

Catheter-induced arterial spasm and standing waves

Ian C Duncan

FF Rad (D) SA

Unitas Interventional Unit
Centurion

Arterial spasm that is not due to acute vessel trauma but that occurs during arteriography is probably related to focal irritation of the vessel by manipulation of the catheter or guidewire, or to the passage of the contrast agent, or both. The spasm may be focal or involve a long segment of a vessel (Fig. 1). In general this occurs in medium-sized arteries, particularly in children and young adults.¹ It can also occur in veins.

Focal spasm can be mistaken for a focal atheromatous, neointimal or fibrotic stenosis, or type II fibromuscular dysplasia (FMD). We have seen catheter-induced focal spasm occurring in a renal artery mistakenly reported as FMD in a potential renal donor, and as an atheromatous plaque referred for renal angioplasty in another case. In both of these cases the diagnoses were made based on the selective renal arteriograms, and in both cases careful review of the accompanying flush aortograms performed at the onset of each study showed that the stenoses were in fact not present in the same vessels initially. We feel that a flush aortogram should therefore be performed prior to any selective abdominal aortic branch catheterisation, especially

when investigating the renal arteries (Fig. 2). More diffuse spasm over a longer segment may be mistaken for a dissection. The presence of spasm is probably often associated with focal intimal damage, even to the extent of a small intimal tear and so great care

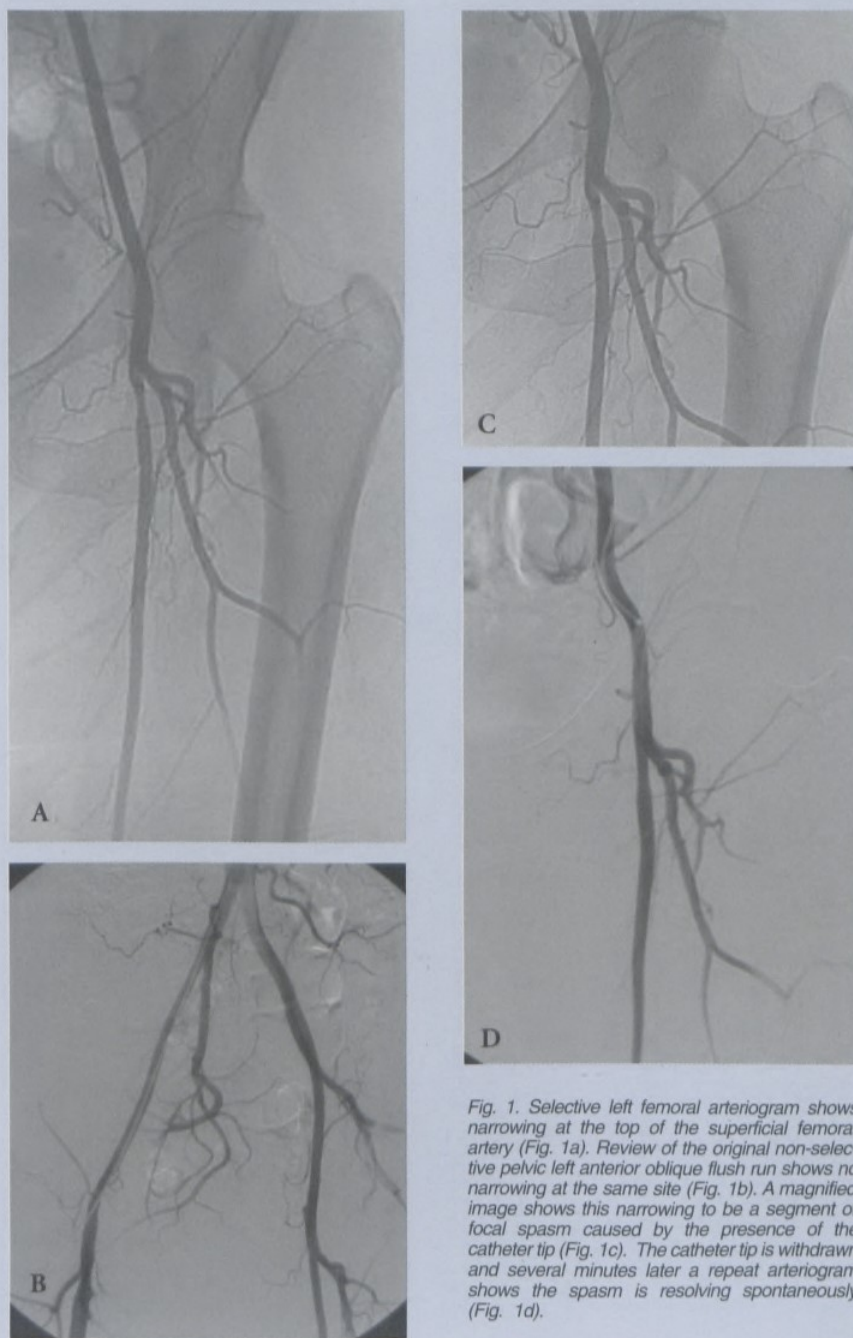


Fig. 1. Selective left femoral arteriogram shows narrowing at the top of the superficial femoral artery (Fig. 1a). Review of the original non-selective pelvic left anterior oblique flush run shows no narrowing at the same site (Fig. 1b). A magnified image shows this narrowing to be a segment of focal spasm caused by the presence of the catheter tip (Fig. 1c). The catheter tip is withdrawn and several minutes later a repeat arteriogram shows the spasm is resolving spontaneously (Fig. 1d).

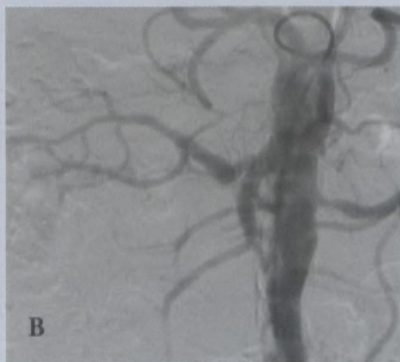
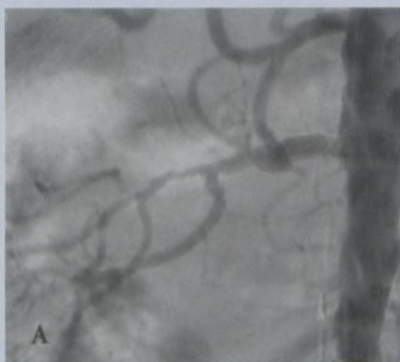


Fig. 2. An irregular beaded appearance to the upper segmental division of the right renal artery suggests fibromuscular dysplasia (Fig. 2a). Retrospective review of the initial flush aortogram shows no beading in the same vessel (Fig. 2b). This appearance is due to spasm induced in this vessel during placement of a stent for an ostial stenosis.

should be taken in manipulating any catheter or wire through a vessel that has already been or is still spastic.

We have found that the best method of alleviating mild to moderate vessel spasm has simply been to remove the irritating stimulus (such



Fig. 3. Standing waves in a superficial femoral artery. Note the regular frequency and diameters of the peaks and troughs of the waves which helps to differentiate this phenomenon from fibromuscular dysplasia.

as the catheter tip or guidewire) from the affected vessel, and to wait for the spasm to resolve by itself. Pharmacological agents that may be useful in the treatment of more severe vessel spasm include the calcium-channel blockers such as nifedipine (Adalat) or nimodipine (Nimotop), and intra-arterial infusion of either papaverine or nitroglycerine. Naturally the offending catheter or wire should be removed as well where possible, and where the flow of blood is severely

impeded the use of heparin should also be considered.

Standing waves, also known as stationary waves, are sometimes observed in medium-sized arteries such as the femoral, popliteal, mesenteric and carotid arteries (Fig. 3). Characteristically the indentations occur at more regular intervals along the artery and to the same degree of narrowing throughout the affected vessel unlike the more irregular beaded appearance seen in type I FMD. In addition, unlike the beading often seen in FMD, the diameter of the individual 'beads' in standing waves never exceeds the diameter of the normal adjacent vessel itself, which also helps to distinguish this appearance from FMD.

The cause of this phenomenon is unknown, but it is thought to represent a kind of diffuse spastic response to the presence of a catheter or guidewire or contrast agent, or even to the transient pressure increase within the vessel lumen during a contrast injection.

Standing waves are a transient phenomenon requiring no specific treatment.

Reference

1. Polak JF. Femoral arteriography. In: Braun S, Pendergrass EP, eds. *Abrams' Angiography*. 4th ed. Boston: Little, Brown and Co, 1997: 1733.