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Minimally Invasive Endovascular Techniques

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I. INTRODUCTION

In the current age of managed care and cost-effective medicine, a trend has developed across the surgical specialties to develop minimally invasive techniques. This trend has also affected vascular surgery. With the emphasis on outpatient procedures and decreased length of stay as well as the technological explosion in the development of endovascular techniques, vascular surgeons have new therapeutic options for treating both arterial and venous disease. In this review, we discuss the currently accepted endovascular interventions including balloon angioplasty, intravascular ultrasound, stenting, atherectomy, percutaneous vena caval filter placement, and thrombolytic therapy.

II. VASCULAR ACCESS

GENERAL PRINCIPLES

Every endovascular procedure requires (1) arterial access, (2) fluoroscopic-guided wire placement, and (3) fluoroscopic-guided placement of an intraluminal introducer sheath. Because most complications in endovascular interventions occur as a result of access-site problems, an understanding of the techniques involved is essential.

ACCESSING THE ARTERY

The artery may be accessed percutaneously or by cutdown. The percutaneous method is typically used and is often performed using the Seldinger technique. The artery of choice is punctured, and then a guidewire is placed through the lumen of the needle using fluoroscopic guidance. The soft tissue tract is dilated, and a

sheath is passed over the wire through which subsequent catheters, guidewires, balloons, etc are passed and manipulated.

In the event that a percutaneous method is not desired or cannot be performed, the artery may be accessed by a cutdown approach. A cutdown method is preferred for large (> 12F) devices, combined endoluminal and open reconstructive procedures, and when the intervention is done within 4 weeks of exposure and circumferential dissection of the vessel of interest.¹ The vessel is dissected and isolated using proximal and distal control and may be entered by formal arteriotomy or by direct puncture.

ARTERIAL PUNCTURE

There are two methods of arterial puncture—a single wall and a double wall technique. The double wall puncture technique is performed by penetrating the anterior and the posterior walls of the artery. The needle is then slowly withdrawn back into the lumen. The needle tip is intraluminal when pulsatile flow is obtained. This technique assumes that the patient's hemostatic mechanisms will prevent the posterior puncture site from bleeding excessively. The single wall puncture technique involves puncturing only the anterior wall and is preferred in patients with compromised hemostatic mechanisms, with need for thrombolytic therapy, or with marked soft tissue laxity or marked cachexia.

Normally, the artery is punctured percutaneously over the palpable pulse. If the pulse is not palpable, the artery can be accessed using bony landmarks that are visualized radiographically. The best puncture site to enter the common femoral artery is 1 cm lateral to the cortex of the femoral head with the needle held at an angle of 30 to 45 degrees.²

The artery can be punctured in an antegrade or retrograde fashion depending on the location of the