

Surgical anatomy of the hypoglossal nerve

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Detailed knowledge of regional anatomy and anatomical variations is fundamental to achieve successful surgical procedure. Although primary objective of neurosurgery is to restore physiological vital functions, remove intracranial mass and prevent further brain damage, while preserving tissue and organ integrity, the neurosurgeon takes the risk of impairing non-vital functions. Occasionally, as with the hypoglossal nerve, the impairment of anatomical structures found on surgical route is due to their still barely known anatomical relations and variations. In order to provide an anatomically and surgically oriented classification to guide neurosurgical procedures and to ensure the preservation of nerve integrity, the aim of the present study is to detail the course of the 12th cranial nerve (CN) and to establish anatomical landmarks for surgeons.

A combination of anatomical dissection of the neck and oral floor and skull base far lateral approach of 6 cadaveric human heads (3 male, 3 female, age 62±4) was performed, on both sides, to explore and follow the entire course of the 12th CN, from its emergence in the preolivary sulcus to the tongue. Skeletal, muscular and vascular relationships were meticulously analyzed and documented during anatomic and surgical dissections. According to our observations, hypoglossal nerve can be divided into five segments. The first two are intracranial, *cisternal* and *intracanal*, and the other three, namely the *descending*, *horizontal* and *ascending*, are extracranial. Intriguingly, we found unreported relations of the nerve that, apart from their anatomical interest, have tremendous significance for surgeons operating on head and neck. Specifically, the *intracanal* segment passes through a venous lacuna that, to the best of our knowledge, was never described before as such. This venous structure drains into the jugular bulb and acts as a sheath between the nerve and the osseous wall of the canal. The nerve in the venous sheath bends and it is elastically fixed to the osseous wall of the canal by fibrous bands. Therefore, the venous lacuna guarantees mobility to the nerve, and cushion the nerve from the bone. As for the *descending* segment, during its course it has very close relationship with the internal jugular vein, the internal carotid artery, the posterior belly of digastric muscle, and the styloid process and muscles inserting on it. The *descending* segment provides the *ansa hypoglossi*, branches to muscles inserting on the styloid process and to the sternocleidomastoid muscle. The *horizontal* segment has relationship with the intermediate digastric tendon, the stylohyoid, hyoglossus and mylohyoid muscles and the submandibular gland. The *ascending* segment might be very short and sometimes it is absent. The fifth and last segment becomes deeper at the anterior edge of hyoglossus muscle, and terminates into several branches supplying intrinsic and extrinsic musculature of tongue.