

## A Ruptured Distal Posterior Inferior Cerebellar Aneurysm Our Case and Review of the Literature

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### ABSTRACT

We present a case of ruptured distal posterior inferior cerebellar artery (PICA) aneurysm, and review the literature and discuss the treatment strategy. A 77-year-old woman presented with the sudden onset of severe headache, nausea and vomiting. Computed tomography revealed an intraventricular hemorrhage, predominantly in the fourth ventricle and hydrocephalus with a thin subarachnoid hemorrhage (SAH). Angiography revealed an aneurysm arising at the turning point of the vessel, from the telovelotonsillar segment of the right PICA. On the 17<sup>th</sup> day after the onset, repeated angiography revealed a smaller aneurysm than the one detected on the first day at the same place and with no spasm. On the 22<sup>nd</sup> day, the aneurysm was proved to be partially thrombosed and was safely clipped via a right lateral sub-occipital approach.

SAH with a fourth ventricular hemorrhage or an isolated fourth ventricle hemorrhage should raise the suspicion of a distal PICA aneurysm. Aneurysms of the distal PICA have often been reported to arise at a turning point of the artery rather than at a junction of the vessel. It is suggested that the pathogenesis could be hemodynamic stress that has developed due to embryological factors. Distal PICA aneurysms have often gone undetected in many previous cases because of thrombosis inside the aneurysms. Thus, particularly in the case of intentionally delayed surgery, we recommend repeated angiography under various conditions to identify how the aneurysm develops just before surgery.

**Key words:** *Distal posterior inferior cerebellar artery, Aneurysm, Thrombosis, Angiography, Aneurysm at the turning point of the vessel*

Aneurysms of the distal posterior inferior cerebellar artery (PICA) are rare, accounting for only 0.49% to 3% of all intracranial cerebral aneurysms in previously reported series<sup>10,17,21</sup>. The site of some cases was not at the junction of the vessel but at the turning point<sup>2,3,6,7,12,19</sup>. Moreover, ruptured aneurysms of the distal PICA have often not been detected by angiography in previously reported cases due to spontaneous thrombosis, fibrin formation inside the aneurysm, destruction of the aneurysm by hematoma or high intracranial pressure, and the small size of the aneurysm<sup>1,3,14,20,22,23</sup>. Here, we present a case of a ruptured distal PICA aneurysm which arose from the turning point of the vessel. In this patient, aneurysm of the distal PICA was seen to have grown smaller by repeated angiography because of spontaneous thrombosis inside the aneurysm. We discuss the pathogenesis of the aneurysm and the treatment strategy from

the viewpoint of radiological findings in a case of intentionally delayed surgery.

### CASE REPORT

A 77-year-old woman presented with the sudden onset of severe headache, nausea and vomiting. She was drowsy and had no deficits. Computed tomography (CT) revealed an intraventricular hemorrhage (IVH) and hydrocephalus, predominantly in the fourth ventricle with a thin subarachnoid hemorrhage (SAH) (Fig. 1). Angiography revealed an aneurysm arising at the turning point of the vessel, from the telovelotonsillar segment of the right PICA. On the 17<sup>th</sup> day from the onset, repeated angiography showed at the same location a smaller aneurysm than the one detected on the first day (Fig. 2A, B). No spasm was identified either angiographically or clinically. After an intentional delay, on the 22<sup>nd</sup> day, the aneurysm was proven to be

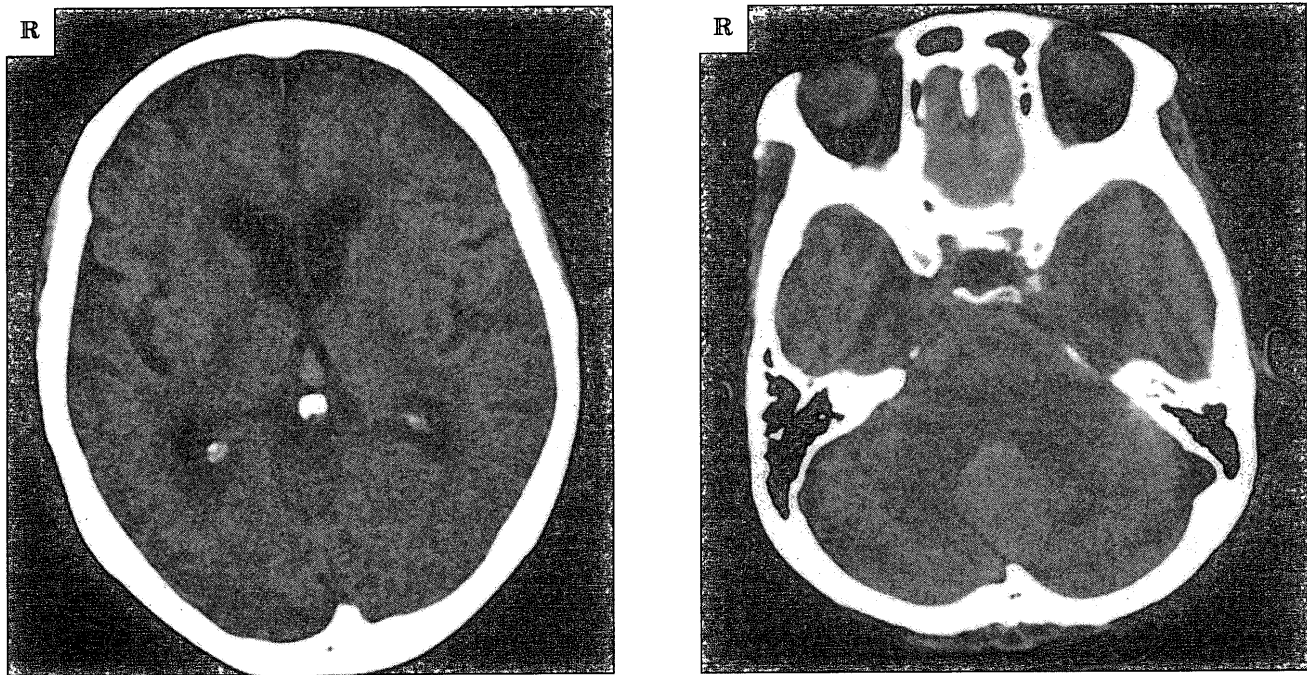


Fig. 1. CT scan on admission revealing a hematoma within the fourth ventricle extending into the third ventricle

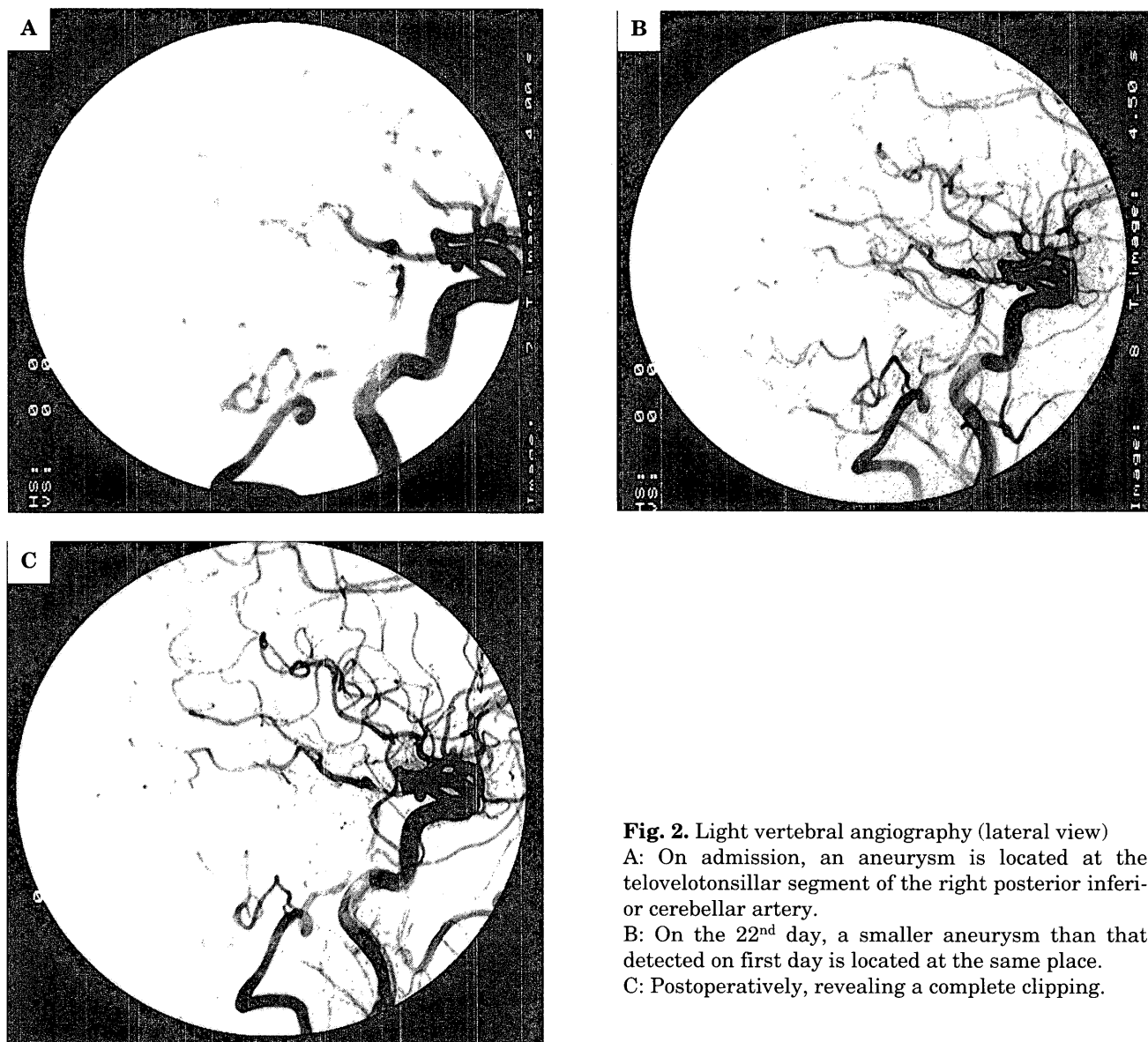
partially thrombosed and was safely clipped via a right lateral suboccipital approach. Postoperative angiography revealed a complete clipping of the aneurysm and no new aneurysms (Fig. 2C). Postoperative CT revealed neither new infarction nor hemorrhage. She became lucid and the same as she used to be in terms of neurological findings before the SAH.

#### DISCUSSION

The rarity of distal PICA aneurysms has been recognized for many years<sup>10,17,21</sup>. Lister et al divided the PICA into four segments, the lateral medullary, tonsillomedullary, telovelotonsillar, and cortical segment<sup>16</sup>. According to Kamada, most distal aneurysms are located on the left side in the telovelotonsillar segment<sup>11</sup>. In the present case, angiography revealed the aneurysm arising from the telovelotonsillar segment of the right PICA. Some distal PICA aneurysms have been reported to arise at a turning point of the artery rather than at a junction of the vessel as in this case<sup>2,3,6,7,12,19</sup>. It is suggested that the pathogenesis of the aneurysm could be hemodynamic stress that has developed due to embryological factors<sup>2,3,6,7,12,19</sup>. In embryo the arteries of the embryonic medulla present a somewhat plexiform appearance including anterior inferior cerebellar arteries (AICA) and PICA. So in embryo, identification of the stems for both AICA and PICA, especially the latter, is still difficult among the numerous arteries that supply the posterior part of the hindbrain. This developmental process may explain the varied origin of the AICA and the PICA in the adult. In this case, the basilar artery was supplied predominantly via the right verte-

bral artery. In addition, right AICA showed hypoplasia. So the right PICA was stressed directly by the blood flow, especially at the turning point of the vessel. We deduced that there was more stress in the right PICA than usual.

In this case, CT revealed intraventricular hemorrhage (IVH) with slight SAH. According to Kim, the incidence of IVH is 55% of ruptured distal PICA aneurysms. In the telovelotonsillar segment, the incidence is 71%. The incidence of an isolated IVH is reported to be 33% among cases with IVH, which is clearly higher than that for other segments of the PICA<sup>12</sup>. Many aneurysms of the telovelotonsillar segment are located on the roof of the fourth ventricle and lead to an intraventricular hemorrhage breakthrough of the roof of the fourth ventricle. Thus, SAH with a fourth ventricular hemorrhage or an isolated fourth ventricular hemorrhage<sup>2,24</sup> should raise the suspicion of a distal PICA aneurysm. No vasospasm was found in this case either angiographically or clinically. Some authors have reported that bleeding of the more distal aneurysms caused no spasm or spasm only in the neighboring small arteries<sup>3,8</sup>. Ruptured aneurysms of distal PICA have often gone undetected in many previous cases, due to spontaneous thrombosis, fibrin formation inside the aneurysm, and destruction of the aneurysm by hematoma or high intracranial pressure<sup>1,14,19,20,22,23</sup>. Aneurysms are most commonly less than 5mm in length<sup>1,6-8,15</sup>. Previous reports have documented multiple aneurysms in the same branch of the PICA<sup>1,4,6,7,10,18</sup>. Roger reported multiple aneurysms in 24% of the patients<sup>10</sup>. Aneurysms were often thrombosed, particularly in the case of multiple PICA aneurysms<sup>1,5,9</sup>. In other



**Fig. 2.** Light vertebral angiography (lateral view)  
 A: On admission, an aneurysm is located at the telovelotonsillar segment of the right posterior inferior cerebellar artery.  
 B: On the 22<sup>nd</sup> day, a smaller aneurysm than that detected on first day is located at the same place.  
 C: Postoperatively, revealing a complete clipping.

words, we need to take into account the possibility of an occulted aneurysm even if no aneurysm is revealed on angiography. A previous report described a case in which a thrombosed aneurysm was mistaken for the real aneurysm and clipped in place of the real aneurysm. We recommend repeated angiography from various viewpoints to recheck the site of the aneurysm and how it develops just before operation in the case of intentionally delayed surgery. In the present case, on the 22<sup>nd</sup> day, repeated angiography revealed a smaller aneurysm than the one detected on the first day of admission at the same location, which was due to spontaneous thrombosis inside the aneurysm, but no new aneurysms were detected by taking various oblique views and enlarged views. Repeated angiography is advisable, despite aneurysms not always being obvious on angiography. In most cases with SAH due to distal PICA aneurysm, intentionally delayed surgery was performed<sup>1,13,15,19,20</sup>. Many reports revealed that dis-

tal PICA aneurysm was easy to change in shape. For this reason, we had better perform repeated bilateral vertebral angiography using various views.

In conclusion, SAH with a fourth ventricular hemorrhage or an isolated fourth ventricle hemorrhage should raise the suspicion of a distal PICA aneurysm. Aneurysms of the distal PICA often arise at a turning point of the artery rather than at a junction of the vessel and are often not revealed by angiography due to thrombosis inside the aneurysms. The possibility of occulted aneurysms has been reported particularly in the cases of multiple distal PICA aneurysms. Thus, we recommend repeated angiography from various viewpoints to recheck how the aneurysm develops just before operation.

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