Histopathological Assessment of Delayed Ipsilateral Parenchymal Hemorrhages After the Treatment of Paraclinoid Aneurysms with the Pipeline Embolization Device

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Introduction

Delayed ipsilateral parenchymal hemorrhage has been observed following aneurysm treatment with the Pipeline Embolization Device (PED; Covidien/ev3; Irvine, CA). The relationship of this phenomenon to the device and/or procedure remains elusive. We present the histopathological analysis of brain sections from three patients who suffered fatal parenchymal hemorrhages (PHs) after initially uneventful PED treatments.

Methods

Three patients with paraclinoid carotid aneurysms were treated electively with PED. All patients were pre-treated with aspririn and clopidrogel. All three cases were performed under general anesthesia, with the use of a tri-axial access system. One (n=2) or two (n=1) PEDs were used for parent artery reconstruction. Two cases required balloon angioplasty to achieve device apposition.

Results

Average age was 66.3 years. Average aneurysm size was 10.2 mm (range 5-13.3 mm). All patients were at their neurological baseline immediately after the procedure and for at least 72 hours thereafter. All three patients presented with a precipitous neurological deterioration related to spontaneous ipsilateral PH, between 3 and 14 days after the procedure (average 7.7 days). No patient experienced any preceding neurological sequela. In all three patients, autopsy confirmed a large PH distributed within the hemisphere ipsilateral to the reconstructed artery. Hemorrhages were anatomically remote from the aneurysm and reconstructed parent vessel. In all cases, histopathological analysis revealed basophilic, granular, non-polarizable foreign material completely occluding the lumen of the affected vessels in the region surrounding the observed hemorrhage (Fig 1). Vessels in the unaffected regions of the brain were spared of these foreign body emboli.

Conclusions

Delayed ipsilateral parenchymal hemorrhage can be observed following aneurysm treatment with the PED. The identification of embolized foreign material in the distribution of the hemorrhages in all three autopsy specimens suggests a potential relationship between intra-procedural foreign material emboli and delayed ipsilateral parenchymal hemorrhage after PED reconstruction.

Learning Objectives

By the conclusion of the session, participants should be able to: 1) Describe the role of pipeline embolization device in treatment of paraclinoid aneurysms, 2) Discuss the potential hemorrhagic complication associated with pipeline embolization device, 3) Identify the histopathology associated with pipeline device related intracranial hemorrhage.