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CONVENTIONAL AND VARIANT ORIGIN OF THE TRANSVERSE CERVICAL ARTERY IN A SELECT KENYAN POPULATION

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ABSTRACT

Data from previous studies have highlighted on the use of transverse cervical artery (TCA) flaps as posterior neck musculocutaneous flaps in reconstructive surgeries. General preference of flap selection relies heavily on the neurovascular supply of the flap in question and even though known, the transverse cervical artery has been shown to vary among populations, therefore affecting its use as a potential flap. Additionally, variant points of origin of the trans-cervical artery have been shown to predispose to brachial plexus compression. Our data on the same, however, remains partly elucidated and therefore a study aimed at describing the conventional and variant origin of the TCA in a Kenyan population would aid in deciding on its use as musculocutaneous flaps and determining the possible prevalence of brachial plexus compression because of its variant origin. The origin of the transverse cervical artery was studied bilaterally in 26 adult Kenyan cadavers in the Department of Human Anatomy, University of Nairobi. As regards their origin, the different types were photographed and grouped into five: Types I to V relative to its origin. The data collected was then analysed using SPSS version 21 and findings presented as percentages. The findings were presented in a bar graph and pie chart. The TCA was present in all the 26 cadavers studied. Type I origin of the TCA was the most common (71.15%) while type V was the least (1.92%). While type I origin occurred mostly on the left limbs, the other types were more prevalent on the right side. The significant variant origin of the TCA and its resultant aberrant course should be important considerations during the planning of posterior neck musculocutaneous flaps as well as in understanding brachial plexus compression associated with its variant origin.

Key Words: Anatomy, Transverse cervical artery.

INTRODUCTION

The transverse cervical artery (TCA) is one of the proximal branches of the subclavian artery located within the root of the neck. It supplies the skin of the lower part of the back of the neck via its superficial branch while its deep branch, whenever present, supplies the intrinsic back muscles in the cervical region (Lischka et al., 1982).

Although routinely reported to arise from the thyrocervical trunk (TT), the TCA has been variably shown to arise as a branch of the first part of the subclavian artery or as a common trunk with other arteries including the inferior thyroid, internal thoracic, and suprascapular arteries (Huelke, 1958; Bartanuszova et al., 2016). These variant origins of the TCA have been associated with an alteration in its course and relational anatomy (Reiner and Kasser, 1996). The artery has further been reported to be absent in up to 6% of the cases (Huelke, 1958).

The TCA have been used with success as recipient vessels for microsurgical reconstruction in the oral and maxillofacial region which makes their variant anatomy an important consideration during these procedures (Hanasono et al., 2009; Xu et al., 2015; Li et al., 2018) . Furthermore, aberrant vessels have been linked to compressions of the brachial plexus in other instances (Muhly and Orebaugh, 2011; Murata et al., 2012; Kohli et al., 2014). Despite the paramount importance of the TCA in these surgical procedures, local data on the anatomy of the

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TCA is remains partly elucidated. This study therefore aimed at describing the conventional and variant origin of the TCA in a Kenyan population.

METHODOLOGY

The present study, a descriptive cross-sectional study of sample size 26, was carried out during a routine dissection at the Department of Human Anatomy, University of Nairobi. The specimens used were from adult Kenyan indigenous ethnicity. Ethical approval for use of cadaveric materials is provided for in the Kenyan Constitution. Any cadaver that had previous neck surgical operations or were missing either of the upper limbs was excluded from the study.

To locate the vessel, a systematic dissection at the root of the neck was carried out. First, the skin and fascia surrounding the root of the neck was removed and this enabled visualization of the subclavian artery, the trapezius muscle and the anterior scalene muscle. The TCA was then identified as "the artery deep to the trapezius at its terminal course" (Huelke, 1958) and it was followed up to its origin. The assessment of the types of TCA origin were according to a previously described criteria (Huelke, 1958):

Type I – the artery has its origin with the suprascapular artery by a common stem arising from the thyro-cervical trunk

Type II – the artery arose directly from the thyrocervical trunk

Type III – the artery arose from the dorsal scapular artery

Type IV – the artery arose from the internal thoracic artery.

Data on the origin of the vessel was recorded and photographs taken for the different variations. The data was presented as percentages and side differences were analysed.

RESULTS

The TCA was found in all the 26 cadavers studied. Type I origin of the TCA was the most prevalent (37 cases – 71.15%) while type V had the least (1.92%). While type I origin occurred mostly on the left limbs, the other types were more prevalent on the right side. Type IV origin was not observed from any of the cadavers dissected.

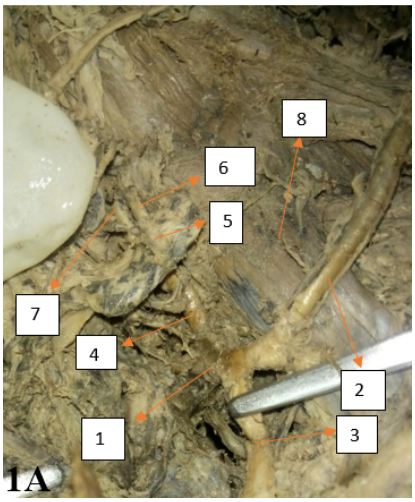

Fig. 1A: Type I variation where TCA branches from a common stem with SSA.

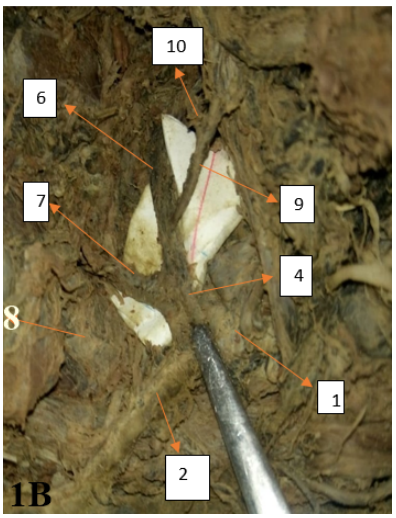

Fig. 1B: Type II variation where TCA branches directly from TT

1: First part of Subclavian artery (SA); 2: Second part of SA; 3: Internal thoracic artery (IntTA); 4: Thyrocervical Trunk (TT); 5: Common stem for TCA and SSA; 6: Suprascapular artery (SSA); 7: Transverse cervical artery (TCA); 8: Anterior scalene; 9: Inferior thyroid artery (ITA); 10: Ascending cervical artery (ACA)

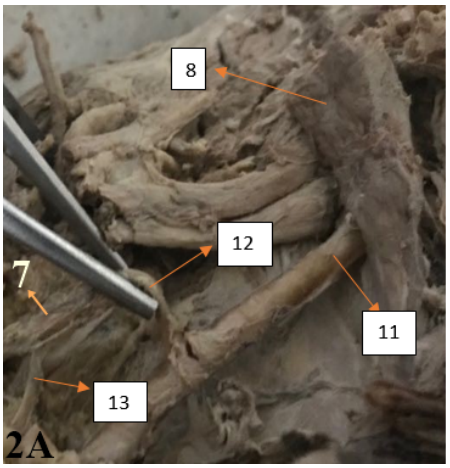

Fig. 2A: Type III variation where TCA is a branch of the Dorsal Scapular Artery (DSA) in the 3rd part of SA

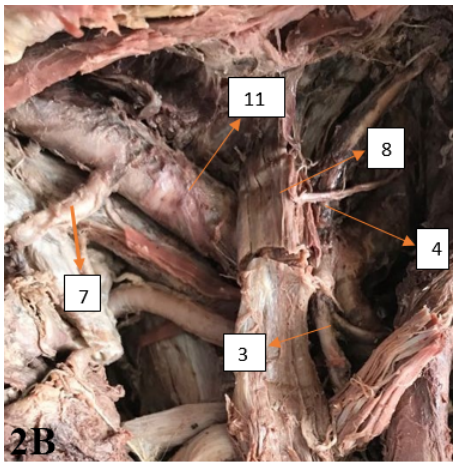

Fig. 2B: Type 'V' variation where TCA branches directly from the 3rd part of SA

1: 1st part of Subclavian artery (SA); 2: 2nd part of SA; 3: Internal thoracic artery (IntTA); 4: Thyrocervical Trunk (TT); 5: Common stem for TCA and SSA; 6: Suprascapular artery (SSA); 7: Transverse cervical artery (TCA); 8: Anterior scalene; 9: Inferior thyroid artery (InfTA); 10: Ascending cervical artery (ACA); 11: 3rd part of SA; 12: Dorsal scapular artery (DSA); 13: Continuation of DSA.

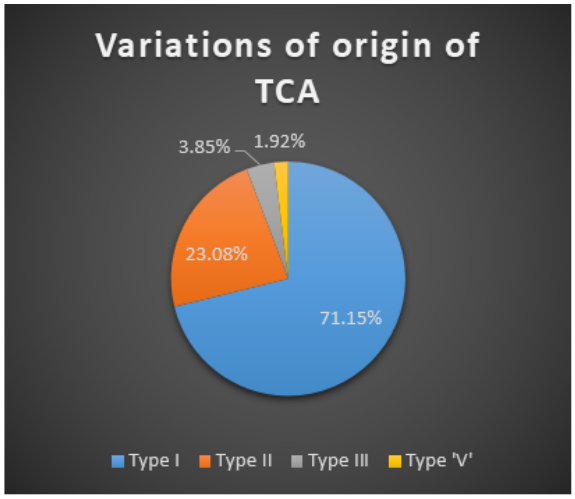

Figure 3: Pie chart showing the variations of origin of TCA.

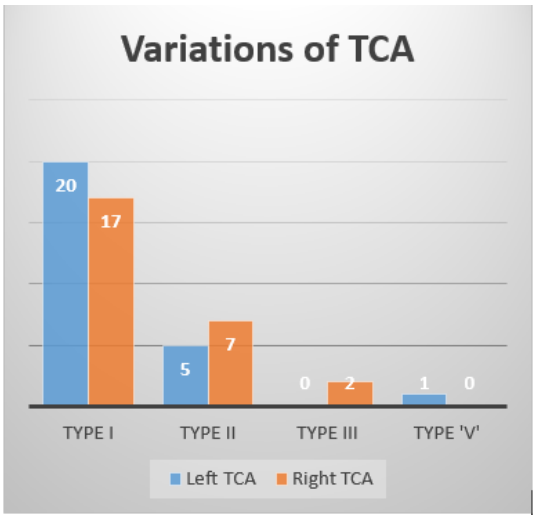

Figure 4: Graph showing the side variations of origin of TCA

TABLE 1: Summary findings of the types of TCA in other studies and in the present study

Author	Type I	Type II	Type III	Type IV	Type V
(Huelke, 1958)	40.4%	37.1%	20.8%	1.7%	
(Thompson 1891)	11.8%	75%	12.7%	0.4%	
(DeGaris, 1924)	10.4%	81.0%	7.9%	0.7%	
(Read and Trotter, 1941)	48.4%	22.4%	28.9%	0.3%	
Current study	71.15%	23.08%	3.85%		1.92%

Thompson 1891 and DeGaris 1924 used the terms, "superficial cervical artery" or "ascending branch of the transverse cervical artery" to denote the transverse cervical artery.

DISCUSSION

The TCA in the current study was present in all the limbs. This was similar to a previous study by Tessler et al (2017) in a Canadian population. Owing to its constituency, it has been regarded as a reliable and robust recipient artery in free flaps selection in head and neck reconstructive surgeries (Xu et al., 2015).

The predominance of type I origin of the TCA (71.15%) as reported in the current study is similar to those of other studies that looked at the same (Thomspon, 1891; Huelke, 1958; De Garris, 1924; Read and Trotter, 1941.). An important finding made was the observation that the TCA originated directly from the third part of subclavian artery in one of the cadavers, this finding has not been reported before by previous authors. The findings from this study in comparison to other previous studies is summarised in table 1 below. Further, out of the TCA studied in our setting, roughly 30% had aberrant origins, from vessels other than the subclavian. Previous studies have associated these aberrant courses to compression of the brachial plexus trunks and as such, clinicians should take note in cases where brachial plexus compression appears due to such a case. The variance of the TCA origin has been reported to occur mostly as a 'replacement' of the dorsal scapular artery especially when it is either missing or hypoplastic (Lischka et al., 1982; Reiner and Kasser, 1996). Owing to the close relation of the dorsal scapular artery and the brachial plexus, its replacement with the transverse cervical artery places this vessel at a risk of compression of the brachial plexus just as the dorsal scapular artery.

While the variant origin of the TCA in the current study was more commonly in the right side compared to the left side, the differences were of no statistical significance. This is in agreement with some previous findings that showed that neither race, sex nor side of the body influenced the origin of the TCA (Reiner and Kasser, 1996). There are however other reports indicating right/differences with regard to the origin of this artery (Lischka et al., 1982; Verenna et al., 2016). The marked variability in origin of the posterior neck triangle arteries has been attributed to the late acquisition of the TT in both its phylogeny and ontogeny (Lischka et al., 1982).

In conclusion, the significant variant origin of the TCA and its resultant aberrant course should be important considerations during the planning of posterior neck musculocutaneous flaps and in anaesthetic procedures involving the brachial plexus as well as understanding brachial plexus compressions possibly due to variant origins of the trans-cervical artery.

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