Feasibility of carotid stent deployment in swine using an electromagnetic navigation device for catheter guidance size

F. Banovac\textsuperscript{a,*}, B. Wood\textsuperscript{b}, T. Popa\textsuperscript{a,c}, D. Lindisch\textsuperscript{a}, H. Zhang\textsuperscript{a}, K. Cleary\textsuperscript{a}, N. Glossop\textsuperscript{d}

\textsuperscript{a}Imaging Science and Information Systems (ISIS) Center, Department of Radiology, Georgetown University, Washington, DC, USA
\textsuperscript{b}NIH Clinical Center, Bethesda, MD, USA
\textsuperscript{c}University of Craiova, Romania
\textsuperscript{d}Traxtal Inc., Bellaire, TX, USA

Keywords: Electromagnetic tracking; Guidewire; Swine; Interventional radiology

Introduction: Carotid stenting is becoming an accepted alternative to surgical endarterectomy in treatment of atherosclerotic stenosis of the internal carotid arteries. A prototype electromagnetically tracked guidewire was used to place a stent in the carotid artery in one anesthetized swine using an electromagnetic navigation system with pre-procedural CT arteriography registered to the swine for guiding stent deployment.

Methods: Pre-operative 2 mm CT images of a ventilated 45 kg Yorkshire swine with skin surface fiducials were obtained after administration of intravenous contrast. Under suspended respirations, a rigid body registration was carried out by identifying the points on the CT scan and in electromagnetic space. A hydrophilic guidewire with a miniature electromagnetic sensor inside its tip (Traxtal, Bellaire, TX) was displayed on the graphic user interface (GUI) and guided to deployment, using only electromagnetic navigation. The wire was guided from the right femoral artery through the abdominal aorta and placed in the left common carotid artery. Once in place, a balloon expandable stent was placed over the wire and deployed in the left common carotid artery. A final angiogram of the carotid artery was obtained.

Results: Multiplanar reconstructions allowed for real-time guidance with an electromagnetically tracked guidewire. Likewise, the wire could be navigated into the carotid arterial system without using conventional fluoroscopy. The final position of the stent, before and after deployment, was confirmed by fluoroscopy. The final angiogram of the left common carotid artery demonstrated a patent vessel with good antegrade flow.

Conclusion: A custom electromagnetically tracked guidewire can be accurately navigated from the femoral arteries through the entire length of the aorta and placed in the desired location in the carotid artery. Thus, standard over-the-wire deployment of a stent in the carotid artery can be achieved without using customary fluoroscopic guidance or additional contrast delivery. This work was funded by U.S. Army grant DAMD17-99-1-9022.

* Corresponding author. Tel.: +1 202 687 8253.
E-mail address: banovac@isis.imac.georgetown.edu (F. Banovac).