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A Rare Anatomical Variation of the Spinal Accessory: Case Report

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ABSTRACT

Anatomical variation in the location of the spinal accessory nerve as it relates to the internal jugular vein has been reported in the literature and anatomy texts. Knowledge of the landmarks of the spinal accessory nerve and its relationship to the internal jugular vein is extremely helpful in its identification during neck surgery for precluding neurovascular complications. The nerve mostly passes laterally (anterior) or medially (posterior) to the internal jugular vein at the level of the medial aspect of the posterior belly of the digastric muscle. However, there is a rare anatomical and surgical variant. In our case report, we describe an unusual relationship of the spinal accessory nerve to the internal jugular vein. In our case study, the nerve pierces the internal jugular vein.

1. Case report

A 35-year-old female who was healthy, presented with a neck mass that she had had for one month. A physical examination revealed a mass commencing on the anterior side of the neck with enlargement in multiple lymph nodes involving the right-side lymph nodes at level II, III, IV and V.

The fine needle aspiration report showed papillary thyroid cancer. The patient was taken to the operating room for surgical intervention. A half apron incision was made from the right side. As the dissection proceeded, at the upper end of the internal jugular vein, the accessory nerve was detected coursing through the center of the vein (Figure 1). Following surgery, no accessory nerve dysfunction was observed.

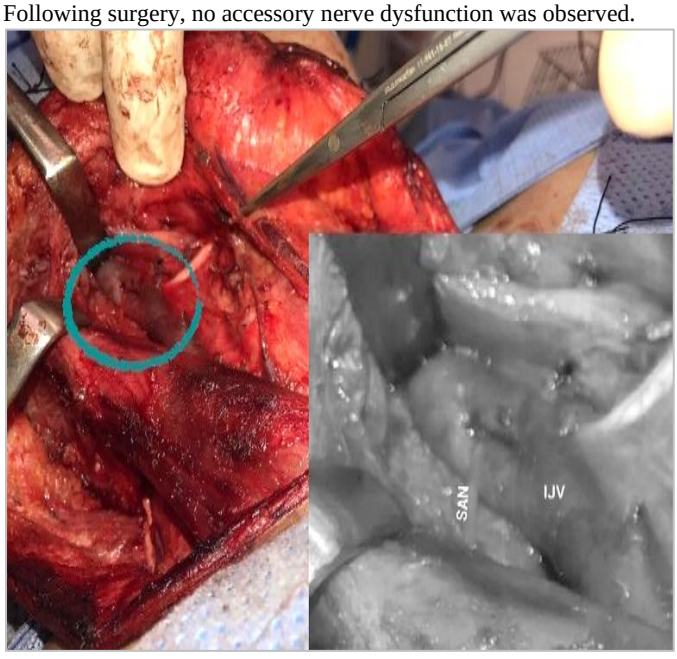

Figure 1: The intraoperative appearance of the patient is shown. The arrow ring shows the right spinal accessory nerve passing through the fenestrated internal jugular vein. SAN: spinal accessory nerve; IJV: internal jugular vein.

2. Discussion

The anatomical relationship between the spinal accessory nerve (SAN) and the internal jugular vein (IJV) is particularly important for precluding neurovascular complications. During a surgical intervention dealing with level II, the most important anatomical structure is the spinal accessory nerve. The spinal accessory nerve has been described as having various intracranial and extracranial connections with other nerves, and the term "spinal accessory nerve plexus" has been introduced to describe this (1). A lot of studies in the literature describe it and define the course of the accessory nerve and its relation to other structures in the neck; however, few articles have been published describing rare anatomical variations of this nerve sometimes seen intraoperatively in neck surgery (2-4). Moreover, most publications have been based on cadaver studies (5-8).

It's important to study anatomical relationships and variations in the spinal accessory nerve and internal jugular vein. In the case series of Lee et al., the SAN passed the IJV ventrally (anterior) in 39.8 percent of the cases, and dorsally (posterior) in 57.4 percent of the cases. In only 2.8 percent of the cases did the SAN pass through the fenestrated IJV, as in our case (9). In addition, Christine B. et al. found that the most common location of the SAN was lateral to the IJV (95 percent). In 2.8 percent of the cases, the SAN was identified as being medial to the IJV, and two nerves pierced the IJV. A new variant of the SAN splitting around the SAN was identified (10).

The terms "fenestration" and "duplication" were used interchangeably by authors in describing the accessory lumen of the IJV. Downie et al. suggested a new classification. They argued that the term "duplication" should be used for cases of the IJV joining the subclavian vein as two separate veins in an upside down Y pattern. They also mentioned that the term "fenestration" should be used for cases which have the IJV branching into two veins for some distance; the veins re-fuse and enter the subclavian vein as a single vein, as in our case (11).

Many theories have tried to explain this duplication (12). The vascular theory is the most common one that is usually accepted. According to this theory, the accessory nerve passes between two veins in fetal life: the lateral and the medial veins of the head. The lateral vein, which is superficial to the spinal accessory nerve, usually

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disappears, leaving the nerve superficial to the vein. More rarely, the medial vein disappears, leaving the nerve lying deep below the vein. Duplication is thought to result from the appearance of a secondary venous ring at a lower level surrounding the spinal accessory nerve. The persistence of this secondary ring in adult life may be important in the etiology of venous duplication. The other less common theory assumes a neural or bony anomaly. The neural hypothesis depends on the position of the spinal accessory nerve in relation to the transverse process of the atlas. Normally, the nerve emerges in the neck at the level of this transverse process, but it may lie up to two centimeters below the process. If this occurs, the development of the internal jugular vein may be disrupted, leading to its duplication. The bony hypothesis suggests that a variation in the ossification of the bony bridges of the jugular foramen causes the venous duplication. However, this theory does not explain the relation of the spinal accessory nerve to the duplicated jugular vein (13).

3. Conclusion

The most common location of the spinal accessory nerve was lateral to the internal jugular vein. Also, the frequent rare variant was the nerve being medial to the internal jugular vein or passing through the fenestrated internal jugular vein. The cause of this variation is generally accepted to be an embryological insult. Surgeons should be aware of the common location as well as the rare variation during surgical manipulation at level II in order to avoid iatrogenic injury to the spinal accessory nerve, which can cause shoulder syndrome (9).

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