

# Celebrating Member Success



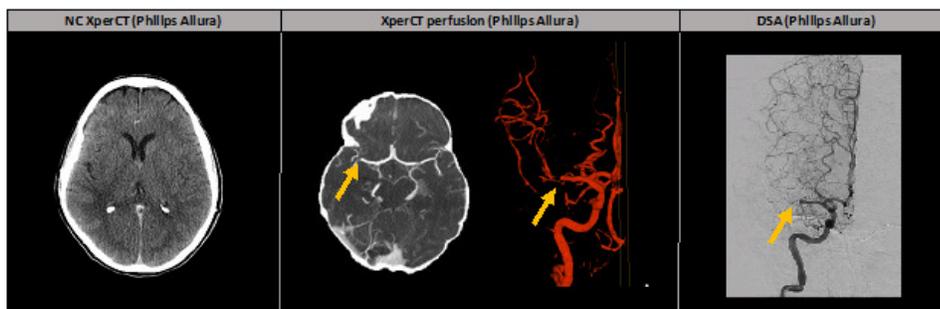
## New Cone Beam CT Assessment of Acute Stroke Patients: Are We Ready for Prime Time?

Nicole Cancelliere, MRT(R) MSc, is a Clinical Research Technologist at the Joint Department of Medical Imaging in Toronto. She recently presented her team's work on stroke imaging technology at the Society of NeuroInterventional Surgery conference in San Francisco and in a SiriusFM Doctor Radio interview on the 'Vascular Surgery Show with Dr. Todd Berland', along with Dr. Vitor Mendes Pereira, the lead investigator of the study. Their research group's findings on cone beam CT assessment of acute ischemic stroke patients, and the potential for reduction of treatment delays and improved patient outcomes, are summarized below.

Stroke is the leading cause of disability in Canada and the third leading cause of death. Every year there are over 50,000 new strokes, with nearly 14,000 of cases resulting in death. For every minute delay in treating a stroke, a patient loses 1.9 million brain cells. Thus, it is vital that revascularization therapy is performed as soon as possible.

Upon arrival to the hospital, a patient suspected of suffering an acute ischemic stroke (AIS) must undergo either a CT or MRI of the brain in order to rule out a hemorrhage, determine the site and size of occlusion, and assess the infarcted area. If it is determined that the patient has a large vessel occlusion (LVO) with a small infarcted area and larger area at risk, they are an ideal candidate for endovascular thrombectomy (EVT) treatment. Using mechanical aspiration or stent retrieval techniques, the clot can be removed allowing reperfusion to the ischemic tissue (Pereira et al., 2015).

In 2015, five randomized control trials showed that EVT treatment is more effective than standard medical care for patients with AIS caused by occlusion of arteries in the proximal anterior circulation (Goyal et al., 2016). These trials also demonstrated that reduced time between symptom onset and



**Figure 1. Stroke imaging using cone beam CT in the angiography suite.** Non-contrast enhanced XperCT (left) illustrates absence of cerebral infarction. Intravenous XperCT perfusion imaging and 3D reconstruction (middle) demonstrates the exact location of the right M1 occlusion (yellow arrows) as visualized on the Digital Subtraction Angiography (DSA) image (right).

revascularization is an independent predictor of improved patient outcomes. Thus, it is important that EVT candidates receive treatment as soon as possible.

Analysis of the time between patient arrival and treatment has shown that intra-hospital transfer from CT to the angiography suite (where revascularization takes place) can take up to 60 minutes. This has motivated the Toronto Western Hospital's (TWH) multidisciplinary neurovascular research team to work with the angiography suite imaging research engineers to develop advanced stroke imaging within the angiography suite, offering the possibility to skip the traditional CT and bring patients straight to the angiography suite for treatment. The group has improved the imaging quality of CT-like images acquired in the angiography suite and developed software to analyze these brain perfusion images.

These images are acquired using cone beam techniques, utilizing the c-arm fluoroscopic x-ray system ('XperCT', Philips Healthcare, The Netherlands). Using a 5-point quality assessment questionnaire, the perfusion XperCT imaging was evaluated by an experienced interventional neuroradiologist and compared to previously acquired standard CT, perfusion CT and follow-up CT imaging acquired 24 hours later. Preliminary results including 9 patients demonstrate that XperCT stroke imaging software in the angiography suite provides the necessary diagnostic information required for treatment decision-making, including detection of ischemic core, collaterals

and vessel patency (Figure 1). Moreover, core definition compared to baseline CT, CT perfusion and follow-up CT showed good prediction of the final infarct in cases with complete revascularization in less than 60min from baseline imaging.

Currently, stroke patients must first visit the CT department for imaging to confirm LVO before going to the angiography suite for EVT treatment. The results of this study suggest that in the future eligible patients could

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bypass CT and go directly to the angiosuite for imaging and treatment. Nicole concluded the study results at the conference saying, "By using this technology in the angiosuite, hospitals can reduce treatment delays by up to 60 minutes and hence the time of stroke symptom onset to treatment, which will significantly reduce brain damage and improve outcomes for patients."

Nicole and Dr. Pereira would like to thank the following co-authors who were instrumental to the research being presented: Nicholson P<sup>1</sup>, Bracken J<sup>2</sup>, Nijnatten F<sup>3</sup>, Grunhagen T<sup>3</sup>, Hummel E<sup>3</sup>

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The manuscript for this work is being drafted and the authors are looking forward to submission later this year. Readers interested in further information about this study can contact the author at [Nicole.Cancelliere@uhn.ca](mailto:Nicole.Cancelliere@uhn.ca).

### References

Goyal, M., Menon, B., van Zwam, W., Dippel, D., Mitchell, P., & Demchuk, A. et al. (2016). Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. *The Lancet*, 387(10029), 1723-1731. doi: 10.1016/s0140-6736(16)00163-x  
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