Morphological assessment of renal arteries after radiofrequency catheter-based sympathetic denervation in a porcine model.

Abstract:

Catheter-based renal artery denervation has been successfully introduced as alternative treatment for patients suffering from drug-resistant essential hypertension. However, the local morphological changes within the vessel wall accompanying this technique remain elusive and we sought to characterize these by utilizing the simplicity radiofrequency catheter approach. Following treatment of seven pigs, renal arteries were assigned to either the acute (n = 6), subacute (10-day follow-up, n = 6) or control (untreated, n = 2) group. At follow-up blood analysis, final angiography and optical coherence tomography (OCT)-imaging of the treated arteries were performed and renal arteries and kidneys were processed for histopathology and immunohistochemistry. Radiofrequency-derived energy application to the vessel wall induced transmural tissue coagulation and loss of endothelium resulting in local thrombus formation also detectable by OCT. At 10 days, the luminal surface was almost completely re-endothelialized. Mural wall damage was replaced by fibrotic tissue and the adventitial layer showed strong inflammatory infiltration including vasculogenesis. Remnant autonomic nerve fascicles within the lesion segments of the subacute group displayed enhanced vacuolic degeneration and an impaired neurofilament protein immunostaining.
pattern. Examination of the kidneys revealed no abnormalities and blood parameters remained within the physiological range. Catheter-based application of radiofrequency energy resulted in circumscribed transmural injury within the arterial wall affecting autonomic nerve fascicles delayed to treatment. Acute loss of endothelialization resulted in thrombus formation leaving kidney perfusion apparently unimpaired.