



## Original article

### Anatomical Variations of The Termination of The Thoracic Duct In Humans

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#### ABSTRACT

**Back ground:** The Thoracic duct is the major lymphatic duct in the human body, the variations in the termination of the thoracic duct are of great clinical importance during surgeries related to the cervical region, but still now a detailed study had not been done in Andhra Pradesh state, it was decided to undertake this present study. Isolation of the thoracic duct and tracing the termination were done to know more about it than already documented and thereby hoping to add more information to guide the radiologists and operating surgeons. **Materials and methods:** A total number of 45 cadavers were studied, of these 15 were female and 13 were male cadavers. The material consisted of adult cadavers between the ages of 42-81 from the dissection halls of department of anatomy of 3 different medical colleges in coastal Andhra Pradesh. **Results:** The observations of the variations in the termination in cervical region are documented in this study. The present findings showed a great variability compare the previous studies. **Conclusion:** The findings noted in the present study regarding termination of the thoracic duct will provide better understanding of the anatomy of the thoracic duct and they will be useful to clinicians in their respective fields.

**KEYWORDS:** Cervical, Termination, Thoracic duct, Variations.

#### INTRODUCTION

The thoracic duct is the largest lymph trunk of the body. It arises in a dilatation, the cistern chyli, in the upper abdomen deep to the right crus of the diaphragm. It passes through the aortic opening to the right of the aorta, ascends in the posterior mediastinum between the vertebral column and oesophagus with the descending thoracic aorta on

left side and azygos vein on the right side, in close relation to the splanchnic nerves on either side. It crosses from the right side to the left with varying degrees of obliquity at the level of the T<sub>4</sub>-T<sub>5</sub>. It reaches the root of the neck, where it arches from behind the left common carotid artery, to open into the left brachiocephalic vein at the junction

between the left internal jugular and left Subclavian veins [1].

The thoracic duct drains the lymph from the lower half of the body and the gastrointestinal tract into the large cervical veins. In addition, the thoracic duct collects and transports long-chain fatty acids from the intestine. Impaired transportation of the lymph results from obstruction, injury, or tumorous infiltration of the thoracic duct. Such pathologic conditions present clinically as chylothorax, chylous ascites, chylopericardium, or chyluria [2–5].

Many modern surgical procedures involve the area near the distal portion of the thoracic duct, in both the neck and the upper mediastinal area. The distal portion of the duct is the most commonly injured, resulting in either a chylothorax or a chylous fistula unless recognized at the time of injury and repaired. Such injuries have been reported as complications of block dissections in the neck for tuberculous nodes or malignant tumor, scaleniotomy, esophageal resection, the Blalock operation for congenital pulmonary stenosis, radical breast amputation, and operation for left-sided torticollis and during left phrenicoexeresis [6].

With the recent advances in radioimaging techniques like ultrasonography, computerized tomographic scanning, MRI, lymphangiography and lymphoscintigraphy and also catheterization of the thoracic duct are being successfully undertaken to demonstrate the termination of the thoracic duct in cervical region [7]. The thoracic duct is the largest lymph channel which could be traced. Since it is at danger in number of injuries and operations in the region of neck a detailed study of its termination were made. The common pattern and variations are studied in a detailed manner to help the surgeons and thereby to prevent complications during their surgeries.

## MATERIALS AND METHODS

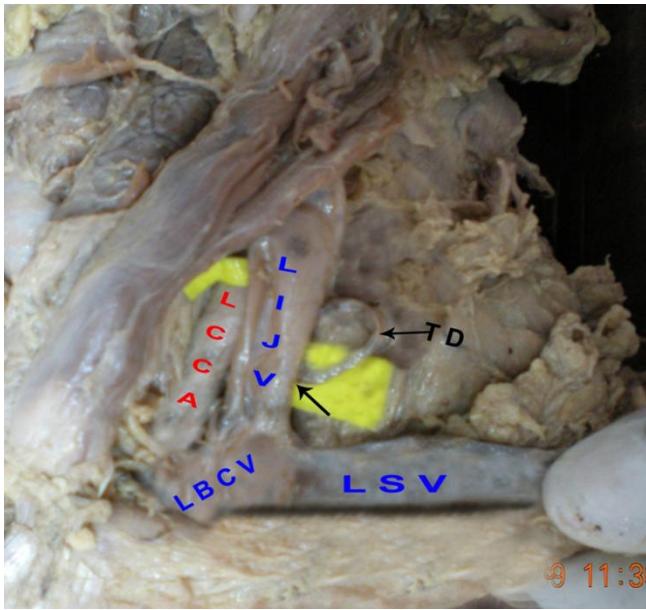
A total number of 45 cadavers were studied, of these 15 were female and 13 were male cadavers. The material consisted of adult cadavers between the ages of 42-81 from the dissection halls of Departments of Anatomy of ASRAM, Eluru, A.P. and Department of Anatomy of PIMS, Ganavaram, A.P. and Department of Anatomy of KIMS, Amalapuram, and A.P. The study was carried in the dissection halls of the above colleges.

During routine dissection of thorax, abdomen and head & neck region part of the work was done in the particular region whenever the dissection was in progress. The observations were neatly taken by 8.1 Mega pixel of Nikon camera.

## OBSERVATIONS

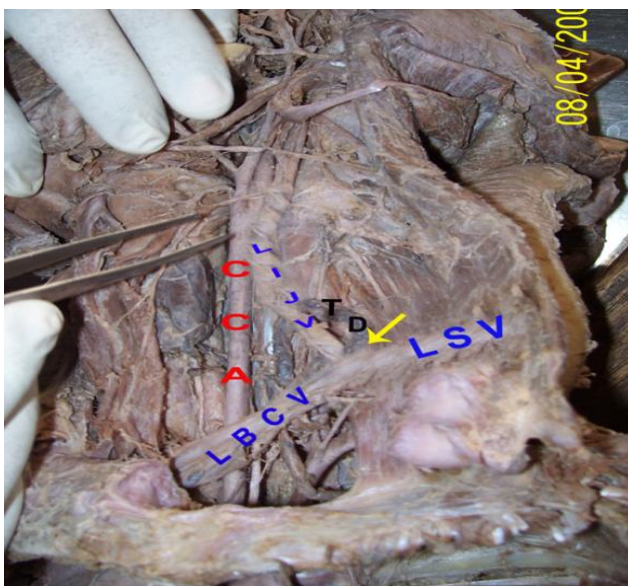
The thoracic duct normally terminates in to the left brachiocephalic vein at the junction between the left internal jugular and left Subclavian veins. During our study we found normal termination and also some variations in the termination of the thoracic duct, all those observations documented here. In the present study we observed the thoracic duct terminated into the left internal jugular vein in 19 specimens (42.2%) (Fig. 1) out of 45 specimens. The thoracic duct terminated into the left jugulo-subclavian junction in 18 specimens (40%) (Fig. 2). The thoracic duct terminated into the left subclavian vein in 4 specimens (8.8%) (Fig.3). The details are shown in the Table 1. Multiple terminations were observed in 4 specimens (8.8%) out of 45 specimens (Fig. 4). Details were shown in Table 2.

**Figure 1:Left Internal Jugular Vein Type Of Termination Of The Thoracic Duct**



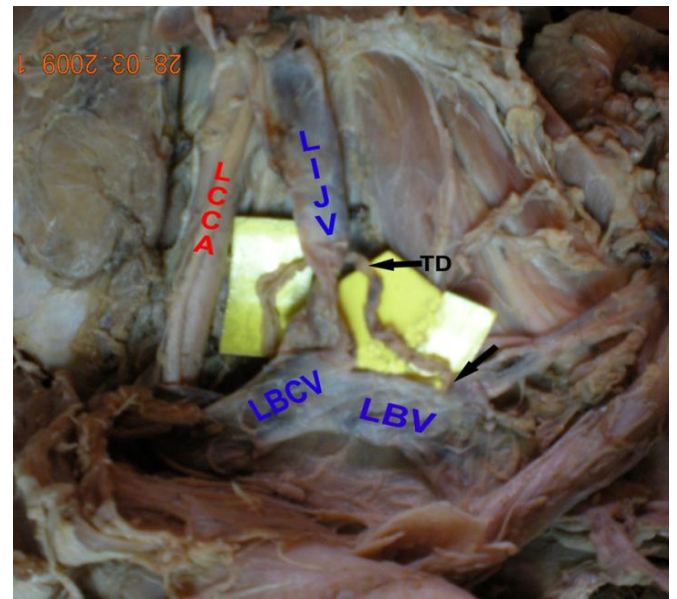
LIJV-Left Internal Jugular Vein, LSV –Left Subclavian Vein, LBCV- Left Brachio-Cephalic Vein, LCCA-Left Common Carotid Artery, TD-Thoracic Duct

**Figure 2:Termination Of The Thoracic Duct Into The Left Jugulo-Subclavian Junction**



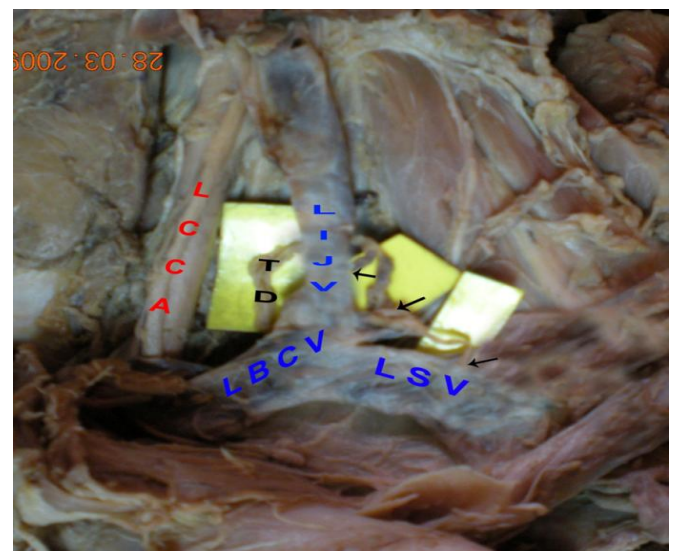
LSV-Left Subclavian Vein, LBCV-Left Brachiocephalic Vein, LIJV-Left Internal Jugular Vein, LCCA-Left Common Carotid Artery, TD- Thoracic Duct

**Figure 3:Termination Of The Thoracic Duct into The Left Subclavian Vein**



LSV-Left Subclavian Vein, LBCV-Left Brachio-Cephalic Vein, LIJV-Left Internal Jugular Vein, LCCA-Left Common Carotid Artery, TD-Thoracic Duct

**Figure 4: Multiple Terminations Of The Thoracic Duct**



LSV-Left Subclavian Vein, LBCV-Left Brachio-Cephalic Vein, LIJV-Left Internal Jugular Vein, LCCA-Left Common Carotid Artery, TD-Thoracic Duct

Table 1: Variations in the termination of thoracic duct

S.No.	Site of termination	No. of specimens	Percentage of incidence
1	Left internal jugular vein	19	42.2%
2	Left jugulo-subclavian junction	18	40%
3	Left subclavian vein	4	8.8%
4	Left brachio-cephalic vein	0	0%

Table 2: Multiple termination of thoracic duct

S.No.	Specimens	Total no. of cadavers	Multiple termination	Percentage of incidence
1	Adult males	30	3	6.6%
2	Adult females	15	1	2.2%
3	Total	45	4	8.8%

Table 3: Comparison of termination of thoracic duct with other investigators

S.No.	Observer	Left Internal jugular vein termination	Left jugulo-subclavian termination	Left subclavian vein termination	Left brachiocephalic vein termination
1	Jadnov (et al)[2]	48%	35%	9%	8%
2	Kinnaert (et al) [4]	36%	34%	17%	–
3	Shuiade &Sato (et al)[8]	27%	38%	–	–
4	Present study	42%	40%	8%	–



## DISCUSSION

The thoracic duct as per the usual text book description mostly terminates as a single trunk into the left jugulo-subclavian venous junction, into left subclavian vein or left internal jugular vein. Just before the point of termination the left jugular lymph trunk and the left subclavian trunk join it or they drain independently. The left bronchomediastinal lymph trunk sometimes joins it. The terminal one centimeter of the thoracic duct always presented a bicuspid valve guarding lympho-venous junction. These prevent the entry of the blood into the thoracic duct under normal conditions.

Jdanov (et al) [2], Kinnaert (et al) [4] and Shunada and Sato (et al) [8], studied about thoracic duct termination. Their observations were compared with the observations of the present study in the Table 3. The pattern of termination of the thoracic duct was almost similar to that of Jdanov.

In the present work in 4 out of the 45 adult subjects the distal part of the thoracic duct is showing multiple terminations. In most of the text books the percentages of the incidence of multiple termination of the thoracic duct or its relation to the sex of the individual were not available. However the present incidence of 8.8% of multiple terminations was not in inconformity with the range of 10-40% mentioned by the Kinnaert [4].

## CONCLUSION

The precise site of termination of the thoracic duct was variable. These variations are described and their relevance to surgery involving the left side of the neck is discussed. A thorough knowledge of its origin, course and termination relation to the neighboring structures is very essential to give an accurate and precise, interpretation of the latest radio imaging techniques.

This study is very useful for the anatomists, radiologists, surgeons during their respective procedures

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