Segmentation of the Peritruncal Cerebellar Arteries Based on their Cranial Nerve Relationships: A Cadaveric Surgical Simulation Study

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Introduction

The existing classification of the cerebellar arteries is based on landmarks that might not be commonly encountered during routine surgical procedures (1). The anatomic relationship between neurovascular structures around the brainstem can provide a useful orientation tool while navigating this complex region. This cadaveric study aims to propose a novel nomenclature for the peritruncal cerebellar arteries, viz. Superior Cerebellar Artery(SCA), Anteroinferior Cerebellar Artery(AICA) and Posteroinferior Cerebellar Artery(PICA), using the cranial nerves as anatomic landmarks.

Methods

The course of the peritruncal cerebellar arteries was studied anteriorly via the rostrocaudal expanded endoscopic endonasal approach (EEA) and laterally via the following approaches: subtemporal for SCA, anterior transpetrosal for AICA and far-lateral for PICA, in 10 specimens. The length of the proposed segments, the relationship and distance between the arteries and their corresponding cranial nerves were recorded

Results

Starting form its origin and based on its closest vertical point with CN III-V, the SCA was divided into 3 segments: occulomotor, trochlear and trigeminal. The mean length of these segments was found to be 8.0mm, 5.2mm and 8.0mm, respectively. The mean caudal distance between SCA and the CNV was 6.0mm. In all the specimens, the SCA was in contact with CNIII and CNIV. The AICA was divided in 2 segments: abducens and facio-vestibular. The mean length of these segments was 6.9mm and 15.9mm, respectively. The PICA was divided in 2 segments: hypoglossal and accessory. The mean lengths of these segments were 3.3 mm and 13.1mm. The mean distance between the PICA and CN XII was 1.35 mm and it was in contact with the CN XI in all specimens.
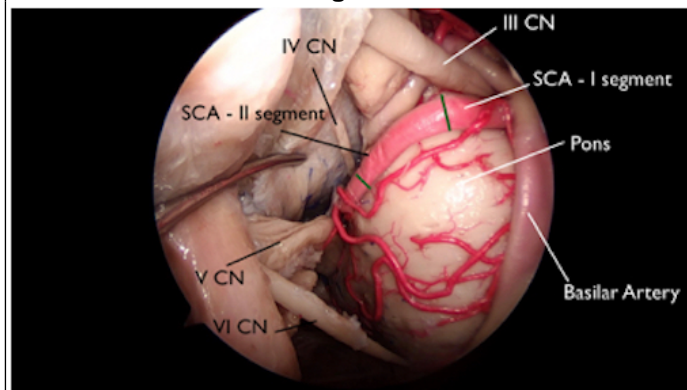
Conclusions

The proposed segmentation of the peritruncal cerebellar arteries utilized structures routinely exposed during microsurgical and EEA. This classification could be a practical tool for intraoperative neurovascular orientation and navigation during vascular and skull base procedures.
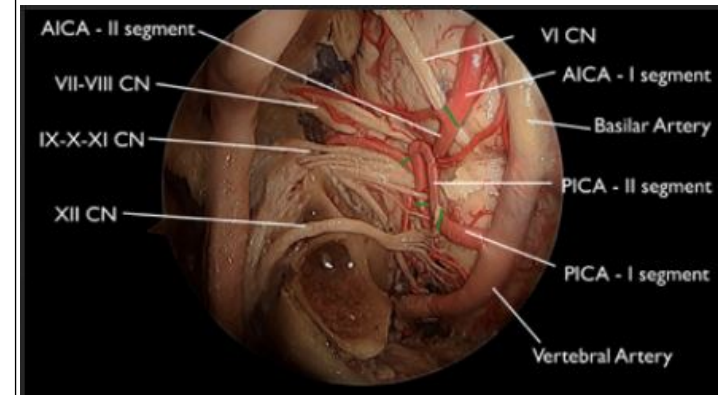
Learning Objectives

1. Understand the anatomy and the course of the Superior Cerebellar Artery (SCA), Anteroinferior Cerebellar Artery (AICA) and Posteroinferior Cerebellar Artery (PICA)
2. Understand the relationship between cerebellar arteries and the cranial nerves in their vicinity
3. Be able to apply the proposed classification intra-operatively using the described surgical landmarks.
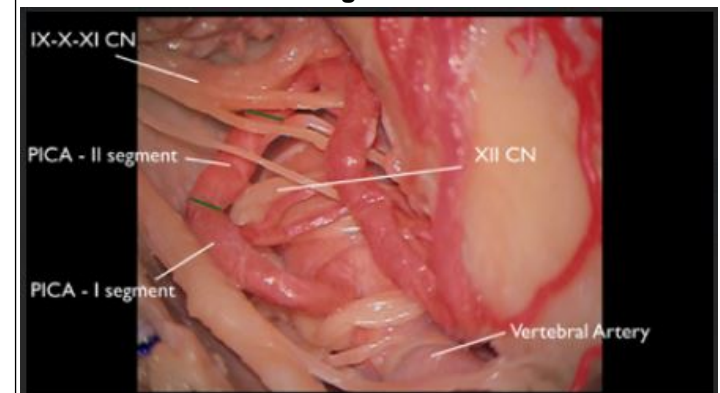
Figure 2

Extended EEA: AICA I and II segments well defined by the crossing of the VI and VII-VIII cranial nerves; antero lateral view of PICA segments I and II and their relationship with IX-X-XI-XII cranial nerves.

Figure 3

Far lateral approach: PICA segments I and II from a postero lateral view. The green lines mark the intersection between nerves and artery.

Figure 1

Extended EEA: I and II SCA segments embracing the antero-lateral pons surface and their relationship with III,IV and V cranial nerves.

Figure 4
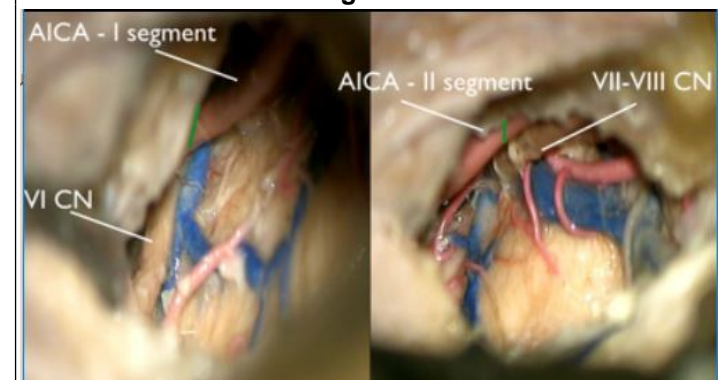
Anterior petrosectomy: AICA segments I and II crossing VI and VII cranial nerves. The green lines mark the intersection between nerves and artery.