

Morphologic Characteristics of PICA Influencing the Feasibility of PICA to PICA Bypass: A Cadaveric Surgical Simulation Study

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Introduction

Fusiform and dissecting Posterior inferior cerebellar artery (PICA) aneurysms are not amenable to routine clipping and may require alternative revascularization techniques such as aneurysm trapping and/or bypass. PICA to PICA side-to-side bypass is a useful revascularization option for non-clippable PICA aneurysms. This study aims to describe the morphological characteristics of PICA, in particular those affecting the feasibility of PICA-PICA bypass, using surgical simulation in cadavers.

Methods

The far-lateral approach was performed in 15 specimens. The dura was opened and the cerebellomedullary fissure was dissected to expose the tonsillar segment of PICA bilaterally. The following parameters were assessed: (i) the distance between the closest point of the bilateral tonsillo-medullary segment of PICA; (ii) the number of perforators arising from the P3 segment; (iii) the distance that the P3 segment could be mobilized after it was fully dissected on each side (iv) the relation of P3 with tonsillar pole (v) diameter of the P3 bilaterally. Once the morphological characteristics of PICA were assessed and recorded, PICA to PICA side-to-side bypass was attempted.

Results

PICA-PICA bypass could be performed in 7 of 15 (46.7%) specimens. The morphology of bilateral P3 in the midline was classified into five types: **Type 1-** bilateral P3s were caliber matched and coursed below the cerebellar tonsil, forming a large caudal loop; **Type 2-** bilateral P3s formed a small caudal loop and coursed behind tonsil; **Type 3-** bilateral P3s coursed behind tonsil and were widely separated the midline, without caudal loops; **Type 4-** only one PICA formed a caudal loop, while the other had a variant course; **Type 5-** P3s had an obvious caliber mismatch. Type 1 was the favorable morphology for performing PICA-PICA bypass.

Conclusions

PICA-PICA side-to-side bypass is technically challenging. Important morphological characteristics guiding the feasibility of this bypass include the caliber of bilateral PICA, the presence of caudal loop and the relationship of the P3 segment with the cerebellar tonsil. The presence of large cuadal loops, coursing below the cerebellar tonsil makes PICA-PICA side to side bypass most technically feasible.

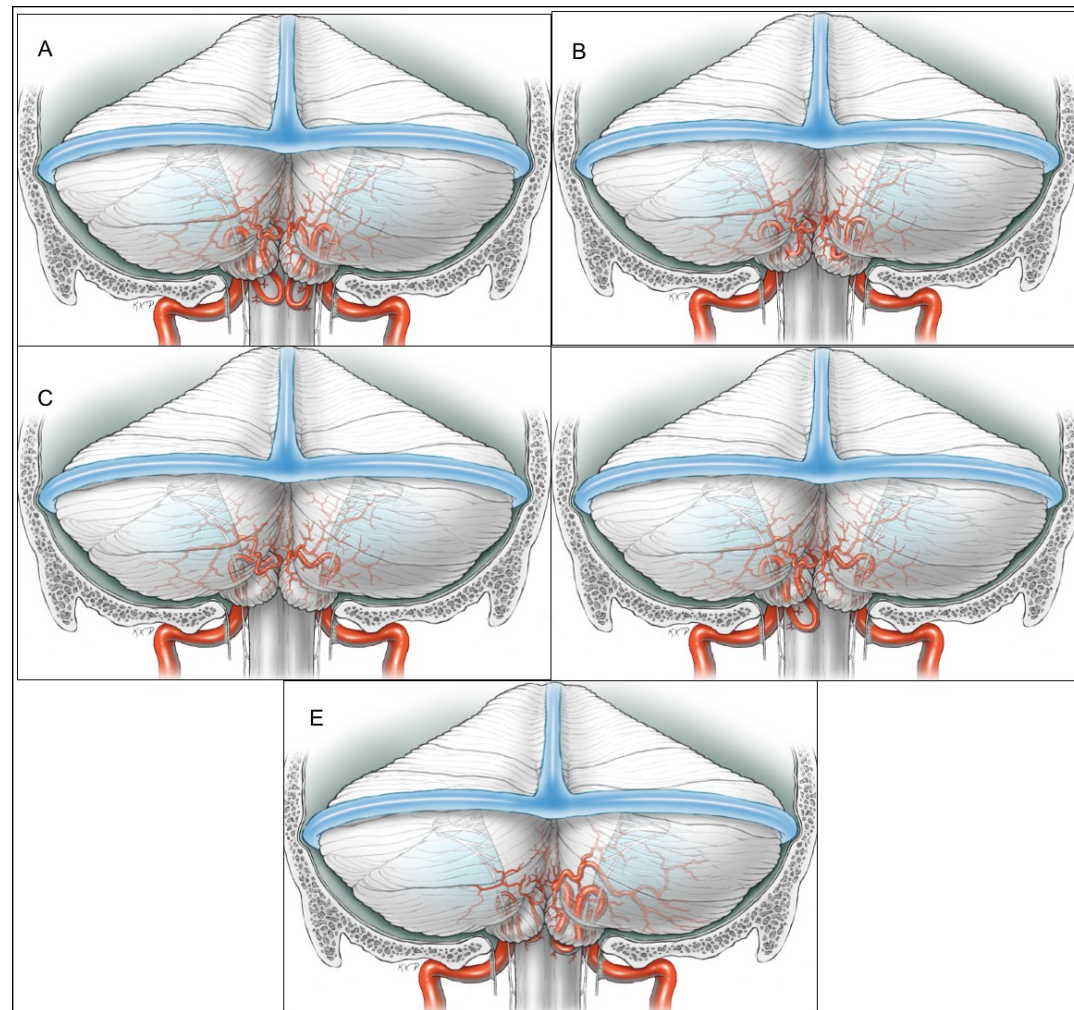


Figure 1. Artists illustration depicting the five types of P3 morphologies. A, Type 1- bilateral P3s were caliber matched and coursed below the cerebellar tonsil, forming a large caudal loop; B, Type 2- bilateral P3s formed a small caudal loop and coursed behind tonsil; C, Type 3- bilateral P3s coursed behind tonsil and were widely separated the midline, without caudal loops; D, Type 4- only one PICA formed a caudal loop, while the other had a variant course; E, Type 5- P3s had an obvious caliber mismatch.