Onset Time of Ischemic Events and Antiplatelet Therapy after Intracranial Stent-assisted Coil Embolization

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Background: Stent-assisted coil embolization is effective for intracranial aneurysms, especially wide-necked aneurysms; however, the optimal antiplatelet regimens for ischemic events that develop after coil embolization have not yet been established. We aimed to determine the onset time of such postoperative ischemic events and the relationship between these events and antiplatelet therapy. *Methods:* We performed coil embolization using a vascular reconstruction stent for 43 cases of intracranial aneurysms and evaluated the incidence of postoperative ischemic events in these cases. *Results:* Nine patients showed postoperative ischemic events during the follow-up period (13 ± 7 months). Two patients developed cerebral infarction within 24 hours. Five patients developed transient ischemic attack within 40 days while they were receiving dual antiplatelet therapy. In addition, 1 patient showed cerebral infarction 143 days postoperatively during single antiplatelet therapy, and a case of transient visual disturbance was reported 191 days postoperatively (49 days after antiplatelet therapy had been discontinued). We increased the number of antiplatelet agents in 4 of these patients. The other 5 patients were under strict observation with dual antiplatelet therapy. All these patients were shifted to single antiplatelet therapy 3-13 months postoperatively. No recurrence of ischemic events was noted. *Conclusions:* Postoperative ischemic events are most likely to occur within 40 days postoperatively. For patients with postoperative ischemic events, additional ischemic events can be prevented by increasing the number of antiplatelet agents; subsequently, they can be shifted to single antiplatelet therapy after the risk of recurrence has decreased. **Key Words:** Intracranial aneurysm—stent-assisted coil embolization—ischemic event—antiplatelet therapy.

Introduction

The use of intracranial stent-assisted coil embolization for treating intracranial aneurysms is associated with increased packing density and decreased coil deviation rates of the parent artery.[1] Its use is effective for wide-necked aneurysms.[2,3] However, this procedure is also associated with the adverse complication of thromboembolic events. Previous studies have reported that adverse events occurred in 25% of cases in which this procedure was performed, and ischemic events were specifically found in 4%-22% of cases.[4-7] In these earlier studies, 2 antiplatelet agents were used for

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periods of 3 weeks to 6 months after the operation, followed by administration of a single antiplatelet agent intended to be administered for the rest of the patients' lives.[4-7] However, administration of multiple antiplatelet agents has been reported to increase the risk of hemorrhagic events.[8,9]

Recently, a 5% risk of ischemic events was observed after a 6-week course of dual antiplatelet therapy.[10] The optimal antiplatelet agent regimen for patients who have undergone intracranial stent-assisted coil embolization has not yet been established.[7,10] In the present study, we examined the onset time of postoperative ischemic events following stent-assisted coil embolization and the relationship between these postoperative ischemic events and antiplatelet therapy.

Methods

We retrospectively analyzed data from 96 patients with unruptured intracranial aneurysms at Fukuoka University Chikushi Hospital between July 2010 and May 2012. Patients were included for data analysis if they were treated by coil embolization with an intracranial stent and if a follow-up assessment by a neurologist or neurosurgeon was performed at least 3 months after the operation. In Japan, the indications for using a CORDIS ENTERPRISE Vascular Reconstruction Device (Cordis Neurovascular, Inc., Miami, FL) include wide-necked intracranial aneurysms (diameter of aneurysmal neck >4 mm or dome/neck ratio <2) with a maximum aneurysmal dome diameter of 7 mm and a parent artery diameter between 2.5 mm and 4 mm. All patients gave their prior informed consent for participation in the study, which was approved by the ethics committee of Fukuoka University Chikushi Hospital.

We used the techniques of standard multiprojection cerebral angiography, 3-dimensional digital subtraction angiography (DSA), magnetic resonance imaging (MRI), and time-of-flight magnetic resonance angiography for preoperative evaluation measures. Morphologic evaluation and measurement of the aneurysm were done using reconstructed 3-dimensional DSA or magnetic resonance angiography images.

Our typical dual antiplatelet therapy before the operation was that patients received any 2 of the following 3 antiplatelet agents: aspirin (100 mg/day, first dose at least 3 days before the operation), clopidogrel (75 mg/day, first dose at least 5 days before the operation), or cilostazol (200 mg/day, first dose at least 2 days before the operation). During the operation, patients were administered heparin at a dose that kept activated clotting times longer than 2-2.5 times their baseline values before insertion of the stent. Our typical protocol was to prescribe dual antiplatelet therapy for a period of 3-6 months following the operation; subsequently, we prescribed single antiplatelet therapy after a postoperative investigation that included MRI and/or DSA.

We investigated the relationship between the onset of postprocedural ischemic events and antiplatelet therapy. Postprocedural ischemic events primarily consisted of cases of cerebral infarction or transient ischemic attack (TIA); however, we also monitored ischemic eye symptoms as potential postoperative ischemic events if the intracranial stent was placed in the internal carotid artery of the ipsilateral side. The event was defined as a cerebral infarction if the symptoms persisted for more than 24 hours and an abnormal new high-intensity area was detected by MRI examination with diffusion-weighted imaging. If the symptoms disappeared in less than 24 hours and an abnormal new high-intensity area was not detected by MRI examination with diffusion-weighted imaging or MRI examination with T2-weighted imaging after the ischemic event, it was defined as a TIA. In the case of ischemic eye symptoms, detailed examination including the eye ground was performed by ophthalmologists for confirmation.

Fisher exact test was used to determine significant differences in gender, presence or absence of hypertension and ischemic heart disease, use of antiplatelet agents, and stent length between the group that experienced postoperative ischemic events and the group that did not. The Mann–Whitney *U* test was used for assessing all other parameters. *P* value less than .05 was considered to indicate statistical significance.

Results

Of the 96 patients treated in our department with endovascular procedures during a 22-month period, 43 patients underwent coil embolization with an intracranial stent. These 43 patients comprised 11 men and 32 women with an average age of 60 ± 13 years (mean ± SD). Of these 43 patients, 16 had hypertension, 2 had diabetes mellitus, 3 had ischemic heart disease, 1 had chronic heart failure, and 1 had left subclavian artery occlusion. None of these 43 patients had a history of cerebral infarction before the operation. In all patients, an angiography performed immediately after coil embolization showed no signs of thromboembolic events.

Two of the 43 cases discontinued antiplatelet therapy postoperatively. In 1 patient, antiplatelet therapy was discontinued because of apparent allergy to all 3 antiplatelet agents, a situation that was discovered on the 10th postoperative day. This patient was administered icosapentanoic acid and did not experience an ischemic event. In the other patient, antiplatelet therapy was discontinued because of the patient's low compliance with taking the drug. This patient experienced transient visual disturbance on the 191st postoperative day, 49 days after discontinuation of antiplatelet therapy.