

Unilateral separation of the hypoglossal nerve from the cranial cavity through two hypoglossal foramina: case report

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Abstract

The twelfth cranial nerve, known as the hypoglossal nerve, is a somatomotor nerve. Functionally, it innervates the intrinsic muscles of the tongue and all extrinsic tongue muscles except the palatoglossus. Anatomically, the hypoglossal nerve exits the cranium via the hypoglossal canal. This case report describes a variation identified during routine dissection of two adult cadavers in the dissection laboratory of the Karabük University Faculty of Medicine, Department of Anatomy. During the standard dissection procedure, the cranial cavity was first exposed, and the brain tissue was removed. Subsequent examination revealed that, in one cadaver, the hypoglossal nerve on the left side exited the cranium through two separate small foramina instead of the typical hypoglossal canal. A review of the literature indicated that reports on this anatomical variation are scarce. This case report aims to contribute valuable insights to the field of anatomy and provide critical information for clinicians performing surgical procedures in this region.

Keywords: anatomical variation; cranial cavity; hypoglossal nerve

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Introduction

The hypoglossal nerve, also known as the twelfth cranial nerve, is composed exclusively of motor fibers. It innervates all intrinsic and extrinsic muscles of the tongue, with the exception of the palatoglossus muscle. The palatoglossus muscle is innervated by the cranial part of the accessory nerve. The nucleus of the hypoglossal nerve is located in the medulla oblongata (bulb) and is referred to as the hypoglossal nucleus. The nerve exits from the medulla through the hypoglossal canal. It then descends, traversing the carotid and digastric triangles, ultimately reaching and innervating the muscles of the tongue.^[1–4]

The morphology of the cranium, along with the structure of its foramina and canals, provides critical insights into human evolution. The hypoglossal canal, situated on the occipital condyle and anterolateral to the foramen magnum, is a significant anatomical feature.^[5]

Case Report

This case was identified during routine cranial dissection of cadavers in the dissection hall of the Karabük University

Faculty of Medicine, Department of Anatomy. The dissection process involved preparing the cadavers and dissection materials, followed by removing the scalp using a scalpel. The calvaria was then opened with a bone saw, bone-cutting spiral, and osteotome, and the dura mater was carefully dissected. Subsequently, the brain tissue was mobilized and removed to expose the skull base. During the examination of the cranial nerves, it was observed that the hypoglossal nerve on the left side of one cadaver emerged from the anterolateral sulcus as a single root but exited the cranium through two small foramina instead of the typical hypoglossal canal (**Figure 1**). Further dissection of these foramina revealed that they each extended into distinct bony canals (**Figure 2**).

Discussion

The variation anatomy is a crucial branch of anatomical science, focusing on differences that deviate from the typical structure of the human body. This field is built upon extensive anatomical knowledge and the experiences of clinicians performing interventional procedures.

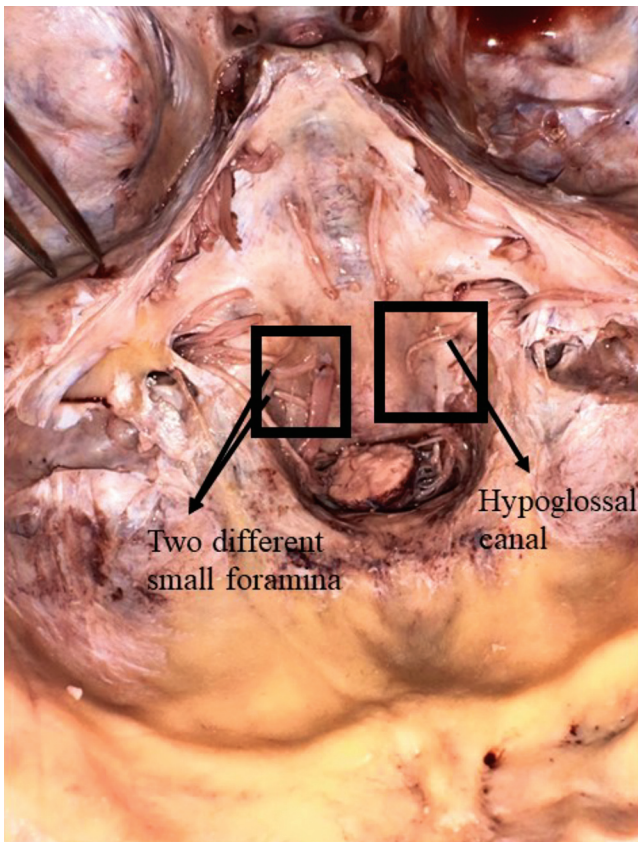


Figure 1. Hypoglossal nerve emerging from two different foramina.

While most anatomical variations do not adversely affect the human body, some can lead to functional impairments or issues involving surrounding tissues. Among anatomical structures, blood vessels exhibit the greatest variability. Regarding nerves, peripheral nerves are the most prone to variation. Variations in the nervous system are significant as they can influence both the nerve's course and its function.^[6]

Variations of the hypoglossal nerve most commonly occur in its course after exiting the cranium, with intracranial variations being relatively rare.^[1] For instance, Islam et al.^[7] reported a case of a 50-year-old male undergoing surgery for facial paralysis, where the hypoglossal nerve was found to give an aberrant branch in the carotid triangle before entering the tongue Bergman et al.^[8] described a case where the hypoglossal nerve arose unusually from the posterior aspect of the medulla oblongata.

The hypoglossal canal, an anatomically narrow structure located anterolateral to the foramen magnum, accommodates the hypoglossal nerve, the meningeal branch of the ascending pharyngeal artery, and small vascular plexuses. Its clinical significance stems from its proximity to the occipital lobe and its role in skull base surgeries.^[9] Bhuller et al.^[10] studied 32 cadavers and reported that the hypoglossal canal was bisected by a small bony fragment in



Figure 2. Two separate bony hypoglossal foramina (dissected).

28.12% of cases. Similarly, Wysocki et al.^[11] in their study of 100 human skulls and various mammalian skulls, identified double hypoglossal canals in 43% of human skulls. Carolineberry and Bery^[12] documented a variation rate of 7–27.4% for the hypoglossal canal in their study on cranial variations. Nikumbh et al.^[5] analyzing 100 adult dry skulls, found unilateral hypoglossal canals in 25% of cases and bilateral canals in 3%. Zaidi et al. observed double hypoglossal canals in 5 of the 40 dry skulls they studied.^[13] Francisco et al.^[14] examined 492 human skulls and identified double hypoglossal canals in 97 specimens. Muthukumar et al.^[15] in a study of 50 dry skulls, noted that the hypoglossal canal was divided into two by a bony septum in 30% of the cases.

In the present case, it was observed that the hypoglossal nerve exited the cranium via two unilateral small foramina instead of the typical hypoglossal canal. It is believed that this finding provides valuable insights for future studies on anatomical variations in cadavers and offers critical guidance for surgeons operating in this region.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions

All authors contributed equally.

Ethics Approval

The authors confirm that they have complied with ethical guidelines for cadaveric studies.

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