

The impact of procedure time and pre-procedure PRU value on the incidence of thromboembolic events in patients undergoing Pipeline Embolization Device placement

Lee A. Tan MD; Kiffon M. Keigher N.P.; Stephan Munich BS, MD; Roham Moftakhar MD; Demetrius K. Lopes MD
Department of Neurosurgery
Rush University Medical Center



Introduction

Thromboembolic events after Pipeline Embolization Device (PED) placement remain a feared complication among neuroendovascular surgeons. Recent data from prospective, randomized control trials in the cardiac literature showed that a periprocedural P2Y12 reaction unit (PRU) of less than 208 was associated with lower rate of stent thrombosis and adverse cardiac events. Similar retrospective studies in the neuroendovascular literature also suggested that patients with lower pre-procedural PRU values are less likely to have perioperative thromboembolic events. This study is aimed to investigate the relationship between pre-procedure PRU and other potential risk factors for thromboembolic events in patients undergoing PED placement for treatment of cerebral aneurysms.

Methods

Medical records of patients who underwent PED placement from April 2011 to August 2013 were reviewed. Variables including age, gender, smoking status, aneurysm characteristics, pre-procedure antiplatelet regiment, pre-procedure PRU value, pre-procedure aspirin reaction unit (ARU), procedure time, number of PEDs deployed, and perioperative neurovascular complications up to four weeks after PED placement were recorded. Multivariate analysis was performed to identify risk factors for perioperative thromboembolic complications in these patients.

Results

Results: Seventy-four patients who underwent PED procedures were identified during the study period. A total of six patients (8.1%) had changes in neurological status after PED placement: five cases (6.8%) were due to thromboembolic complications and one case (1.4%) was due to a delayed intracranial hemorrhagic one week after the procedure. During the study period, 56 patients had magnetic resonance imaging (MRI) obtained within 24 hours after the procedure; 29 of these 56 patients (50.9%) had DWI changes on post-procedural MRI.

Longer procedure time (> 116 minutes) and multiple PED placement (>1) were identified as statistically significant risk factors for symptomatic thromboembolic events (p <0.01). All five patients with symptomatic thromboembolic complications had pre-procedural PRU values > 208, but PRU > 208 did not reach statistical significance as a predictive risk factor in our cohort (p=0.06); a PRU value >208 was not a statistically significant risk factor for DWI changes (p=0.79). The single case of hemorrhagic complication occurred in a patient with a pre-procedural PRU of 67 and DWI changes on MRI.

Conclusions

DWI changes on MRI occurred at a much higher rate than new neurologic symptoms following PED placement. Longer procedure time and multiple PED deployment were associated with higher risks of new neurological changes due to thromboembolic events. There was a trend for increased risk of symptomatic thromboembolic events in patients with pre-procedural PRU values >208 but did not reach statistical significance. Reloading of clopidogrel 600 mg in patients with pre-operative PRU > 208 was safe and may have a protective effect on thromboembolic events. The combination of low pre-procedural PRU and presence of DWI changes may increase the risk for hemorrhagic complications. Larger and prospective studies may help to further validate our findings. We hope this information will help to improve patient safety with PED procedures.

Learning Objectives

1) Describe the impact of pre-procedure PRU value and procedure time on incidence of thromboembolic events in patients undergoing PED placement; 2) Discuss, in small groups, the steps that could be taken to reduce thromboembolic complication in patients undergoing PED placement; 3) Identify an effective treatment strategy for dealing with patients who are hypo-responders to clopidogrel to minimize thromboembolic complications in this group of patients.

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