

## **Introduction**

The use of catheter-based interventions for endovascular neurosurgery is growing rapidly; their introduction represents a marked advancement in the treatment of intracranial aneurysms, cerebral vascular malformations, ischemic stroke, and other revascularization procedures. Defining complications, which are used to measure overall quality, is necessary to allow critical review of the delivery of care and management and quality improvement in endovascular neurosurgery, which lacks common definitions for complications. Furthermore, in endovascular interventions, events that may be labeled complications may not always negatively affect outcome. We critically review our interventions and propose a classification of endovascular complications into four categories: mechanical, technical, judgment errors, and adverse incidents.

## **Methods**

This single-center review included all patients who had endovascular interventions from September 2013 to August 2015 at the University of Utah. Complications were analyzed and defined by a senior endovascular neurosurgeon. A descriptive analysis was performed to calculate the incidence of complications overall and in each category.

## **Results**

Two hundred and seventy-five endovascular interventions were performed in 245 patients (65% female, mean age 55 years, range 0.5–92 years). Forty complications occurred in 39 patients (15%), most commonly during treatment of intracranial aneurysms 24/40 (60%). Mechanical complications (e.g., device deployment, catheter, or closure device failure) occurred in 8/40 (20%), technical complications (e.g., failure to deploy flow diverter, unintended embolization, air emboli, retroperitoneal hemorrhage, dissection) in 11/40 (27.5%), judgment errors (e.g., patient or equipment selection) in 9/40 (22.5%), and adverse incidents (e.g., groin hematoma, hemorrhagic or thromboembolic complications) in 12/40 patients (30%). Only 12/40 complications (30%) resulted in new neurological deficits, vessel injury requiring surgery, or blood transfusion.

## **Conclusions**

On the basis of our series of endovascular interventions, we propose an endovascular-specific classification system of complications with four categories: mechanical, technical, judgment errors, and adverse incidents. This provides a framework for future studies and quality control in endovascular neurosurgery.

## **Learning Objectives**

1. Recognize potential complications in endovascular neurosurgery.
2. Understand the frequency of complications, both with and without potential consequences.
3. Understand the need for prospective collection and tracking of complications data in endovascular neurosurgery.

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