

Superficial occipital artery: report of a rare case and literature review

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SUMMARY

We report a rare case of an aberrant occipital artery found during routine dissection of the right posterior neck and the occipital region of an embalmed 67-year-old Caucasian male cadaver. The right occipital artery, having considerable size (diameter 4 mm), arose from the postero-lateral side of the external carotid artery just above the posterior belly of the digastric muscle. Consequently, the aberrant occipital artery turned laterally around the posterior belly of the digastric and the stylohyoid muscles, reaching the subcutaneous layer as it passed transversely over the upper attachment of the sternocleidomastoid muscle. Distally, the artery showed typical branching pattern. Detailed knowledge about the basic anatomy of the occipital artery, as well as its variations, are highly important in preventing complications during extra-to-intracranial bypass surgery and therapeutic embolization via this vessel. A careful preoperative examination of the artery is necessary to reveal some of its rarest anatomical variation.

Key words: Occipital artery – Variation – Extra-to-intracranial bypass – Human

INTRODUCTION

The occipital artery (*arteria occipitalis*) is a vessel of considerable size that arises from the posterior part of the external carotid artery and supplies the posterior part of the scalp (Clemente, 1985). Along its course, based upon anatomical considerations,

three distinctive segments could be identified – digastric, horizontal (suboccipital) and terminal (subgaleal) (Alvernia et al., 2006). Usually, within the first two segments the artery is covered by a number of muscles and after that comes superficially piercing the fascia connecting the cranial attachments of the trapezius and sternocleidomastoid muscles (Clemente, 1985).

In the anatomical, surgical and radiologic literature numerous variations of the occipital artery have been described (Newton and Young, 1968; Marques et al., 2002; Tubbs et al., 2004; Aggarwal et al., 2006; Alvernia et al., 2006; Ustunsoz et al., 2007; Chitra, 2008; Iwai et al., 2012). These variations may be of theoretical as well as practical interest, because of the many clinical applications of the occipital artery - as a basic donor vessel in performing extra-to-intracranial bypass surgery for both anterior and posterior cerebral circulation (Alvernia et al., 2006; Yonekawa, 2010) or as a useful route for therapeutic transcatheter embolization of some vascular and neoplastic processes (Alvernia et al., 2006).

Among the occipital artery variations the rarest one seems to be its unusual superficial course (Adachi, 1928; Lippert and Pabst, 1985; Bergman et al., 2013). Because this interesting variation is scarcely described in the pertinent anatomical and surgical literature, we herein report a cadaver case of such an aberrant artery. The medico-legal office and local Ethics Committee has approved the study.

CASE REPORT

A routine superficial dissection of the right posterior neck and occipital region of an embalmed 67-

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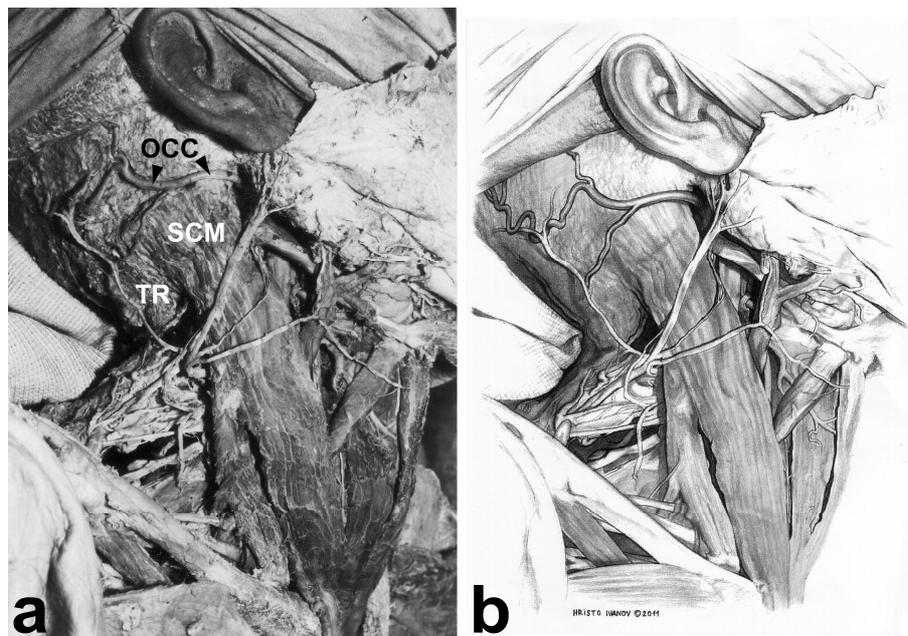


Fig. 1. Photograph (a) and schematic lateral view (b) of the right side of the head and neck showing variant course and location of the occipital artery. Muscles – SCM, sternocleidomastoid muscle; TR, trapezius muscle. Arteries – OCC, occipital artery.

year-old Caucasian male cadaver was done to expose the subcutaneous nerves and vessels. While dissecting the occipital artery branches, it was found that instead of coming off from the deep and piercing the fascia connecting the cranial attachments of the trapezius and sternocleidomastoid muscles, as usual, they all came from a large superficial artery. The following complete dissection revealed that this was an occipital artery having unusual course and location (Fig. 1a,b). This vessel of considerable size (diameter 4 mm) arose from the postero-lateral side of the right external carotid artery just above the posterior belly of the digastric muscle. Consequently, the aberrant occipital artery turned laterally around the posterior belly of the digastric and the stylohyoid muscles, reaching the subcutaneous layer as it passed almost transversely over the upper attachment of the right sternocleidomastoid. Further, the artery gave off some typical branches that accompanied the respective cutaneous nerves and supplied blood to the scalp at the back of the head. From the initial part of the occipital artery arose the posterior auricular artery and a small branch entering the deep surface of the sternocleidomastoid. No obvious arterial variations were recorded on the left side of the same subject.

DISCUSSION

The occipital artery may have numerous variations. Some of these variations are frequently encountered on angiographic images (Newton and Young, 1968; Ustunsoz et al., 2007; Iwai et al., 2012), but others need a gross-anatomy dissection revealing the relationship of the occipital artery

with neighboring soft tissues (Marques et al., 2002; Tubbs et al., 2004; Aggarwal et al., 2006; Alvernia et al., 2006; Chitra, 2008). The reported variations of the occipital artery could be summarized as follows: 1) variations of origin; 2) formation of common trunks with some neighboring arteries (e.g. posterior auricular artery, ascending pharyngeal artery); 3) presence of an unusual arterial course and location; 4) variations in branching pattern and formation of anastomoses.

The aberrant course and superficial location of the occipital artery reported here is a quite rare variation mentioned in a few sources (Adachi, 1928; Lippert and Pabst, 1985; Bergman et al., 2013). According to Lippert and Pabst (1985), a superficial occipital artery running over the upper attachment of the sternocleidomastoid occurs in 1% of the cases. In his famous work *Das Arteriensystem der Japaner*, Adachi (1928) accounted that a small superficial branch of the occipital artery located over the sternocleidomastoid was infrequently recorded. However, a truly superficial occipital artery was found in only two of the 298 hemiheads examined (estimated frequency – 0.67%). In our dissection series, the aberrant superficial occipital artery was the only instance of over 200 hemiheads examined, with an estimated frequency of less than 0.5%.

An existing aberrant superficial occipital artery may present some diagnostic and therapeutic challenges. Because of its superficial location, just under the skin, such an artery would be more vulnerable to some blunt and open traumatic injuries (John et al., 2009). Taking biopsy specimen from a large superficially located occipital artery due to

suspected giant cell arteritis (Alvernia et al., 2006) may also result in excessive bleeding. The most serious complication of such an aberrant occipital artery can probably occur when mobilizing the arterial segment as a donor site in extra-to-intracranial bypass surgery. An unexpected superficial artery can be badly injured during initial surgical dissection, and thus impede the bypass construction. This can be avoided by careful preoperative ultrasound examination (Yonekawa, 2010) that bears in mind this rare anatomical variation.

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REFERENCES

- ADACHI B (1928) *Anatomie der Japaner I. Das Arteriensystem der Japaner, Bd I: A. pulmonalis, Aorta bis Arcus volaris profundus*. Verlag der Kaiserlich-Japanischen Universität zu Kyoto, Kyoto, pp 80-82.
- AGGARWAL NR, KRISHNAMOORTHY T, DEVASIA B, MENON G, CHANDRASEKHAR K (2006) Variant origin of superior thyroid artery, occipital artery and ascending pharyngeal artery from a common trunk from the cervical segment of internal carotid artery. *Surg Radiol Anat*, 28: 650-653.
- ALVERNIA JE, FRASER K, LANZINO G (2006) The occipital artery: a microanatomical study. *Neurosurgery*, 58 (1 Suppl): ONS114-122.
- BERGMAN RA, AFIFI AK, MIYAUCHI R. In: Illustrated encyclopaedia of human anatomic variations. Cardiovascular system: Occipital artery. Available at: <http://www.anatomyatlases.org/AnatomicVariants/AnatomyHP.shtml>. Accessed March 15, 2013.
- CHITRA R (2008) Trifurcation of the right common carotid artery. *Indian J Plast Surg*, 41: 85-88.
- CLEMENTE CD, editor (1985) *Anatomy of the human body*. 30th Ed. Lea and Febiger, Philadelphia, pp 675-676.
- IWAI T, IZUMI T, INOUE T, MAEGAWA J, FUWA N, MITSUDO K, TOHNAI I (2012) Occipital artery arising from the anterior aspect of the internal carotid artery identified by three-dimensional computed tomography angiography. *Iran J Radiol*, 9: 100-102.
- JOHN N, LEACH JL, RACHANA T, MANGANO FT (2009) Traumatic aneurysm of the occipital artery secondary to paintball injury. *Clin Neurol Neurosurg*, 111: 105-108.
- LIPPERT H, PABST R (1985) *Arterial Variations in Man: Classification and Frequency*. J.F. Bergmann Verlag, München, pp 84.
- MARQUES SR, ITEZEROTE AM, SAVIOLO MOREIRA R, DE ANGELIS MA, PRATES JC (2002) Anatomical variations of the occipital artery: relate of two cases. *Rev Chil Anat*, 20: 193-196.
- NEWTON TH, YOUNG DA (1968) Anomalous origin of the occipital artery from the internal carotid artery. *Radiology*, 90: 550-552.
- TUBBS RS, SALTER G, OAKES WJ (2004) Continuation of the ascending cervical artery as the occipital artery in man. *Anat Sci Int*, 79: 43-45.
- USTUNSOZ B, GUMUS B, KOKSAL A, KORUGLU M, AKHAN O (2007) Missed total occlusion due to the occipital artery arising from the internal carotid artery. *Cardiovasc Intervent Radiol*, 30: 116-117.
- YONEKAWA Y (2010) Posterior circulation EC-IC bypass via supracerebellar transtentorial SCTT approach applied in a young patient with congenital multiple occlusive cerebrovascular anomalies – Case report and technical note. In: Laakso A, Hernesniemi J, Yonekawa Y, Tsukahara T (eds). *Surgical Management of Cerebrovascular Disease. Acta Neurochir Supp*, 107: 89-93.