A Case of Anterior Choroidal Artery Occlusion Caused by Stuck of Microguidewire during Cerebral Aneurysm Embolization

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Objective: A case in which a microguidewire unintentionally entered the anterior choroidal artery and was trapped there during embolization of a cerebral aneurysm is reported.

Case Presentations: A 69-year-old female was due to undergo coil embolization of an unruptured anterior communicating artery aneurysm under general anesthesia. After the microguidewire unintentionally entered the anterior choroidal artery, it became impossible to manipulate or withdraw it, and a craniotomy was performed to attempt its recovery. The microguidewire was seen at the origin of the left anterior choroidal artery through the vascular wall and was considered to have entered a “false” lumen. Its extraction under direct vision was impossible. Therefore, after clipping, the microguidewire was cut at the puncture site, and the stump was left subcutaneously. The patient developed cerebral infarction in the territory of the anterior choroidal artery and was transferred to another hospital after half a year. Seven years after surgery, no change was observed in the brain or at the puncture site.

Conclusion: A microguidewire unintentionally entered the anterior choroidal artery during embolization of a cerebral aneurysm, caused arterial dissection, became irremovable, and induced cerebral infarction.

Keywords ▶ unruptured cerebral aneurysm, coil embolization, anterior choroidal artery occlusion, microguidewire injury

Introduction

For coil embolization of cerebral aneurysms, it is necessary to guide a microcatheter into the aneurysm using a microguidewire. Perforations have been reported as a complication associated with manipulation of the microguidewire.\(^1\) In the patient reported here, the microguidewire unintentionally entered the anterior choroidal artery during coil embolization of a cerebral aneurysm and became irremovable, followed by the occurrence of cerebral infarction.

Case Presentation

The patient was a 69-year-old woman. As an unruptured anterior communicating artery aneurysm 4 mm in long diameter, which was detected by head MRI/MRA performed for close evaluation of headaches, progressively enlarged, treatment was indicated (Figs. 1, 2A–2C). She had a history of hypertension, dyslipidemia, and diabetes, which were all treated by oral medication. In the operation room, coil embolization using portable DSA (OEC-8800, Katecs, Osaka) was attempted under general anesthesia. A 6F sheath was inserted into the right femoral artery, and a guiding catheter 6F Launcher 90 cm (Medtronic, Minneapolis, MN, USA) was guided to the left cervical internal carotid artery. Heparin was administered systemically by intravenous route. An SL10 (Boston Scientific, Natick, MA, USA) microcatheter and a Transend Ex platinum 0.014 inch (Boston Scientific, Natick, MA, USA) microguidewire were used. When the microguidewire passed the C1/C2 segment of the internal carotid artery, it erroneously entered the anterior choroidal artery and got trapped...
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Objective of surgery, the microcatheter, guiding catheter, and sheath were removed consecutively while observing the tip of the microguidewire under direct vision. The microguidewire was cut at the puncture site by the endovascular objective of surgery, the microcatheter, guiding catheter, and sheath were removed consecutively while observing the tip of the microguidewire under direct vision. The microguidewire was cut at the puncture site by the endovascular...
surgeons, and the stump was left subcutaneously. The patient postoperatively developed cerebral infarction in the territory of the anterior choroidal artery (Fig. 5) with right-sided paralysis, right-sided sensory disturbance, sensory aphasia, right temporal field defect, and left blindness persisting as sequelae. She was transferred to a care facility after 6 months in a state of needing a cane to walk. Presently, 7 years after surgery, the patient shows disorientation, right-sided paralysis, and still needs a cane to walk but is capable of oral feeding. Abdominal CT scans 3 years after surgery and abdominal radiography 5 years after surgery showed no change in the microguidewire position in the body (Figs. 6, 7A and 7B). The puncture site where the microguidewire was placed did not show complications, such as pain and inflammation.

Discussion

Irremovable microguidewires during endovascular treatment are rare and there has been no previous report for a microguidewire to be trapped in the anterior choroidal artery during coil embolization of an unruptured cerebral aneurysm. There have been also sporadic reports of vessel perforation as a complication induced by the microguidewire during intracranial endovascular treatment, but only three cases of erroneous entry and trapping of the microguidewire in a brain artery have been reported.

In the patient reported here, the microguidewire Transend Ex platinum 0.014 inch (Boston Scientific, Natick, MA, USA) unintentionally entered the anterior choroidal artery while it was guided via the internal carotid artery to the anterior cerebral artery and became irremovable. Cho et al. reported three cases of entry and trapping of a microguidewire in the wrong vessel during intracranial endovascular treatment. The tip of the microguidewire was confirmed angiographically to be in an extravascular space in all three cases. In simple vessel perforation, the microguidewire is unlikely to become irremovably stuck in the wrong vessel. Therefore, the microguidewire is

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Fig. 3  The tip of the microguidewire protruded from the left ICA. ICA: internal cerebral artery

Fig. 4  Microscopic intraoperative images (A) There was no subarachnoid hemorrhage. The tip of the microguidewire was seen through the thin wall of the anterior choroidal artery. (B) The anterior communicating aneurysm was surgically clipped. Lt A1: A1 segment of left anterior cerebral artery; MACC: median artery of corpus callosum
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considered to have entered the subintimal space, caused vascular dissection, penetrated the adventitia, and reached an extravascular space. In one case, tissue was confirmed to attach to the tip of the extracted microguidewire, and it was speculated to have been subintimal tissue. The vessels in which the microguidewire was trapped were the middle cerebral artery in one and posterior cerebral artery in two cases, with the microguidewire being Transend 300 Floppy (Boston Scientific, Natick, MA, USA) in all three cases. In our patient, examination during craniotomy confirmed that the microguidewire became irremovable, because it had entered the subintimal space and caused vascular dissection.

The tip of the microguidewire remained in the subintimal space and did not cause vessel perforation, presumably because no violent manipulations, such as advancing it further by force, were performed after it became un-manipulable. The two cases reported by Cho et al. in which the tip of the microguidewire was confirmed radiographically to be in the extravascular space, but was extracted by force, both developed cerebral hemorrhage or subarachnoid hemorrhage with consequent cerebral infarction in the territory of the vessel in which the microguidewire was trapped. The third case by Cho et al. and our case, in which the trapped microguidewire was left in the body, developed cerebral infarction in the territory of the vessel in which the microguidewire was trapped but no hemorrhagic complications. When a microguidewire has entered the wrong vessel and becomes irremovable, it should be left in the body without extracting it, if perforation is clear. If perforation is unclear, the choices are (1) to administer a vasodilator (nimodipine, nifedipine, papaverine) intra-arterially to prevent vasospasm, (2) to attempt extraction

Fig. 5  Brain computed tomography at the 4th postoperative day showed infarction in the left thalamus, posterior limb of internal capsule and lateral geniculate body.
of the microguidewire by advancing the microcatheter to the site where the microguidewire was stuck, (3) to apply a snare wire over the microguidewire and microcatheter, hold them at a site as distal as possible, and pull, (4) to wait for some time and attempt extraction again, and (5) to leave the microguidewire in the body if it is irremovable. In our patient, craniotomy was performed, and extraction was attempted under direct vision, to accomplish the intended treatment for the aneurysm. We eventually failed to retrieve the microguidewire, but extraction under direct vision by craniotomy should be attempted if the site where the device is trapped can be approached surgically.

If a microguidewire is left in the body, it is cut at the puncture site, and the stump is left in the subcutaneous tissue.
In our patient, the microguidewire was pulled as much as possible by another surgeon while its tip was directly observed during craniotomy, and it was cut at the puncture site in the groin. The stump slipped back into the subcutaneous space as much as it had been pulled and was buried subcutaneously in the groin. The stump was not fixed. While the patient postoperatively complained of pain at the puncture site, it could be controlled by oral administration of analgesics. The puncture site was painless at the examination after 5 years. No complications due to the remaining microguidewire were noted by plain radiography or abdominal/pelvic CT. According to the report by Cho et al., the microguidewire broke into two fragments where it was cut, and, while the distal fragment continuous with the part in the vascular lumen did not cause problems, the proximal fragment migrated into the muscle at the puncture site and required removal by incision. Since the microguidewire was made of stainless steel and contraindicated MRI, postoperative MRI was impossible to be performed.

Microguidewires are classified according to their tip structure into (1) ultra-elastic alloy type and (2) spring type. A spring type microguidewire is a stainless steel wire with a coil wound around it and has characteristics such as slightly inferior torque transmission, higher tip plasticity, and less stress to the vascular wall. Transend Ex platinum is a spring type microguidewire relatively less invasive to the vascular wall, but apparently caused subintimal dissection. If a spring type microguidewire with a coil wound around it is guided to a dissected region by mistake, tissue is considered likely to be caught in the coil, causing its trapping.

Technical and patient related factors are considered to have been involved in the subintimal dissection. Technically, it is important to manipulate the microguidewire with minimal invasion to the intracranial vessels. To prevent its unintended entry into vessels other than the target vessel, such as the anterior choroidal artery, posterior communicating artery, and other penetrating branches, it is safer to manipulate the device at an appropriate working angle, i.e., if there is an important branch on the proximal side of the target site, the trouble of first securing a working angle that allows the identification of its origin should be taken and, after the passage of the microguidewire and microcatheter, it should be changed to the final working angle. It is also important not to advance the microguidewire further if it is suspected to have entered the wrong branch. A factor on the patient side is vascular vulnerability due to atherosclerosis. Our patient had hypertension, diabetes, and dyslipidemia as complications, and vascular vulnerability due to atherosclerosis may have increased the risk of intimal injury and vascular dissection by the tip of the microguidewire.

Anterior choroidal artery occlusion syndrome with a symptomatic triad of hemiparesis, hemihypoesthesia, and hemianopsia, presently known as Monakow syndrome, was first reported in 1925 by Foix et al. Of the triad, hemiparesis occurs most frequently, but hemihypoesthesia and hemianopsia may be missing, and other cortical signs are observed even less frequently. Our patient developed cerebral infarction in the territory of the anterior choroidal artery due to its occlusion, and serious symptoms, such as right-sided paralysis, right-sided sensory disturbance, sensory aphasia, right temporal field defect, and blindness of the left eye, persisted. Since an instant of mismanipulation of the microguidewire may result in its trapping, occlusion of an intracranial artery, and serious sequelae, sufficient attention to avoid its entry into an unintended vessel is necessary when manipulating a microguidewire.

Conclusion

In the patient reported here, a microguidewire unintentionally entered the anterior choroidal artery during embolization of a cerebral aneurysm, caused arterial dissection, became irremovable, and induced cerebral infarction.

Disclosure Statement

The top author and co-authors have no conflicts of interest.

References