Safe and Effective Harvesting of the Occipital Artery: A Cadaveric Study

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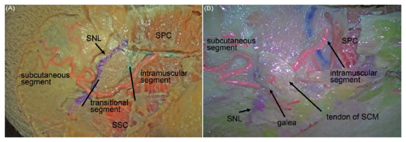
Introduction

The occipital artery (OA) is an important donor artery for posterior fossa bypass surgery. In contrast to the superficial temporal artery (STA), which runs in the same vertical anatomical layer all the way, harvesting the OA is believed to be difficult and time-consuming due to its 3-dimensional course through different suboccipital muscle layers (Figure 1). However, a safe and effective method for harvesting the OA has yet to be fully described.

Figure 1. Subdermal Anatomy of the OA.

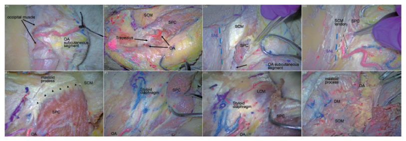


(A) The three segments of the OA are shown. The splenius capitis muscle (SPC) is divided to reveal the intramuscular segment of the OA. (B) The transitional segment of the OA runs through two layers vertically, the tendon of the SCM and the galea aponeurotica.

Methods

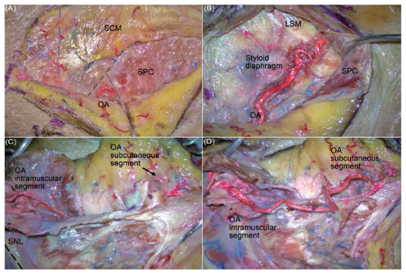
Using five preserved cadaveric heads (10 sides) previously injected with colored latex, the course of OA was explored and a safe and effective means of dissection from surrounding tissue was proposed (Figures 2, 3, and 4). The OA was divided into three segments, subcutaneous, transitional, and intramuscular, based on the vertical anatomical layer it runs through (Figure 1). Subsequently, three different approaches were attempted based on the encountered microsurgical anatomy.

Figure 2. OA Dissection by a Distal Approach with a Hockey Stick Incision.



(A) OA distal end is ligated and cut. Skin flap is flipped over with the OA subcutaneous segment. Occipital muscles are divided to reveal OA. (B) OA transitional segment runs through the tendon of the trapezius muscle. (C) SCM and SPC are exposed. (D) OA transitional segment. (E) SCM is flipped laterally and the attachment of the SPC to the mastoid process is shown (arrowheads). (F) SPC is detached and reflected downwards. OA runs in the styloid diaphragm. (G) OA intramuscular segment is partially dissected. OA runs under the LCM. (H) OA harvesting is completed.

Figure 3. OA Dissection by a Proximal Approach with a Hockey Stick Incision.

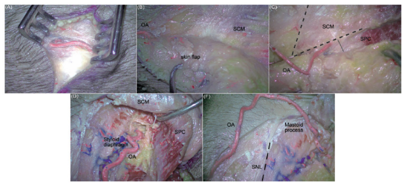


(A) SCM and SPC are exposed by lateral skin incision. OA transitional segment is located at the angle of the posterior edge of the SCM tendon and superior edge of the SPC. (B) OA intramuscular segment is dissected following detachment of the SCM and SPC. (C) The scalp -muscle flap is reflected. The OA subcutaneous segment is visible. (D) Dissection of OA is completed.

Results

The subcutaneous segment of the OA was found to run above the galea, without changing anatomical layer, and was easily dissected from the surrounding subcutaneous tissue down to superior nuchal line. The portion between the superior nuchal line and the digastric groove, traditionally defined as the suboccipital segment, was divided into the transitional and intramuscular segments bordering the superior edge of the splenius capitis muscle (SPC).

Figure 4. OA Dissection by Reverse-C Incision.



(A) Distal end of OA subcutaneous segment is located by first skin incision. (B) SCM is exposed by the skin incision on the mastoid process. Distal end of OA exposed. (C) OA transitional segment is identified. (D) OA intramuscular segment is dissected out of the styloid diaphragm, following the detachment of SCM and SPC. (E) Dissection of OA by novel reverse-C skin incision is completed.

The course of the intramuscular segment of the OA initially seemed to be complicated, however, once the suboccipital muscles were detached and retracted, the OA was found to run in a single vertical layer, the styloid diaphragm. Because the transitional segment of the OA, from the superior nuchal line to the superior edge of the SPC, ran vertically through the galea aponeurotica and the tendon of the sternocleidmastoid muscle (SCM) to reach styloid diaphragm, dissection of this segment required a great care. The respective advantages and disadvantages of these three dissection methods were also assessed (Table 1).

Table 1. Harvesting of the Occipital Artery by Approach.

Method	Exposure of Transitional Aspect	OA Patency	Surgeon's Familiarity
Hockey-stick, distal	+	±	+
Hockey-stick, proximal	±	+	+
Reverse-C	++	++	±

OA, occipital artery; ++, very good; +, good; ±, fair.

Learning Objectives

(1) The anatomy of the occipital artery and (2) how to safely harvest it surgically.

Conclusions

Although the course of OA is complex, precise anatomical knowledge of the suboccipital muscles and a stepwise dissection makes harvesting the OA relatively simple. The anatomical segments of the OA were redefined based on the OA's microsurgical anatomy. This practical segmentation provides a safe and effective procedure for harvesting the OA, particularly when where dissecting the transitional segment is a key step.

References

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