

# An Unusual Variation of the Accessory Nerve

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## ABSTRACT

In this manuscript, we report an anatomic variation of the spinal accessory nerve for the first time in the literature. The spinal accessory nerve was exited from the skull base in duplicate, and these two branches merged in the anterior triangle of the neck and continued as a common branch in a 68-year-old male patient who underwent total laryngectomy and bilateral modified neck dissection.

**Keywords:** Anatomy, anatomic variations, cranial nerves, spinal accessory nerve

## INTRODUCTION

The spinal accessory nerve (CN 11), with its intracranial and extracranial branches, forms the CN 11 plexus together with other cranial, cervical, and sympathetic nerves. Functionally, it provides the union of the autonomic, motor, and sensory nerves of the mouth, palate, pharynx, and larynx for effective functioning of swallowing, phonation, and respiration (1). This plexus has high individual flexibility. Variable connections between intracranial and extracranial nerve roots and nerves make the neural composition of the plexus very different amongst individuals (2).

The most common cause of CN 11 damage is surgical procedures in the head and neck region. It may occur especially after lymphadenectomies are performed in the posterior cervical triangle, neck dissection, or tumor excision (3). Therefore, knowing the morphology and topography of cervical nerve structures and variations will positively result in head and neck surgeries. This case report describes a branching variant of CN 11 that has not been reported in the literature before.

## CASE REPORT

A 68-year-old male patient underwent total laryngectomy and bilateral modified neck dissection due to advanced-stage

laryngeal squamous cell carcinoma (T3N2bM0). The 11<sup>th</sup> CN was found in its standard anatomical location on the left side of the neck. However, it was observed that the nerve exited from the skull base in duplicate and that these two branches merged in the anterior triangle of the neck and continued as a common branch (Figure 1). Stimulating both nerve branches with a Medtronic NIM 3.0 Nerve Monitor nerve stimulator with 0.5 mA caused a contraction in both SCM and trapezius muscles. We preserved both of the nerve branches. There was no variation in the CN 11 and other anatomical structures in the right neck of the patient. We did not observe any complications in the early and late postoperative periods. The patient gave informed consent for the publication of this case report.

## DISCUSSION

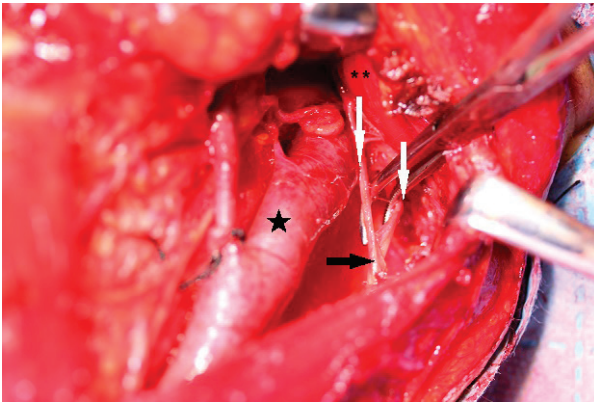
The accessory nerve has motor fibers consisting of spinal and cranial roots. The spinal root consists of C1 and C5 cervical segments and enters the skull base with the foramen magnum and joins with the cranial roots. The nerve descends inside the skull to the jugular foramen and exits the jugular foramen together with the vagus nerve and the glossopharyngeal nerve (4-7). It is the only nerve among the cranial nerves that receives some of its branches from the spinal cord. CN 11 trunk passes through the jugular foramen into the neck. Then it lies between

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**Figure 1:** Intraoperative photograph taken during left selective neck dissection, showing the accessory nerve double exiting from the skull base and merging into a single branch. The sternocleidomastoideus muscle was retracted laterally. (The white arrow indicates the separate branches of the duplicated accessory nerve, the black arrow indicates the joining accessory branch, the star indicates internal jugular vein, and double little star indicates posterior belly of digastric muscle)

the internal jugular vein (IJV) and the internal carotid artery. It crosses the IJV at the posterior part of the digastric muscle. The common trunk enters the retrostyloid space (8). CN 11 descends forward and past the IJV laterally, although there are some variations. Then CN 11 generally traverses the transverse process of the atlas anteriorly. Occasionally, it lies medial or lateral to the transverse process of the atlas. It then descends medially to the styloid process and passes the digastric muscles and stylohyoid (6). Then it descends inferiorly to give motor branches to the SCM muscle. The SCM branch extends over the occipital artery and enters the inside of the upper part of the SCM muscle. Once inside the muscle, it connects with fibers from C2 only or C3 only, or both C2 and C3 (9). After that, it enters the posterior triangle inferior to the intersection of the upper and middle third of the sternocleidomastoid muscle, shows a posterior-inferior course, and disappears at the level of the upper part of the trapezius muscle (2, 9).

Anatomical variations of the CN 11 have been reported in the literature. The anterior and posterior rootlets of the first five cervical nerves contribute to the spinal portion of it. Four different patterns have been defined with the intradural connection of the CN 11 and first spinal rootlets. For the type 1 variant, the posterior root of C1 is absent, and CN 11 connects with the anterior root of C1. In the type 2 variant, there is no connection between the CN 11 and the roots of C1. In the type 3 variant, CN 11 connects at the junction of the rootlets of C1 or the anastomotic branch of C1 to the posterior rootlet. Finally, in the type 4 variant, it connects the CN 11 with the C1 root, which does not have a spinal cord connection (10, 11).

In a cadaveric study, it was observed that in 87% of the cases, the CN 11 starts from the anteromedial of the IJV within the jugular foramen. In neck dissections, it was observed that 67% of the nerve was lateral to the IJV after exiting the foramen

jugulare (4). In another study, it was observed that the CN 11 crossed the IJV anteriorly (7).

The differences in the course of the CN 11 in the posterior cervical triangle and the differences in the number of branches ending in the trapezius are among the most common variations seen in the literature (5-7). Apart from this, Overland showed that the CN 11 passes inside the IJV (6). In another study, it was shown that by connecting the CN 11 and the facial nerve, both nerves provide the innervation of the SCM muscle. In the same study, it was shown that the CN 11 made intracranial duplication for the first time (7).

In our case, when the SCM was retracted laterally in the second region during neck dissection, it was observed that the CN 11, which was detected in its standard anatomical location, split into two branches before exiting from the skull base. We confirmed the nerve by using the nerve simulator with 0.5 mA as it is in the literature (12). With the stimulation of both nerve branches, muscle activation was observed in both the SCM and the trapezius muscle. The fact that the nerve converges distally before entering the SCM makes our case different from the first duplication described by Tubbs et al. (7). The variation described with this feature is the first in the literature.

CN 11 is one of the essential structures of the head and neck. It is vital for the surgeon to know the anatomy of the CN 11, as iatrogenic injuries to the nerve will significantly impair the patient's quality of life. So, care should be taken when working around the nerve, bearing in mind that variations can occur.

**Informed Consent:** Written informed consent was obtained.

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