

GROSS ANATOMICAL STUDY ON ANOMALIES OF THE THYROID GLAND

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SUMMARY

Purpose : This study investigates gross anatomical features of the thyroid glands of 25 (12 males, 13 females) psychiatric patient cadavers from Elazığ, which is an endemic goitre region. **Methods :** Twenty-five psychiatric patient cadavers were supplied by Mental Hospital of Elazığ - Turkey. The ages of cadavers varied between 11 and 60. The cadavers were fixed in 60 % ethanol containing 10 % formalin, and their thyroid glands were carefully dissected in situ under stereomicroscope. **Results :** In 7 (2 males, 5 females) of the cadavers, developmental thyroid abnormalities such as; absent isthmus, isthmus lobules with extraordinary appearances, ectopic (or accessory) thyroids placed at the base of the isthmus or gland, fibrous levator of the thyroid gland and/or variously arranged pyramidal lobes were noted. **Conclusion :** It is concluded that in the presence of thyroid dysmorphogenetic and anatomic defects, the medicine given to psychiatric patients probably causes the changes in the gross anatomical features of the thyroid glands.

Key Words : Thyroid Gland, Pyramidal Lobe, Ectopic Thyroid Tissue.

INTRODUCTION

During the early stages of embryonic development of mammals, the thyroid gland is connected with endodermal depression of the tongue via thyroglossal duct. At the 7th week of gestation, the connection disappears and the thyroid gland takes its final position in the neighbourhood of larynx and trachea (1-11). The morphology of the gland and its arteries show variations from fetal to adult type (6, 7, 12-17).

In some cases, the distal end of the thyroglossal duct continues to develop. As a consequence, pyramidal lobe or a fibrous (or fibromuscular) band occurs in adults (4, 5, 8, 11, 18, 19). The congenital anomalies of the thyroid gland can be summarized

as follows: partial and total agenesis of the gland, various ectopic thyroid tissues or accessory thyroids (2, 3, 8, 9, 11, 19, 20), permanent thyroglossal duct anomalies such as cyst, fistula, or sinus (1-5, 8, 9, 11, 18, 19, 21).

The anomalies of the development of the thyroid gland distort the morphology of the gland and cause clinical functional disorders and various thyroid illnesses (1-3, 11, 19, 21). Another important fact is that lithium treatment for psychiatric patients changes morphology of the thyroid gland and this in turn causes hypothyroidism (22).

This work studies thyroid gland anomalies in psychiatric patients of Elazığ, which is a characteristic region of endemic goitre. In this area,

illnesses related to the thyroid gland are more common in females than males (23, 24).

MATERIAL AND METHODS

For this work, 25 psychiatric patient cadavers (12 males, 13 females) supplied by Mental Hospital of Elazığ - Turkey, were studied. The ages of cadavers varied between 11 and 60. All the female cadavers were older than 18 years old. No records of thyroid gland illnesses were present. The cadavers were fixed in 60% ethanol containing 10% formalin, and their thyroid gland was carefully dissected in situ under stereomicroscope. Seven of the cadavers were displaying anomalies and were studied on the basis of the following criteria: 1) Whether anomaly caused by the medicine for psychiatric patients; 2) The type and relative position of the anomaly; 3) Possible relations among anomalies and anomalies-age-sex relations.

Each thyroid gland with gross anatomical variations was investigated on the basis of its individual variations. The measurements were

made by using tape measure and calliper compass. The hypothetical horizontal plane cross cutting the laryngeal prominence (LPr) was used as basis for measurements and drawings which were simplified from real photographs.

RESULTS

The gross anatomical features observed from 7 (2 males, 5 females) of the 25 cadavers, are summarized as follows;

1- Apparently middle aged (age document absent) female: A weakly developed pyramidal lobe which ascends obliquely towards the anteromedian line. The lobe is attached to the laryngeal prominence and hyoid bone by a ligamentous structure at the upper end and to the right lobe of the gland and by a fascia at the lower end (Fig. 1, Fig. 8:1, Table- 1:1).

2- 45-year-old female: The isthmus is composed of two differently appearing lobules. The right isthmus lobe is quite larger than the left

Age and gender	a	b	c	d	l ₁	l ₂	Py _a	Py _b	Isl ₁	Isl ₂	Isd	Ectopic (Accessory) thyroids
1.1 Middle aged, female	3,35	2,95	6,3	5,5	5,1	4,7	Py _{a1} =2,4	Py _{b1} =1	-	-	-	-
1.2 45 years old, female	See: Isl ₁ -Isl ₂ columns		6,7	5,5	5,1	4,8	-	-	2,7	2	2 (Isl ₁ +Isl ₂)	-
1.3 18 years old, male	4,1	-	-	d ₁ =3,4 (-)=0,4 + d ₂ =3,2 d=7	5,9	5,8	Py _{a1} =1,3 Py _{a2} =1,9	Py _{b1} =0,7 Py _{b2} =0,6	-	-	(-)=0,4	e
1.4 34 years old, female	3,7	1,5	5,2	4	4,3	4,7	-	-	-	-	-	f, g, h
1.5 16 years old, male	3,15	1,6	4,75	5,6	4	4,2	-	-	2,6	1,8	3,6 (Isl ₁ +Isl ₂)	-
1.6 50 years old, female	3,6	3,1	6,7	7,45	5,4	4,7	Py _{a2} =2,9	Py _{b2} =1,4	-	-	-	-
1.7 35 years old, female	3,1	2,5	5,6	4,3	4,1	3,2	Py _{a2} =1,9	Py _{b2} =0,5	-	-	-	-

See: The abbreviations

Table 1: Dimensional data of thyroid glands from seven cadavers with gross anatomical features (in centimeters).

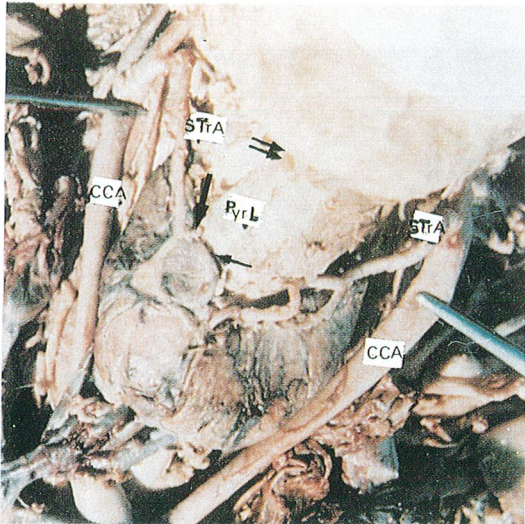


Fig. 1 : Apparently middle aged female cadaver. A weak pyramidal lobe (PyrL) on the right. Ligamentous structure connecting upper end of the pyramidal lobe to the hyoid bone (double arrow), fascia extending from lower end of the pyramidal lobe to the right lobe (single arrow), superior thyroid artery (STrA), ramus of superior thyroid artery supplying the pyramidal lobe (long arrow), common carotid artery (CCA).

one and placed more cranially (Fig. 2, Fig. 8:2, Table 1: 2).

3- 18-year-old male: The isthmus is absent. A lobulus-like accessory thyroid is extending from the right lobe towards caudomedial. In addition,

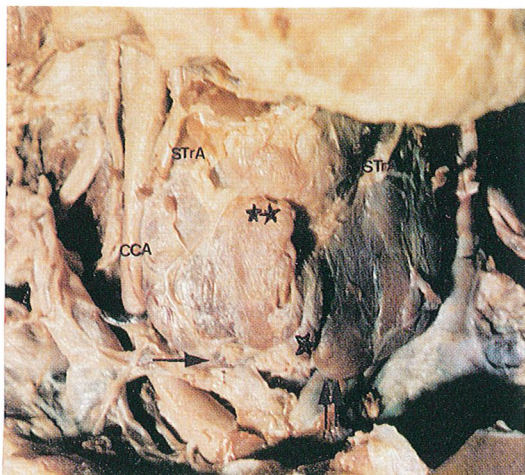


Fig. 2 : From cadaver of a 45-year-old female. The isthmus of the thyroid gland is consisting of right and left parts. Lower ends of the right lobe, isthmus and the left lobe of the thyroid gland show inclination from right to left. Cranial end of the right lobe of isthmus (double star), caudal end of the left lobe of isthmus (single star), caudal end of the right lobe of the thyroid gland (single arrow), caudal end of the left lobe of the thyroid gland (double arrow), common carotid artery (CCA), superior thyroid artery (STrA).

two pyramidal lobes, ascending from both of the lobes towards craniomedial, are present. The left pyramidal lobe is connected to the left lobe of the gland by a fibrous tissue and the upper end of it is more cranial than the right one (Fig. 3, Fig. 8:3, Table- 1:3).

4- 34-year-old female: Three ectopic thyroid tissue-like lobules are present. Their diameters are (from right to left); 0.8cm, 0.7cm and 0.75cm (Fig. 4, Fig. 8:4, Table- 1:4).

5- 16-year-old male: Thyroid gland appears four-lobed due to additional two isthmus lobes. Fibrous tissues extends upwards from cranial ends of the isthmus lobes and those originating from the right one are longer and more branched (Fig. 5, Fig. 8:5, Table- 1:5).

6- 50-year-old female: The thyroid gland is exceptionally large and has a large pyramidal lobe on the immediate left of anteromedian line. The pyramidal lobe is only 2cm far from the top end of a massive isthmus (Fig. 6, Fig. 8:6, Table- 1:6).

7- 35-year-old female: A small pyramidal lobe on the left and inclining towards median plane is present. The top end of it is wider and the lower end is attached to the gland by a fascia. Although the right lobe is larger, the gland, as a whole, is weakly developed (Fig. 7, Fig. 8:7, Table- 1:7).

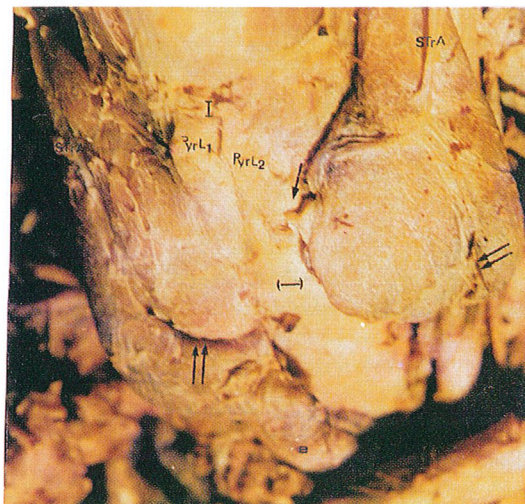


Fig. 3 : 18-year-old, male cadaver. The isthmus connecting the right and the left lobes of the thyroid gland, is absent (-). Lobulus extending from the right lobe towards caudomedial (c), right pyramidal lobe (PyrL1), left pyramidal lobe (PyrL2), the distance between cranial ends of the PyrL1 and PyrL2 (I), fibrous tissue at the lower end of PyrL2 (single arrow), the deep grooves as traces of arteries (double arrow), superior thyroid artery (STrA).

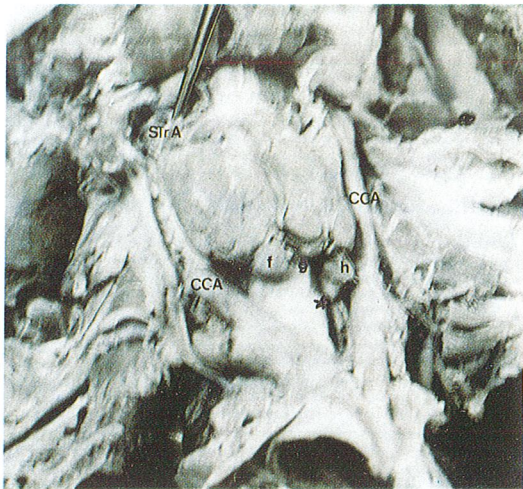


Fig. 4 : From cadaver of 34-year-old, female. Ectopic thyroid tissue- like lobules what are located on lower end of the thyroid gland. The lobulus situated at the lower end of the border between the right lobe and isthmus of the gland (f), the lobulus located in the middle of the lower ends of the left lobe and isthmus, is appended tightly to the back of the thyroid gland (g), the lobulus situated at the lower-lateral of the left lobe (h), has an extension (star) in its medial, common carotid artery (CCA), superior thyroid artery (STrA).

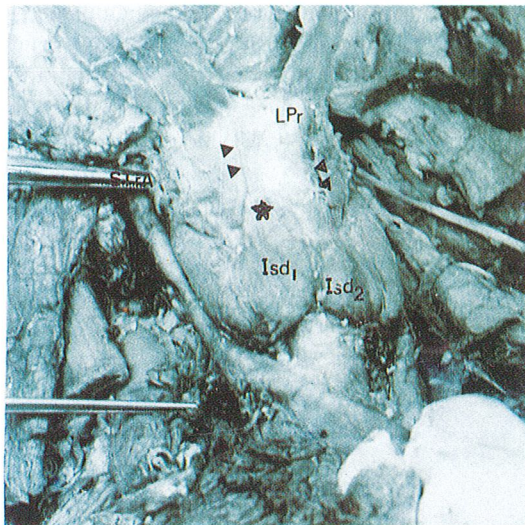


Fig 5 : 16-year-old, male cadaver. Four lobed appearance due to lobes of isthmus of the thyroid gland. Width of the right isthmus lobe (Isd1), width of the left isthmus lobe (Isd2), cranial end of the right isthmus lobe (single star), fibrous tissue extending cranially from the right, and left isthmus lobe to the laryngeal prominence.

Abbreviations: Laryngeal prominence (LPr), hyoid bone (Hyb), distance between LPr and upper edge of the isthmus (a), distance between upper and lower edges of the isthmus (b), distance between LPr and lower edge of the isthmus (c), width of the gland (including isthmus) (d) - (d1 = right, d2 = left), right lobe (RI), left lobe (LI), isthmus (Is) - (Is1 = right, Is2 = left), height of the RI (I₁), height of the LI (I₂), pyramidal lobe (PyrL) - (PyrL1 = right, PyrL2 = left), height of the PyrL (Pya) - (Pya1 =

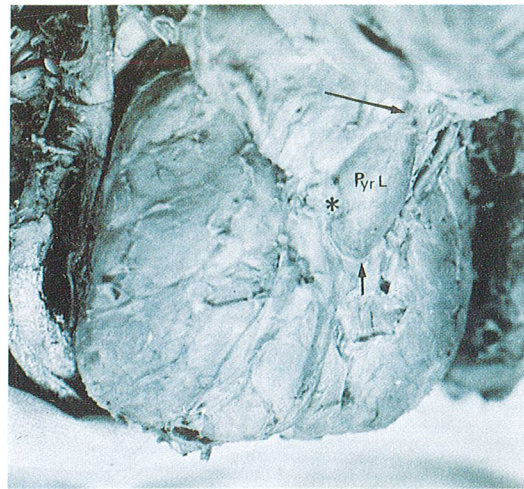


Fig 6 : 50-year-old, female cadaver. Distinct pyramidal lobe (PyrL) which is situated at the immediate left of anteromedian line and has a notch at this edge. Upper end of the pyramidal lobe (long arrow), lower end of the pyramidal lobe (short arrow) which is close to isthmus of the thyroid gland, the notch at the right edge of the pyramidal lobe (asterisk).

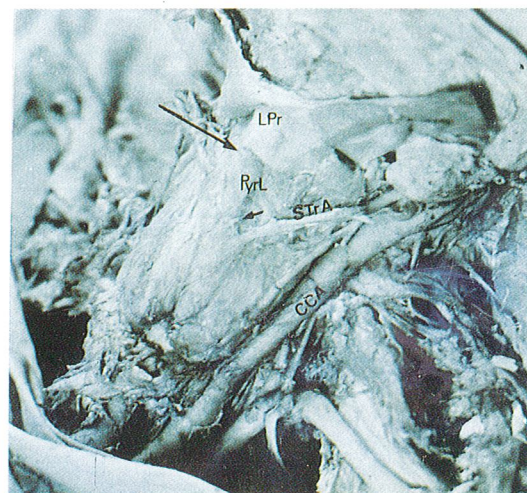


Fig 7 : 35-year-old, female cadaver. A small pyramidal lobe (PyrL) which is extending from the left lobe-isthmus of the thyroid gland border medially. Laryngeal prominence (LPr), larger upper end of the pyramidal lobe (long arrow), short fascia connecting the pyramidal lobe to the left lobe-isthmus of the thyroid gland border (short arrow), superior thyroid artery (STrA), common carotid artery (CCA).

right, Pya2 = left), width of the PyrL (Pyb) - (Pyb1 = right, Pyb2 = left), height of the right lobe of Is (Is1), height of the left lobe of Is (Is2), total width of Is (Isd) - (Isd1 = right, Isd2 = left), absent isthmus (-), distance between cranial ends of the PyrL1 and PyrL2 (I), various ectopic (or accessory) thyroids (e, f, g, h), ligamentous structure connecting the upper end of PyrL1 to Hyb (double arrows), fascia (or fibrous tissue) extending from lower end of PyrL1 (or PyrL2) to RI or Is or LI (single arrow), extension of the h (star), fibrous tissue extending from Is1 and Is2 to cranially (triangles), notch of PyrL2 (asterisk).

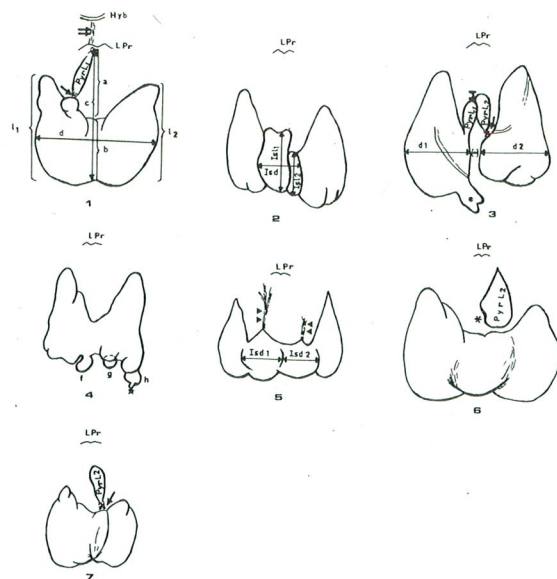


Fig 8: The semischematic drawings (1 - 7) based on photos and actual sizes of the thyroid glands showing gross anatomical anomalies. The legends a, b, c, d, I1, I2 are shown in figure 8: 1 and valid for all the figures.

DISCUSSION

The anomalies were observed more often in female psychiatric patient cadavers (5 out of 7) than in males, in this study. This contradicts the findings of Chatterjee et al. (22) who found that lithium treated male rats show distinct hypothyroidism. The remaining 18 psychiatric patient cadavers did not show any anomalies related to their ages, treatments, or sexes.

In Elazığ region, goitre is common in females (23, 24). This study, as well, indicates that thyroid defects are seen more often in females. However, these defects are developmental anomalies of the thyroids. Such anomalies are given roughly in standart textbooks (4, 5, 8, 11, 18) and major anomalies are quite scarce: Williams et al. (21) found only 41 congenital defects in 29004 autopsies and only 18 of them were major. According to them, absent isthmus prevalence was 0.24/1000 (5 males, 2 females). Many workers (3, 5, 11, 18) claim that isthmus absence is quite rare in the human, and in adult animals the isthmus is either present or absent (12, 13, 17). In our study, an absent isthmus was observed in one male.

Other developmental thyroid abnormalities observed in this study and references about the abnormalities and number of cadavers with defects, are summarized below: a) Isthmus lobes with anomalous appearance (3-6, 9, 11, 18, 19) in two cadavers; b) ectopic (or accessory) thyroids (1, 3-6,

11, 18-21) in two; c) fibrous levator of the thyroid (4, 5, 8, 11, 18, 19) in four; d) detached pyramidal lobes (11) in four: in two females on the left (4, 5, 8, 11, 14, 18, 19), in one female on the right (21), in one male bilateral (5).

As it is known, the thyroid gland is generally asymmetric (3, 5, 12, 13, 16, 17), and asymmetry caused by exceptional development of the right lobe is quite rare (21), (0.34/1000) and indicates hemiagenesia (3). Asymmetries were observed often in studied samples.

Many researchers state that the size of thyroid gland varies with age, and it is larger in the young and female (2, 3, 5, 7, 11, 23). In this study, it was seen that the 35-year-old female had a larger gland and pyramidal lobe than the 50-year-old female. This might be the result of medicine.

Williams et al. (21) observed that most of the 41 congenital defects were related to neonatal period and 24 of them were in males. There was not any female under 18 years old among studied samples, and one male under 18 had such defects. This can be interpreted that the defects are more persistent in females than males.

Above mentioned defects have strong effects to human health; maldevelopment of the gland may be responsible of transient hypothyroidism at birth (21). Ectopic thyroids may cause hypothyroidism (2, 3) and chronic lithium treatment aggravates

hypothyroidism (22).

The reason for abundance of anomalies in the thyroid glands of the studied cadavers is probably the lithium treatment which may influence the gross anatomical features of thyroid in the presence of congenital thyroid malformation.

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