Internal Jugular Vein Duplication: Anatomic Relationship With the Spinal Accessory Nerve

Badr Ibrahim, MD, [*] *Ilyes Berania, MD,* [†] *Sami P. Moubayed, MD,* [‡] *Apostolos Christopoulos, MD, MSc,* [§] *and Tareck Ayad, MD* [‖]

Level II neck dissection is a commonly performed procedure in head and neck surgery. It carries the risk of injury to the spinal accessory nerve (SAN) and the internal jugular vein (IJV). Injury to any of these structures leads to increased intraoperative and postoperative complications and morbidity. Knowledge of the anatomic relation and possible variations from the norm is vital to decrease the morbidity of this frequently practiced procedure. This report describes 2 rare variations of the relation of the SAN to the IJV: *1)* the IJV splitting with SAN passage through the IJV window and *2)* the IJV splitting without SAN passage through the IJV window. Preoperative imaging and the pertinent literature regarding the variability in the relations of these structures are reviewed.

J Oral Maxillofac Surg 74:1502.e1-1502.e4, 2016

Conservation neck surgery has evolved over the years to preserve non-lymphatic structures such as the sternocleidomastoid, internal jugular vein (IJV), and spinal accessory nerve (SAN) when not involved by malignancy to decrease morbidity. Lateral neck dissection, widely indicated in head and neck cancer, carries precisely the risk of injury to the IJV and the SAN. Dissection involves removal of all lymph nodes that lie along the IJV from the skull base to the clavicle. In level II, the SAN should be identified and followed along its course up to the posterior belly of the digastric muscle, where it is most frequently anterior to the IJV.[1] This report describes a rare case of transvenous passage of the SAN with IJV splitting and a case of IJV splitting without passage of the cranial nerve XI through the split IJV. Knowledge of these anatomic variations is critical for improved outcomes in cases in which the SAN does not follow its usual course.

Report of Cases

CASE 1

A 58-year-old man was brought to the operating room for a lateral neck dissection for a regional recurrence of laryngeal squamous cell carcinoma treated with a transoral supraglottic partial laryngectomy 2 years previously. A lateral neck dissection was performed. During dissection of level IIA, it was noted that the SAN passed through a splitting of the IJV (Fig 1). The neck dissection was uneventful and the patient did not show any sign of SAN palsy on long-term follow-up.

CASE 2

A 73-year-old woman was brought to the operating room for a selective node dissection of left levels II to V for metastatic papillary thyroid cancer a year after undergoing thyroidectomy. During neck dissection, splitting of the IJV was encountered without passage of the SAN between the 2 arms of the split IJV (Fig 2).

Received from the Division of Otolaryngology-Head and Neck Surgery, Centre Hospitalier de l'Université de Montréal (CHUM), Montreal, Canada.

*Resident.

†Resident.

‡Fellow.

§Attending Surgeon and Consultant.

‖Attending Surgeon and Consultant.

Address correspondence and reprint requests to Dr Ibrahim: Centre Hospitalier de l'Université de Montréal and Hôpital Notre Dame, 1560 Sherbrooke Street, Montreal, QC H2L 4M1, Canada; e-mail: ibra.badr@gmail.com

Received January 26 2016

Accepted March 7 2016

0278-2391/16/00267-6

http://dx.doi.org/10.1016/j.joms.2016.03.002

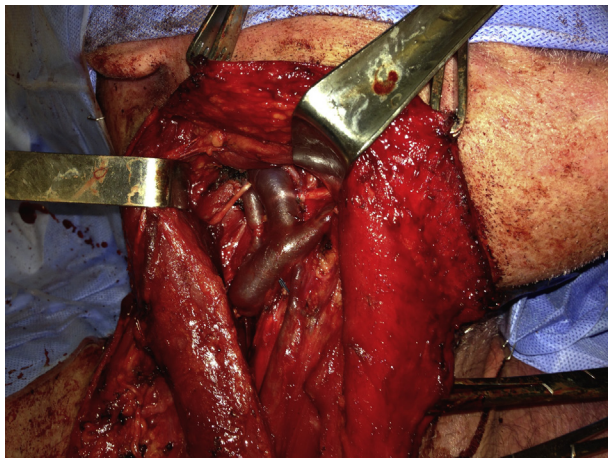

FIGURE 1. Completed right neck dissection. Fenestration of the internal jugular vein with penetration of the spinal accessory nerve.

Ibrahim et al. Internal Jugular Vein Duplication. J Oral Maxillofac Surg 2016.

Discussion

Various isolated reports over the years have described the existence of an anatomic variation in the position of the SAN relative to the IJV, whereby the SAN passes through a fenestration in the IJV.[1-3] The SAN passes anterior to the IJV in 56 to 90% of cases (Fig 3A) and posterior to the IJV in 10 to 44% (Fig 3B) of cases.[4,5] An IJV duplication with SAN passage through the 2 arms of the IJV is a rare anatomic finding, with an estimated incidence ranging from 0.4 to 3.3%[3] (Fig 3C). An even rarer occurrence is a splitting of the IJV without passage of the SAN through the fenestration. A very rare variant of the SAN in relation to the IJV was described by Taylor et al,[6] whereby the SAN split in 2 branches, with one branch passing anterior and the other medial to the IJV at the level of the digastric muscle.

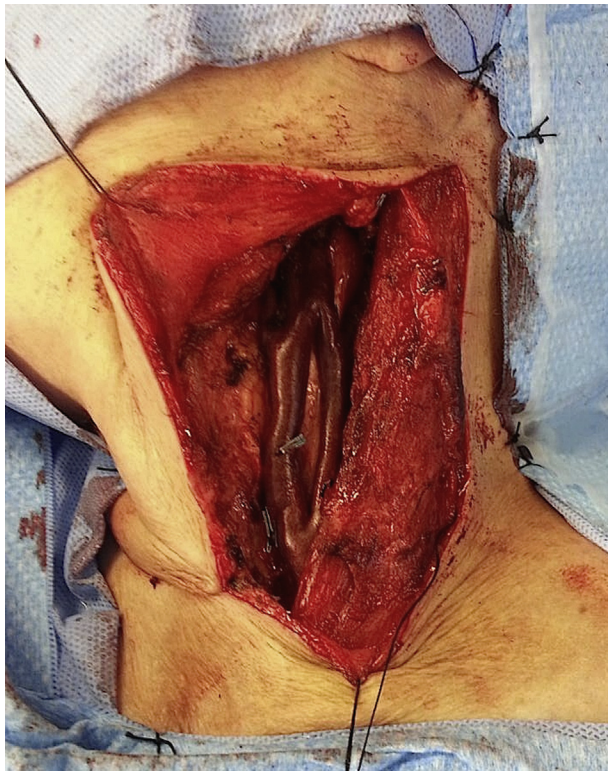

FIGURE 2. Completed left neck dissection. Fenestration of the internal jugular vein without penetration of the spinal accessory nerve.

Ibrahim et al. Internal Jugular Vein Duplication. J Oral Maxillofac Surg 2016.

The IJV can be duplicated or split. These 2 terms are often used interchangeably but refer to 2 distinct patterns of multiple IJVs as defined by Downie et al.[7] In the 2 patterns, the IJV exits the jugular foramen as a single vessel. In duplication, the IJV separates into 2 distinct vessels coursing independently and draining separately in the subclavian vein. In fenestration, the 2 veins bifurcating from the IJV reunite proximal to the subclavian vein to drain in the subclavian vein as a single vessel.

Knowledge of the anatomic relation between the SAN and the IJV carries practical implication in functional and radical neck dissections. In the former, care is taken to identify and preserve the SAN and the IJV. Given the propensity of the nerve to lie superficial to the vein, many surgeons consider it safe to separate all tissues superficial to the SAN in a level II neck dissection without visualizing the IJV along its full course. This can lead to accidental damage to the IJV. Conversely, when dissecting deep to the IJV, the SAN can be accidentally damaged or severed. Similarly, in radical and modified radical neck dissection, failure to recognize a SAN coursing through or deep to a fenestrated or duplicated IJV can lead to accidental preservation of a venous branch or unexpected damage to the duplicated branch of the IJV[8] or to the SAN.

The morbidity associated with injury to any of these structures is substantial. Injury to the SAN can lead to a shoulder pain syndrome (pain in the affected shoulder, shoulder shrug weakness, limitation in active range of motion, or scapular winging).[9] This syndrome is an important determinant of postoperative quality of life.[10] Also, unnecessary damage or sacrifice of the IJV can lead to considerable intraoperative bleeding, possible intracranial edema, and decreased options for eventual microvascular reconstruction.

Knowledge of the existence of these anatomic variants in the relation between the SAN and the IJV and intraoperative vigilance remain the best way to avoid complications in level II neck dissections. However, clinicians can extract predictive information from preoperative imaging. Indeed, splitting of the IJV in case 1 was visible on preoperative computed tomogram (Fig 4) and should alert the surgeon that the SAN might be in an unusual relation to the IJV. Other publications