



Incidence and Characteristics of Remote Intracerebral Hemorrhage After Endovascular Treatment of Unruptured Intracranial Aneurysms

Sook Young Sim¹, Jihye Song², Se-yang Oh³, Myeong Jin Kim⁴, Yong Cheol Lim⁵, Sang Kyu Park⁶, Yong Sam Shin⁷, Joonho Chung^{8,9}

■ **OBJECTIVE:** The purpose of this study was to investigate the incidence and characteristics of remote intracerebral hemorrhage (ICH) after endovascular treatment (EVT) of unruptured intracranial aneurysms (UIAs).

■ **METHODS:** Between March 2007 and September 2015, 11 patients with remote ICH from a series of 2258 consecutive patients with 2597 UIAs treated via EVT were identified. Baseline demographic characteristics, medical history, radiologic imaging data, characteristics of remote ICH, and clinical outcomes were retrospectively reviewed. The characteristics of patients with remote ICH were compared with those of patients without remote ICH.

■ **RESULTS:** All hematomas were single lesions located in the subcortical white matter as lobar-type in 9 patients (81.8%) and in the basal ganglia in 2 patients (18.2%). Events occurred mostly within 1 week and up to 3 weeks after EVT. Hematoma was located on the ipsilateral side in 8 patients (72.7%) and in the contralateral side in 3 patients (27.3%). Compared with patients without remote ICH, there were more aneurysms located on the internal carotid artery (ICA) ($P = 0.041$), more patients treated with stents ($P < 0.001$), more patients with hypertension ($P = 0.026$), and poorer clinical outcomes at discharge ($P < 0.001$) for patients with remote ICH.

■ **CONCLUSIONS:** The incidence of remote ICH after EVT of UIAs was 0.46%. This event occurred mostly in patients with stents, hypertension, and UIAs on the ICA. It presented mostly as an ipsilateral lobar-type hemorrhage within 1 week after the procedure. This complication should not be neglected because of its poor clinical outcomes.

INTRODUCTION

Remote intracerebral hemorrhage (ICH) is defined as an intracranial hemorrhage that occurs at a distant site from the treated lesion. In neurosurgical fields, remote ICH is a major complication. It has been reported after microsurgery for supratentorial lesions or spine surgery, probably because of excessive cerebrospinal fluid diversion during surgery.^{1,2} It has also been reported after carotid recanalization because of hyperperfusion syndrome.³ Remote ICH is very rare and is usually unexpected.

It is even rarer in neuroendovascular fields, and because of the use of flow diverters in clinical practice to treat unruptured intracranial aneurysms (UIAs), remote ICH has been reported as a potential limitation.⁴⁻⁷ Previous to the flow-diverter era, remote ICH after endovascular treatment (EVT) of UIAs was not well described. Because such a life-threatening complication should not be neglected, we retrospectively reviewed our series to deter-

Key words

- Cerebral aneurysm
- Cerebral hemorrhage
- Complication
- Endovascular treatment
- Remote intracerebral hemorrhage
- Stent-assisted coiling

Abbreviations and Acronyms

- CT:** Computed tomography
- DWI:** Diffusion weighted image
- EVT:** Endovascular treatment
- FLAIR:** Fluid-attenuated inversion recovery
- ICA:** Internal carotid artery
- ICH:** Intracerebral hemorrhage
- MRI:** Magnetic resonance imaging
- mRS:** Modified Rankin Scale
- UIA:** Unruptured intracranial aneurysm

From the ¹Department of Neurosurgery, Inje University Seoul Paik Hospital, Seoul;

²Department of Neurosurgery, Konyang College of Medicine, Konyang University Hospital, Daejeon; ³Department of Neurosurgery, Inha University College of Medicine, Incheon;

⁴Department of Neurosurgery, Gachon University Gil Medical Center, Incheon; ⁵Department of Neurosurgery, Ajou University College of Medicine, Suwon; ⁶Department of Neurosurgery, Incheon St. Mary's Hospital, The Catholic University of Korea, Incheon; ⁷Department of Neurosurgery, Seoul St. Mary's Hospital, The Catholic University of Korea, Seoul;

⁸Department of Neurosurgery, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul; and ⁹Severance Institute for Vascular and Metabolic Research, Yonsei University College of Medicine, Seoul, Republic of Korea

To whom correspondence should be addressed: Joonho Chung, M.D., Ph.D.
[E-mail: ns.joonho.chung@gmail.com]

Citation: *World Neurosurg.* (2016) 95:335-340.
<http://dx.doi.org/10.1016/j.wneu.2016.08.057>

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

1878-8750/\$ - see front matter © 2016 Elsevier Inc. All rights reserved.

mine the incidence and characteristics of remote ICH. Therefore, the purpose of this study was to investigate the incidence and characteristics of remote ICH after EVT of UIAs.

MATERIALS AND METHODS

Subjects

The institutional review board of our institute approved all research protocols, and informed consent was waived. The data were gathered from 5 hospitals in which 5 neurosurgeons, all alumni of a single institution, treated patients with intracranial aneurysms using similar endovascular techniques. The prospective collected database contained a series of 2258 consecutive patients (694 patients were treated using at least 1 stent) with 2597 UIAs treated with EVT between March 2007 and September 2015. During the same period, 1275 ruptured aneurysms were treated with EVT. Among the 2258 patients, 11 with remote ICH were identified. Two independent investigators not directly involved in patient care reviewed baseline demographic characteristics, medical history, radiologic imaging data, characteristics of remote ICH, and clinical outcomes. These clinical outcomes were assessed using the modified Rankin Scale (mRS) at the time of discharge and 90 days after onset of remote ICH. An mRS score of 0–2 was defined as favorable, whereas an mRS score of 3–6 was defined as unfavorable. The characteristics of patients with remote ICH were compared with those of patients without remote ICH.

EVT

All procedures were performed under general anesthesia using standard approaches from the common femoral artery. A 6- or 7-French guiding catheter was positioned in the internal carotid artery (ICA) for anterior circulation aneurysms, and a 5- or 6-French guiding catheter was positioned in the vertebral artery for posterior circulation aneurysms. Intravenous systemic heparin (50 U/kg) was administered during placement of the guiding catheter. A single microcatheter was used if the aneurysm morphology was saccular with a narrow neck. Aneurysms with an unfavorable angioarchitecture required adjunctive techniques, such as multiple microcatheters or balloon-assisted or stent-assisted techniques. Patients had taken a daily dosage of 75 mg of clopidogrel and 100 mg of aspirin for more than 5 days before the procedure. Patients who had undergone stent-assisted coiling were prescribed 75 mg of clopidogrel daily for 3 months and 100 mg of aspirin daily for a minimum of 12 months after the procedure. Patients who had previously used anticoagulants (mostly warfarin) were prescribed the same anticoagulant and aspirin (100 mg/d). Magnetic resonance imaging (MRI) was routinely obtained within 24 hours after the procedure in all patients, including diffusion weighted image (DWI), T2-weighted image, fluid-attenuated inversion recovery (FLAIR), and gradient echo image. Cerebral angiographs were acquired to assess the degree of aneurysm occlusion and confirm detectable thromboembolic events. After the occurrence of remote ICH, dual antiplatelet therapy was stopped, and aspirin monotherapy was restarted at 1 week after onset.

Statistical Analysis

All statistical analyses were performed by a biostatistician using SPSS 22.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics

were performed for the characteristics of patients with remote ICH and compared with those of patients without remote ICH. Mann-Whitney U tests were used for numerical variables. The χ^2 tests were used for nominal variables. The P values of <0.05 were considered to be statistically significant.

RESULTS

Among 2258 patients with UIAs treated via EVT, 11 (0.49%) suffered remote ICH. The clinical data of all patients with remote ICH are shown in **Table 1**. The mean age of the participants was 59.9 ± 8.5 years, and there were 6 women. Aneurysms were located in the ICA in 8 patients (72.7%), including 1 aneurysm on the posterior communicating artery; in the anterior cerebral artery in 2 patients (18.2%); and in the basilar bifurcation in 1 patient (9.1%). The mean aneurysm and neck sizes were 6.4 ± 3.6 and 4.8 ± 1.3 mm, respectively. Stents were deployed in 8 patients (72.7%, Enterprise [Codman Neurovascular] stents in 6 patients and Neuroform [Stryker Neurovascular] stents in 2 patients). There were no procedure-related complications during or after the procedure. Based on MRI review within 24 hours after the procedure, there was no microbleeding on gradient echo image in any of the patients. Small asymptomatic signal changes not related to the site of remote ICH were observed on DWI in 6 patients. On FLAIR images, there were no signal changes at the site of remote ICH. There was grade 0 leukoaraiosis in 6 patients, grade 1 leukoaraiosis in 4 patients, and grade 3 leukoaraiosis in 1 patient.

Initial computed tomography (CT) findings of remote ICH in all cases are shown in **Figure 1**. All hematomas were single lesions, located in the subcortical white matter as lobar-type in 9 patients (81.8%, frontal lobe in 2 patients, parietal lobe in 2 patients, temporal lobe in 3 patients, frontotemporal lobe in 1 patient, and temporo-occipital lobe in 1 patient) and in the basal ganglia in 2 patients (18.2%). Remote ICH mostly occurred within 1 week and up to 3 weeks after EVT of UIAs; 1 occurred on day 630 (case 6) after the procedure. Hematomas were located on the same side of the treated aneurysm in 8 patients (72.7%) and on the opposite side in 3 patients (27.3%). The mean ICH volume was 36.5 ± 17.8 mL. Two patients underwent craniotomy for ICH evacuation, 4 patients underwent catheterization for ICH drainage, and 5 patients were treated medically without surgery. Platelet counts were within normal ranges in all patients on the day of remote ICH. Clinical outcomes at discharge showed an mRS score of 1 in 3 patients, mRS score of 2 in 1 patient, mRS score of 3 in 3 patients, and mRS score of 5 in 4 patients. One patient with an mRS score of 5 died during the follow-up period.

In patients with remote ICH, there were fewer female patients ($P = 0.008$), more aneurysms located on the ICA ($P = 0.041$), more patients treated using stents ($P < 0.001$), and more patients with hypertension ($P = 0.026$) than among patients without remote ICH (**Table 2**). Clinical outcomes at discharge were poorer in patients with remote ICH ($P < 0.001$).

DISCUSSION

The incidence of remote ICH was 0.46% after EVT of UIAs. Remote ICH tended to occur mostly as an ipsilateral lobar-type hemorrhage within 1 week (up to 3 weeks) after the procedure

Download English Version:

<https://daneshyari.com/en/article/6043054>

Download Persian Version:

<https://daneshyari.com/article/6043054>

[Daneshyari.com](https://daneshyari.com)