



Variant communication of phrenic nerve in neck

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Abstract

Purpose Variations of the phrenic nerve gain importance in the context of subclavian vein cannulation, implanted venous access portals and supraclavicular nerve block for regional anaesthesia. Some of the variations of phrenic nerve are very common and may have implications even while performing very simple and routine procedures.

Methods During routine dissection in the Department of Anatomy, an anatomical variation was observed in the course of the phrenic nerve in an adult male cadaver.

Results On the right side, phrenic nerve in its early course in the neck, close to its origin was giving a communicating branch to the upper trunk of the brachial plexus. Further course of the phrenic nerve was typical. On the left side, no such communication between phrenic nerve and brachial plexus was observed.

Conclusions A thorough knowledge of the anatomical variations and standard anatomy of phrenic nerve is a necessity for the safe and efficient practice of regional anaesthesia.

Keywords Brachial plexus · Phrenic nerve · Anatomical variations · Neck · Diaphragm

Introduction

Phrenic nerve is the chief motor supply of the diaphragm. It arises mainly from ventral ramus of C4 and receives contributions from C3 and C5. It is formed at the upper part of the lateral border of scalenus anterior and descends almost vertically across its anterior surface behind the prevertebral fascia. It then descends posterior to sternocleidomastoid, inferior belly of omohyoid, internal jugular vein, transverse cervical and suprascapular arteries. At the root of the neck, it runs anterior to the second part of the subclavian artery, posterior to the subclavian vein and enters the thorax by crossing medially in front of the internal thoracic artery [10].

Anatomical variations of the phrenic nerve have been extensively studied [1, 3, 5, 6, 8]. Some of these variations are very common and may have surgical implications even while performing very simple and routine procedures [8]. The variations in the origin of phrenic nerve were of importance when phrenic nerve avulsion was used as a procedure to paralyse the diaphragm as part of treatment

of tuberculosis [4]. Variations in origin of phrenic nerve also gain importance from the point of view of occurrence of ipsilateral paralysis of diaphragm after supraclavicular block [7]. Hemidiaphragmatic paralysis is also an important complication in right subclavian vein cannulation which is a commonly performed procedure for vascular access for hemodialysis [9].

Hence, a thorough knowledge of anatomical variations and standard anatomy of phrenic nerve is a necessity for the safe and efficient practice of various procedures in the region.

Case report

During the routine dissection for MBBS students in the Department of Anatomy, we detected an unusual variation in the course of the phrenic nerve on the right side in a middle-aged male cadaver.

The phrenic nerve was formed at the upper part of the lateral border of the scalenus anterior muscle and descended almost vertically across its anterior surface behind the prevertebral fascia and sternocleidomastoid muscle. While crossing the lateral border of the sternocleidomastoid muscle, the nerve gave off a communicating branch to the upper

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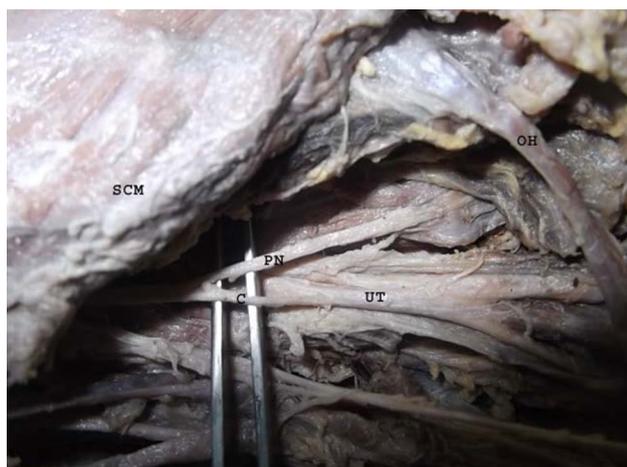


Fig. 1 Dissection of neck showing communication (C) between phrenic nerve (PN) and upper trunk of brachial plexus (UT). *SCM* sternocleidomastoid muscle and *OH* inferior belly of omohyoid muscle

trunk of brachial plexus (Fig. 1). Further course of the phrenic nerve was typical. It descended posterior to inferior belly of omohyoid, internal jugular vein, transverse cervical and suprascapular arteries, and at the root of the neck, it ran anterior to the second part of the subclavian artery, posterior to the subclavian vein.

On the left side, no such communication between phrenic nerve and brachial plexus was observed.

Discussion

Variations in the origin, course and distribution of the phrenic nerve have been reported previously and most reports have cited variations in the origin of the phrenic nerve as it may receive contributions from various sources [5, 7]. Phrenic nerve may receive fibres from the nerve to subclavius, nerve to sternohyoid, second or sixth cervical spinal nerves, ansa cervicalis, hypoglossal nerve and spinal accessory nerve [2]. The accessory phrenic nerve is composed of fibres from the fifth cervical ventral ramus which run in a branch of the nerve to subclavius. It lies lateral to the phrenic nerve and descends posterior (occasionally anterior) to the subclavian vein and joins the phrenic nerve near the first rib. Its fibres may be derived from the fourth or sixth cervical ventral rami or from the ansa cervicalis. The nerve has been reported to be present in about 75% of cadavers [3]. Madhyastha and Bhat [6] described a case with phrenic nerve receiving a branch from superior trunk of brachial plexus and considered this communication as the

accessory phrenic nerve. But in the present case, the communicating branch between the phrenic nerve and the upper trunk of the brachial plexus cannot be described as accessory phrenic nerve as it has branched from the phrenic nerve and preceded distally and laterally in caudal direction to join the upper trunk of the brachial plexus. Aktan et al. [1] also described a case with left phrenic nerve communicating with the superior trunk of brachial plexus but they were not very clear in description and discussion of this communication.

Such variations may be asymptomatic but cannot be overlooked when some surgical intervention to the neck or interscalene and supraclavicular nerve blocks are required. The communication described in the present case may lead to partial or complete right phrenic nerve block and hence hemidiaphragmatic paralysis following interscalene or supraclavicular brachial plexus block.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest. The authors also declare that the study complies with the current law in the country.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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