
Squamous cell carcinoma	—	—	—	0.1
Undifferentiated carcinoma	0.4	1.2	—	0.4
Medullary carcinoma	—	0.6	—	0.3
Other carcinoma	—	0.4	—	0.2
Non-epithelial tumor	—	—	—	0.05
Malignant lymphoma	—	0.1	—	0.03
Secondary tumor	—	0.2	—	0.08
Adenomatous goiter	7.4	42.7	15.7	34.6
Diffuse hyperplasia	17.3	4.8	—	9.3
Chronic lymphocytic thyroiditis	—	1.5	6.4	1.0
Hashimoto's thyroiditis	4.2	0.2	—	4.2
Subacute thyroiditis	—	—	—	0.7
Riedel's thyroiditis	—	—	—	0.1
Others	—	—	—	1.3
Total	100(%)	100(%)	100(%)	100(%)

Table 5. Comparison of relative frequency of malignant thyroid neoplasia with various studies

	Park et al (337 cases) (1983)	Choi et al (406 cases) (1986)	Woolner et al (885 cases) (1961)	Present series (1853 cases) (1989)
Follicular carcinoma	15.7	14.5	17.7	15.7
Papillary carcinoma	76.9	79.8	61.1	79.5
Squamous cell carcinoma	—	0.5	—	0.5
Undifferentiated carcinoma	3.9	3.0	14.7	1.7
Medullary carcinoma	2.0	1.5	6.5	1.2
Other carcinoma	1.2	—	—	1.0
Non-epithelial tumor	—	—	—	0.2
Malignant lymphoma	0.3	0.7	—	0.1
Total	100(%)	100(%)	100(%)	100(%)

followed by diffuse hyperplasia (18%), Hashimoto's thyroiditis (8.1%), chronic lymphocytic thyroiditis (2%), and subacute thyroiditis (1.5%). Cystic lesions without viable tissue or mural nodule were encountered in 102 cases, comprising 2.6%. Eight cases of Riedel's thyroiditis (0.2%) were included.

Age and sex distribution (Table 7, Fig. 3)

Among total 7449 patients, age and sex were identified in 7136 cases, consisted of 844 males and 6292 females. The male to female ratio was 1:7.5. The patients ranged in age from 3 to 86 years. Age distritutions were similar in both sex groups. The diseases commonly occurred in patients between the age of 20 and 59 years (87%) and the peak incidence was noted in 4th decade. The mean age of the patients was 39 years. Patients below the age of 20 years comprised 6%, and those above 60 years comprised 6.8% (Fig. 3). The age distribution of patients with follicular adenoma was similar to that of thyroid diseases in

Table 6. Distribution of Thyroid Diseases by Age Groups

	Childhood (0-15)	Young adult (16-29)	Middle age (30-49)	Old age (50-)
Follicular adenoma	35	524	914	355
Other adenomas	1	5	36	17
Follicular carcinoma	1	75	140	66
Papillary carcinoma	19	291	638	472
Squamous cell carcinoma	—	—	3	7
Undifferentiated carcinoma	—	1	4	26
Medullary carcinoma	—	2	12	8
Other carcinomas	—	4	13	5
Non-epithelial tumor	—	2	1	1
Malignant lymphoma	—	1	1	—
Secondary tumor	—	—	—	6
Adenomatous goiter	46	544	1273	647
Diffuse hyperplasia	26	382	258	48
Chronic lymphocytic thyroiditis	3	22	30	16
Hashimoto's thyroiditis	2	90	136	90
Subacute thyroiditis	2	9	35	12
Riedel's thyroiditis	—	—	—	7
Others	7	32	41	20
Total	142	1984	3535	1803

Table 7. Sex ratio and Mean Age of Patients with Thyroid Diseases

	Male to Female ratio	Mean age
Follicular adenoma	1:9.2	37.1
Other adenoma	1:8.7	40.1
Follicular carcinoma	1:5.5	39.0
Papillary carcinoma	1:6.4	41.8
Squamous cell carcinoma	1:1.25	51.1
Undifferentiated carcinoma	1:4.3	58.0
Medullary carcinoma	1:1	43.3
Other carcinoma	1:3.5	50.8
Non-epithelial tumor	1:0.3	27.0
Malignant lymphoma	1:0	45.5
Secondary tumor	1:2	58.8
Adenomatous goiter	1:8.7	39.8
Diffuse hyperplasia	1:5.2	30.1
Chronic lymphocytic thyroiditis	1:25.6	36.2
Hashimoto's thyroiditis	1:31.2	39.6
Subacute thyroiditis	1:13.5	39.0
Riedel's thyroiditis	1:1.7	59.3
Others	1:4.7	36.9

general. The peak incidence was in 4th decade with the mean age of 37 years (27.8%). The age between 20 and 59 years comprised 87%. The male to female ratio was 1:9.2 (Fig. 4). The age distribution of patientis with follicular carcinoma was also similar to that of other diseases. The peak incidence was noted in 4th decade (25.4%). There was relatively equal distribution between 3rd to 6th decades in male. The mean age was 39 years. The age between 20 and 59 years comprised 88%. The male to female ratio was 1:5.5

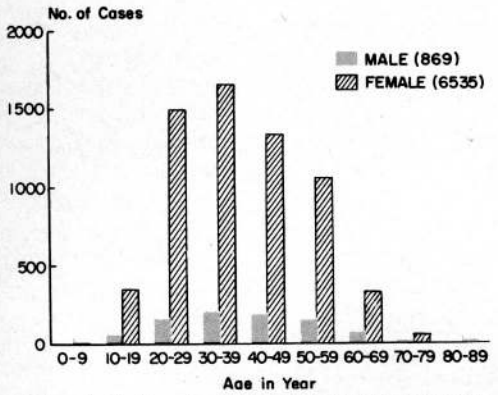

Fig. 3: Age distribution of patients with total thyroid diseases by sex.

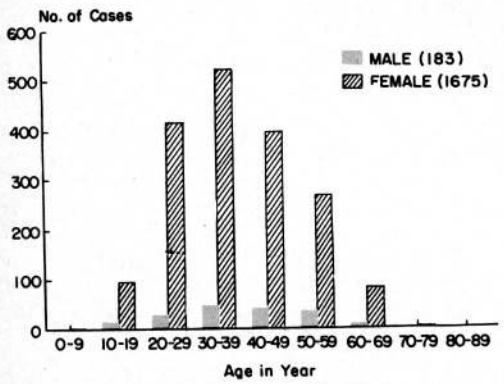

Fig. 4: Age distribution of patients with follicular adenoma by sex.

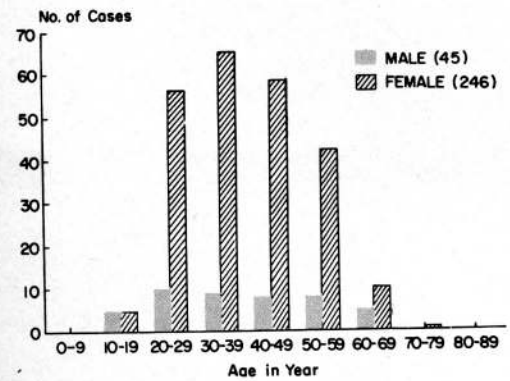

Fig. 5: Age distribution of patients with follicular carcinoma by sex.

(Fig. 5). The age distribution of patients with papillary carcinoma was slightly shift to the right than that of other thyroid diseases. The peak incidence was in 6th

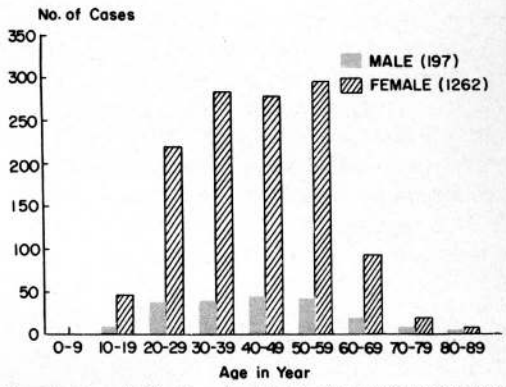

Fig. 6: Age distribution of patients with papillary carcinoma by sex.

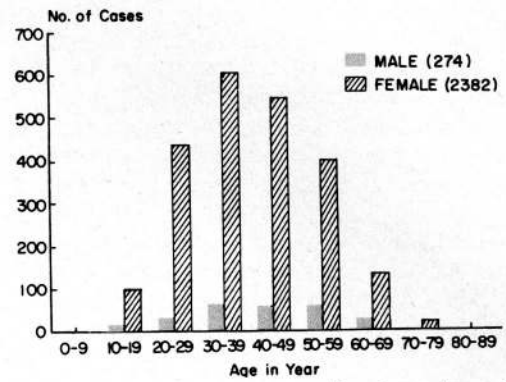

Fig. 7: Age distribution of patients with adenomatous goiter by sex.

decade, comprised 22.7%. There was relatively equal distribution between 3rd to 6th decades in both sexes. The mean age was 42 years. The ages between 20 and 59 years comprised 83.2%. The male to female ratio was 1:6.4 (Fig. 6). In adenomatous goiter, age distribution was similar to that in others with peak incidence at 4th decade. It comprised 25%. In male, relatively equal distribution was noted between 4th to 6th decades. The mean age was 39.8 years. The ages between 20 and 59 years comprised 82%. The male to femal ratio was 1:8.7 (Fig. 7). In other diseases, female predominance was always present, except in squamous cell carcinoma and malignant lymphoma. Among rare malignant neoplasia, the male to female ratio of undifferentiated carcinoma and medullary carcinoma were 1:4.3 and 1:3.5, respectively. Squamous cell carcinoma was equal in sex distribution and two cases of malignant lymphoma developed in male. The highest incidence with female predominance was noted in Hashimoto's thyroiditis and chronic lymphocytic

thyroiditis. In former, incidence in female was 31 times more prevalent than that in male. A few cases of Riedel's thyroiditis also revealed higher female occurrence. In summary, most thyroid diseases, either neoplasia or tumor-like lesions, showed similar age distribution and female predominance. The diseases developed most commonly between 3rd and 6th decades with peak incidence at 4th decade. In malignant neoplasia, the age of patients was slightly older than that of patients with benign neoplasia and tumor-like diseases.

Thyroid Diseases in Childhood (Table 6)

The age below 16 years belonged to the group of childhood. There were 142 cases (1.8%) of total thyroid diseases. The pattern of thyroid diseases in the childhood was all the same as that in general. Neoplasia comprised 56 cases (37.4%) and tumor-like lesions were 86 cases (60.6%). Adenomatous goiter was the most frequent lesion, comprising 32.4 %. The second common lesion was follicular adenome, comprising 24.6 %. The papillary carcinoma was the most frequent malignant neoplasia, comprising 13.4% (19 cases). A single case of follicular carcinoma was present. No other malignant neoplasia were noted. Non-epithelial tumors or secondary tumors were absent. Diffuse hyperplasia comprised 18.3%, which was a relatively high proportion compared to that in general.

Thyroid diseases in adolescence and young adult (Table 6)

The age between 15 and 29 years belonged to this group. There were 1984 cases (25.6%) of total thyroid diseases. The pattern of thyroid diseases was relatively similar to that in general except high proportion of diffuse hyperplasia (382 cases, 19%). In this age group, diffuse hyperplasia was at its peak (53.1% of total 719 cases). Most common diseases were adenomatous goiter and follicular adenoma, 544 cases (27.4%) and 524 cases (26.4%), respectively, Papillary carcinoma, most common malignancy also in this age group, comprised 291 cases (14.7%). A total of 75 cases of follicular carcinoma was noted, comprising 3.8%.

Thyroid diseases in old age group (Table 6)

The age between 30 and 49 years belonged to this group. Thyroid diseases most commonly developed in this age group, comprising 45.6% (3535 cases). The distribution of diseases also reflected overall trends of thyroid diseases in general. Most common disease was adenomatous goiter, comprising 1273 cases (36%). Follicular adenoma and papillary carcinoma followed, comprising 914 cases (25.8%) and 638 cases (18%), respectively.

Thyroid diseases in middle age group (Table 6)

The ages of 50 years and older belonged to this group. A total of 1803 cases (23.2%) comprised this group. All malignant neoplasia except follicular carcinoma showed relatively high frequency in this age group. Twenty-six cases of undifferentiated carcinoma (86.7% of total) and seven cases of squamous cell carcinoma (70% of total) occurred in this group. Papillary carcinoma comprised 32 % of total cases. All metastatic tumors and Riedel's thyroiditis were exclusively occurred in this age group.

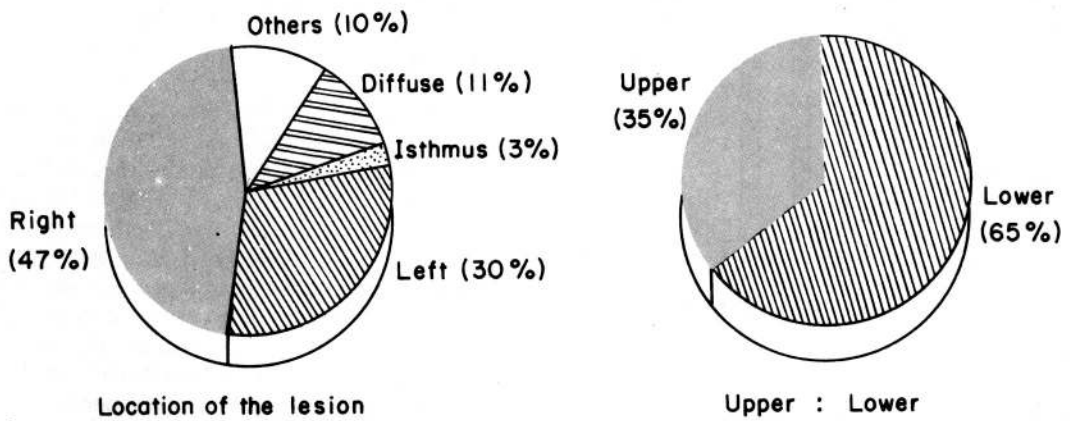

Fig. 8: Topographic distribution of thyroid nodules. The left one represents the site within the thyroid and the right one shows proportion of lesions in upper and lower pole within a lobe.

Table 8. Topographic Distribution of Thyroid Lesions

	No. of cases	Percent (%)
Right, NOS	3390	41.2
Right upper	164	2.0
Right lower	291	3.5
Left, NOS	2058	25.0
Left upper	130	1.6
Left lower	248	3.0
Isthmus	225	2.7
Pyramidal	1	0.01
Diffuse	886	10.8
Others	826	10.0
Total	8219	100

Topographic distribution (Table 8, Fig. 8)

Although the specified side and location of lesions within the thyroid being requested, many cases revealed incomplete documentation of this item. The description of either the right or the left side would be suffice in this study. The location was identified in 8219 cases, adding 826 not specifed cases. Of which, 3845 cases were developed in the right side, comprising 46.7%, and 2436 cases were in the left, comprising 29.6%. The ratio between the right and the left was 1.57:1. A total of 455 cases were specified either as the right upper or as the right lower, and the ratio of upper to lower was 1:1.77. A total of 378 cases was specified either as the left upper or as the left lower, and the rato was 1:1.9. Diffuse process involving both lobes of the thyroid were present in 886 cases (10.8%). The lesions developing in isthmus were 225 cases (2.7%). A single lesion occurred in the pyramidal lobe. This trends were maintained in all thyroid disease groups except in adenomatous goiter. In adenomatous goiter, the right lobe and the lower portion of the gland were more preferred sites (R:L=3.5:1, Upper:Lower= 1:4.8).

Diagnositic procedure (Fig. 9)

Types of procedure for diagnosis were stated in 7424 cases. A total of 904 cases were obtained either by needle biopsy or by wedge excision. Needle biopsy was performed in 720 patients (9.7%), and wedge excision was done in 184 cases (2.5%). The most common procedure was lobectomy, comprising 4042 cases (54.4%). The second common procedure was subtotal thyroidectomy, comprising 1078 cases (14.5%). There was 642 cases of total thyroidectomy (8.7%), 249 cases of isthmectomy (3.4%), and 137 cases of radical neck dissection (1.9%). About 10% (372 cases) were diagnosed by other procedures.

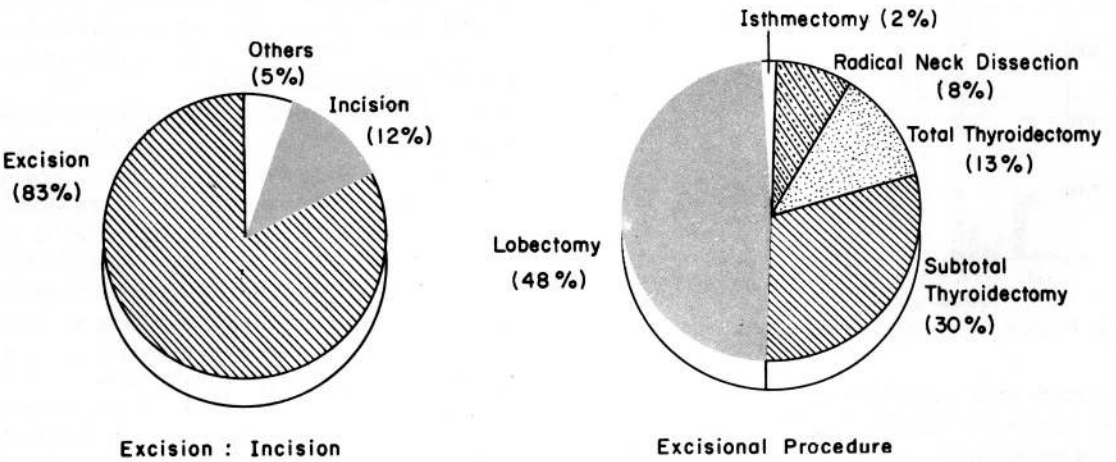

Fig. 9: Procedures to obtain histologic diagnoses. The right one represents proportions of detailed surgical procedures.

Multiplicity (Fig. 10)

Multiplicity of lesions was stated in 7047 cases. Single lesions was noted in 4503 cases (63.9%), double lesions in 694 cases (9.8%),multiple lesions in 736 cases (10.4%), and diffuse lesions in 1114 cases (15.8%). Diffuse lesions consisted mainly of diffuse hyperplasia and a variety of thyroiditis. Follicular adenomas showed the largest proportion of single lesion.

Size of the lesion (Fig. 11)

The measurable size of the lesion was stated in 5947 cases. The nodules were most common in the size of 1-3 cm in diameter, comprising 2701 cases (45.4%). The second most common size was 3-5 cm in diameter (1830 cases, 30.8%). The nodules over 5 cm

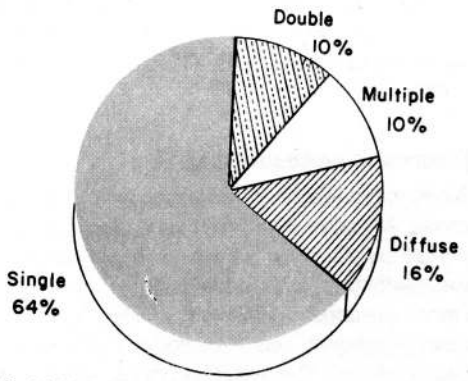

Fig. 10: Multiplicity of the lesions.

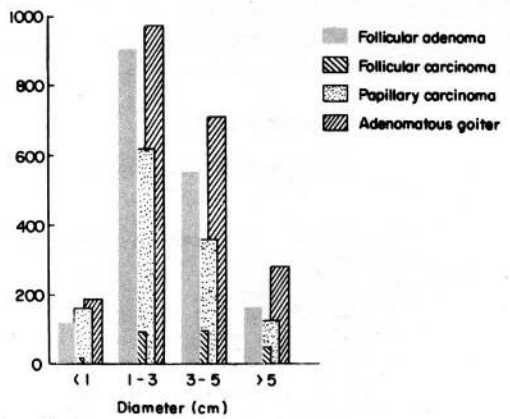

Fig. 11: Size of the major thyroid diseases.

in diameter were noted in 806 cases (13.6%) and less than 1 cm in 610 cases (10.3%). The follicular carcinoma tended to be larger than other lesions. About 20% of follicular carcinoma had nodules over 5 cm in diameter.

DISCUSSION

Palpable nodules in the thyroid are not uncommon and the incidence varies from 2% to 7% of population (Compagno, 1986). The incidence of thyroid cancer also varies considerably throughout the world (Compagno, 1986; Franssila et al., 1981; Lee et al., 1988). In American study, thyroid cancer occupied about 1% of all malignancies or 2-3 per 100,000 persons (Meissner et al., 1969), or 1.79% in autopsy series (Silverberg, 1966). The incidence of thyroid cancer was about 1.2 per 100,000 persons in northern Europe (Franssila, 1971). In Korea, the incidence of thyroid cancer was reported to be 4.43% of all malignancies (Lee et al., 1988).

The relative incidence also tends to be increasing, especially in cases of female (Lee, et al., 1988; Heitz et al., 1976). There is, however, no significant change in incidence in this study during this 3-year period.

The thyroid diseases, both neoplasia and tumor-like lesions, were disease of women. The diseases occurred 7.5 times more common in females than in males in this country. This female predominance was consistently present in nearly all thyroid diseases, and was marked in benign tumor and tumor-like lesions. This tendency was also noted in the previous studies performed in this country, showing 8.1 times (Yim et al., 1973; Park et al., 1982), 8.5 times (Suh, 1983), 7.3 times (Woo et al., 1981), 7.1 times (Hur et al., 1980), and 6.1 times higher (Choi et al., 1986). However, the figures far exceeded than that of northern European and other western countries, showing 2.4 times (Franssila, 1971), 2.5 times (Heitz et al., 1976), and 2.6 times higher (Franssila et al., 1981). In America, it showed 2.1 times higher in cases of malignancy (Woolner et al., 1961) and about 5 times higher in cases of follicular adenoma(Franssila, 1985).

Thyroid diseases frequently developed in middle age group with peak incidence in 4th decade and the mean age of 39 years. Most thyroid diseases showed similar trends with a few exceptions. Other studies also showed same results (Yim et al., 1973; Park et al., 1982; Suh, 1983; Choi et al., 1986). In western countries, the study of thyroid cancer revealed increased incidence in older age group (Woolner et al., 1961; Franssila 1971). The mean age tended to be older in thyroid malignancy than in benign tumor or tumor-like lesions except in case of follicular carcinoma in this study. Patients with follicular carcinoma were slightly younger than those with other malignancies. Among malignant tumors, undifferentiated carcinoma and

metastatic tumors were presented with the highest mean age(58 years), and remaining malignancies showed mean ages at their forties or fifties. Eight cases of Riedel's thyroiditis were studied, which showed oldest mean age in all thyroid lesions, corresponding to results studied in the United States (DeLellis, 1989; Woolner et al., 1961). Thyroid diseases are, hence, diseases of middle age group both in males and in females.

Adenomatous goiter was the most common disease followed by follicular adenoma and papillary carcinoma. The results were highly concordant with one of other studies (Park et al., 1983) (Table 4). However, the incidence of follicular adenoma was more than two times higher than that of adenomatous goiter in other studies (Kim et al., 1985; Woo et al., 1981; Yim et al., 1973). This discrepancy might attribute to the diagnostic criteria distingushing these two entities. Except a few cases, most common benign neoplasia of the thyroid was classified as follicular adenoma. Among other adenomas, Hürthle cell adenoma was the second major entity studied.

Most of studies performed in this country and abroad dealt with epidemiology of malignant thyroid neoplasia. The studies in this country showed results very similar to the present (Park et al., 1983; Choi et al., 1986; Yim et al., 1973). Minor difference was noted in the studies performed in the United States (Woolner et al., 1961; DeLellis, 1989). In contrast, the studies from abroad including Scandinavia showed quite different results in areas. The incidence of follicular carcinoma was equal to or higher than that of papillary carcinoma in one study, although the latter tended to be increasing (Heitz et al., 1976). Anaplasic or undifferentiated carcinoma also occupied higher proportion (15-25%), nearly equa lincidence to that of follicular carcinoma in foreign studies(Franssila,1971; Selzer et al., 1977; Woolner et al., 1961).

The discrepancies might attribute to the racial difference in some aspects and to numbers of autopsy not included in the studies in Korea in other aspects (Franssila et al., 1981; Meissner, 1969). In northern Europe, especially in Iceland and in Norway, the distribution of malignant neoplasia was somewhat similar to those in Korea (Williams et al., 1977; Franssila et al., 1981). The frequency close to that of this study was noted in the study performed in Iceland. She was represented as an area of high iodide intake and as an area of high incidence of papillary carcinoma and low incidence of follicular carcinoma (Williams et al., 1977). The high incidence of thyroid diseases in Korea was rather correlated to that in Iceland.

The right lobe was preferred site developing thyroid diseases, either neoplasia or tumor-like lesions. The nodular thyroid lesions more commonly developed in the lower portion than in the upper. There was no significant difference in sidedness in other studies(Suh, 1983; Woo et al., 1981), and mild right side predominance was noted in one study (Woolner et al., 1961). The development in the lower pole was more prevalent than in the upper in one study (Wanebo et al., 1981).

Surgical excision was frequent method for diagnosis (90.3%). Among these procedures, lobectomy was the most common way to obtain lesions (54.5%). It partly represented difficulty to arrive correct diagnosis before surgery. This also resulted in somewhat biased or limited statistical study of this report due to exclusion of aspiration procedure, which has been most popular mode of diagnosis nowadays.

Multiple thyroid nodules were not uncommon. Over 30% of lesions had two nodules or more. Of these, discrete nodules were noted in 20%, whereas diffuse involvement without nodularity comprised 15%. Follicular adenoma was most frequently presented as a single nodule, and the adenomatous goiter was the least. Conversely in neoplasia, nodules tended to be multiple when malignant (Kim et al., 1985).

The size of thyroid nodules were investigated in various studies. Average size of the tumor was about 1.5 cm to 5 cm in most studies (Suh, 1983; Yim et al., 1973; Park et al., 1982; Choi et al., 1986; Woolner et al.,1961). This corresponded to that in this study, although the size was somewhat smaller than that of other studies. Malignant tumor tended to be larger in this and other studies, especially in case of follicular carcinoma (Woolner et al., 1961). Over ten percent of papillary carcinoma were smaller than 1 cm in diameter, which represented the presence of occult sclerosing tumor detected only by histologic examination.

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