

FOLIA MEDICA CRACOVIENSIA

Vol. LVII, 1, 2017: 23–28

PL ISSN 0015-5616

Residua of thymus in the mediastinum — clinical aspects — cadaveric study

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Abstract: The main goal of this study was to investigate possible residua of thymic tissue in 100 adult cadavers with no thoracic pathology known before, by dissection of standard locations of thymic tissue in perithyroid, periaortic, peritracheal and retrotracheal spaces, as well as areas located next to the course of phrenic, vagus and left recurrent laryngeal nerves. Thus obtained tissue samples were studied by two pathologists independently. The remnants of the thymic tissue were found in 61 out of 100 specimens studied. It means that residua of ectopic thymic tissue is common, which may have a huge impact on the results of treatment of many diseases i.e. myasthenia gravis in course of thymoma.

Key words: thymus, ectopia, autopsy, mediastinum.

Introduction

The most evident moment in the development of the head and neck is the development of the pharyngeal apparatus consisted of pharyngeal arches and clefts. Simultaneously with the development of arches and clefts, a number of internal outgrowths — pharyngeal pouches, arise along the lateral wall of foregut (mostly future pharynx). The pouches ingrow the mesenchyme but do not communicate with the clefts. It is the third and fourth pouches which are characterized by a dorsal and ventral wings at their distal ends. During the fifth week the epithelium lining the dorsal area of the third pouch differentiates into the inferior parathyroid gland, while the ventral turns into thymus. Both of these regions quickly loose connection to the pharyngeal wall and migrate caudally. This is why the main portion of the thymus dislocates into thorax, but its beginning still persists in the thyroid region, sometimes forming isolated thymic nests.

Further development or rather growth of the thymus occur until puberty, although in the young children thymus is widely “dispersed” occupying space of anterior mediastinum (mostly behind the sternum, anterior to the pericardial sac and great vessels). In elderly thymic tissue undergoes physiological involution, atrophies and is replaced mostly by fatty tissue.

Remnants of thymic tissue in adults are of special consideration for the treatment of myasthenia gravis. However opinions of different authorities do not agree. Expansion of thymic tissue in the chest is one of important factors which determine success of the therapy — several studies regarded to distribution were undertaken since the time of fundamental publication which appeared in 1975 [1, 2]. It is proved that even most extensive resection of thymic tissue remnants although good results were obtained by the authors who performed most extensive thymectomies. None of the operative techniques used is able to secure removal of all thymic tissue remnants. Anyway such attempts should be undertaken. This study is a continuation of our own observation [3] based on cadaveric study, although conclusions of our previous tests were not very promising.

Materials and methods

The study was carried out on hundred cadavers (82 males and 18 females) autopsied without any known intrathoracic pathologies in the Department of Forensic Medicine Jagiellonian University Medical College (Head: prof. dr hab. Małgorzata Kłys). The study and its design was accepted by the Bioethical Committee of the Jagiellonian University (KBET 2012/23/17). Initially the sternum and adjacent costal cartilages were removed. The thymus was removed together with perithymic tissues. Next the brachiocephalic veins were exposed and both pleural cavities widely opened. Both the

phrenic and recurrent laryngeal nerves were identified. Connective tissue from the bottom of the neck was removed. It was tried to keep the border of the dissection at about 1 cm away from these nerves. The neck dissection followed as far as the lower border of the thyroid gland. Connective tissue (fat) localized next to the “plane” of veins and arteries within anterior pretracheal mediastinum, including the aorto-pulmonary “window” was removed, subsequently the fat pads of pericardiophrenic recesses were excised.

The next stage of dissection was associated with fat removal from difficult to access regions of the mediastinum — which normally are difficult to remove because of technical reasons. First both phrenic and recurrent laryngeal nerves were removed — together with surrounding connective-fatty tissue. Consecutively a tissue bloc was removed (consisted of lungs, trachea, larynx, heart, esophagus, pharynx, and aorta). After organ removal an attempt of dissection of the fat tissue localized in the vicinity of the thyroid gland, trachea and descending aorta was made.

Tissue samples collected were placed in separate containers with a buffered 10% formaldehyde solution and precisely described. Tissue samples from every location were designated for microscopic study, cut into slides and stained using haematoxylin and eosin. Thus prepared and stained tissues were examined by two independent pathologists — under the criteria of finding the Hassall corpuscles [3].

Results and discussion

We have examined 100 adult cadavers — all of them were characterized by the absence of any known intrathoracic pathology. 87 male bodies and 13 female bodies were examined, aged 15–84 (the mean age was 45.2 years). During pathological examination ectopic thymic tissue was found in 61 out of 100 cadavers (61%). In 29 cadavers ectopic thymic tissue was found in locations normally accessible during standard surgical thymectomies, while in 32 — locations were located in inaccessible positions. Overall the total amount of ectopic foci of thymic tissue found in 61 cadavers was 98 — of which 26 were located in the neck and 62 in the mediastinum.

The number of foci of ectopic thymic tissue was variable. One focus was found in 29 cadavers, two foci were found in 18 cadavers, three foci in 8 cadavers, four foci in 5 cadavers; and finally five foci in one cadaver. It must be stressed out that a number of locations of ectopic thymic foci was higher in the places which normally are not accessible and revised during operation with respect to standard accessible locations. This is confirmed by data obtained by Tomulescu and Popescu [4]. It is a big question to be asked if this is worth to perform even the most extensive thymectomy if majority of the remnants still remain not accessible. In our previous paper we stressed out [3] that following studies of Jaretzki [5] complete remission in long-term follow-up even after the most precise and extensive thymectomies was about 62% — so it is clear

Table 1 shows distribution of ectopic thymic tissue in certain locations (see [3]).

	N (%)
Standard accessibility during a surgery	
Perithymic fat	26
Aorto-caval groove	2
Aorto-pulmonary window	11
Right pericardiophrenic angle (costophrenic recess)	0
Left pericardiophrenic angle (costophrenic recess)	1
Difficult or impossible access for standard surgery	
Retrothyroid	9
Peritracheal	7
Right phrenic nerve	6
Left phrenic nerve	21
Right recurrent laryngeal nerve	6
Left recurrent laryngeal nerve	5
Retrotracheal	4
Periaortic	0

to us that even the most extensive operations will never achieve the rate of nearly 100%. This is probably why even more precise attempts to remove more post-thymic tissue may lead to increased morbidity only. Our studies proved that location and distribution of the remnants of thymic tissue is difficult to predict. Besides the residua reside not only in the mediastinum but also in the neck, what makes surgical approach even more problematic. Some authors observed remnants of thymus in quite unusual locations [6–12]. Comparing to our previous study [3] we found the incidence in the left pericardiophrenic angle but this observation is still not consistent with the results obtained by other authors [13].

Further attempts to carry out randomized studies both regarded to technique and the range of the thymectomy should be continued however extension of the surgical procedure may lead to complication (i.e. nerve damage). It seems to be interesting how much of the residua of thymic tissue remain in a close vicinity to the left phrenic nerve. This phenomenon requires further studies and explanation although we suppose that special path of thymic tissue during its development might be a good explanation for this fact [14]. Generally we postulate that incidence of thymic tissue in some regions of mediastinum and neck may be of higher incidence than expected. This is why stressing that remnants of thymus may be present in locations that have never

been considered for revision during surgical procedures. Our study was performed on the cadavers characterized by absence of thoracic lesions and tumors — this may have probably an impact on the data collected however it seems that distribution of remnants of the thymic tissue is quite random. Is a more aggressive approach to surgical treatment of myasthenia gravis a solution of future? Is an application of the newest operation techniques a remedium in this case? [15, 16] We do not think so — and this is the most important limitation of all surgical procedures in this case. The best possible solution is a simultaneous development and improvement of the knowledge, to raise awareness of surgeons considering the possibilities of existence of thymic residua both in mediastinum and neck [17, 18].

Conflict of interest

None declared.

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