Endovascular recanalization is considered first-line therapy for chronic central venous occlusion (CVO)" Schwein et al (2017).

Abstract:

OBJECTIVE: Endovascular recanalization is considered first-line therapy for chronic central venous occlusion (CVO). Unlike arteries, in which landmarks such as wall calcifications provide indirect guidance for endovascular navigation, sclerotic veins without known vascular branching patterns impose significant challenges. Therefore, safe wire access through such chronic lesions mostly relies on intuition and experience. Studies have shown that magnetic resonance venography (MRV) can be performed safely in these patients, and the boundaries of occluded veins may be visualized on specific MRV sequences. Intraoperative image fusion techniques have become more common to guide complex arterial endovascular procedures. The aim of this study was to assess the feasibility and utility of MRV and intraoperative cone-beam computed tomography (CBCT) image fusion technique during endovascular CVO recanalization.

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METHODS: During the study period, patients with symptomatic CVO and failed standard endovascular recanalization underwent further recanalization attempts with use of intraoperative MRV image fusion guidance. After preoperative MRV and intraoperative CBCT image coregistration, a virtual centerline path of the occluded segment was electronically marked in MRV and overlaid on real-time two-dimensional fluoroscopy images. Technical success, fluoroscopy times, radiation doses, number of venograms before recanalization, and accuracy of the virtual centerline overlay were evaluated.

RESULTS: Four patients underwent endovascular CVO recanalization with use of intraoperative MRV image fusion guidance. Mean (± standard deviation) time for image fusion was 6:36 ± 00:51 mm:ss. The lesion was successfully crossed in all patients without complications. Mean fluoroscopy time for lesion crossing was 12.5 ± 3.4 minutes. Mean total fluoroscopy time was 28.8 ± 6.5 minutes. Mean total radiation dose was 15,185 ± 7747 μGy/m2, and mean radiation dose from CBCT acquisition was 2788 ± 458 μGy/m2 (18% of

mean total radiation dose). Mean number of venograms before recanalization was 1.6 ± 0.9, whereas two lesions were crossed without any prior venography. On qualitative analysis, virtual centerlines from MRV were aligned with actual guidewire trajectory on fluoroscopy in all four cases.

CONCLUSIONS: MRV image fusion is feasible and may improve success, safety, and the surgeon's confidence during CVO recanalization. Similar to arterial interventions, three-dimensional MRV imaging and image fusion techniques could foster innovative solutions for such complex venous interventions and have the potential to affect a great number of patients.

Reference:

Schwein, A., Lu, T., Chinnadurai, P., Kitkungvan, D., Shah, D.J., Chakfe, N., Lumsden, A.B. and Bismuth, J. (2017) Magnetic resonance venography and three-dimensional image fusion guidance provide a novel paradigm for endovascular recanalization of chronic central venous occlusion. Journal of Vascular Surgery. Venous and Lymphatic Disorders. 5(1):60-69.

doi: 10.1016/j.jvsv.2016.07.010.

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