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ABSTRACT

Thymus is bilobed primary lymphoid organ situated in superior and anterior mediastinum. The appearance of thymus varies considerably with age. It reaches maximum size at puberty and eventually undergoes “fibro fatty involution”, but it may persist actively to old age. Therefore, normal appearance and size of thymus have been elusive. Embryologically, it develops, as two separate organs from the endoderm of third pharyngeal pouches of embryo in common with inferior parathyroid glands and fuse in the midline.

The study was carried on 10 embalmed cadavers of known sex in Anatomy Department of National Medical College, Birgunj, Nepal.

We found a large bilobed thymus in about 65 year old male cadaver. This fact is clinically important to make differential diagnosis of radiological review in cases of mediastinal mass. A thorough knowledge of its anatomical and embryological features of the thymus, its normal variations, incessant in adults is necessary before doing any therapeutic, diagnostic and invasive procedures.

Keywords: Diagnostic, Fibrofatty Involution, Incessant, Invasive procedures, Lymphoid organ

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INTRODUCTION

Thymus is one of the primary lymphoid organs. It is a soft, capsulated, bilobed gland which belongs to endocrine system¹ responsible for the provision of thymus-processed lymphocytes (T lymphocytes) to the entire body, and provides a unique microenvironment in which T-cell precursors (thymocytes) undergo development, differentiation and clonal expansion. Its lobes lie close together side by side, joined in the midline by connective tissue that merges with the capsule of the organ. The greater part of the thymus lies in the superior and anterior inferior mediastinum behind the manubrium. Superiorly, it extends commonly into the neck and may reach the inferior poles of the thyroid gland or even higher. Inferiorly, the lower border of the thymus reaches the level of the fourth costal cartilages. Anterior to the gland in the neck are sternohyoid and sternothyroid muscles and fascia; in the thorax the gland is covered anteriorly by the manubrium, the internal thoracic vessels, the upper three costal cartilages and laterally by the pleura. Posteriorly, it is in contact with the vessels of the superior mediastinum, especially the left brachiocephalic vein, the thoracic trachea and the upper part of the anterior surface of the heart. The thymus is supplied mainly from branches of the internal thoracic and inferior thyroid arteries. Thymic veins drain to the left brachiocephalic, internal thoracic and inferior thyroid veins. The thymus has no afferent lymphatics. The thymus is innervated from the sympathetic chain via the cervicothoracic (stellate) ganglion or from the ansa subclavia and the vagus.²

The gland develops from the epithelial cells derived from the endoderm of the third pair of pharyngeal pouches and from mesenchyme into which epithelial tubes grow. Thymus development also depends on direct interaction of mesenchymal derivatives of the neural crest with pharyngeal epithelium. Some cells of the epithelial cords become arranged around a central point, forming small groups of cells the thymic corpuscles (Hassall corpuscles). The mesenchyme between the epithelial cords forms thin incomplete septa between the lobules. Lymphocytes soon appear and fill the interstices between the epithelial cells. The lymphocytes are derived from hematopoietic stem cells. Growth and development of the thymus are not complete at birth. It is a relatively large organ during the prenatal period and may extend through the superior thoracic aperture at the root of the neck and plays an essential role in the development of immune system. Subsequently, it descends with pericardium from the neck into the thorax.³

Ectopic thymic tissue is sometimes found. Small accessory nodules may occur in the neck. They represent portions that have become detached during their early descent.² As both lobes develop independently; each lobe has its own separate blood supply, lymphatic drainage and nerve supply.³

It weighs about 10-15 gm at birth and it progressively increases in size and weighs to about 20-30 gm till puberty. Then it undergoes fibrofatty involution.¹ By adulthood, it is often scarcely recognizable because of fat infiltrating the cortex of the gland; however, it is still functional and important for the maintenance of health. In addition to secreting thymic hormones, the adult thymus primes thymocytes (T-cell precursors) before releasing them to the periphery.³

Acute shrinkage of thymus also occurs in conditions such as stress, infection, pregnancy, malnutrition, surgery, chemotherapy and malignancy.⁴

Thymic dysfunction leads to diseases such as myasthenia gravis, tumors, growth disorders, rheumatic disease etc.⁵

CASE REPORT

During routine dissection of thorax in National Medical College, Birgunj, Nepal, a bilobed incessant thymus gland was found in about 65 years old male cadaver. The dissection was done as follows- A vertical incision over the skin of thorax was given extending from the suprasternal notch to the xiphoid process and another horizontal incision from jugular notch along the clavicle to the acromion. The skin was reflected following which the pectoral muscles were exposed. The pectoralis major and minor muscles were reflected. The thoracic cavity was exposed cutting at the sternoclavicular joints and ribs at midaxillary lines on either sides respectively extending from 2nd to 10th ribs and the anterior thoracic wall was reflected downwards. The fascia over the anterior mediastinum was dissected carefully and a bilobed thymus gland was found at the region of manubrium below the thyroid gland.⁶

Observations were noted as follows:

- An uneven length bilobed thymus gland with half or more soft-tissue parenchyma along with partial fibrofatty tissue.
- The gland was extending from root of the neck below the thyroid gland, to the superior and anterior mediastinum.
- The gland was flat and two lobes were connected by fat and fibrous connective tissue.

The gland showed following relations:

Superiorly – Thyroid gland

Anteriorly – Manubrium of sternum

Posteriorly – Aortic arch, pericardium and heart

Laterally – Cervical pleura covering right and left lobes of lung

Inferiorly - Pericardium.

- Two thymic veins were found on posterior surface draining into the right brachiocephalic trunk separately.
- The gland was not of uniform length, breadth and thickness and hence maximum measurements were considered.

After measurements a small section was sent in pathology laboratory for histological slide

preparation. Slide revealed only fibrous tissue. Probably the reason may be due to delayed preservation of body in formalin after death.

1. Right thymus
2. Left Thymus
3. Thyroid Gland
4. Right Lung covered by Pleura
5. Left Lung covered by Pleura
6. Pericardium covering Heart and Great Blood Vessels
7. Thyroid cartilage



Figure 1: Anterior view of Bilobed Thymus of Cadaver in situ.

Table 1: Measurements of the Gland

Thymus	Right side	Left side
Maximum Length (upper pole to lower pole)	5 cm	3.2 cm
Maximum Breadth (at superior mediastinum)	1.4 cm	2 cm
Maximum Thickness	0.4 cm	0.4 cm
Weight including connective tissue	4.9 gm	2.6 gm

DISCUSSION

Thymus appears in a variety of shape and size even in same individual during different age of life. This is mainly due to its involution during development and partially due to acute shrinkage

of thymus during bodily stress. During recovery period, it grows back to its original or even larger size. This phenomenon is known as thymic rebound hyperplasia. Rebound hyperplasia is commonly seen in children but also occurs in adults. These anatomic variations and dynamic changes appears as main source of confusion. These misinterpretations with pathological condition lead to prolonged chemotherapy or radiotherapy or unnecessary biopsy. Thus it sets a major confusion for radiologist.⁴

A study by Krishna Murthy JV, et al. shows thymus in adult life may be normal or abnormal. The prepubertal thymic glands were pyramidal in shape, pinkish grey to brown in color while post pubertal thymus were flattened, varied from greyish white to yellow.⁷

As described by Sushmita Bhatnagar, et al. posterior mediastinal accessory thymus was reported. Surgeons dealing with mediastinal structures should have a better knowledge about these variations.⁸

Studies of Yasumasa Monden, et al. proposed that 63% (44% males and 19% females) of myasthenia gravis patients have thymomas. Scientist believed that thymus gland may give incorrect instructions to developing immune cells, ultimately resulting in autoimmunity and the production of acetylcholine receptor antibodies. Thymectomy performed in myasthenia gravis patients has great prognosis.⁹

Prevalence of large anterior mediastinal thymus is also reported in 65 year old male cadaver.¹

A study by Tetsuro Araki, et al. suggested Cigarette smoking and high BMI are associated with advanced fat degeneration of the thymic gland. Cigarette may facilitate fatty degeneration of the thymus. However, the effect of smoking on the adult thymus has not been understood.¹⁰

CONCLUSION

Thymus shows morphological variation in the gross anatomy. It may be incessant in the adult. Discovery of a mediastinal mass is usually alarming. This fact is clinically important

thus a thorough knowledge of anatomy and embryological changes of thymus, its normal variations, ectopic locations and non neoplastic conditions such as rebound hyperplasia from neoplastic conditions is necessary before doing any therapeutic, radiotherapy or invasive procedures.

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