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Analysis of the thymus in different age groups using multidedector computed tomography

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Abstract

Objectives: The aim of this study was to assess the morphological properties of the thymus in different age groups.

Methods: 306 multidedector computed tomography (MDCT) images were retrospectively evaluated between 2014–2017 and 181 images (mean age: 51.093±18.631).

Results: The mean volume of thymus in males was significantly higher than in females ($p<0.05$). The arrowhead shape was the most frequent type (71.27%). The thymus was mostly located at the level of T4–5 vertebrate (44.20%). The thymus tend to be more inferiorly located with an increase in age, being at T6–7 vertebrate level. The thymus was most frequently located left to the midsagittal plane (74.03%). Volume of the thymus was noticed to increase with age; however, it was noted to decrease after 50–59 years of age.

Conclusion: In majority of the cases, the thymus was observed to be located left to midline the at the T4–5 vertebrate level. The volume of the thymus tend to decrease after age of 50 and tend to have a more inferior position.

Keywords: anatomy; morphology; multidetector computerized tomography; thymus

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Introduction

Thymus is a soft and spongy tissue located anteriorly at the superior and inferior mediastinum. It develops from the 3rd pharyngeal arch. It usually extends up to the fourth costal cartilage.[1,2] It plays an important role in the development of cells in the immune system.[3] Organogenesis of the thymus starts during the early stages of fetal development. It starts to develop at the 7th and 14th gestation weeks and shows lineer growth throughout the fetal development.[4] At the 9th week of pregnancy, lymphocytes and haematopotic cells are seen in the thymus. Evaluation of the thymus size has played an important role in determining immunological conditions before and after birth.[5]

The name of the thymus gland is derived from the Greek word "thumos", which means "soul", and for centuries, it was believed that the soul was localized in this part of the body. Galen was the first who noted that the thymus diminishes as the organism ages.[6] The thymus grows from birth to 2–3 years of age, then it reaches its maximum weight (30–40 gr), and then begins to shrink in the period of adolescence because of the influence of sex hormones present in the bloodstream.

The age intervals at which thymus stops development has been a debate in previous studies. It is common belief that the thymus grows until puberty after which the cortical lymphocytes and epithelial cells gradually atrophies and is replaced with adipose tissue.[7] Nutritional deficiency, infections and increase in body temperature are known to cause thymic atrophy. While Roitt[7] reported that the thymus continues to grow until puberty, Hasselbalch et al.[8] concluded that the size of the thymus continually increases at the first months and then gradually reduces after the 6th month of age. Dervişoğlu[9] suggested that

Figure 1. Determination of thymus type on axial images. *Thymus; (**a**) arrowhead type; (**b**) round type; (**c**) bilobal type.

changes in thymus size according to age has an important impact on autopsies.

The variations regarding the size, shape and localization of the thymus has been a subject of various studies in addition to its changes with age.[10–13] The aim of this study was also to assess the morphological properties of the thymus according age of the participants in a large series by multidetector CT and contribute to literature.

Materials and Methods

In this cross-sectional large-scale study, multidetector computed tomography (MDCT) (Siemens Somatom Sensation, Erlangen, Germany) thoracic images of 306 patients were examined between 2014 and December 2017. The images were randomly selected from Division of Radiology, Selçuk University Hospital. Images of 125 cases were excluded from the study due to some technical problems or pathological conditions affecting the anterior mediastinum. Thus, 181 images (96 males and 85 females) without any known thymic malformation were included in the study. The acquired data was later on processed at a workstation in axial plane and VRT (volume rendering technique) format to acquire volumetric and subvolumetric images. These cases were grouped according to age intervals (**Table 1**). Morphological and morphometrical analyses of thymus was done on axial images. All analyses and measurements were conducted by the same person.

Table 1
Groups according to age and the number of participants.

Group	Age (years)	n
1	≤29	29
2	30–39	26
3	40–49	19
4	50–59	38
5	60–69	41
6	>70	28

The shape of the thymus were classified into 3 groups as previously described in the literature[14] according to its appearance in the axial images. Accordingly, the shape of the thymus was described as; arrowhead (**Figure 1a**), bilobal (**Figure 1b**), and round (**Figure 1c**). The localization of thymus tissue in relation to the midsagittal plane was described as midline, or predominantly right or left-sided (**Figure 2**). The widest anteroposterior (verti-

Figure 2. The localization of thymus according to its relation with midsagittal plane on axial images. *Thymus; (**a**) left to the midsagittal plane; (**b**) right to the midsagittal plane; (**c**) at the midsagittal plane.

cal) and the widest transverse diameter of thymus was measured (**Figure 3**). The thymus volume was measured by following the contour of the thymus manually on each slice on the workstation screen, with automatic workstation calculation in cm^3 (**Figure 3**). The density of the thymus was classified under 5 types according to its solid tissue component as; Type 1 (10–25%), Type 2 (25–50%), Type 3 (50–75%), Type 4 (75–100%), Type 5 (100% d).[14] (**Figure 4a–e**).The position of the thymus was determined according to the level of vertebrae on the VRT images (**Figure 5a–d**).

The data were expressed as number, percentage, mean±standard deviation (SD), maximum and minimum values. The relationship between the parameters was analyzed by independent sample t-test for to analyze whether or not there were differences in the mean vertical and transverse diameter, volume and density in respect of the gender of the participants. The relationship between grouped variables according to age was calculated with one-way Anova test. In the groups that had significant difference, post-hoc tests were used to determine the source of the difference. Variance homogeneity showed that the variance of vertical diameters and volume of the thymus was not homogeneously distributed. So that, Tamhane's T2 test was used in the post-hoc comparisons of these variables. The data obtained in the study were analyzed using SPSS (Statistical Package for Social Sciences) for Windows (Version 22, Chicago, IL, USA). For all analyses; $p<0.05$ was considered as statistically significant.

Results

The mean age of the participants in our study was 51.093±18.631 in males (range: 17–86 years) and 51.635± 18.631 in females (range: 19–86 years). The most frequent shape of the thymus was arrowhead in 129 (71.27%); and bilobal in 41 (22.65%); round in 11 (6.08%). In males; thymus was arrowhead shaped in 77 (42.54%), bilobal in 16 (8.84%), round in 3 (1.66%), whereas in females arrowhead in 52 (28.73%), bilobal in 25 (13.81%) and round in 8 (4.42%).

Thymus was located at the middle of the midsagittal plane in 35 cases (19.34%); left to the midsagittal plane in 134 cases (74.03%) and right to the midsagittal plane in 12 cases (6.62%).

When the location of thymus evaluated according to the gender, it was seen that thymus was located at the middle of the midsagittal plane in 20 females (11.05%), on the right in 5 females (2.76%) on the left in 60 females (33.15%). Whereas in 15 males (8.29%) it was located at the middle of the midsagittal plane, in 7 males (3.87%) on the right and in 74 males (40.88%) on the left of the midsagittal plane. Overall, thymus was dominantly located left to the midsaggital plane in majority of the cases (**Table 2**).

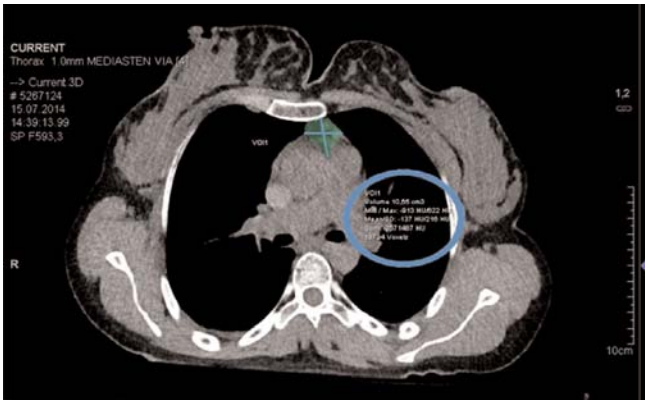

Figure 3. Measurements of volume (**blue circle**); transverse and vertical diameters (**horizontal and vertical lines**) on axial images.

The mean vertical diameter of the thymus was 2.509±0.865 cm in males and 2.326±0.846 cm in females. The vertical diameters showed no statistically significant difference among genders ($p>0.05$) (**Table 3**).

The widest transverse diameter of the thymus was 2.329±0.840 cm in males and 2.190±0.636 cm in females.

Table 2
Localization of thymus according to its relation with midsagittal plane.

	Midsagittal	Right	Left
Female	20 (11.05%)	5 (2.76%)	60 (33.15%)
Male	15 (8.29%)	7 (3.87%)	74 (40.88%)
Total	35 (19.34%)	12 (6.62%)	134 (74.03%)

Table 3
Distribution of the vertical diameter (cm), transverse diameter (cm) and volume (cm^3) of thymus according to gender.

Diameter		n	Mean	SD	p-value*
Vertical	Male	96	2.509	0.865	0.153
	Female	85	2.326	0.846	
Transverse	Male	96	2.329	0.840	0.217
	Female	85	2.190	0.636	
Volume	Male	96	14.921	9.920	**0.021**
	Female	85	12.003	6.386	

*$p<0.05$.

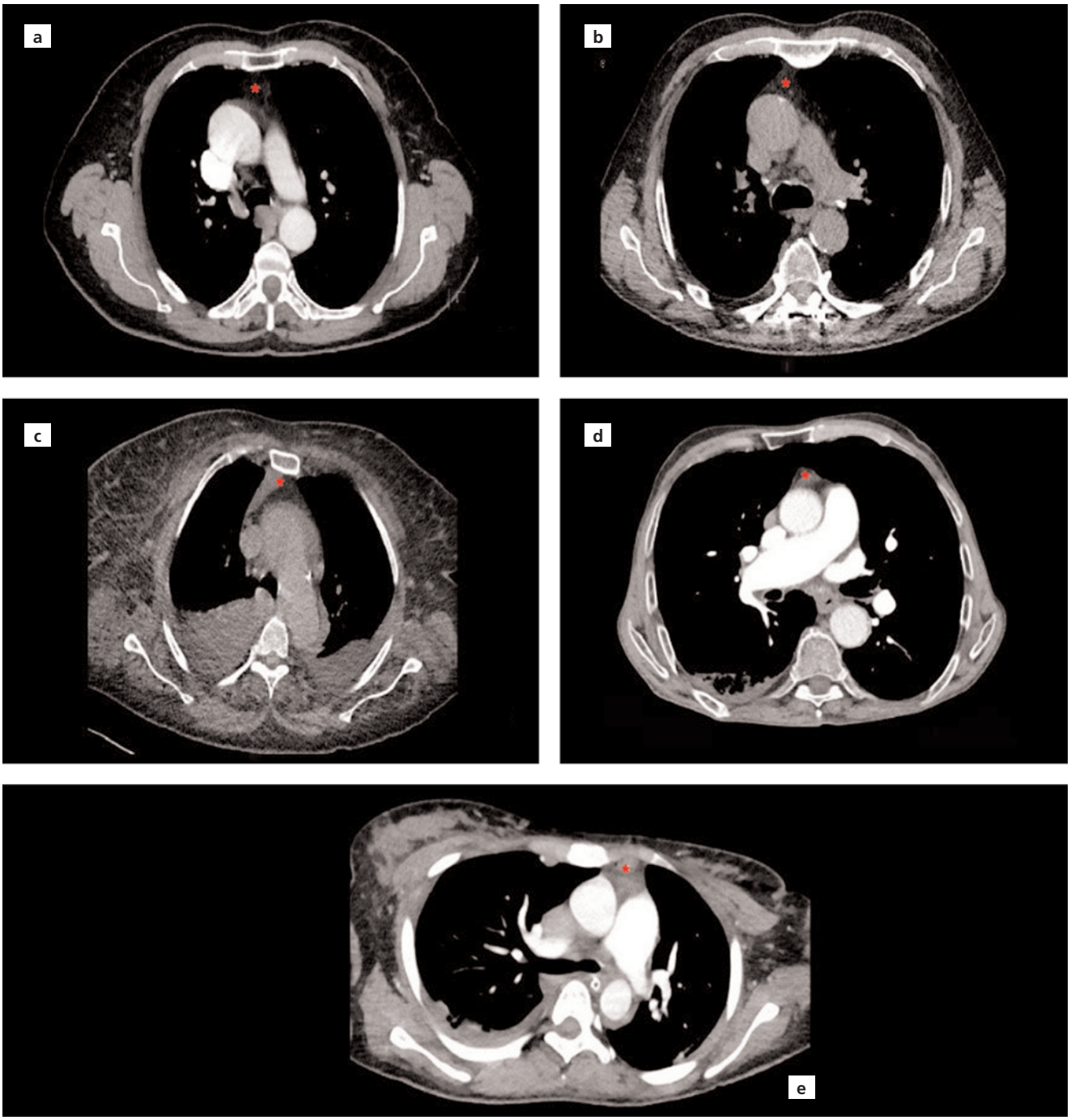

Figure 4. Classification of the density of the thymus under 5 types according to solid tissue component thymus. (**a**) Type 1 (solid tissue density: 0–25%); (**b**) Type 2 (solid tissue density: 25–50%); (**c**) Type 3 (solid tissue density: 50–75%); (**d**) Type 4 (solid tissue density: 75–100%); (**e**) Type 5 (solid tissue density: 100%).

Males had longer transverse diameters than females, however this difference was statistically significant ($p>0.05$) (**Table 3**).

The mean volume of the thymus was 14.921±9.920 cm^3 in males and 12.003±6.386 cm^3 in females. The average volume of the thymus in males was significantly higher than in females ($p<0.05$) (**Table 3**).

The vertical lengths showed no significant difference between males and females, but the difference was significant ($p<0.05$) between the age groups (**Tables 3** and **4**).

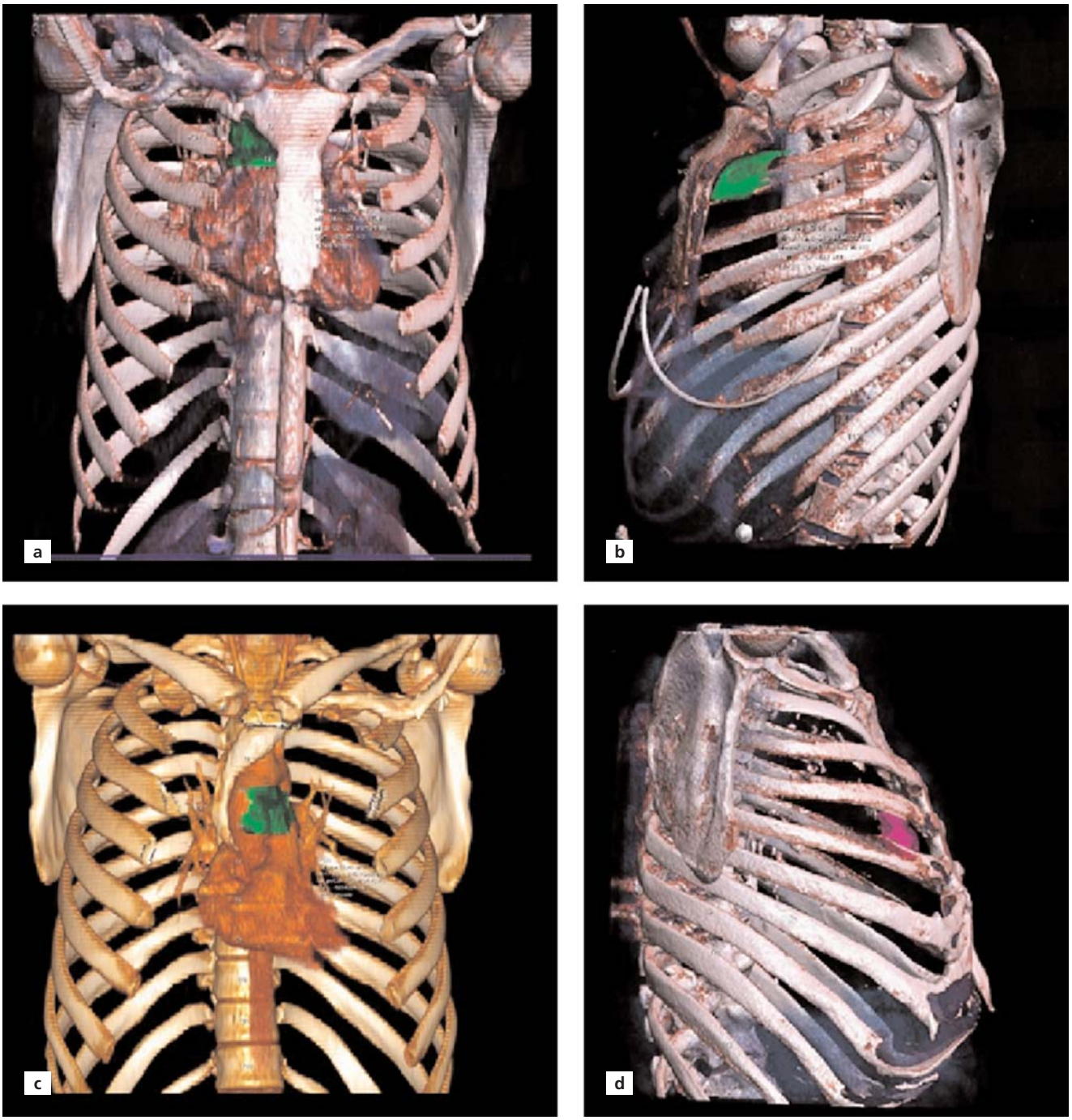

Figure 5. Determination of thymus position in relation to the vertebral level using VRT image. (**a**) T3–4 vertebral level; (**b**) T4–5 vertebral level; (**c**) T5–6 vertebral level; (**d**) T6–7 vertebral level.

The diameter and volume variables were seen to be significantly different according to age. According to the results of post-hoc comparisons there was a significant difference in the averages of vertical diameter between group 1 and groups 3, 4, 5 and 6 and between group 2 and group 4 ($p<0.05$) (**Table 4**).

As for volume, there was a significant difference ($p<0.05$) between group 4 and groups 1 and 5 (**Table 4**). In majority of the cases the density of the thymus was noted as Type 1 (40.33%) and in minority as Type 5 (4.42%) in all age groups. When the groups were evaluated separately, it was determined that in group 1; type 4

Table 4
Distribution of the vertical diameter (cm), transverse diameter (cm) and volume (cm^3) of thymus according to age groups.

	Group	Mean	SD	f	p-value*	Significant difference
Vertical diameter	1	1.875	0.589	6.019	0.000	1–3
	2	2.108	0.422			1–4
	3	2.767	0.986			1–5
	4	2.802	0.870			1–6
	5	2.411	0.970			2–4
	6	2.550	0.768			
Transverse diameter	1	2.105	0.661	2.224	0.054	
	2	2.166	0.693			
	3	2.105	0.703			
	4	2.587	0,865			
	5	2.155	0.686			
	6	2.346	0.774			
Volume	1	10.040	7.447	4.936	0.000	1–4
	2	12.480	6.675			4–5
	3	12.787	7.192			
	4	18.961	11.060			
	5	11.881	6.358			
	6	13.802	8.143			

*p<0.05.

(34.48%), in groups 2 and 3; type 2 (65.38% and 47.37%), in groups 4, 5 and 6; type 1 (52.63%, 53.66%, 67.89%) was most commonly found type (**Table 5**).

In all age groups, thymus was mostly located at T4–T5 vertebral level. When evaluating the vertebral level of thymus according to age groups, it was determined that the location of the thymus tends to be at T6–T7 vertebral level (**Table 6**).

Discussion

Computed tomography (CT) may be used for investigation of neck and mediastinal masses due to ease of acquisition and serves as an ideal tool for investigating the thymus. Contour of the orthotopic anterior mediastinal thymus on cross-sectional imaging varies with age. At its maximal volume during childhood, the thymus has a quadrilateral shape with convex borders. As it begins to involute and reduce in volume, it forms a triangular shape with convex or straight borders. By adolescence, thymus appears as a thin band of tissue anterior to mediastinal vascular structures. Similar to observations on other imaging modalities, the thymus typically moulds to the contours of the mediastinum and other surrounding structures without deforming or compressing them.[10]

A four-point classification system was suggested by different researchers depending on the ratio of fat and

Table 5
Distribution of the density type of thymus according to age groups.

Groups	Type 1	Type 2	Type 3	Type 4	Type 5	Total
1	6 (20.6%)	5 (17.24%)	6 (20.69%)	10 (34.48%)	2 (6.90%)	29 (100%)
2	0 (0.0%)	17 (65.38%)	7 (26.92%)	1 (3.85%)	1 (3.85%)	26 (100%)
3	6 (31.58%)	9 (47.37%)	3 (15.79%)	1 (5.26%)	0 (0.00%)	19 (100%)
4	20 (52.63%)	11 (28.95%)	2 (5.26%)	4 (10.53%)	1 (2.63%)	38 (100%)
5	22 (53.66%)	8 (19.51%)	3 (7.32%)	6 (14.63%)	2 (4.88%)	41 (100%)
6	19 (67.89%)	6 (21.43%)	0 (0.00%)	1 (3.57%)	2 (7.14%)	28 (100%)
Total	73 (40.33%)	56 (30.94%)	21 (11.60%)	23 (12.71%)	8 (4.42%)	181 (100%)

Table 6
The vertebral level of thymus according to age groups.

Group	T3–T	T4–T5	T5–T6	T6–T7	Total
1	6 (20.69%)	15 (51.72%)	7 (24.14%)	1 (3.45%)	29 (100%)
2	5 (19.23%)	12 (46.15%)	9 (34.62%)	0 (0.00%)	26 (100%)
3	4 (21.05%)	11 (57.89%)	4 (21.05%)	0 (0.00%)	19 (100%)
4	7 (18.42%)	17 (44.74%)	11 (28.95%)	3 (7.89%)	38 (100%)
5	6 (14.63%)	16 (39.02%)	12 (29.27%)	7 (17.07%)	41 (100%)
6	7 (25.00%)	9 (32.14%)	6 (21.43%)	6 (21.43%)	28 (100%)
Total	35 (19.34%)	80 (44.20%)	49 (27.07%)	17 (9.39%)	181 (100%)

soft tissue content of the thymus under CT guidance.[11,12] Accordingly, fatty degeneration of the thymus with age was noticed.[11,12] While, thymus dysfunction leads to serious disturbances in the body's defense mechanisms, its hyperactivity results in serious autoimmune diseases. In recent years, studies have been reported aiming to produce thymus tissue *in-vitro*, such as forming transplantable thymic organoids by biofabrication techniques.[13]

There are different views in the literature concerning the effects of thymus on fetal growth and development[15,16] and also the measurements of thymus.[17,18] Cho et al.[19] reported that the anterior-posterior diameter of thymus varied significantly according to its size and the location of the major blood vessels. They also reported that it would be difficult to determine the borders of thymus in every patient and measurements would take a long time. Özlü et al.[20] concluded that the transverse measurement of thymus was easier and more accurate when compared to the circumference of thymus. Luis et al.[21] evaluated the size of the thymus in pregnant women with prenatal ultrasonography and found out that the transverse diameter of thymus was bigger in male fetuses. Similarly Iscan et al.[22] reported that out of 65 newborns, males had a wider transverse diameter but the difference in between female and male fetuses was not statistically significant. Furthermore they also revealed that the transverse diameter and thymus index (transverse diameter × sagittal diameter) was directly proportional to the newborn's size and weight. The results of our study showed that the vertical and transverse diameters were bigger in males but the difference was not statistically significant.

Araki et al.[12] found out that apart from the transverse diameter of the thymus and the right lobe's length, there was a significant correlation between its size and age in women. The results of our study did not show any significant relationship between transverse diameter and age of the participants. The vertical lengths showed no significant difference between males and females, but the difference was significant ($p<0.05$) between the age groups (**Tables 3** and **4**). These differences were found especially between group 1 and groups 3, 4, 5 and 6 and between group 2 and group 4. These results suggest that it is important to evaluate the vertical diameter of the thymus in different age groups.

Three types of thymus have been described regarding the shape of thymus. Araki et al.[12] described arrowhead shape as the most commonly found shape as well as Yekeler et al.,[23] Tunaci[24] described mostly bilobal subtypes in late adolescence and early adulthood ages. Yekeler et al.[23] reported bilobal subtype (23.2%) as the least common type in their study. The results of our study suggests that the most common type is arrowhead (71.27 %) as reported by Araki et al.[12] and Yekeler et al.[23]

The location of thymus in fetuses and newborns was mostly reported as being in the middle by Hasini et al.[2] and Yekeler et al.,[23] Garly et al.[25] also revaled the location of the thymus in fetuses and suggested that the size of the thymus was related to mortalities after birth. All our participants were adults and the thymus was noted to be left to the midsagittal plane (74.03%) in most of our cases.

The size and weight of thymus has been shown to vary according to age. Roitt[7] reported that thymus continues to grow up to puberty whereas Hasselbalch et at.[8] reported that the size of thymus increases during the first month and then decreases after the 6th month. The results of our study showed that the volume of thymus is significantly bigger in males than in females ($p<0.05$). Significant differences between volume and age has been seen ($p<0.05$). This difference has been noted between group 4 and groups 1 and 5 (**Table 4**). According to these results we suggest that volume increases up to the ages 50–59 and then decreases after the age of 60.

The density of thymus was studied by different researchers.[22–26] These studies revealed that the quantity of solid tissue generally decreases with age. In our study, we used the classification system of Simanovsky et al.[14] Similar to what was revealed by Simanovsky et al.,[14] we found out that the quantity of solid tissue decreases with age and solid tissue density fits to Type 1 (10–25%) especially when age advances (>50 years).

There are very few reports on the level of thymus in the literature. In a study done on fetuses, the upper pole of thymus was shown to be at the level of the cervical vertebrae and the lower pole of thymus to reach the thoracoabdominal diaphragm.[2] The results of our study showed that the upper border of the thymus reaches to T3–T4 vertebrae and the lower border descends till the T6–T7 vertebrae. Thymus was most frequently located to be at T4–T5 vertebral level. Our results showed that the level of thymus does not show a major change according to different age groups but as age advances thymus tissue is frequently seen at level T6–T7.

Conclusion

MDCT images clearly defines the appearance of thymus and therefore it is important for surgeons and radiologists in terms of differentiating normal and variant structures and analysis of changes in thymus according to age.

Conflict of Interest

No conflict of interest was declared by the authors.

Author Contributions

The authors equally contributed to concept, design, data processing, literature reviewing, data analysis and interpretation, and writing manuscript.

Ethics Approval

The study was approved by Selçuk University Clinical Research Ethics Committee (Ethics No: 2015131). The study was also carried out in accordance with the Helsinki Declaration of Principles.

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References

1. Sone S, Higashihara T, Morimoto S, Yokota K, Ikezoe J, Masaoka A, Monden Y, Kagotani T. Normal anatomy of thymus and anterior mediastinum by pneumomediastinography. AJR Am J Roentgenol 1980;134:81–9.
2. Hasini HS, Velichety DS, Thyagaraju K, Jyothirmayi K, Jaipal Ch. Morphological features and morphometric parameters of human fetal tymus glands. International Journal of Anatomy and Research 2014;2:202–7.
3. Muñoz-Chápuli M, Gámez F, Bravo C, Ortiz L, Pérez R, De León-Luis JA. The thy-box for sonographic assessment of the fetal thymus: nomogram and review of the literature. J Ultrasound Med 2015;34:853–8.
4. Kuper CF, vanBilsen JV, Cnossen H, Houben G, Garthoff J, Wolterbeek A. Development of immune organs and functioning in humans and test animals: implications for immune intervention studies. Reprod Toxicol 2015;64:180–90.
5. Re C, Bertucci E, Weissmann-Brenner A, Achiron R, Mazza V, Gindes L. Fetal thymus volume estimation by virtual organ computer-aided analysis in normal pregnancies. J Ultrasound Med 2015;34:847–52.
6. Zdrojewicz Z, Pachura E, Pachura P. The thymus: a forgotten, but very important organ. Adv Clin Exp Med 2016;25:369–75.
7. Delves PJ, Martin SJ, Burton DR, Roitt IM. Roitt's essential immunology. Oxford: Blackwell Publishing; 2006. 496 p.
8. Hasselbalch H, Nielsen MB, Pedersen JF. The thymic size in children: a preliminary sonographic study. European Journal of Ultrasound 1997;6:117–9.
9. Dervişoğlu S. Timus ve aksidental atrofisi. The Turkish Journal of Pathology 1992;81:67–70.
10. Wee T, Lee AF, Nadel H, Bray H. The paediatric thymus: recognizing normal and ectopic thymic tissue. Clin Radiol 2021;76:477–87.
11. Murata O, Suzuki K, Sugiura H, Kondo Y, Takeshita M, Koga K, Takiguchi M, Kurisu R, Kassai Y, Yasuoka H, Yamaoka K, Morita R, Yoshimura A, Takeuchi T. Thymus variants on imaging in patients with rheumatoid arthritis-clinical and immunological significance. Rheumatology 2021;60:5595–600.
12. Araki T, Nishino M, Gao W, Dupuis J, Hunninghake GM, Murakami T, Washko GR, O'Connor GT, Hatabu H. Normal thymus in adults: appearance on CT and associations with age, sex, BMI and smoking. Eur Radiol 2016;26:15–24.
13. Sharma H, Moroni L. Recent advancements in regenerative approaches for thymus rejuvenation. Adv Sci (Weinh) 2021;8:2100543.
14. Simanovsky N, Hiller N, Loubashevsky N, Rozovsky K. Normal CT characteristics of the thymus in adults. Eur J Radiol 2012;81:3581–6.
15. De Muth JE. Basic statistics and pharmaceutical statistical applications. Boca Raton, FL: Chapman & Hall/CRC Press; 2014.
16. Liu D, Ellis H. The mystery of the thymus gland. Clin Anat 2016;29:679–84.
17. Zalel Y, Gamzu R, Mashiach S, Achiron R. The development of the fetal tymus: an in utero sonographic evaluation. Prenat Diagn 2002;22:114–7.
18. Felker RE, Cartier MS, Emerson DS, Brown DL. Ultrasound of the fetal thymus. J Ultrasound Med 1989;8:669–73.
19. Cho JY, Min JY, Lee Y, McCrindle HB, Hornberger LK, Yoo SJ. Diameter of the normal fetal thymus on ultrasound. Ultrasound Obstet Gynecol 2007;29:634–8.
20. Özlü T, Özyüncü Ö, Önderoğlu SL. The role of fetal thymus dimensions in the prediction of chorioamnionitis and early neonatal complications in cases with preterm labor and premature rupture of membranes. Anatolian Journal of Clinical Investigation 2013;7:18–23.

21. De Leon-Luis J, Gamez F, Pintado P, Antolin E, Perez R, Ortiz-Quintana L, Santolaya-Forgas J. Sonographic measurements of the thymus in male and female fetuses. J Ultrasound Med 2009;28:43–8.
22. Iscan A, Tarhan S, Güven H, Bilgi Y, Yüncü M. Sonographic measurement of the thymus in newborns: close association between thymus size and birth weight. Eur J Pediatr 2000;159:223–6.
23. Yekeler E, Tambag A, Tunaci A, Genchellac H, Dursun M, Gokcay G, Acunas G. Analysis of the thymus in 151 healthy infants from 0 to 2 years of age. J Ultrasound Med 2004;23:1321–6.
24. Tunacı A. Radiology of thymus. Toraks Cerrahi Bülteni 2012;1:16–20.
25. Garly LM, Trautner LS, Marx C, Danebod K, Nielsen J, Ravn H, Martins CL, Bale C, Aaby P, Lisse IM. Thymus size at 6 months of age and subsequent child mortality. J Pediatr 2008;153:683–8.
26. Shilovsky GA, Feniouk BA, Skulachev VP. Thymic involution in ontogenesis: role in aging program, Biochemistry (Mosc) 2015;80:1629–31.

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