P-017 DELAYED CEREBRAL ISCHEMIA SECONDARY TO ARTERIOVENOUS MALFORMATION RUPTURE

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Objective Vasospasm and resultant clinical deterioration caused by delayed cerebral ischemia (DCI) are well known sources of morbidity after aneurysmal subarachnoid hemorrhage. Cerebral arteriovenous malformation (AVM) rupture is a relatively common cause of spontaneous parenchymal hemorrhage, as well as subarachnoid and intraventricular hemorrhage. However, ensuing vasospasm associated with AVM rupture is rare, with only 20 cases documented in the literature. We report a series of patients with ruptured AVMs in order to evaluate the prevalence of vasospasm and resultant DCI.

Methods We retrospectively reviewed our own series of 854 patients presenting to our institution with an ICD-9 code for intracranial hemorrhage between September 2005 and May 2014. Thirty-six of these patients were found to have acute intracranial hemorrhage secondary to a ruptured cerebral AVM. Diagnostic cerebral angiograms were reviewed by two blinded neurointerventionalists. Electronic medical records, laboratory data, all related noninvasive imaging and angiographic data of the patients were reviewed.

Results The mean age of the patients was 43 years; there was a 1.25:1 male to female predominance. Twenty-six patients had an intraparenchymal hemorrhagic component (72%), while 10 patients (28%) had pure extra-axial hemorrhage. Fifteen patients had subarachnoid component (42%) and 24 patients had intraventricular component (67%). Three patients (8.3%) had pure intraventricular hemorrhage. All patients had AVMs diagnosed on CT angiography or digital subtraction angiography as part of their workup for the intracranial hemorrhage. All patients had digital subtraction angiography within 7 days of hemorrhage. Twenty-seven patients had supratentorial AVM nidus. Five patients demonstrated angiographic vasospasm (13.9%), 4 of whom went on to develop DCI (11.1%). The mean time from ictus to demonstration of vasospasm was 6.6 days. All of the 5 patients who developed vasospasm had intraventricular hemorrhage. Of the 3 patients with pure intraventricular hemorrhage, all developed DCI.

Conclusions Although typically associated with aneurysmal subarachnoid hemorrhage, angiographic vasospasm after AVM rupture is possible. AVM rupture classically produces parenchymal hemorrhage, but may also present with subarachnoid and/or intraventricular hemorrhage, both of which are associated with vasospasm and DCI. In cases with AVM rupture causing extra-axial hemorrhage, arterial vasospasm may be a rare, however under-reported, consequence. Specifically, in cases with pure intraventricular hemorrhage, arterial vasospasm does remain a possibility and may be a factor in patients who develop DCI.

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P-018 PARENT ARTERY CURVATURE AND ANGLE OF INCIDENCE OF BLOOD FLOW AFFECT FLOW DIVERSION EFFECT OF PIPELINE

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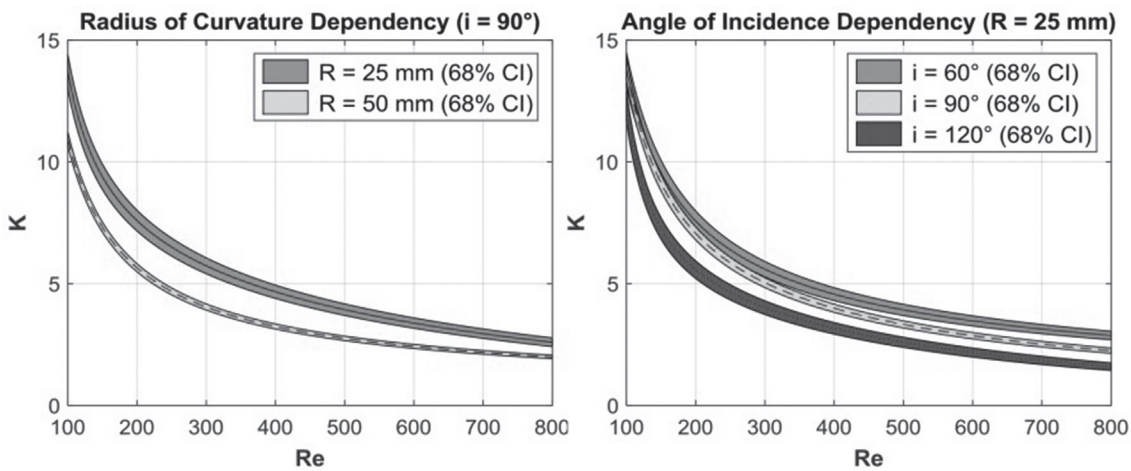
Introduction Pipeline flow diversion stent is often placed in a tortuous anatomy. Nevertheless, effect of parent artery curvature on the flow diversion effect from Pipeline stent is poorly understood. The flow diversion effect could be enhanced or diminished depending on the curvature of Pipeline or the angle at which blood flow strikes the Pipeline (angle of incidence). These variations may explain why not all aneurysms are obliterated after Pipeline treatment despite its high efficacy. We evaluated the flow diversion effect of Pipeline in various parent artery curvatures and angle of incidence in in-vitro models.

Methods Four acrylic prototypes of curved tube with a side branch were constructed with circular cross section with the inner diameter of 3.8 mm. The variation among the prototypes was made in terms of the radius of curvature R (R = 25 mm and 50 mm), and the relative angle θ of the side branch (θ = 60, 90, and 120). The angle θ of the side branch determines the angle of incidence. The identical Pipeline of diameter 4.75 mm were placed to each prototype and the pressure loss (K) occurring in the flow through the Pipeline mesh was measured for the Reynolds numbers ranging from 100 to 800. Careful error analysis on the measured data



Abstract P-018 Figure 1

made it possible to quantify weak change of the flow resistance due to the geometrical variations.

Results The parent artery curvature and angle of incidence of the blood flow clearly affect the flow diversion effect (K) of Pipeline (Figure 1). Flow diversion effect diminishes in tighter curvature. Also noted is higher angle of incidence reduces flow diversion effect.

Conclusion The parent artery curvature and angle of incidence are important parameters that may affect the efficacy of Pipeline.

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P-019 THE PLAVIX CONUNDRUM: DETERMINING WHO WILL RESPOND TO PLAVIX

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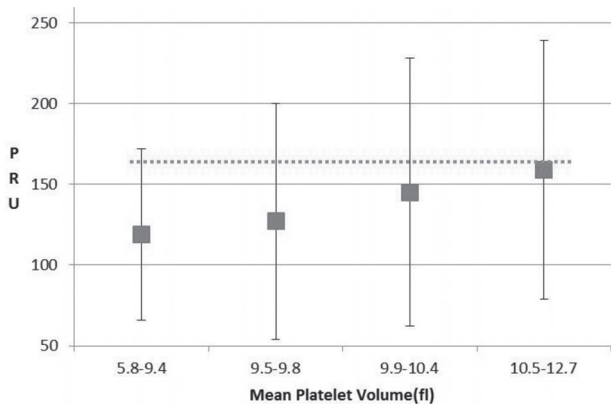
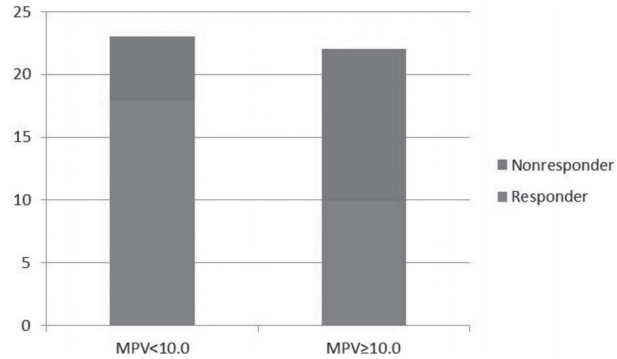
Introduction There has been increasing use of dual antiplatelet therapy in neuroendovascular procedures due to the advent of more versatile stents and flow diverters. The cardiac literature suggests that approximately 30% of patients are resistant to Plavix. Multiple studies have suggested that an inappropriate response to Plavix is related to increased risk of embolic complication. Predicting which patients will respond to Plavix would be beneficial and time saving, particularly in urgent scenarios. We sought to determine if there were any factors which could predict responsiveness to Plavix therapy.

Materials and methods We conducted a retrospective analysis of 82 patients who were started on aspirin and Plavix dual therapy in preparation for placement of stent placement for aneurysm treatment. A chart review was conducted in order to determine lab values. A PRU ≤ 170 was defined as a Plavix responder.

Results 82 patients who had been started on aspirin and Plavix dual therapy were identified. Seven patients were loaded for an urgent procedure and these patients were excluded from the remainder of the evaluation. Twenty three (31%) of patients were found to be resistant to Plavix with a PRU > 170 and nine patients (12%) were found to be hyperresponsive (PRU < 40). Women were three times more likely to be nonresponders when compared to men (35% vs 11%, p = 0.05). There was no difference in hyperresponsiveness between the two genders (11% vs 17% (p = 0.7)).



Abstract P-019 Figure 1 Average PRU among the MPV quartiles. The dotted line represents a therapeutic PRU of 170



Abstract P-019 Figure 2 A bar graph depicting nonresponders and responders to Plavix separated by MPV

Prior cardiac studies have suggested that a larger mean platelet volume (MPV) may be associated with Plavix nonresponsiveness. This cohort was divided into quartiles based on the MPV prior to Plavix administration. The average PRU increased as the MPV increased between the quartiles (Figure 1).

A subgroup of female patients was then further analyzed in order to determine if any value was predictive of platelet responsiveness. A MPV prior to Plavix initiation of ≥10.0 was found to be associated with Plavix nonresponsiveness. Five of 23 patients (22%) who had a MPV < 10.0 were found to be nonresponders compared to 12 of 22 patients (55%) who had a MPV ≥ 10.0 (p = 0.03) (Figure 2).

Conclusion Determining which factors play a role in plavix responsiveness will become more essential to the endovascular neurosurgeon as a wide variety of stents continue to be used. This data suggests that women are more likely than men to be nonresponders (35% vs 11%, p = 0.05) and that a MPV ≥ 10.0 was associated with nonresponsiveness. Larger studies are needed however it may be reasonable to consider starting an alternative antiplatelet agent in female patients with MPV ≥ 10.0 in urgent situations.

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P-020 NON-ISCHEMIC CEREBRAL ENHANCING (NICE) LESIONS SECONDARY TO ENDOVASCULAR ANEURYSM THERAPY: NICKEL ALLERGY OR FOREIGN BODY REACTION? REPORTS OF TWO CASES AND REVIEW OF THE LITERATURE

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