IMAGING AND QUANTITATIVE ESTIMATION OF THROMBUS BURDEN IN PATIENTS WITH ST ELEVATION ACUTE MYOCARDIAL INFARCTION (STEMI) WITH THE USE OF MICRO-COMPUTED TOMOGRAPHY-A METHODOLOGICAL APPROACH

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Purpose: The study aims to assess for the first time, through the application of innovative technologies (micro-Computed Tomography, micro-CT), important characteristics of aspirated thrombi (their volume and their density), which might be linked to certain clinical outcomes, in patients presenting with STEMI.

Methodology: After being aspirated using dedicated catheters, thrombi are preserved in formalin. As they consist of soft tissue with very low X-ray absorption, thrombi have to be stained using contrast enhancing chemicals prior to scanning; in particular a solution containing 0.3% phosphotungstic acid (PTA) is used (Metscher protocol). The scanning procedure results into a series of projection images arranged in the form of image stacks which, in turn, are reformed in sections (cross-section images) with the use of special software, which applies a modified algorithm of backward projection Feldkamp. The resulting sections are combined to create the 3D models which are further analyzed to extract useful measurements for the characteristics of the thrombi, such as the volume and the relative density.

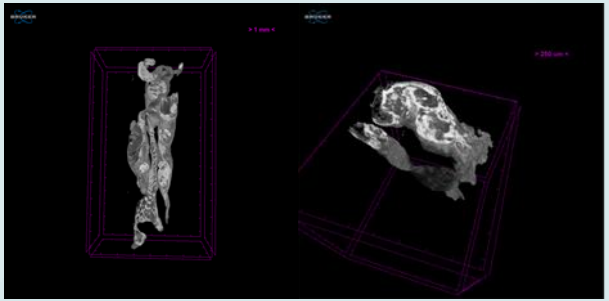

Fig. 1 Coronary thrombi as depicted on micro-CT

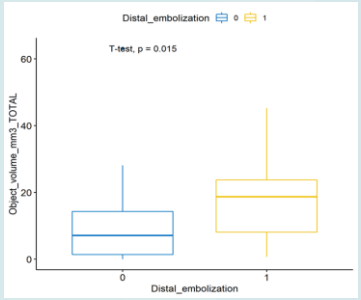

Fig. 2 Relationship between distal embolization and thrombus volume

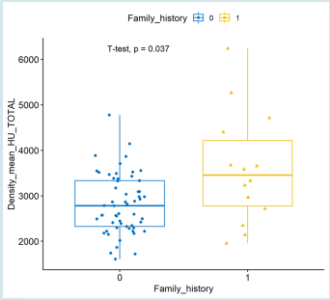

Fig. 3 Relationship between family history for CAD and thrombus density

Results: From January 2018 till May 2019, a total of 66 patients were enrolled in the study. Mean age was 60.36 (±11.71) years and the majority of them (78.7%) were men. Mean pain-to-PCI time was 358±255 minutes. Distal embolization was observed in 27.5% of the patients and no-reflow phenomenon was seen in 11.6%. Angiographically evident residual thrombus burden was observed in 6 patients (8.7%). Final Thrombolysis in Myocardial Infarction (TIMI) flow III was achieved in the majority of patients (87%). Micro-CT managed to effectively quantify the volume and the density of aspirated thrombi. Mean volume was 12.98±10.84 mm^3, mean density was 2992±872 HU and mean surface was 0.206±0.19.

Conclusion: Micro-CT can be used as a tool to effectively assess important characteristics of aspirated thrombi (such as their volume and their density), which might be linked to certain clinical outcomes. Thus, this method could be used in larger, clinically-oriented trials to help stratify patients with thrombus burden according to their risk for adverse outcomes.

Declaration of interest: None
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