



“CADAVERIC STUDY OF ANATOMY AND RELATIONSHIP OF PHRENIC NERVE AND SUBCLAVIAN VEIN”

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ABSTRACT **Background:** During subclavian vein catheterization. We conducted a cadaver study focused on the possible anatomical relationships between the subclavian vein and the phrenic nerve. Students of medical sciences gain knowledge and theoretical data through actual visualization of anatomic structures of the cadavers also anatomic relations can be studied more efficiently by practicing on cadavers. As phrenic nerve may be damaged during subclavian vein catheterization the relationship between the phrenic nerve and the subclavian vein is of clinical interest. During the subclavian vein catheterization analogous variable relationships are helpful to explain and prevent damage to the phrenic nerve.

Material and Methods: Total 36 cadaver 25 male and 11 female found in the Department of Anatomy at IGIMS Patna Bihar. Dissection was started from the root of the neck. No surgical scars, gross anatomical and morphological abnormalities was noted on the cadaver. Measurements were taken during the anatomical dissections.

Results: Of the 36 cadavers dissected in 34 (94.44%) cases phrenic nerve was found posterior to the subclavian vein and in 2(5.56%) cases found anterior to the subclavian vein of which one case was male and the other was female. In the male case in which phrenic nerve was passing anterior to the subclavian vein, it was adherent to the anterior wall of the subclavian vein and was not piercing the vein wall.

Conclusion: The variants of the relationship of the subclavian vein and the phrenic nerve should be familiar to anaesthesiologists during subclavian vein cannulation in order to achieve successful vein approach without causing phrenic nerve palsy. So, the puncture site should be more laterally at the outermost portion of the subclavian vein. Anatomical variants during invasive practical procedures should be always kept in mind.

KEYWORDS : phrenic nerve, subclavian vein, phrenic nerve palsy.

INTRODUCTION:

Deep knowledge of anatomy is an essential part of surgical practice. The main teaching modality in anatomy education was cadaveric which was introduced in the ancient times. From the viewpoint of anatomy and physiology In the 3rd century AD, the first human cadaveric dissections were performed in Greece by Herophilus of Chalcedon and Erasistratus of Chios to understand the whole body. However, religious and moral attitudes and taboos towards physicians and medical schools had many detrimental effects on the scientific value of cadaver-based educationⁱ. Students of medical sciences gain knowledge and theoretical data through actual visualization of anatomic structures of the cadavers also anatomic relations can be studied more efficiently by practicing on cadaversⁱⁱ.

As phrenic nerve may be damaged during subclavian vein catheterization the relationship between the phrenic nerve and the subclavian vein is of clinical interestⁱⁱⁱ. The phrenic nerve usually enters the thoracic cavity posterior to the subclavian vein^{iv}. The terminal branches of phrenic nerve pierce the diaphragm and travel on the abdominal surface of the diaphragm supplying the parietal peritoneum through connections with branches of celiac plexus^v. During the subclavian vein catheterization analogous variable relationships are helpful to explain and prevent damage to the phrenic nerve.

MATERIAL AND METHODS:

The study was carried out in the department of Anatomy in Indira Gandhi Institute of Medical Science Patna Sheikhpura Bihar. During dissection of 36 cadavers, 25 male and 11 female we found the topographical relationship of the subclavian vein and the phrenic nerve at the thoracic outlet. Dissection was started from the root of the neck. Nosurgical scars, gross anatomical and morphological abnormalities was noted on the cadaver. Measurements were taken during the anatomical dissections.

RESULTS:

36 cadavers dissected in 34 (94.44%) cases phrenic nerve was found posterior to the subclavian vein and in 2(5.56%) cases found anterior to the subclavian vein of which one case was male and the other was female. In the male case in which phrenic nerve was passing anterior to the subclavian vein, it was adherent to the anterior wall of the

subclavian vein and was not piercing the vein wall.

DISCUSSION

The phrenic nerve is sole motor supply to the corresponding half of the diaphragm, and it sends afferent fibres from the diaphragm, pericardium, pleura, and peritoneum^{vi}.

Commonly phrenic nerve arises from the 4th cervical root with occasional contributions from 3rd and 5th cervical root. It almost descends vertically on the anterior surface of the anterior scalene muscle, posterior to the pre-vertebral fascia. Then, it crosses anterior to the first portion of the subclavian artery posterior to the subclavian vein and enters the thorax by intersecting anteromedially to the internal thoracic artery. Each nerve lies in the thorax in contact with the mediastinal pleura throughout its course towards the diaphragm.

It is observed that in 4–35% of the cases subclavian vein catheterization can cause complications like haemothorax, pneumothorax, mediastinal haematoma, cannulation of the subclavian artery, brachial plexus injury, thrombophlebitis, air embolism, injury to the recurrent laryngeal nerve, erosion of catheter, and phrenic nerve injury. Phrenic nerve injury can be immediate as well as there can be late complications causing phrenic nerve palsy.

Also it is shown that accessory phrenic nerve (APN) describing the nerve to subclavius as the major origin of the APN. Also it was reported that an APN was associated with 99 of the phrenic nerve (61.8%), with bilateral occurrence in 31 cadavers (38.8%). Bilateral symmetrical origin of the APN, from the nerve to subclavius, was observed in 10 cadavers. cadaveric dissection is important in improving surgical and technical knowledge for surgery residents. Detailed practice dissection of surgical procedures prior to live patient operations, increases the confidence levels and surgical skills^{vii}.

There can be compression of the phrenic nerve by the rigid tip of the venous catheter without perforating the subclavian vein can occur^{viii} and Phrenic nerve palsy generally represents an immediate complication of subclavian vein puncture. Also, large needle size and repeated attempts are predominant factor for more severe nerve injury.

An accessory phrenic nerve is present in about 61.8% to 75% of the

people. Loukas et al in their study reported that in 45% cases, the loop between the phrenic and accessory phrenic nerve involved the subclavian vein. Codesido and Guerri-Gutenberg reported a case of accessory phrenic nerve passing through an annulus of the subclavian vein located 1 cm away from the jugulosubclavian junction.

In our study of 36 cadavers, 34 (94.44%) cases phrenic nerve was found posterior to the subclavian vein and in 2(5.56%) cases found anterior to the subclavian vein of which one case was male and the other was female. In the male case in which phrenic nerve was passing anterior to the subclavian vein, it was adherent to the anterior wall of the subclavian vein.

CONCLUSION

The variants of the relationship of the subclavian vein and the phrenic nerve should be familiar to anaesthesiologists during subclavian vein cannulation in order to achieve successful vein approach without causing phrenic nerve palsy. So, the puncture site should be more laterally at the outermost portion of the subclavian vein. Anatomical variants during invasive practical procedures should be always kept in mind.

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