

Relations of the accessory nerve with the internal jugular vein: surgical implications in cervical lymph node clearances

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Abstract

The position of the lateral branch of the accessory nerve in relation to the internal jugular vein is given variously by different authors. In surgery of the neck, and especially in conservative cervical lymph node clearances, the lateral branch of the accessory nerve is protected when it is situated lateral to the vein. However, when the nerve is medial to the vein there is a risk of damage to the internal jugular vein. A prospective peroperative study of 123 cervical lymph node clearances, as well as a dissection study of 5 fresh subjects, was carried out to determine the position of the lateral branch of the accessory nerve in relation to the internal jugular vein. The surgical study showed that the lateral branch of the nerve was anterior and lateral to the vein in 122 of the 123 clearances, while the cadaveric study found the nerve always anterior and lateral to the vein. Thus the risk of injuring the internal jugular vein during cervical lymph node clearances is very small. The differences observed by authors may be explained by collapse of the internal jugular vein observed during cadaveric dissections.

The position of the lateral branch of the accessory n. (AN) in relation to the internal jugular v. (IJV) is variable. It may pass in front of and then lateral to the vein, or else medially and then behind it. This lateral branch of the AN is an important surgical landmark in the technique of cervical lymph node clearance [4]. The surgeon follows its course during the dissection and divides all the structures lateral to the nerve to perform the so-called "supra- and retrospinal" part of the clearance [4]. When the lateral branch of the AN is lateral to the IJV, it is protected. When the lateral branch of the AN is medial and posterior to the IJV it may be damaged by the surgeon.

The aim of our simultaneous anatomic and prospective surgical study was to define the frequency of the different positions of the lateral branch of the AN in relation to the IJV and to assess the risk of damaging the AN during conservative cervical lymph node clearance.

Material and methods

Our study comprised

1. A prospective study of 91 patients (77 men, 14 women) operated for conservative cervical lymph node clearance - right, left or bilateral - by the same surgeon between 1 December 1993 and 31 October 1999. The operations were all performed as part of the surgical treatment of cancers of the oral cavity. In every case the lymph node clearance(s) preceded the surgical excision. The lateral branch of the AN was routinely dissected from the medial aspect of the posterior belly of the digastric m. up to its entry into the sternocleidomastoid m., thus allowing visualization of the entirety of the crossing of the AN and the IJV. The position of the lateral branch of the AN in relation to the IJV, whether anterior and lateral or posterior and medial, was routinely noted (Table 1).

	Right clearances	Left clearances	Bilateral clearances
Number of clearances	29	30	32
Lateral branch of AN anterior and lateral to IJV	28	30	32
Lateral branch of AN medial and posterior to IJV	1	0	0

Table 1. Results of the surgical study. AN, accessory n. IJV, internal jugular v.

2. A dissection study in five fresh cadavers. The cervical dissections were bilateral and covered the position and course of the lateral branch of the AN in relation to the IJV from the jugular foramen to the penetration of the nerve into the sternocleidomastoid m.

Results

Surgical study (Table 2)

Authors	Lateral branch of AN anterior and lateral to IJV	Lateral branch of AN medial and posterior to IJV	Total
Keith (1896)	37 (74%)	13 (26%)	50
Tandler (1907)	100 (66.6%)	50 (33.3%)	150
Piffer (1980)	12 (19%)	52 (81%)	64
Khee-Chee (1986)	18 (56%)	14 (44%)	32
Diop (1987)	61 (58%)	45 (42%)	106
Caliot (1989)	90 (90%)	10 (10%)	100

Table 2. Review of the literature. AN, accessory n. IJV, internal jugular v.

During the 91 surgical procedures (123 nodal clearances), we noted that in 122 cases the lateral branch of the AN passed in front of and lateral to the IJV, following a course obliquely caudal and lateral (Fig. 1). In only one of the 123 clearances the lateral branch of the AN passed medial to and then behind the IJV, following a course obliquely caudal and lateral (Fig. 2).



Fig. 1 Operative view of right cervical nodal clearance. The digastric m.(D) is above. The lateral branch of the accessory

n. (*N*) passes in front of and lateral to the internal jugular v. (*V*)



Fig. 2 Operative view of right cervical nodal clearance. The digastric m. (*D*) is above. The lateral branch of the accessory n. (*N*) passes medial to and then behind the internal jugular v. (*V*)

Anatomic study

During the dissections, in every case the lateral branch of the AN travelled in front of and lateral to the IJV, following a course obliquely caudal and lateral. In one dissection the lateral branch of the AN gave a false appearance of being posterior to the IJV, which was collapsed (Figs. 3, 4).

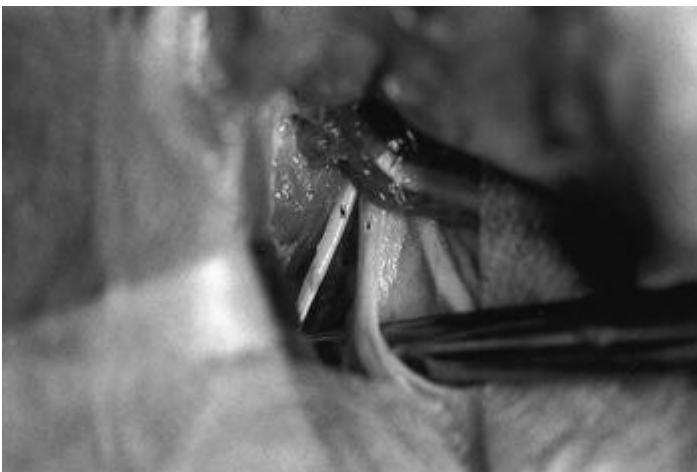


Fig. 3 Right cervical dissection of a fresh cadaver. The lateral branch of the accessory n. (*N*) may falsely seem posterior to the internal jugular v. (*V*), which is collapsed. It is essential to carry the dissection of the nerve to the medial aspect of the posterior belly of the digastric m. (*D*)



Fig. 4 Dissection of the subject in Fig. 4 carried to the medial aspect of the digastric m., which is retracted. The lateral branch of the accessory n.(N) passes in front of and lateral to the internal jugular v.(V)

Discussion

In our study a position of the lateral branch of the AN posterior and medial to the IJV proved exceptional. This posterior position represented 0.8% of cases (1/123), considering only the prospective study of the patients operated for cervical nodal clearance. It represented 0.75% of cases (1/133) if we combine the results of the studies on both operated patients and dissected cadavers. The risk of injury to the IJV during the performance of cervical lymph node clearance because of variation of the position of the lateral branch of the nerve is therefore very small. This risk is often associated with the presence of satellite adenopathies of the AN, which may render dissection of this region more difficult. However this may be, it is advisable to begin the surgical approach to this region with a study of the AN, bearing in mind that the nerve may, exceptionally, be situated medial to the IJV.

The material used for this study was not uniform. It included both fresh cadavers and patients operated for nodal clearance. These procedures were not bilateral in every case, the indication for unilateral or bilateral clearance depending essentially on the position of the tumor in the oral cavity.

This study was concerned with a localized section of the course of the AN, from its crossing with the IJV to its entry into the sternocleidomastoid m., as the dissection performed in the surgical clearances is restricted to this short segment.

A review of the literature shows that, for most authors [2-3, 5-8, 10-11] (Table 2), the lateral branch of the AN is in a position anterior and lateral to the IJV. Earlier authors (Keith [7] in 1896 and Tandler [10] in 1907), described the lateral branch of the nerve in a position anterior and lateral to the IJV in 66-74% of cases. More recent authors have described the lateral branch of the AN in this anterior and lateral position in 56-58% of cases [8, 3]. Only Piffer et al [9], in 1980, described the lateral branch in a position medial and posterior to the IJV in 81% of cases.

Our results are very different from those of all these authors, but agree with those of Truffert [12] and of Testut and Latarjet [11], who stated that the lateral branch of the AN is always anterior and lateral to the IJV. Hovelacque [5] states that the lateral branch is "much more often" anterior to the vein.

How are we to explain such differences between these authors? Until now, every author has studied the position of the AN in cadaveric dissections, whereas the greater part of our study dealt with conservative nodal clearances in live subjects. We found that in all the dissections of cadavers, even fresh ones, the IJV could be collapsed, which modifies its relations with the AN. If dissection of the IJV is not carried high enough, at least as far as the medial aspect of the digastric m., the nerve may falsely seem to lie posterior to the vein (Fig. 3). A recent study by Adetokunboh et al [1] concerning the anatomy of the jugular foramen, confirms our results in dissections of 10 cadavers (20 sides), the AN was in a position anterior and lateral to the IJV in the retrostyloid space of the lateropharyngeal region in 19 dissections, i.e. in 95% of cases. When studying the position of the lateral branch of the AN during cadaveric dissections, it is important to carry the dissection of the nerve as far as the medial aspect of the posterior belly of the digastric m. in the retrostyloid space.

References

1. Adetokunboh Ayeni S, Kenji Ohata, Kiyooki Tanaka, Akira Hakuba (1995) The microsurgical anatomy of the jugular foramen. *J Neurosurg* 83 903-909
2. Caliot Ph, Bousquet V, Midy D, Cabanié P (1989) A contribution to the study of the accessory nerve surgical implications. *Surg Radiol Anat* 11 11-15
3. Diop EM, Sow ML, Diop LS, Sylla S (1987) Considérations anatomiques concernant le nerf spinal accessoire. *Ann Oto-laryng* 104 227
4. Guerrier Y (1980) *Traité de technique chirurgicale ORL et cervico-faciale. Tome IV.* Masson, Paris, pp 56-123
5. Hovelacque A (1927) *Anatomie des nerfs crâniens et rachidiens et du système grand sympathique chez l'homme.* Doin, Paris, pp 252-253
6. Hill JH, Olson NR (1979) The surgical anatomy of the spinal accessory nerve and the internal branch of the superior laryngeal nerve. *Laryngoscope* 89 1935-1942
7. Keith A (1896) The relative position of the spinal nerve to the jugular vein, in Hovelacque A (1927) *Anatomie des*

nerfs crâniens et rachidiens et du système grand sympathique chez l'homme. Doin, Paris, pp 252-253

8. Khee-Chee S, Peter J, John P, Gerald W (1986) Anatomy of the accessory nerve and its cervical contribution in the neck. *Head Neck Surg* 9 111-115

9. Piffer CR, Garcia PJ, Soares JC (1980) Trajet et relations de la branche externe du nerf accessoire au niveau de la première partie de la veine jugulaire interne. *Anat Anz* 148 252-257

10. Tandler J (1907) Die Entwicklung der Lagebeziehung zwischen N. accessorius und V. jugularis beim Menschen. *Anat Anz* 31 473-480

11. Testut L, Latarjet A (1949) *Traité d'Anatomie Humaine Tome III*. Doin, Paris, pp 187-193

12. Truffert P (1922) *Le cou. Anatomie topographique*. Arnette, Paris, p 62

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