DOI: 10.7860/JCDR/2015/13620.6027

Case Report

Anatomy Section

Aberrant Dual Origin of the Dorsal Scapular Nerve and Its Communication with Long Thoracic Nerve: An Unusual Variation of the Brachial Plexus

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ABSTRACT

Pre and post-fixed variations at roots of the brachial plexus have been well documented, however little is known about the variations that exist in the branches which arise from the brachial plexus. In this paper, we describe about one such rare variation related to the dorsal scapular and the long thoracic nerve, which are the branches arising from the roots of the brachial plexus. The variation was found during routine dissection. The dorsal scapular nerve, which routinely arises from the fifth cervical nerve root (C5), was seen to receive contributions from C5 as well as sixth cervical nerve (C6), while the long thoracic nerve arose from C6 and seventh cervical nerves (C7) only. Furthermore along with variations in origin of the dorsal scapular and long thoracic nerves, the brachial plexus was seen to exist as a prefixed plexus receiving a contribution from C4 nerve root. An aberrant communicating branch between the dorsal scapular and long thoracic nerve was also identified. Knowledge about the course and anatomy of such variations can be vital for understanding the aetiology of various conditions such as winging of scapula, interscapular pain, administration of cervical nerve blocks, surgeries and for effective management of regions and muscles supplied by dorsal scapular and long thoracic nerve.

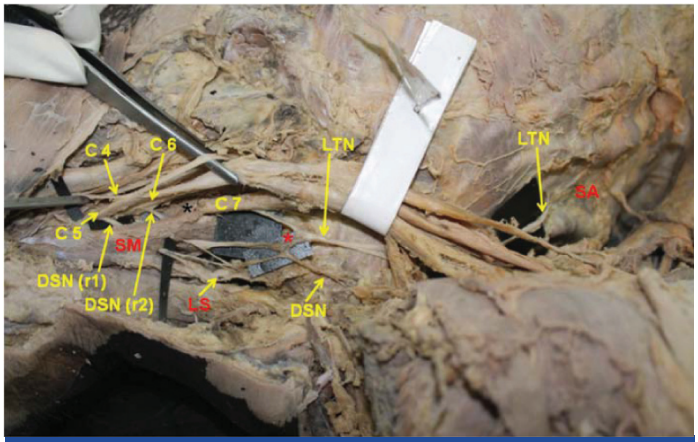
Keywords: Dorsal scapular nerve, Long thoracic nerve, Posterior triangle

CASE REPORT

During a routine dissection of the posterior triangle of the neck (right side) on a male cadaver, a variation related to the dorsal scapular nerve and long thoracic nerve was encountered. After firm identification of the variation, the region was dissected to reveal the full details of the course of dorsal scapular and long thoracic nerve, and the variation was photographed using an 8 megapixel digital camera. An atypical formation of dorsal scapular nerve [Table/Fig-1] was seen, in the posterior triangle of the neck. The dorsal scapular nerve (DSN) which usually comes from the C5 root, had contributions from C5 and the C6 roots. The C5 component of the DSN pierced the scalenus medius muscle and divided into two branches within the muscle. The bigger branch ended by supplying the levator scapula muscle, while a smaller branch continued downwards and joined with a branch arising from the C6 root. On further dissection, it was found out that the two branches from the C5 and C6 roots united and coursed down as main trunk of dorsal scapular nerve. On the contrary, it was observed that the long thoracic nerve was formed by two components C6, C7 [Table/Fig-1] mainly instead of three ventral rami of C5, C6, C7 cervical nerves. The C5 component of the long thoracic nerve was not apparently seen, but a communicating branch was given from C6 which seemed to carry fibres from C5. The C7 component was seen to arise from the middle trunk, which is a continuation of the ventral rami of the C7 spinal nerve. The C6 nerve root pierced the scalenus medius muscle and divided within the muscle into two smaller branches. The larger branch coursed down to join the C7 component of the long thoracic nerve (LTN), while the smaller branch coursed down to join a branch from the C5.

Further, the brachial plexus as a whole was prefixed with contribution from the ventral rami of the 4th cervical nerve [Table/Fig-1], thus the upper trunk formed by the union of the C5 and C6 was thick and long. The Erbs point was identified and the nerve to subclavius and suprascapular nerves were also seen.

A band of muscle fibers was further observed to connect the middle portion of the scalenus medius with the scalenus anterior muscle [Table/Fig-1]. The ventral ramus of the C7 spinal nerve continuing as upper trunk passed below this band of muscle.



[Table/Fig-1]: Shows the dorsal scapular nerve (DSN) and long thoracic nerve (LTN) with variations. DSN (r1) = Dorsal scapular nerve root 1 from C5; DSN (r2) =Dorsal scapular nerve root 2 from C6; LTN = long thoracic nerve; C = ventral rami of cervical nerves; SM= scalenus medius muscle; LS= levator scapulae; SA= serratus anterior; (*) = Aberrant communicating branch between DSN and LTN; (*) =muscular band passing from SM to scalenus posterior.

DISCUSSION

The DSN typically originates from the anterior/ventral primary rami of fifth cervical nerve (C5) nerve before forming the upper trunk of brachial plexus. In its course, the DSN pierces the scalenus medius and then passes behind the levator scapulae muscle which normally assists in elevation of the scapula; the DSN is also suggested to occasionally supply the levator scapulae [1]. A few predominantly motor branches arising from the DSN supply the rhomboideus major and minor muscles, which pulls the scapula towards the spine and helps in retraction of the scapula. A detailed knowledge on the branching pattern of the nerves in scapular/cervical region is important for administrating interscalene nerve blocks in the neck during various surgeries related to the cervical region [2]. Variations

in the course of the C5 and C6 nerve roots in the interscalene groove has been described before [3] and it has been suggested that anomalies in the nerve supply to muscles of the Cervical region can lead to the improper administration of local anaesthetic injection resulting in inadequate analgesia [4]. Such variations incorporating the C4, C5 and C6 roots of the brachial plexus resulting in the formation of prefixed plexuses have been well documented [5]. However, a pre-fixed brachial plexus with dual origin of DSN incorporating C4 and C5 nerve roots with abnormal communicating branch to the long thoracic nerve arising from C5 and C6 nerve roots is unknown, and a thorough description depicting the course of these nerves may be important in many neurosurgical procedures like brachial plexus repair, scalenotomy etc [6]. The anatomy of the dorsal scapular nerve (DSN) and its communication with the long thoracic nerve (LTN) can also be important for understanding the aetiology of muscular pain related to the shoulder regions and also for proper management of conditions such as winging of scapula and pain in the interscapular region [7-9].

Knowledge of the variations involving the brachial plexus is important, not only for anatomical studies but such findings may also be valuable for anaesthesiologists, surgeons, physiotherapist and chiropractioner who are routinely involved in analysing various procedures related to cervical and shoulder region. The course of the long thoracic nerve especially is important for surgical procedures considering the fact that abnormal functioning of this nerve can results in clinical problems such as winging of scapula [10].

The DSN which is formed mostly by the contribution from the C5 nerve, had contribution from both C5 and C6 nerve roots which is an infrequent finding. This report on variation in origin of the DSN may aid medical practitioner during routine testing for abnormal pain symptoms involving the dorsal scapular nerve. It is also known that DSN can become entrapped in the scalenus medius muscle due to its close relationship with the muscle, especially during inflammation of the shoulder region and hence variation in origin of the roots can be important for understanding the aetiology and for effective treatment of the interscapular pain [8].

The long thoracic nerve is formed by the contribution of the branches originating from the ventral rami of 5th, 6th and 7th cervical nerves. The C5 and C6 components of the long thoracic nerve roots primarily lie between the scalenus medius and the scalenus posterior muscles and sometimes they pass through the scalenus medius muscle [10]. In the present report, the C5 component of LTN was not present. In general, the LTN is formed by C5 and C6 along with the C7 component in the axillary region [11]. In the present case, union of the C6 and the C7 components of the LTN occurred above the axillary region in an area just behind the clavicle. Such anomalous position of the nerve may make it vulnerable to injuries during clavicular fracture and in treatment of the thoracic outlet syndrome.

Further in this case report, it was found that the C6 component pierced the scalenus medius muscle and continued as the dorsal scapular nerve, and even gave a communicating twig to the C7 component of the long thoracic nerve. Furthermore, the C5 component of the long thoracic nerve was missing. The C5 and C6 nerve root usually lies between scalenus medius and scalenus posterior muscle [9], and eventually joins with the C7 root. However, in this case the ventral ramus of the C7 nerve was seen passing below the band of muscle formed between the scalenus medius and the scalenus anterior muscle, and this may account for condition such as thoracic outlet syndrome [12]. Such variation in the branching pattern arising from the brachial plexus also suggests positional changes of the developing spinal cord, as it is well known that in the embryo the spinal cord extends the entire length of the vertebral canal and the spinal nerves pass through the intervertebral foramina near their levels of origin [13], but this relationship does not exist in adults because the spine and the dura mater grow more rapidly than the spinal cord after birth, it may thus be likely that neuroepithelial cells in the developing spinal cord may follow an altered course during such positional changes in the embryo giving rise to variations.

CONCLUSION

Variations of the brachial plexus are known but this paper shows one such rare case associated with the anomalous origin, course and union of the dorsal scapular and long thoracic nerve which may be of significance for various surgical interventions.

REFERENCES

[1] Standring S, Elllis H, Healy JC, Johnson D, Williams A, Collins P, Wigley C. Grays Anatomy of the Human body. 39th edition. Elsevier: Churchill Livingstone. 2005;1213-25.
[2] Hanson NA, Auyong DB. Systematic ultrasound identification of the dorsal scapular and long thoracic nerves during interscalene block. *Reg Anaesth Pain Med.* 2013;38(1):54-57.
[3] Harry WG, Bennett JD, Guha SC. Scalene muscles and brachial plexus: Anatomical variations and their clinical significance. *Clin Anat.* 1997;10:250-52.
[4] Yadav N, Saini N, Ayub A. Anatomical variations of interscalene brachial plexus block: Do they really matter? *Saudi J Anaesth.* 2014;8(1):142-43.
[5] Matejcik. Variations of nerve roots of brachial plexus *Bratisl Lek Listy.* 2005;106(1):34-36.
[6] Tubbs RS, Salter EG, Custis JW, Wellons JC 3rd, Blount JP, Oakes WJ. Surgical anatomy of the cervical and infraclavicular parts of the long thoracic nerve. *J Neurosurg*. 2006;104(5):792-95.
[7] Wiater JM, Flatow EL. Long thoracic nerve injury. *Clin Orthop Relat Res*. 1999;368:17–27.
[8] Wood VE, Frykman GK. Winging of the scapula as a complication of first rib resection: a report of six cases. *Clin Orthop Relat Res*. 1980;149:160–63.
[9] Sultan HE, Younis El-Tantawi GA. Role of dorsal scapular nerve entrapment in unilateral interscapular pain. *Arch Phys Med Rehabil*. 2013;94(6):1118-25.
[10] Yazar F, Kilic C, Acar HI, Candir N, Comert A. The long thoracic nerve: Its origin, branches and relationship to the middle scalene muscle. *Clin Anat.* 2009;22(4):476-80.
[11] Bertelli JA, Ghizoni MF. Long thoracic nerve: anatomy and functional assessment. *J Bone Joint Surg Am*. 2005;87(5):993-98.
[12] Paraskevas G, Loannidis O, Papaziogas B, Natsis K, Spanidou S, Kitsoulis P. An accessory middle scalene muscle causing thoracic outlet syndrome. *Folia Morpho (Warsz).* 2007;66(3):194-97.
[13] Moore L Keith, Persaud TVN, Torchia G Mark. The developing human: Clinically oriented embryology, 8th Edition. Elsevier/Saunders, 2008. Pp. 390.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Feb 20, 2015**
Date of Peer Review: **Mar 29, 2015**
Date of Acceptance: **Mar 29, 2015**
Date of Publishing: **Jun 01, 2015**