Artificial stroke clots: How good is the applicability to the real world?

M. Berndt¹, S. Prothmann¹, P. Oberdieck³, C. Zimmer¹, B. Hegge⁴, H. Poppert² and T. Boeckh-Behrens¹

(1) Department of Neuroradiology, Klinikum rechts der Isar, Technical University of Munich, Munich, Germany
(2) Department of Neurology, Klinikum rechts der Isar, Technical University of Munich, Munich, Germany
(3) Department of Cardiology, Munich University Clinic, Ludwig-Maximilians University, Munich, Germany
(4) Acandis GmbH u. Co. KG, Pforzheim, Germany

PURPOSE
Especially since the establishment of mechanical thrombectomy as part of the standard stroke therapy, artificial thrombi have become important in the training of interventionalists as well as for the development and testing of devices. So far, these in vitro clots lack direct comparisons with ex vivo thrombi. We therefore compared the histological appearance of dynamically produced clots with that of stroke thrombi acquired during mechanical recanalization.

METHODS
Thrombi of 145 consecutive stroke patients with large-vessel occlusions were histologically compared with 10 artificial clots, dynamically created from human blood and pig's blood using a Chandler loop system. Quantified FP/RBC ratios (fibrin/platelets divided by red blood cell fraction) and WBC (white blood cell) fractions were identified and compared between artificial (human and pig) and ex vivo thrombi obtained from patients with various stroke etiologies.

RESULTS
There were no significant differences in the analysis of FP/RBC ratios between artificial thrombi and ex vivo thrombi (p=0.42) or in the more precise analyses considering etiological subgroups. Distinct differences were observed for the WBC fraction, with lower values in artificial thrombi (median 1.34%) than ex vivo thrombi (median 5%) (p<0.001).

DISCUSSION
The main clot components, FP and RBC, are presumably the most influential factors for clot stability and mechanical resistance. Similarities between artificially generated and ex vivo stroke clots (and when considering different stroke subgroups) support the utility of these artificial thrombi in the pre-evaluation of thrombus extraction devices and as appropriate training material.