

# A CASE OF PERSISTENT THYMUS DIVERTICULA IN THE NECK

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The persistence of stalks of thymic tissue in the neck, demonstrating the embryological origin of the thymus gland from the entoderm of the third pharyngeal pouch, is undoubtedly a rare condition. In the course of 30 years' experience of teaching anatomy this is the first instance of such a condition that I have seen in the

dissecting room. Descriptions of such a congenital abnormality are absent in many standard anatomical and embryological textbooks, and only a few references could be found. In Braus' *Anatomie des Menschen* (1924) there is a schematic and hypothetical drawing of the neck and upper thoracic region in the adult, with the various

branchial outgrowths *in situ*. The two lobes of the thymus gland are shown to have long stalks reaching upwards into the neck; the stalks being labelled 'cervical thymus.' In Cunningham's *Text-book of Anatomy* (1951)<sup>2</sup> it is stated that the thymus may exhibit slender prolongations into the neck on each side, antero-lateral to the trachea, and that these prolongations are the remains of the stalks by which the developing thymus was connected with the third pharyngeal pouches on each side. In Patten's *Human Embryology* (1946)<sup>3</sup> there is a figure showing a persistent cord of thymic tissue on the left side of the neck, and in the text it is mentioned that the commonest developmental irregularity involving the thymus is the persistence of thymic tissue along the course followed by the gland in its descent. Such cords may be either unilateral or bilateral.

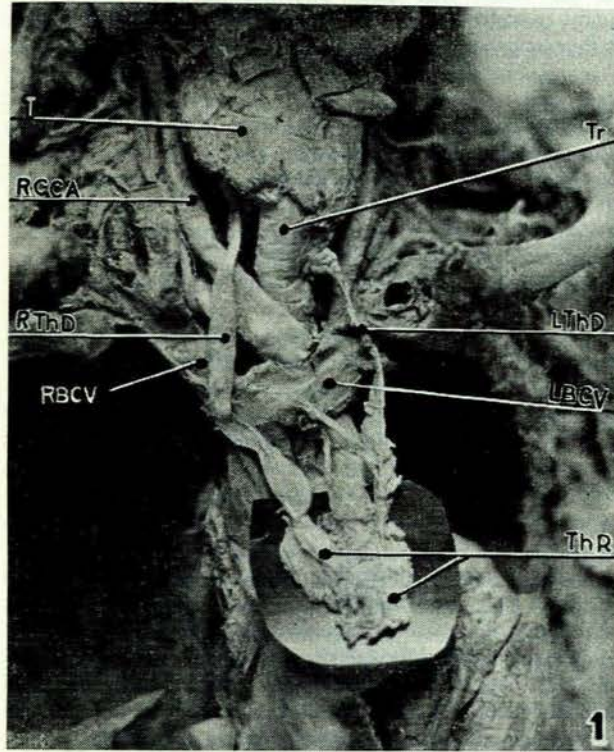


Fig. 1. The dissected remains of the thymus and the right and left thymus diverticula in the neck. T=right lobe of thyroid gland, RCCA=right common carotid artery, RThD=right thymus diverticulum, RBCV=right brachio-cephalic vein, Tr=trachea, LThD=left thymus diverticulum, LBCV=left brachio-cephalic vein, ThR=thymus remains. (A piece of dark cardboard has been placed behind the mass of glandular and fatty tissue representing the remains of the thymus gland, in order to differentiate it from the pericardium and the arch of aorta, in front of which it was lying.)

The present instance of thymic diverticula was found by a group of student-dissectors of the 1963 anatomy class, Messrs. B. Freedman, D. Hirschowitz, S. Lipper and J. Mayo. The subject was a male Cape Coloured, aged 42; the cause of death being recorded as pulmonary tuberculosis. During the dissection of the neck, long yellowish-white structures were seen running in front of the carotid sheath and between the common carotid artery and the

trachea. These structures were present on both sides, but that on the right was much the wider and thicker of the two. At a later stage of the dissection, after opening the thorax, these solid, cord-like bands were traced to the remains of the thymus gland situated in the usual anatomical position in front of the brachiocephalic veins (innominate veins) and in front of the upper part of the pericardium (Fig. 1).

#### DESCRIPTION OF THE SPECIMEN

In the photograph of the specimen (Fig. 1) the thymus gland remains are seen as a mass of tissue no larger than is usually found in adult subjects in the dissecting room. Proceeding from this mass of tissue were two bands of yellowish-white tissue on each side which extended upwards to the thoracic inlet in front of the brachiocephalic veins, and on the right side in front of the bifurcation of the brachiocephalic trunk. On the right side this band was

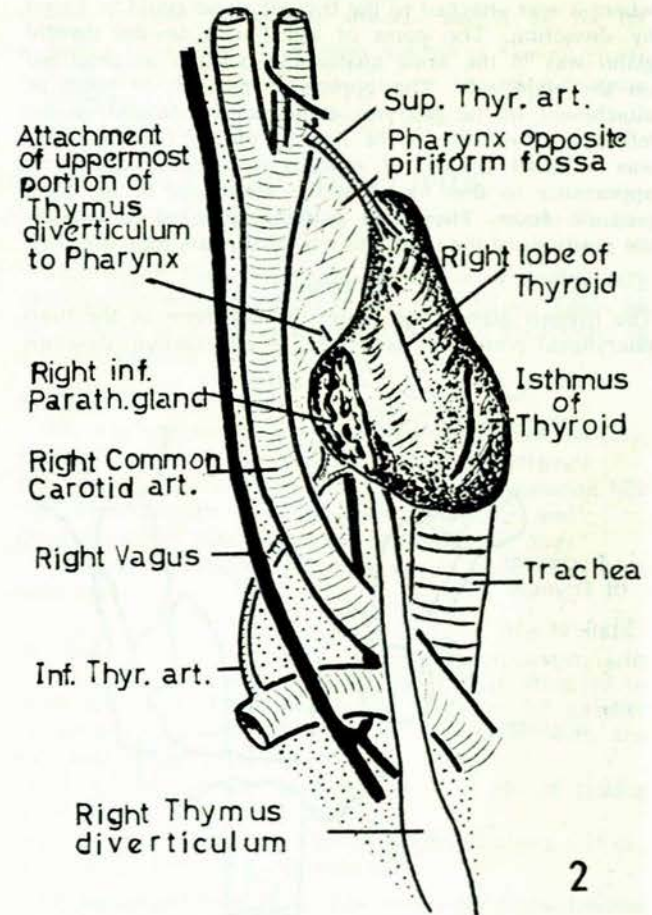


Fig. 2. The attachment of the right thymus diverticulum to the thyroid and parathyroid glands and its upward continuation to the wall of the pharynx. (The common carotid artery and the vagus nerve have been displaced backwards.)

7 mm. thick in its widest part; on the left side the diverticulum was a thin thread in the neck, and this had become broken in the course of dissection.

Further dissection, after removal of the specimen from the vertebral column, showed the following: On the right



side the thymic stalk became attached to the thyroid gland near the junction of the right lobe with a more darkly tinted portion, which was presumed to be the right inferior parathyroid gland (Fig. 2). The point of attachment to the thyroid gland was a little in front of the course of the right recurrent laryngeal nerve and near the entrance of the inferior thyroid artery. Above the thyroid gland the stalk could be defined again at its point of attachment to the wall of the pharynx. In the interior of the pharynx the point of attachment was seen to be opposite the bottom end of the piriform fossa. Here the piriform fossa showed a little pocket directed downwards and limited on the inside by a small fold of mucous membrane, stretching from the back aspect of the cricoid cartilage to the lateral wall of the pharynx. There was no opening to suggest that the stalk had a lumen.

Conditions on the left side were very similar. The thin thymic stalk on this side had broken, but the upper part where it was attached to the thyroid gland could be found by dissection. The point of attachment to the thyroid gland was in the same anatomical position as described on the right side. The uppermost portion, or point of attachment to the pharynx, could not be defined on the left side. However, in the interior of the pharynx there was a small pocket of mucous membrane, similar in appearance to that found at the lower end of the right piriform fossa. These two pockets appeared to indicate the positions of the right and left third pharyngeal pouches.

#### DISCUSSION

The thymus gland arises from the entoderm of the third pharyngeal pouch on each side. Its primordium develops

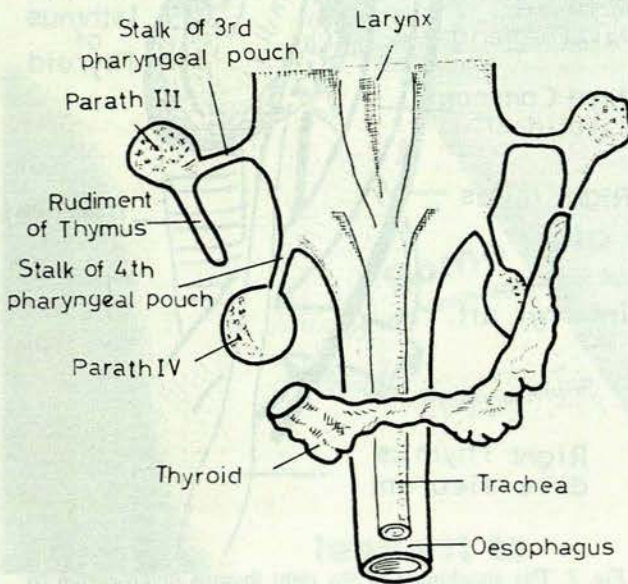


Fig. 3. Ventral view of the primitive pharynx in an embryo of the 6th week (modified from Cunningham).

from the ventral part of the pouch, while the dorsal part of the pouch gives origin to the inferior parathyroid gland, often referred to as parathyroid III (Fig. 3). The two elongated thymic rudiments become solid cords which grow forward on each side of the trachea, and then

descend in front of the large vessels at the thoracic inlet. The anatomical relationship to the thyroid gland is important. As each thymic diverticulum descends, it passes behind the corresponding lobe of the thyroid gland. The thyroid gland has developed from a median diverticulum in the floor of the pharynx and has assumed a position in front of the trachea, forming the isthmus, and later by sideways extensions the right and left lobes (Fig. 3). Below the level of the thoracic inlet the two buds of the thymus become united by connective tissue but do not fuse. The right and left lobes of the thymus gland, such a prominent feature in the anterior and superior mediastinum of the foetus at term, remain separate structures.

The connection between the primordium of the thymus and of the inferior parathyroid persists for some time, with the result that each parathyroid gland is drawn caudally with the descending thymus gland. The inferior parathyroids become attached along the dorsal border of the corresponding lobe of the thyroid gland. It is in this position that one would expect remains of the thymic diverticula to make their appearance. This is confirmed in the present instance. The upper ends of the two thymus diverticula blended with the thyroid gland at its junction with the inferior parathyroid (Fig. 2). The uppermost piece of the diverticulum, only found on the right side, was attached to the pharyngeal wall opposite the lower end of the piriform fossa, and this would represent the stalk of the third pharyngeal pouch (Fig. 3). After investigating the present instance of thymic diverticula I find it difficult to agree with the schematic drawing seen in Braus' textbook.<sup>1</sup> In this figure a cervical thymus is shown as passing upwards to a level above the thyroid cartilage and linking up with a pharyngeal pouch bulging outwards on each side through the thyrohyoid membrane; theoretically this was meant to represent the third pharyngeal pouch.

The existence of *thymic cysts* in the neck, as one variety of branchial cyst, is occasionally reported in the surgical literature.<sup>4</sup> These are multilocular cysts, the walls of the cyst containing foci of thymic tissue. Such cysts are usually accepted as having grown from remains of the thymus diverticula, derived from the third pharyngeal pouch. King<sup>5</sup> reported on 76 cases of 'branchial cyst' which he prefers to call lympho-epithelial cysts, a name suggested by their histological features. In the walls of 8 out of the 76 traces of thymic tissue were found, i.e. typical Hassall's corpuscles mixed with lymphoid tissue. In spite of this, the author rejects the current embryological interpretation of such cysts. According to King, branchial clefts and pharyngeal pouches are not represented in any adult tissue below the hyoid bone. Therefore 'branchial cysts' which lie below the hyoid bone cannot be derived from a branchial cleft or pouch. The lining of the cyst may be squamous epithelium, or columnar epithelium, or both. Apparently, this is no criterion of its derivation from external clefts or from pharyngeal pouches.

The embryological interpretation of cysts in the neck is complicated by the existence of the *cervical sinus*, a slit-like gap left by the downward growth of the second arch, which then overlaps the third and fourth arches and the related clefts and pouches. If the epithelial lining of the slit persists it may give rise to the common variety of



*branchial cyst.* The remains of the cervical sinus may present an opening in the skin at the lower part of the neck along the front margin of the sterno-mastoid,<sup>1</sup> and a *branchial fistula* results. In Braus' schematic illustration, already referred to, the cervical sinus is shown linked up on one side with the second pharyngeal pouch and on the other side with the third pharyngeal pouch. The small channels linking the sinus with the pharyngeal pouches would be remains of the epithelium lining the second and third external pharyngeal clefts. A communication may become established with the corresponding pouches, thus explaining the presence of lymphoid tissue or of thymic tissue, or of both in the walls of the branchial cyst. It also explains the term lympho-epithelial cyst favoured by King.<sup>5</sup>

However, the right and left thymic diverticula described here, are obviously independent structures, not linked with a persisting cervical sinus. Any cyst in the neck which had arisen from such a diverticulum would have to be called a thymic cyst, not related to the ordinary type of branchial cyst. The usual embryological interpretation of thymic cysts appears to be the correct one, and the arguments put forward by King cannot be accepted.

#### SUMMARY AND CONCLUSIONS

A case of persistent thymus diverticulum on both sides of the neck is described. This congenital abnormality was found in an adult subject in the dissecting room. The stalk of the diverticulum blended on each side with the thyroid and parathyroid glands and, on the right side, the diverticulum was traced to a pocket in the interior of the pharynx situated at the lower end of the piriform fossa. This was thought to represent the remains of the third pharyngeal pouch; the pocket being present on both sides.

After considering the embryology of the thymus gland, its relationship to thymic cysts and to branchial cysts is discussed. Despite a contrary opinion expressed in surgical literature, it is concluded that the existence of branchial cysts derived solely from thymic remnants in the neck must be accepted.

#### REFERENCES

1. Braus, H. (1924): *Anatomie des Menschen*, Band II, pp. 114, 115. Berlin: Springer.
2. Brash, J. C. ed. (1951): *Cunningham's Text-book of Anatomy*, 9th ed., p. 819. London: Oxford University Press.
3. Patten, B. M. (1946): *Human Embryology*, pp. 539, 540. Philadelphia: Blakiston.
4. Cote, R. and Fortin, C. (1961): *Canad. J. Surg.*, **4**, 566.
5. King, E. S. J. (1949): *Aust. N.Z. J. Surg.*, **19**, 109.