



Case Report

The rare origin of the suprascapular artery arising off the internal thoracic artery in the presence of the thyrocervical trunk: clinical and surgical implications

Published online December 2nd, 2011 © <http://www.ijav.org>

Stavros ATASAS

Jacob N. FOX

H. Wayne LAMBERT *

Department of Neurobiology and Anatomy, West Virginia University School of Medicine,
Robert C. Byrd Health Sciences Center, Morgantown, West Virginia, USA.



* Dr. H. Wayne Lambert, PhD
Associate Professor
West Virginia University School of Medicine
Robert C. Byrd Health Sciences Center
Department of Neurobiology and Anatomy
HSN 4052; P.O. Box 9128
Morgantown, WV, 26506-9128, USA.
☎ +1 304 293-0610
✉ hwlambert@hsc.wvu.edu

Received June 21st, 2011; accepted October 12th, 2011

ABSTRACT

During routine dissection of the subclavian artery and its branches, the suprascapular artery was found arising from the proximal end of the internal thoracic artery in only the left side of a 68-year-old Caucasian male, despite the presence of the thyrocervical trunk on the ipsilateral side. The suprascapular artery ran deep to the proximal one-third of the clavicle then continued its usual course, running parallel to the suprascapular nerve and passing over the superior transverse scapular ligament distally. Knowledge of this variant origin of the suprascapular artery is clinically important because the internal thoracic artery is utilized for a majority of the 800,000 coronary artery bypass surgeries performed worldwide each year. Its course deep to the clavicle is also significant due to clavicular fractures accounting for approximately 5-15% of adult bone fractures. © IJAV. 2011; 4: 182-184.

Key words [anatomical variant] [suprascapular artery] [internal thoracic artery] [branches of subclavian artery] [thyrocervical trunk] [coronary bypass surgery] [radical and modified neck dissections]

Introduction

Anatomical textbooks usually cite the thyrocervical trunk, which arises from the first part of the subclavian artery, as the most common origin of the suprascapular artery [1, 2]. Variations concerning the origin of the suprascapular artery are rare but have been documented arising from all three parts of the subclavian artery, the costocervical trunk, the axillary artery, and the internal thoracic artery (often called the internal mammary artery by clinicians) [3 – 7]. The suprascapular artery can also be duplicated bilaterally or even absent [6]. Two separate case reports even noted the suprascapular artery taking origin from the dorsal scapular artery [8, 9].

Origin of the suprascapular artery from the internal thoracic artery has been documented during comprehensive studies of the subclavian artery and its branches [3, 4, 7]. The rate of this occurrence varies, however, the authors do not mention if these unusual origins took place in the presence of the thyrocervical trunk. In 1905, Bean noted this variant in 12 of his 104 cases (11.5%); however, most studies report a lower incidence for this variant origin, including Read and Trotter (4.2%), DeGaris (2.2%), Coulouma and Van Varseveld (5.0%), Thomson (1.8%), Adachi (4.3%), and recently Takafuji and Sato (4.2%) [4, 6].

In 2005, Weiglein et al. reported the suprascapular artery as arising from trunks called the “cervico-scapular, dorso-scapular, and cervico-dorso-scapular trunks” [10]. The cervico-scapular trunk contains the superficial cervical and suprascapular arteries. The dorso-scapular trunk contains the dorsal scapular and the suprascapular arteries. The cervico-dorso-scapular trunk contains the superficial cervical, dorsal scapular, and the suprascapular arteries [10].

There were two cases of duplicate suprascapular arteries existing bilaterally [6]. The first suprascapular artery followed its most common pattern but the second suprascapular artery originated from the third part of the subclavian artery, was transfixed to the brachial plexus, and ultimately passed under the suprascapular ligament [6]. The occurrence of a subligamentous suprascapular artery has been extensively studied [9, 11, 12], and a 1999 study by Yücel et al. reported the incidence of the suprascapular artery traveling through the suprascapular notch in 2.5% of cases [13], including one case where the suprascapular artery arose from the third segment of the subclavian artery [14]. In 2009, Reineck and Krishnan reported three individual cases of the suprascapular artery passing through the suprascapular notch during arthroscopic suprascapular nerve release [15]. Interestingly, their clinical incidence of 3% closely correlates with studies reported in cadaveric

literature [15]. In 2010, Adibatti and Prasanna observed the suprascapular artery arising from the first part of the axillary artery on the left side and the thyrocervical trunk on the right side of the same cadaver before accompanying the suprascapular nerve beneath the suprascapular ligament bilaterally [16]. Finally, the suprascapular artery has been reported to be absent in almost 3% of the cases [6].

Case Report

During routine dissection of the subclavian artery and its branches, the suprascapular artery was found arising from the proximal end of the internal thoracic artery in a 68-year-old Caucasian male. This rare origin of the suprascapular artery occurred unilaterally on the left side of the cadaver. In this case, the suprascapular artery arose from the proximal end of the internal thoracic artery, which, in turn, originated from the first part of the subclavian artery. The thyrocervical trunk was present and contained its normal remaining branches: inferior thyroid, transverse cervical, and ascending cervical arteries. The suprascapular artery then coursed posterior to the proximal one-third of the clavicle, but anterior to the anterior scalene muscle, third part of the subclavian artery, and trunks of the brachial plexus. The artery continued its course, running parallel to the suprascapular nerve and passing over the suprascapular ligament (Figure 1).

Discussion

Unusual origins of the suprascapular artery, such as arising from the dorsal scapular or internal thoracic arteries, have been attributed to the absence of a thyrocervical trunk [9].

In our case, the suprascapular artery originated from the internal thoracic artery in the presence of a thyrocervical trunk. In 1999, Yücel et al. reported that the suprascapular artery originated from the internal thoracic artery due to the absence of a thyrocervical trunk on the right side [17]. Likewise, Murakami et al. reported nine cases in which the suprascapular artery originated from the internal thoracic artery in 1980 [18]. Other studies have noted this variant origin in 1.8–11.5% of specimens, but these studies did not mention if the thyrocervical trunk were present on the side of the variant origin of the suprascapular artery [6, 10].

In addition to its distributing branches to the musculature of the shoulder region, Havet et al. showed the suprascapular artery gives off nutrient arteries which supply the majority of blood to the proximal 4/5ths of the clavicle [19]. Specifically, their 2008 study reported the suprascapular artery represents the exclusive blood supply for the middle 1/3rd of the clavicle with nutrient branches penetrating the posterior aspect of the periosteum of this bone [19]. Knowledge of the origin and branches of the suprascapular artery provides importance clinically because clavicular fractures account for 5–15% of all adult bone fractures, including 33–44% of shoulder girdle injuries [20–22]. In addition, about 70–81% of clavicular fractures occur in the middle third of the bone [5, 23, 24]. Due to the variant origin off the internal thoracic artery in this case, the suprascapular artery, which coursed obliquely deep to the posterior aspect of the clavicle, would be more susceptible to injury. A broken clavicle would not



Figure 1. The cadaveric dissection shows the variant origin of the *suprascapular artery (SSA)* arising off the *internal thoracic artery (ITA)*. The *thyrocervical trunk (TCT)* is present and contains its remaining branches: inferior thyroid, transverse cervical, and ascending cervical arteries. (*VA*: vertebral artery; *SSN*: suprascapular nerve; *STSL*: superior transverse scapular ligament)

only endanger the nutrient branches of the suprascapular artery, but the entire suprascapular artery along its course.

Variation in the origin of the suprascapular artery is also clinically significant due to current surgical procedures within the heart, anterior neck, and posterior shoulder regions. The internal thoracic artery is often utilized as a graft for a majority of the 800,000 coronary artery bypass surgeries performed worldwide each year [25]. In fact, the left internal thoracic artery offers numerous benefits over saphenous vein grafting – including a ten year patency rate of 85% compared to 61% for venous grafts, a 29% decreased risk of end stage myocardial infarction, as well as a 50% decreased risk of reoperation for similar symptoms [25 – 27]. Surgeons utilizing the internal thoracic artery as a graft in coronary bypass surgeries need to be aware of this variant origin of the suprascapular artery and make sure to graft the artery distal to its origin. Additionally, ligation of the suprascapular artery is required for surgeries in the anterior neck and supraclavicular regions, specifically during radical and modified neck dissections, so the variant origin described in this study would make the suprascapular difficult to find for ligation [28]. Radical and modified neck

dissections are used primarily to control the lymphogenous spread of cancer affecting the head and neck, historically dating back to 1906 [28]. Furthermore, shoulder pain is increasingly attributed to vascular issues, such as suprascapular neuropathy, which can be caused by damage to, or an irregular course of, the suprascapular artery [16]. Therefore, knowledge of the course of the suprascapular artery and its variant origin off the internal thoracic artery is crucial for clinicians performing coronary bypass, radical and modified neck, or shoulder surgeries.

In this case study, the suprascapular artery arose off the internal thoracic artery on the left side of a cadaveric specimen, despite the presence of the thyrocervical trunk and its usual remaining branches. Other studies have noted this variant origin occurring in approximately 1.8–11.5% of specimens, but these studies did not mention if the thyrocervical trunk were present on the side of the variant origin of the suprascapular artery [6, 10].

Acknowledgements

The authors thank Dr. Ferrell R. Campbell for his help in the dissection of this cadaveric specimen as well as Bruce Palmer for figure preparation.

References

- Bergman RA, Thompson SA, Afifi AK, Saadeh FA. *Compendium of Human Anatomic Variation: Text, Atlas, and World Literature*. 1st Ed., Baltimore, Urban & Schwarzenberg. 1988; 70.
- Moore KL, Dalley AF, Agur AMR. *Clinically Oriented Anatomy*. 6th Ed., Philadelphia, Lippincott Williams & Wilkins. 2010; 717.
- Bean RB. A complete study of the subclavian artery in man. *Am J Anat*. 1905; 4: 303–329.
- Read WT, Trotter M. The origins of transverse cervical and of transverse scapular arteries in American Whites and Negroes. *Am J Phys Anthropol*. 1941; 28: 239–247.
- Robinson CM. Fractures of the clavicle in the adult. Epidemiology and classification. *J Bone Joint Surg Br*. 1998; 80: 478–484.
- Takatoji T, Sato Y. Study on the subclavian artery and its branches in Japanese adults. *Okajimas Folia Anat Jpn*. 1991; 68: 171–185.
- Thomson A. Second annual report of the committee of collective investigation of the anatomical society of Great Britain and Ireland for the year 1890-91. *J Anat Physiol*. 1891; 26: 78–93.
- Mishra S, Ajmani ML. Anomalous origin of suprascapular artery – A case report. *J Anat Soc India*. 2003; 52: 180–182.
- Saadeh FA. The suprascapular artery: Case report of an unusual origin. *Anat Anz*. 1979; 145: 83–86.
- Weiglein AH, Moriggl B, Schalk C, Künzel KH, Müller U. Arteries in the posterior cervical triangle in man. *Clin Anat*. 2005; 18: 553–557.
- Cummins CA, Anderson K, Bowen M, Nuber G, Roth SI. Anatomy and histological characteristics of the spinoglenoid ligament. *J Bone Joint Surg Am*. 1998; 80: 1622–1625.
- Pye-Smith PH, Howse HG, Davies-Colley JNC. Notes of abnormalities observed in the dissecting room during winter sessions of 1868-9 and 1869-70. In: Fagge CH, Durham AE, eds. *Cuy's Hospital Reports*. Vol. 18. London, J&A Churchill. 1871; 147–164.
- Tubbs RS, Smyth MD, Salter C, Oakes WJ. Anomalous traversement of the suprascapular artery through the suprascapular notch: a possible mechanism for undiagnosed shoulder pain? *Med Sci Monit*. 2003; 9: 118–119.
- Tubbs RS, Shoja MM, Shokouhi G, Loukas M, Oakes WJ. Retrosplenic course of the transverse cervical artery with the suprascapular artery travelling through the suprascapular notch. *Folia Morphol (Warsz)*. 2007; 66: 80–82.
- Reineck JR, Krishnan SG. Subligamentous suprascapular artery encountered during arthroscopic suprascapular nerve release: A report of three cases. *J Shoulder Elbow Surg*. 2009; 18: e1–e3.
- Adibatti M, Prasanna LC. Variation in the origin of suprascapular artery. *International Journal of Anatomical Variations (IJAV)*. 2010; 3: 178–179.
- Yücel AH, Kizilkant E, Özdemir CO. The variations of the subclavian artery and its branches. *Okajimas Folia Anat Jpn*. 1999; 76: 255–261.
- Murakami K, Tsuda K, Ozeki K, Fujimoto Y. Anomaly of nine cases originated from the internal thoracic artery to the suprascapular artery and especially its morphological relationship to the phrenic nerve. *Gifu Shika Gakkai Zasshi*. 1980; 8: 209–215. (Japanese)
- Havet E, Duparc F, Tobenas-Dujardin AC, Muller JM, Delas B, Fréger P. Vascular anatomical basis of clavicular non-union. *Surg Radiol Anat*. 2008; 30: 23–28.
- Craig E. Fractures of the clavicle. In: Rockwood CA, Green DP, Bucholz RW, Heckman JD, eds. *Fractures in Adults*. 4th Ed., Philadelphia, Lippincott-Raven. 1998; 1109–1122.
- Nordqvist A, Petersson C. The incidence of fractures of the clavicle. *Clin Orthop Relat Res*. 1994; 300: 127–132.
- Postacchini F, Cumina S, De Santis P, Albo F. Epidemiology of clavicle fractures. *J Shoulder Elbow Surg*. 2002; 11: 452–456.
- Neer CS II. Nonunion of the clavicle. *J Am Med Assoc*. 1960; 172: 1006–1011.
- Rowe CR. An atlas of anatomy and treatment of midclavicular fractures. *Clin Orthop Relat Res*. 1968; 58: 29–42.
- Goldman S, Zadina K, Moritz T, Ovitti T, Sethi G, Copeland JG, Thottapurathu L, Krasnicka B, Ellis N, Anderson RJ, Henderson W; VA Cooperative Study Group #207/297/384. Long-term patency of saphenous vein and left internal mammary artery grafts after coronary artery bypass surgery: results from a Department of Veterans Affairs Cooperative Study. *J Am Coll Cardiol*. 2004; 44: 2149–2156.
- Cameron AA, Green GE, Brogno DA, Thornton J. Internal thoracic artery grafts: 20-year clinical follow-up. *J Am Coll Cardiol*. 1995; 25: 188–192.
- Loop FD, Lytle BW, Cosgrove DM, Stewart RW, Goormastic M, Williams GW, Golding LA, Gill CC, Taylor PC, Sheldon WC, Proudfit WL. Influence of the internal-mammary-artery graft on 10-year survival and other cardiac events. *N Engl J Med*. 1986; 314: 1–8.
- Lamb DD. Radical neck dissection. *The Surgical Technologist*. 2010; 449–454.