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Case Report

CASE OF VARIATION OF SCALENE MUSCLES IN A GOAT (*Capra hircus*)

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ABSTRACT

During routine dissection of a goat, the muscles and blood vessels at the entrance of the thorax were separated after removal of the thoracic limb. We found on the left, the ventral scalene muscle originating from VC_3 – VC_5 and inserting on the distal end of the first rib. The dorsal scalene muscle was poorly developed. It originated only from VC5 and ended with a thin aponeurosis on the second rib, the brachial plexus being situated between it and the ventral muscle.

Key words: muscle, scalene, variation, goat

INTRODUCTION

Animal cervical muscles are widely used as a model in the study of human neck Such a study is essential for elucidation of biological events occurring in various pathological processes in these body parts. As models, the cervical muscles of the monkey (*Tokiyoshi et al., 2004*), dogs and small ruminants (*Gooding et al., 1975; Wlitehill & Barry, 1985; Panjabi et al., 1988; Sharp et al., 1989; Villarraga et al., 1999*) are generally used. Numerous biomechanical studies of the cervical part of human and animal spine have been performed (*White et al., 1975; Deng & Goldsmith, 1987; Winters & Peles, 1990; Snijders et al., 1991; Kumaresan et al., 1999; Yoganandan et al., 2001*). In this place, major blood vessels and nerves are situated, whose branches innervate and supply with blood the musculature of this region.

A particular place is occupied by scalene muscles. They are considered as modified intercostal muscles. In humans, they connect the cervical vertebrae to the first two ribs (*Vankov et al., 1998).* There are three scalene muscles with species-related features in animals: *M. scalenus dorsalis (posterior), m. scalenus medius and m. scalenus ventralis (anterior)*.

The dorsal scalene muscle is developed in almost all domestic animals with the exception of sheep and horses. In cattle, it originates from the transverse processes of C_4-C_6 and inserted on the lateral surface of the second rib. In goats this muscle is similar to that in large ruminants, 4–5 cm wide and does not extend beyond the second rib (*Barone, 2000*) whereas in cattle – beyond the fourth rib (*Getty, 1975*).

The middle scalene muscle is encountered only in horses and cattle, originating at C_2-C_7 and inserting on the proximal end of the first rib. Before, this muscle was considered a part of the cervical iliocostal muscle and especially, of its superficial part (*Smuts et al., 1975*).

The ventral scalene muscle is the most developed compared to the other two. *Barone* (*2000*) describes the ventral scalene muscle in horses and cattle as originating from the third, fourth and fifth cervical vertebrae (C_3-C_5), directed backward and inserting on the anterior distal surface of the first rib. Its end part is divided into three from the branches of the brachial plexus (*Getty, 1975*).

Popescu (1980) obtain that in horses, only the middle scalene muscle is developed and that it is divided by the brachial plexus into dorsal and ventral parts (*pars dorsalis* and *pars ventralis*).

In the literature, no data were found about the anatomical variations of these

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muscles in the different animal species as well as reports about differences in the left and right part of the thorax.

MATERIAL AND METHODS

The investigation is based on a dissection of a goat's cadaver. The animal was from a "local goat", with breed-specific good musculature. The age, about 3 years, was determined by the teeth and the body weight was 45 kg. The animal was euthanised with thiabendazole sodium at a dose of 1 g/100 kg b.w. Prior to the euthanasia, the animal was in a good physiological condition.

Immediately after the euthanasia, the skin of the body and the limbs were separated on both sides. All underlying muscles were thoroughly identified and carefully removed. Thoracic limbs were removed from the body by means of dissections across the transversal part of the pectoral muscle, the latissimus dorsi muscle, the serratus muscle and the muscles anterior to the shoulder joint. The brachial plexus and the axillary artery were cut as close as possible to the thoracic limb.

RESULTS AND DISCUSSION

After removal of the left thoracic limb and the separation of the underlying muscles and blood vessels, it was found that the scalene muscles group was represented by the dorsal, the middle and the ventral scalene muscles. The dorsal scalene muscle is generally absent in small ruminants, but is usually found in goats (*Constantinescu, 2001)*. The ventral one is the most developed compared to the other two. It originates on the transverse processes of cervical vertebrae C_3, C_4, C_5 and inserts on the lower third of the first rib. The brachial plexus inserts immediately above it and below the dorsal scalene muscle. *Getty (1975)* reported that in ruminants, only the middle scalene muscle was developed and that is divided by the passing brachial plexus into dorsal and ventral parts (**Figure 1**).

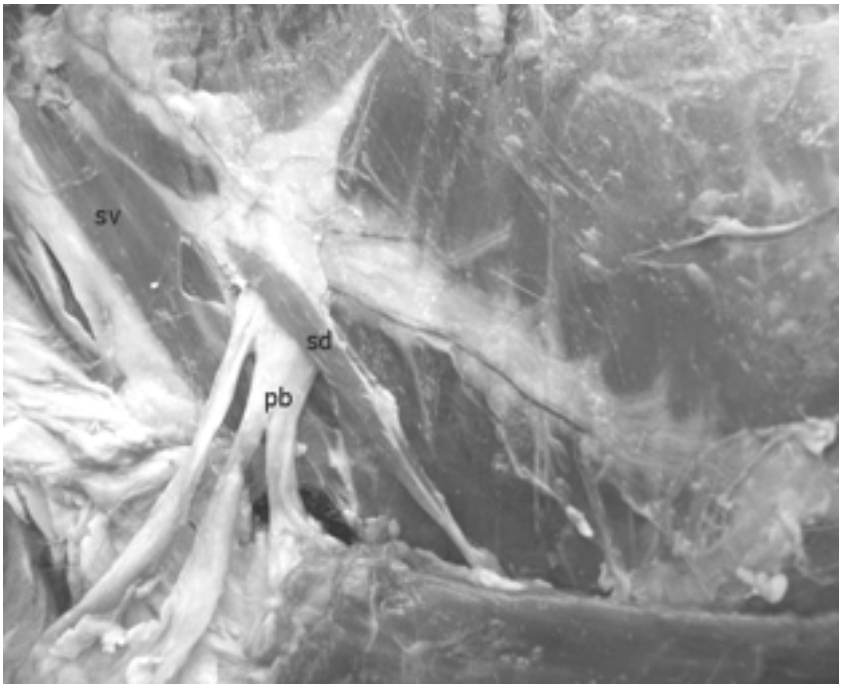

***Figure 1**. Left view. Pb- plexus brachialis; sd- m. scalenus dorsalis; sv- scalenus ventralis*

The middle scalene muscle is poorly developed. It occupies the space between C_5 and the first rib. Stefanov *at al., Constantinescu (2001),* define this muscle as consisting of two parts – superficial and deep, the latter originating from C_1 and inserting together with the superficial part on the proximal part of the first rib. In our case, this deep part of the muscle was absent in a left view (**Figure 2**).

The most superficial and ventral to the middle scalene muscle situates the dorsal scalene muscle. It represents and fine, this muscle band connecting the transverse process of C_5 to the second rib, transforming itself into a thin weak aponeurosis. *Barone (2000)* describes the muscle with origin at C_4-C_6 and inserting on the 3^{rd} -4^{th} rib. The muscle width is about 3 mm. The brachial plexus appears superficially, laterally to the thoracic cavity entrance, inserting between the ventral and the dorsal scalene muscles. From the plexus, the

thoracodorsal muscle is separated, that is the only to pass under the dorsal and middle scalene muscles and is directed backward towards the *latissimus dorsi* muscle, innervating it.

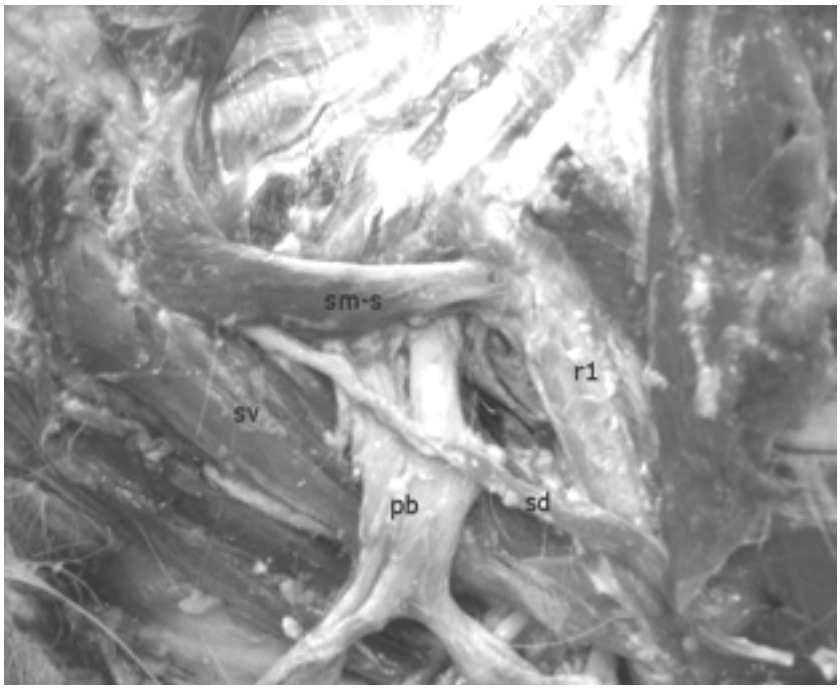

Figure 2. *Pb-plexus brachialis; r1- first rib; sv- scalenus ventralis; sm-s – scalenus medius, pars superficialis; sd- scalenus dorsalis*

On the right, the middle scalene muscle is composed of two parts – superficial that originates also at C_5 and inserts on C1 and deep part that originates at C_7, descending at an angle downward and inserting on the middle third of the first rib (**Figure 3**). The initial point of the brachial plexus is covered by the two parts of the middle scalene muscle and distally, appears superficially to the thoracic cavity passing between the bodies of the dorsal and ventral scalene muscles (**Figure 4**)

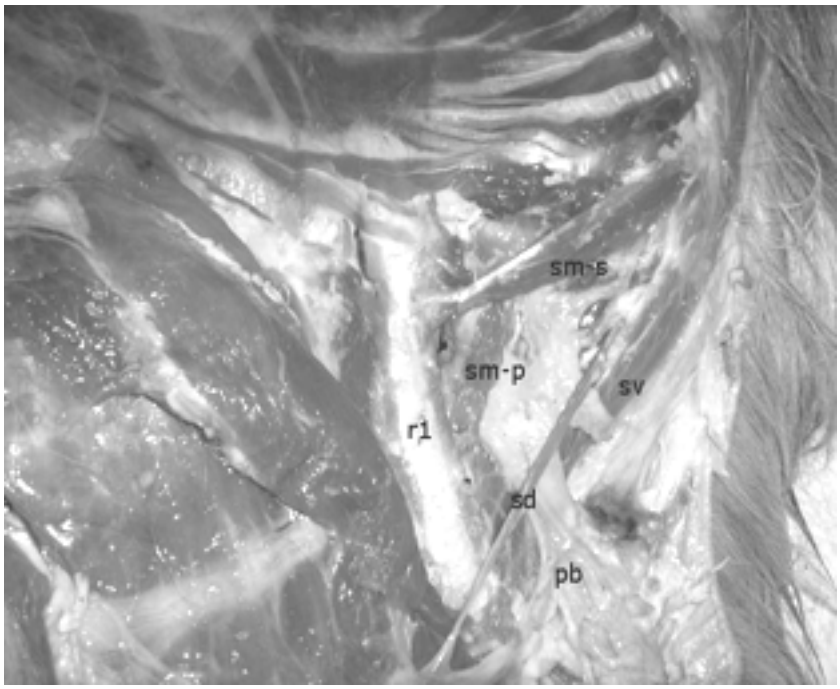

Figure 3. *Right view. r1-first rib; sm-s – scalenus medius, pars superficialis; sm-p – scalenus medius, pars profundus; sv-scalenus ventralis; pb-plexus brachialis*

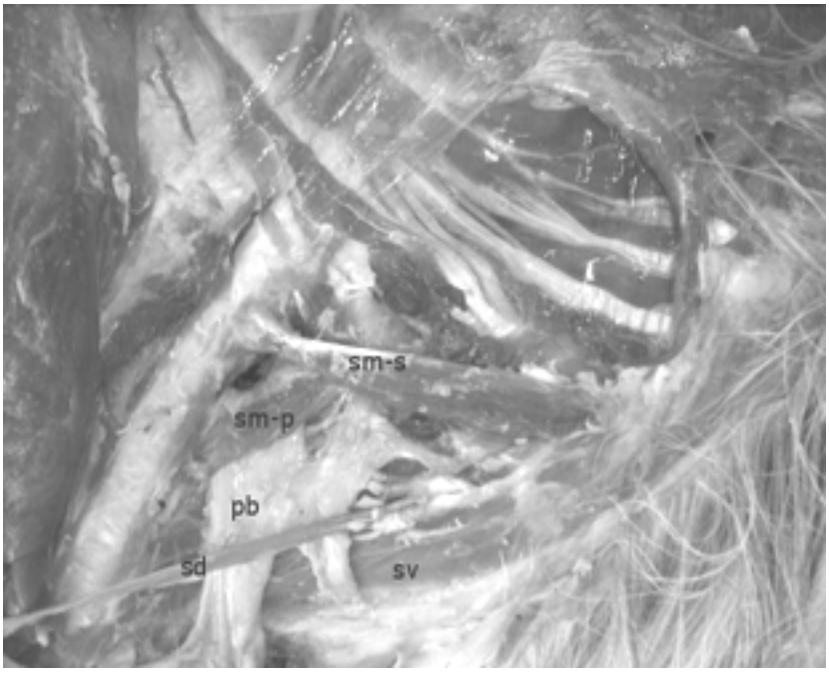

Figure 4. *Right view. ; sm-s – scalenus medius, pars superficialis; sm-p – scalenus medius, pars profundus; sv-scalenus ventralis; pb-plexus brachialis*

CONCLUSIONS

The scalene muscles in the goat exhibit certain variability. The differences consist mainly in the presence or absence of superficial and deep part of the middle scalene muscle. On the left, we did not discover a deep part of the middle scalene muscle. The brachial plexus appears superficially to the thoracic cavity passing between the bodies of the dorsal and ventral scalene muscles.

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