Purpose: Current approaches for ensuring adequate visualization of neuroendovascular devices that are implanted under fluoroscopic guidance, such as stents and flow diverters, are based on ad hoc methods and measures. Lack of specific standards makes it difficult to determine the adequacy of device contrast under clinical conditions. Inadequate device contrast due to low attenuation may result in increased radiation dose to the patient either due to prolonged fluoroscopy or due to the use of high dose-rate imaging sequence. Alternatively, this may lead to inaccurate positioning of these devices within cerebrovascular structures with potential impact on clinical outcome. We developed a protocol and applied it for evaluating such devices.
Methods: The protocol comprises three parts: quantitative measurement of equivalent attenuation (in mm of Al) under conditions used for characterizing imaging system performance (RQA5 of IEC standards), visual assessment of device contrast in homogenous background (water phantom) of anatomically relevant thickness, and visual assessment of the device contrast with anatomic background. Ten devices (2 Ni-Ti stents, 7 Co-Cr and 1 Ni-Ti flow diverters) were assessed using this protocol.
Results: Quantitative assessment of the stents showed substantial equivalent attenuation of the device end/tip marker (Pt) bands but poor attenuation characteristics of the device body. The flow diverters demonstrated improved attenuation along the device body than the stents. The newer generation of flow diverters with Pt wires interwoven with the Co-Cr wires demonstrated improved attenuation characteristics compared to previous generation which did not include Pt wires. Visual assessment under homogenous (16 cm water phantom) and anatomic background (skull phantom immersed in 16 cm water) provided qualitative confirmation.
Conclusions: The proposed protocol with further refinements can serve as the basis for evaluating the adequacy of x-ray contrast of neuroendovascular devices that are implanted under fluoroscopic guidance.

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