Abstract

Mechanical thrombectomy (MT) is a standard treatment for acute ischemic stroke that could cause hemorrhagic complications. We aimed to evaluate the pathology of MT-induced arterial damage and neurovascular unit (NVU) disruption in relation to tissue-type plasminogen activator (tPA) injection for acute ischemic stroke. We induced transient middle cerebral artery occlusion in male SHR/Izm rats for 2 hours. This was followed by reperfusion with/without tPA (3 mg/kg) and "rough suture" insertion that mimicked MT once or thrice (MT1 or MT3). Compared with the control group, the tPA+MT3 group presented with an increase in the cerebral infarct and hemorrhage with severer IgG leakage. Moreover, structural damage reaching the tunica media was detected in the MT3 and tPA+MT3 groups. The tPA+MT3 group presented with increased matrix metalloproteinase-9 (MMP-9) and vascular endothelial growth factor (VEGF) expression with some MMP9-positive cells expressing a neutrophil marker myeloperoxidase. Furthermore, basal lamina detachment from astrocyte foot processes was observed in the tPA+MT1 and tPA+MT3 groups. These findings suggest that MT causes direct arterial damage, as well as VEGF and MMP9 upregulation, which results in NVU disruption and hemorrhagic complications in acute ischemic stroke, especially when combined with tPA.