Neurovascular Complications of Arteriography: Recognition, Assessment, and Therapeutic Options

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Purpose
The number of cerebral and peripheral vascular diagnostic arteriograms have decreased in most centers, due both to improvements in quality of cross-sectional imaging techniques for vascular assessment, and to their increased availability. These techniques include ultrasound, MR angiography, and CT angiography. Conventional catheter angiography is reserved for those cases where cross-sectional imaging fails to fully elucidate the pathologic problem, and for lesions requiring endovascular intervention. For these reasons, it is important for those individuals performing diagnostic angiography, cerebral or peripheral, to review the potential vascular and neurovascular complications and to review methods of recognition, diagnostic assessment, and therapeutic options.

Materials & Methods
Clinical case material was reviewed and selected to illustrate potential complications of angiography within the following categories: Vasospasm, Vascular injury, Embolic phenomenon, Vascular access injury and inadequate hemostasis. Each lesion is defined and described. Available techniques for risk reduction and therapeutic options for treatment are presented and discussed.

Results
Vasospasm: Vasospasm refers to smooth muscle contraction that results in narrowing of a vessel, usually due to irritation caused by the presence of the catheter or guidewire within the vessel or due to a power injection with the catheter tip facing the vessel wall. It may be asymptomatic, or may result in thrombosis or distal embolization of thrombus. Small catheters and meticulous technique minimize vasospasm. Pharmacologic intervention with vasodilators or calcium channel blockers may be needed if catheter reposition is unsuccessful. Vascular injury: Dissection, pseudoaneurysm, laceration or occlusion may result from arterial injury caused by either guidewire or catheter. Meticulous technique and careful observation of both wire and catheter tip are essential. Stents, vascular occlusion, and anticoagulation are all useful therapeutic options when specific treatment is indicated. Embolic phenomenon: Distal migration of air, thrombus or plaque during angiography may lead to TIA, stroke, or ischemia to bowel, extremity, or retroperitoneal organs. Heparinized saline flush and intravenous heparin bolus are the mainstays of risk reduction, coupled with meticulous technique. Thrombolytic therapy, administered intraarterially may allow restoration of flow and prevent tissue injury. Vascular access injury and inadequate access site hemostasis: Micropuncture techniques and careful monitoring of wire and catheter position are key. Puncture below the inguinal ligament and attention to bleeding parameters prior to, during, and after angiography may minimize the risk of
complications. Thrombolysis, stent placement, and surgical revascularization or hematoma removal may be needed for control of problems at the arterial puncture site.

**Conclusion**

Complications of angiography can be clinically significant and sometimes devastating. Prompt recognition of complications such as vasospasm, dissection, pseudoaneurysm, vascular occlusion, and hematoma can allow for rapid institution of treatment, and potentially reduce procedure-related morbidity. Knowledge of complications and the methods for risk reduction in angiography can improve patient outcome.

**References**