E-025

INSULAR INFARCTION AT PRESENTATION AND TOTAL INFARCT GROWTH RATE OVER 48 HOURS IN LARGE VESSEL OCCLUSION STROKE

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Introduction Understanding infarct growth rate (IGR) is key to identifying patients with slow progressing large vessel occlusion (LVO) stroke that may benefit from delayed endovascular thrombectomy (EVT). We hypothesized that the extent of presentation insular ribbon infarction was associated with IGR up to 48 hours after presentation.

Methods Patients with LVO who underwent ≥3 MRIs over 48hr in a clinical trial before EVT became standard of care (2007–2009) were included. Percent insular ribbon infarction (PIRI) score was calculated from DWI and ADC: 0 - 0% infarction, 1 - 25%, 2 - 50%, 3 - 75%, 4 - 100%.

Results Among 31 patients, 39% were female and median age was 71. LVO location was the ICA (23%), M1 (42%), and M2 (36%). PIRI scores were 0 (26%), 1 (10%), 2 (13%), 3 (16%), and 4 (35%). Median onset-to-presentation IGR was different comparing PIRI scores: 0.93, 5.42, 4.69, 14.19, 22.07 (cc/h, p=0.001). Furthermore, presentation-to-48-hour IGR (p=0.005), absolute presentation infarct volume (<0.001), and 90-day FLAIR infarct volume (p=0.02) were different. 90-day mRS £2 was also different: 86%, 33%, 67%, 20%, 0% (p=0.003). In multivariable models controlling for age, LVO location, and collaterals, PIRI was associated with onset-to-presentation IGR (βadj=0.88; 95%CI=0.28,1.48; p=0.004), presentation-to-48 hour IGR (βadj=0.77; 95% CI=0.17,1.38; p=0.01), absolute presentation infarct volume (βadj=1.42; 95%CI=0.71,2.13; p<0.001), presentation-to-48 hour infarct growth (βadj=0.67; 95%CI=0.07,1.27; p=0.03), and reduced 90-day mRS £2 (aOR=0.33; 95%CI=0.14,0.97; p=0.01).

Conclusions In this unique dataset of LVO patients untreated with reperfusion therapies, PIRI was strongly associated with infarct growth up to 48 hours and long-term outcomes. PIRI may help guide management for EVT in the delayed window, especially when there are delays to treatment such as those related to patient transfer.

sought to compare the thrombus composition between proximal vs distal occlusion.

Materials and Methods We performed single-center, retrospective review of prospectively collected thrombi from consecutive AIS-LVO patients. Patients were categorized into two groups (proximal vs distal) based on the site of occlusion. Distal occlusion was defined as any occlusion involving any segment of the anterior cerebral artery (ACA), posterior cerebral artery, or occlusion at or distal to the middle cerebral artery (MCA)-M2. Thrombi were histologically analyzed using Martius Scarlet Blue (MSB) and immunohistochemistry staining for von Willebrand Factor (vWF), CD42b (platelet marker), anti-citrullinated H3 (H3Cit; NETs [neutrophil extracellular traps] marker). Extracted thrombus Area (ETA) was measured on gross photos. vWF/CD42b thrombus-type were defined poor (first tertile), Mix (second tertile), and rich (third tertile). Additionally, we calculated the area of each component by multiplying the component percent by ETA. We used inferential statistics to interpret the data.

Results A total of 138 thrombi were included for this study. The overall average percentage of red blood cells (RBC), white blood cells (WBC), fibrin, platelet/others, H3Cit, CD42b, and vWF components in thrombi was 46.37%, 3.27%, 25.62%, 24.31%, 23.29%, 45.12% and 23.29% respectively. Distal occlusions had similar components compared to proximal occlusions in terms of RBC (p=0.13), WBC (p=0.78), Fibrin (p=0.57), Platelets/others (p=0.13), vWF (p=0.78), CD42b (p=0.64), and H3Cit (p=0.52) (Figure 1). Additionally, vWF/CD42b thrombus-type is not different between proximal and distal occlusions (p=0.87 for vWF thrombus-type; p=0.04 for CD42b thrombus-type). ETA was significantly different between two groups. Area of component was significant for RBC and PLT/others (p values 0.03 and 0.04 respectively).

Conclusion We found that proximal and distal occlusions have mostly similar thrombus compositions however the area of thrombus was different between two major components showing difference as well.

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E-028 THE IMPACT OF TIME DELAYS ON ENDOVASCULAR REPERFUSION SUCCESS IN LATE WINDOW STROKE PATIENTS

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Introduction The use of artificial intelligence and robotics in endovascular neurosurgery promises to transform neurovascular care. We present a review of the recently published neurosurgical literature on artificial intelligence and robotics in endovascular neurosurgery to provide insights on the current advances and applications of this technology.

Methods The PubMed database was searched for (‘neurosurgery’ or ‘endovascular’ or ‘interventional’) AND (‘Robotics’ or ‘Artificial intelligence’) between January 2016 and August 2021. A total of 1296 articles were identified, and after applying inclusion and exclusion criteria, 38 manuscripts were selected for review and analysis. These manuscripts were divided into four categories: 1) robotics and AI for diagnosis of cerebrovascular pathology, 2) robotics and AI for treatment of cerebrovascular pathology, 3) robotics and AI for training in neuroendovascular procedures, and 4) robotics and AI for clinical outcome optimization.

Results The 38 articles presented include 23 articles on AI-based diagnosis of cerebrovascular disease, 10 articles on AI-based treatment of cerebrovascular disease, 2 articles on AI-based training techniques for neuroendovascular procedures, and 3 articles reporting AI prediction models of clinical outcomes in vascular disorders of the brain. Innovation with robotics and AI focus on diagnostic efficiency, optimizing treatment and interventional procedures, improving physician procedural performance, and predicting clinical outcomes with the use of artificial intelligence and robotics. Experimental studies with robotic systems have demonstrated safety and efficacy in treating cerebrovascular disorders, and novel microcatheterization techniques may permit access to deeper brain regions. Other studies show that pre-procedural simulations increase overall physician performance. Artificial intelligence also shows superiority over existing statistical tools in predicting clinical outcomes.

Conclusion The recent advances and current usage of robotics and AI in the endovascular neurosurgery field suggest that the collaboration between physician and machine has a bright future for the improvement of patient care. The aim of this work is to equip the medical readership, in particular the neurosurgical specialty, with tools to better understand and apply findings from research on artificial intelligence and robotics in endovascular neurosurgery.