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Case report

Agenesis of the internal carotid artery with transcavernous anastomosis presenting with an anterior communicating artery aneurysm—A case report and review of the literature

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Abstract

Arterial communication between cavernous segments of the carotid arteries associated with unilateral agenesis of the internal carotid artery (ICA) is extremely rare. We herein present a case of unilateral ICA agenesis with transcavernous anastomosis that presents with an anterior communicating artery (ACoA) aneurysm, and discuss its embryogeny and clinical implications.

A 55-year-old woman with no significant medical history was admitted to our hospital for further examination of agenesis of the left ICA, which was detected in a routine medical examination. She was free of clinical symptoms and had no neurological deficits. Radiological evaluation revealed agenesis of the left ICA with transcavernous anastomosis. Moreover, an incidental multilobulated aneurysm was detected at the ACoA. She underwent microsurgical clipping for this aneurysm, and the post-operative course was uneventful.

Investigation of collateral pathways helps our understanding of the segmental nature of carotid artery development. Recognition of this anomaly also has important implications in the surveillance and detection of associated cerebral aneurysms.
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Keywords: Agenesis; Internal carotid artery; Transcavernous anastomosis; Aneurysm

1. Introduction

Congenital absence of the internal carotid artery (ICA) is extremely rare. In 1787, Tode et al. described the first case of this condition [1], and in 1954, Verbiest et al. demonstrated the absence of the ICA by angiography for the first time [2]. The most common source of collateral circulation in the case of ICA agenesis is via the circle of Willis [3]. In these cases, the basilar artery or the contralateral ICA supplies the middle cerebral artery (MCA) and anterior cerebral artery (ACA) on the side of the absent ICA [3]. However, much less commonly, the collateral circulation is supplied by a transcavernous vessel connecting the ICAs [3]. We herein report an extremely rare case of unilateral ICA agenesis with transcavernous anastomosis that presents with an asymptomatic aneurysm at the anterior communicating artery (ACoA) and discuss its embryogeny and clinical implications.

2. Case report

A 55-year-old woman with no significant medical history was admitted to our hospital for further examination of a recently detected left ICA agenesis. She was free of clinical symptoms and showed no neurological deficits. Non-contrast computed tomography revealed absence of the petrous carotid canal on the left side (Fig. 1A). Intra-arterial

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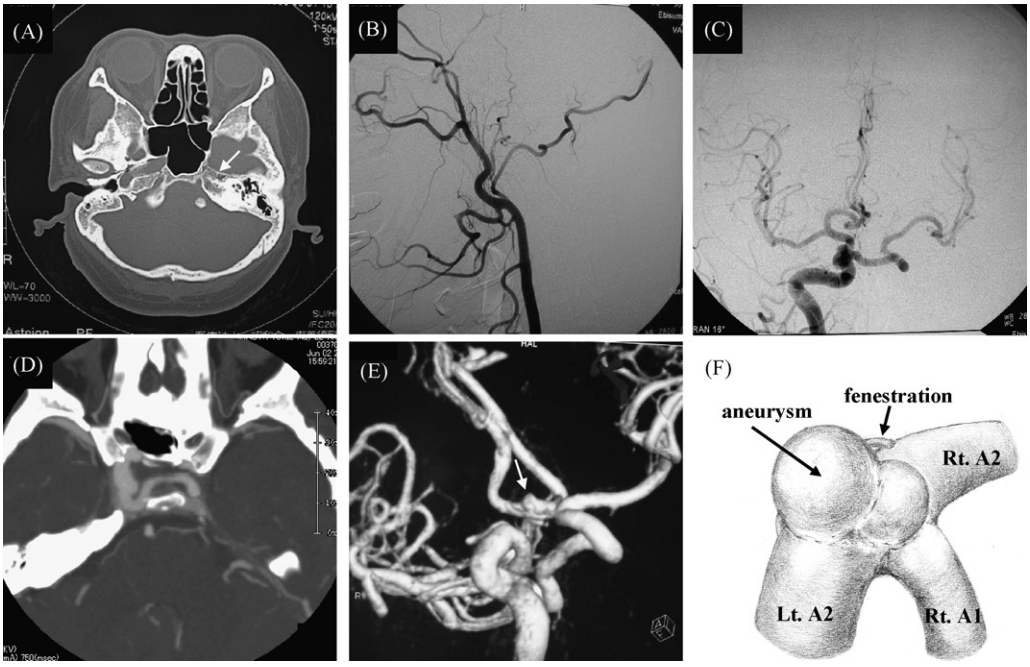

Fig. 1. A brain computed tomography (CT) shows the absence of the left carotid canal (arrow) in the skull base (A). Intra-arterial angiography (B: lateral view; C: A–P view) and CT angiography (D) show an agenesis of the left internal carotid artery (ICA) at the third segment, and the remnant of the intracranial ICA clinoid is refilled from the contralateral ICA via the primitive maxillary artery. A multilobulated aneurysm (arrow) was also identified at the anterior communicating artery (E: three-dimensional digital subtraction angiography; F: operative drawing).

angiography showed an agenesis of the left ICA at the third segment (Fig. 1B). The horizontally oriented vessel connecting the posterior parts of the respective cavernous segments of the ICAs filled the supraclinoid portion of the left ICA (Fig. 1C and D). The left A1 segment of the ACA was absent and the bilateral A2 segments were supplied from the right A1 segment and the ACoA, respectively. In addition, a small aneurysm at approximately 4 mm was detected at the ACoA by three-dimensional digital subtraction angiography (Fig. 1E). She underwent a left fronto-temporal craniotomy. The aneurysm was multilobulated with a fenestration of the ACoA, and the left A1 was confirmed to be absent (Fig. 1F).

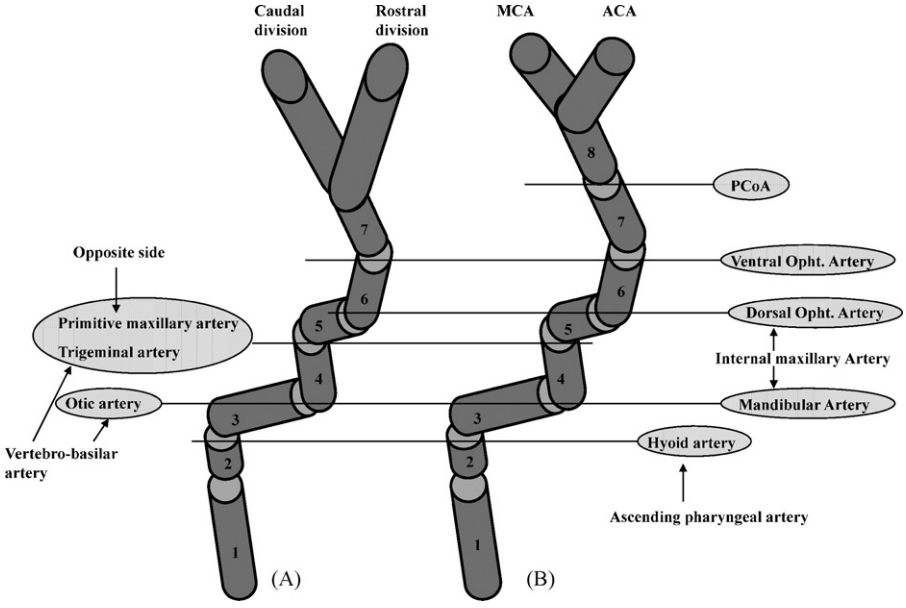

Fig. 2. Illustration of the ICA segmentation (A: Lasjaunias' classification; B: Gailloud's modification). ICA is divided into seven segments (1: cervical segment, 2: initial ascending intrapetrous segment, 3: distal horizontal intrapetrous segment, 4: segment ascending in the sphenoid fissure and through the cavernous sinus, 5: horizontal segment of the carotid fissure, 6: clinoid segment, and 7: terminal segment). The embryonic vessels between the segments have a critical role for rerouting blood flow. Gailloud proposed the eighth segment divided by posterior communicating artery as an embryonic vessel.

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