

## CANNULATION INJURIES OF THE RADIAL ARTERY

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The article by Wallach<sup>1</sup> in this issue reminds us that even such a frequently used and seemingly benign procedure as cannulation of the radial artery can result in serious complications. The possibility of complications is especially high in critically ill patients who have other comorbid conditions. Several steps are required to minimize the risks associated with cannulation of this artery. As Wallach indicates, the first step is properly selecting patients on the basis of the risk-benefit ratio, and several factors that may increase the risk associated with cannulation of the radial artery are described in his article. The second step in preventing complications is using meticulous technique for the cannulation.

Use of proper techniques in cannulating the radial artery or other arteries can reduce the risk for arterial injury. When such techniques are adhered to, the risk of trauma to the radial artery and subsequent thrombosis is reduced even when collateral circulation in the hand is reduced. Proper aseptic technique, as with all invasive procedures, is required to reduce the risk of infection. Next, local anesthesia (without epinephrine) should be used liberally in the skin and subcutaneous tissues. Use of local anesthesia has 2 effects. First, it reduces the chance that the patient will move with the catheter either in, or in proximity to, the artery; such movement can cause injury. Second, the local vasodilatory effects of the local anesthetic can reduce vasospasm, making a successful catheterization more likely, helping ensure flow around the catheter and decreasing the chance of arterial thrombosis.

A technique that minimizes trauma to the artery should be adhered to for any arterial cannulation. The catheter should be directed toward the artery at a 45° angle, with the bevel of the needle up and advanced into the artery. Once pulsatile flow is apparent within

the cannula, the needle can be brought closer to the hand to an angle of approximately 15° to 30°. This maneuver will facilitate cannulation of the vessel. Clearly, multiple puncture attempts will increase the risk of injury due not only to the direct trauma but also to vasospasm. Often when the artery has been entered but cannulation is difficult, a soft 0.018-in (0.46-mm) guidewire can be placed into the artery and used as a guide to advance the catheter in a coaxial fashion. Care must be taken during this maneuver because the guidewire itself can cause trauma to the intima of the artery, resulting in dissection and/or perforation.

Although angiocatheters or other 1-wall needles are used for most cannulations of the radial artery, some clinicians advocate doing a through-and-through cannulation with the catheter being placed into the artery during withdrawal. Needles designed for a through-and-through puncture technique usually have an obturator that is removed after the needle containing the obturator has passed through the vessel. It is generally safer to use a 1-wall technique in which the artery is punctured on the first pass, especially when the relative size of the catheter to the vessel being cannulated is large, as is the situation for the radial artery. Use of a 1-wall technique reduces trauma to the back wall of the artery and the risk of arterial laceration.

In addition, embolization can cause distal ischemia, which can be markedly more difficult to treat than is in situ thrombosis. The radial artery is generally not so severely diseased that embolization is a major issue. Although most cannulation injuries are asymptomatic, the likelihood of an injury increases with the amount of disease in the native vessel. Finally, care must be taken even when removing a radial or other arterial cannula. The radial artery is easily compressed over the adjacent bony prominences. During removal of the cannula, pressure should be held to prevent bleeding at the puncture site but should not impede all flow through the artery. Impeding flow can result in thrombosis.

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Cannulation of the radial artery can be performed in most patients without any untoward effects, and in many instances, the radial artery can be sacrificed without clinical consequences. Even in patients who have thrombosis of the radial artery, the artery often spontaneously recanalizes. However, when complications do occur, they are severe because of the functional importance of the affected areas of the thumb and hand.

#### REFERENCES

1. Wallach SG. Cannulation injury of the radial artery: diagnosis and treatment algorithm. *Am J Crit Care.* 2004;13:315-319