Surgical anatomy of the dorsal scapular nerve

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Object. There is a paucity of literature regarding the surgical anatomy of the dorsal scapular nerve (DSN). The aim of this study was to elucidate the relationship of this nerve to surrounding anatomical structures.

Methods. Ten formalin-fixed human cadavers (20 sides) were dissected, and measurements made between the DSN and related structures. The nerve pierced the middle scalene muscle at a mean distance of 3 cm from its origin from the cervical spine and was more or less centrally located at this exit site. It lay a mean distance of 1.5 cm medial to the vertebral border of the scapula between the serratus posterior superior, posterior scalene, and levator scapulae muscles. It was found to have a mean distance of 2.5 cm medial to the spinal accessory nerve as it traveled on the anterior border of the trapezius muscle. The nerve intertwined the dorsal scapular artery in all specimens and was found along the anterior border of the rhomboid muscles. On 19 sides the DSN originated solely from the C-5 spinal nerve, and on one side it arose from the C-5 and C-6 spinal nerves.

Conclusions. Knowledge of the anatomy of the DSN will aid the surgeon who wishes to explore and decompress this structure.

KEY WORDS • anatomical study • dorsal scapular nerve • peripheral nerve

The DSN originates from the fifth cervical spinal nerve (ventral ramus) in the majority (75%) of cases within the posterior cervical triangle deep to the prevertebral fascia. Nonetheless, this nerve may also receive contributions from C-4 to T-1 and share a common trunk with the long thoracic nerve. It pierces the middle scalene muscle and travels posteriorly between the posterior scalene muscle and the serratus posterior superior and levator scapulae muscles to innervate the rhomboid major and minor muscles and, occasionally, the levator scapulae muscles (Fig. 1). Frank, et al., found that the nerve innervated the levator scapulae muscles in only 11 of 35 neck specimens. These muscles, that is, rhomboids and levator scapulae, collectively retract and elevate the scapula. Kida and Tani have reported that the DSN may innervate the serratus posterior superior muscle, which is thought to be an accessory muscle of inspiration. Clinically, injury to the rhomboid muscles can result in instability of the shoulder and may follow an anterior shoulder dislocation.

In the current study we aimed to establish reliable landmarks for the surgeon who might explore the DSN.

Materials and Methods

Ten formalin-fixed adult human cadavers (six men and four women), that is, 20 sides, were used in this study. With the cadaver in the prone position, dissection was begun by removing the skin and superficial fascia of the shoulder and posterior neck regions. Next, the rhomboid major and minor muscles were cut from their origin on the spine. The DSN was identified on the anterior surface of the rhomboid muscles and traced cephalically toward the posterior cervical triangle at its emergence from the middle scalene muscle (Figs. 1 and 2). Measurements were made between the nerve and surrounding...
Dorsal scapular nerve

Fig. 2. Left: Photograph depicting the posterior view of the DSN piercing the middle scalene muscle (arrowhead) and traveling over the probe toward the levator scapulae muscles (arrow). Right: Line drawing of Fig. 2 left. Note the levator scapulae muscles attaching into the superior angle of the scapula (arrow) and the midline, as illustrated by the drawn cervical vertebrae for reference.

anatomical structures. All measurements were obtained using calipers. No previous surgical scar or dissection was found in this region in any specimen.

Results

The DSN pierced the middle scalene muscle at a mean distance of 3 cm (range 1.8–4.5 cm) from its origin from the cervical spine and was more or less centrally located at this exit site. The nerve lay a mean distance of 1.5 cm (range 1–3.2 cm) medial to the vertebral border of the scapula between the serratus posterior superior muscle and the posterior scalene and levator scapulae muscles. It had a mean distance of 2.5 cm (range 1.2–3.8 cm) medial to the spinal accessory nerve as it traveled on the anterior border of the trapezius muscle. In all specimens, the nerve intertwined the dorsal scapular artery and was found along the anterior border of the rhomboid muscles. On 19 sides the DSN originated solely from the C-5 spinal nerve, and on one (left) side it arose from the C-5 and C-6 spinal nerves. The DSN innervated the rhomboid minor, rhomboid major, and levator scapulae muscles in all specimens. The serratus posterior superior muscle was not innervated by the DSN in any specimen.

Discussion

Isolated trauma to the DSN has been reported. Nonetheless, some authors have described an entrapped or compressed DSN from hypertrophy of the middle scalene muscle. Entrapment of the DSN may result in abnormal shoulder motion with mild winging of the scapula but is rare. Saeed, et al.10 have stated that rhomboid muscle weakness is best demonstrated by having the patient lower his or her arms from the forward elevated position. When these muscles are paralyzed, the examiner can more easily place several fingers under the vertebral border of the scapula. Patients may also complain of shoulder or neck pain. Some researchers have determined that a DSN injury may produce an unsuspected, and thus an underdiagnosed, component of shoulder pain. Interestingly, DSN injury has been reported in two volleyball players. Chen, et al.1 reported on 22 patients in whom the middle scalene muscle was sectioned for relief of DSN compression. The middle scalene muscle was approached surgically through the posterior cervical triangle bounded by the trapezius muscle, posterior border of the sternocleidomastoid muscle, and clavicle. Most (19) of the patients had partial or complete relief of preoperative neck and shoulder pain following surgery. We hope that the measurements made in this study will assist the surgeon who might explore this nerve surgically.

Conclusions

Although rare, injury to the DSN may occur. Knowledge of this anatomical region will assist the surgeon who wishes to explore this nerve.

References


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