INTRODUCTION

 Intracranial aneurysm is a life-threatening condition that affects roughly 1 in 50 people in the United States (1). Rupture rate is 1.6% and associated with extraordinary rates of mortality and morbidity.

 The lack of rapid endothelialization on current flow diverters necessitates antplatelet therapy during aneurysm treatment. This limits the clinical utility of flow diverters, creating a need to balance bleeding risk against device-related thrombosis risk.

 Novel ferromagnetic flow diverters were developed to capture and retain magnetic prototype 2205 stainless steel (right) flow diverters, creating a need to balance bleeding risk against device-related thrombosis risk. The deposition of ECM proteins by cells demonstrates their potential to properly heal the aneurysm site, preventing thrombosis and aneurysm rupture.

 The goal of this study is to characterize the response of BOECs in vitro to being seeded onto a novel ferromagnetic flow diverter designed for the in situ capture and retention of patient-specific BOECs after stent placement.

 I. RABBIT BOEC CHARACTERIZATION

 Figure 1. Flow diverting stents are placed across the aneurysm neck within the parent artery to divert flow away from the aneurysm, promote intra-aneurysmal thrombosis, reduce rupture risk, and accelerate healing (2).

 Figure 2. Magnetically-labeled endothelial cell capture to non-magnetic Pipeline (left) and magnetic prototype 2205 stainless steel (right) flow diverters. Cells are fluorescently labeled red.

 Figure 3. BOECs isolated from rabbit blood exhibit cobblestone morphology (A) and form capillary-like networks when cultured on Matrigel (B). Peripheral blood mononuclear cells were isolated from rabbit blood through density gradient centrifugation and cultured in endothelial cell media until the appearance of BOEC colonies. P4 rabbit BOECs were seeded at 5000 cells/well onto ibidi angiogenesis plates with 10 µl Matrigel per well after 24 hr serum reduction and observed after 4 hours.

 Figure 4. Rabbit BOECs stain positively for endothelial cell markers CD31 (A) and CD34 (B).

 Figure 5. BOECs remain mostly alive after 14 days culture on FDS. Cells were treated with 1 µM Calcein AM for cytoplasmic staining of live cells (green) and 1.6 µM ethidium homodimer-1 for nuclear staining of dead cells (red). Nuclei were stained blue with Hoechst.

 Figure 6. BOECs cultured on FDS for 6 days show a similar percentage of apoptotic cells to those cultured in a monolayer on tissue culture plastic. Cells were evaluated using the Click-iT TUNEL Alexa Fluor 488 apoptosis detection kit. 0.46% ± 0.09% 2D cultured BOECs were apoptotic (green) as compared to 0.45% ± 0.33% of BOECs cultured on novel FDS devices. Nuclei were stained blue with Hoechst.

 III. BOECS FILL IN BETWEEN STRUTS OF FDS AND DEPOSIT COLLAGEN IV, LAMININ, FIBRONECTIN

 Figure 7. BOECs proliferate on FDS as observed by Hoechst staining of nuclei on day 7 (A) and day 36 (B) of culture.

 CONCLUSIONS AND FUTURE DIRECTIONS

 Novel ferromagnetic flow diverting stents are compatible with BOECs as assessed by viability, proliferation, and apoptosis assays.

 The deposition of ECM proteins by cells demonstrates their potential to properly heal the aneurysm site, preventing thrombosis and aneurysm rupture.

 Next, the safety and feasibility of rapid endothelialization of magnetic flow diverters will be tested using a rabbit aneurysm model.

 REFERENCES