AN INTERVIEW WITH...

Wei Zhou, MD, FACS

Dr. Zhou offers insights on a variety of vascular topics, including the use of a brain structural connectivity graph for treatment selection and the impact of embolic infarct volume on cognitive changes.

You recently published a study on using brain structural connectivity to distinguish patients at risk for cognitive decline after carotid interventions. How can brain connectivity analyses affect decision making when treating stroke with carotid intervention?

This study[1] is a part of a larger prospective study evaluating cognitive outcomes among patients who undergo carotid interventions. We hypothesize that patients with greater brain modularity may be less likely to exhibit cognitive impairment after brain injury, such as subclinical embolization. By using a structural connectivity graph that is based on preoperative brain MRIs, we were able to predict which patients would experience postprocedural memory decline with an 81% sensitivity and 83% specificity. We observed that patients whose brains are organized into larger subunits (specifically communities and components) are more vulnerable to cognitive decline after subtle brain injury, such as procedure-related embolization. Although this is a pilot evaluation, the study highlights the tremendous opportunity for personalized care and identifying vulnerable patients preoperatively.

You are scheduled to present data from your study on subclinical microemboli and embolic infarct volume and the effect on long-term cognitive changes at the VEITHsymposium meeting in November. Can you explain these findings and their significance on future treatment?

Although carotid intervention is associated with minimal neurologic complications, subclinical microembolization is common. There is a general agreement on the detrimental cognitive effects of these embolization lesions; however, there is still considerable controversy on the cognitive impacts of these subclinical embolizations. Some studies showed no cognitive consequences. This study showed that the size of microinfarcts matters and may contribute to different clinical observations on the cognitive effects of microembolization.[2] In this study, we used diffusion-weighted imaging to define the volume of 587 new lesions in 115 patients, with a cumulative volume of 29,327 mm^3. Our analysis showed that the overall memory scores (Rey Auditory Verbal Learning Test, our primary outcome measure) improved for both carotid endarterectomy (CEA) and carotid artery stenting patients at 1 month postintervention, with improvement lasting until 6 months. We also found that volumes of embolic infarct correlate with short- and long-term cognitive changes.

You are also scheduled to speak at the VEITHsymposium about the role of digital and tibial artery calcification in the treatment of patients with chronic limb-threatening ischemia. Can you offer a sneak peek about what this discussion will entail and what data it is based on?

This is a collaborative work with Dr. Haywan Chiu, a formal podiatry resident at Palo Alto VA who will be assistant professor at the University of New Mexico in August 2017. Unlike the common belief among vascular surgeons that digital arteries are relatively free of calcification and that the toe-brachial index is a reliable measure of blood flow, Dr. Chiu's team has observed significant digital artery calcification on plain foot x-ray, which is a common imaging modality in podiatric practice. We found that the digital calcification identified on plain foot x-ray predicted worse outcomes for patients with chronic limb-threatening ischemia.

What do you predict will be the primary treatment method for carotid artery stenosis in 2027?

I believe optimal medical therapy will play a large role in managing carotid artery disease. However, both carotid surgery and stenting also have roles in treating patients with carotid stenosis, despite improved medical therapy. I think that CEA will remain the gold standard intervention, but both CEA and carotid stenting will be complementary in selecting the appropriate procedures for patients. Given the increased incidence of dementia and an aging population, the cognitive effects associated with

carotid disease and carotid intervention will contribute to our decision-making process when treating patients with carotid disease.

What current or upcoming research topic in vascular surgery are you most interested in seeing the results of within the next 5 years?

There are so many unknowns that I'd like to explore. The brain is still a "black box" that we know little about and remains one of last frontiers in our understanding of the human body. I hope to continue integrating neuroimaging and cognitive function to better understand the human brain. In addition, through my new role at the University of Arizona, I see many diabetic patients with renal failure and critical limb ischemia, and I would like to better understand the disease pattern and pathophysiology in this unique patient population.

What experiences have directed your path in your current specialty?

Vascular surgery is a primary care specialty that combines advanced surgical techniques, interventional skills, and critical care experiences. I like that the work is diverse, innovative, and never boring. You have to be optimistic, caring, and persistent to be a good vascular surgeon. Although treating a diabetic foot is often frustrating and definitely not glamorous, nothing is better than when a patient comes to you in the clinic to thank you for saving his or her leg. I cannot think of a better or more interesting medical specialty than vascular surgery.

What advice would you offer to medical professionals just starting or considering careers in vascular surgery?

The road can be bumpy and the hours are long, but you have to keep your eye on the finish line and not be afraid to ask for help. The vascular surgery community is a small, friendly community that you can always use to find a friend to help you. For example, I recently had to solicit opinions about a patient with a difficult issue, so I sent out a few emails to several colleagues for their input. Within a few hours, I had heard from nearly everyone I contacted from all over the country, and some were international experts as well. I know I can always count on my colleagues within the vascular surgery community. In vascular surgery, there are also many opportunities for research, innovation, and education. It does not matter what your academic interest is, there are people who are more than willing to provide mentorship. ■

1. Soman S, Prasad G, Hitchner E, et al. Brain structural connectivity distinguishes patients at risk for cognitive decline after carotid interventions. Hum Brain Mapp. 2016;37:2185–2194.
2. Zhou W, Baughman BD, Soman S, et al. Volume of subclinical embolic infarct correlates to long-term cognitive changes after carotid revascularization. J Vasc Surg. 2017;65:686–694.

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