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Treating the Diseased Superficial Femoral Artery

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Vascular disease involving the superficial femoral artery (SFA) is common. Once the decision to treat the SFA is made, the benefits and limitations of angioplasty and stents must be applied to each specific patient. Additionally, the potential role of covered stents as well as drug eluting stents must be considered.
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Endovascular treatment of vascular disease in the femoral popliteal artery is complex because of the involvement of variable vessel length and the unique forces from flexion, torsion, and compression in the region. The Trans Atlantic Inter-Societal Consensus (TASC) II classification along with the amount of vessel calcification warrants special attention when deciding the best treatment option in the superficial femoral artery (SFA).[1] There are a number of available treatment options, which have been described and studied; however, even with the extensive literature and experience, interventionalists are faced with difficult decisions over the treatment of the diseased SFA. For example, when will percutaneous transluminal angioplasty (PTA) be the best option? When should stents be placed? What stents should be used? What are the advantages of covered versus uncovered stents? This article will briefly discuss the treatment options available, particular by the specific techniques used and decisions that are made for the treatment of the diseased SFA.

Noninvasive Treatment or Endovascular Intervention?

The role of noninvasive medical therapy as opposed to surgical revascularization has been studied extensively in patients with claudication.[2,3] Patients should be aggressively initiated on antiplatelet and statin medications, enrolled in exercise and nutrition programs, and counseled on smoking cessation and diabetic glucose control. These noninvasive, conservative treatments have been more effective than surgery in patients with claudication, given the risks associated with surgery. Newer endovascular treatment options have challenged the paradigm of using only medical management for patients with claudication. As the risks of endovascular treatment are traditionally less than those with open surgery and the results have improved, more patients with claudication are undergoing invasive treatment for their symptoms. While there have been some studies that have documented no clinical difference between medical and endovascular intervention, particularly long-term,[4] some studies have identified some advantages for the treatment of claudication.[5] Most interventionalists resist treating claudicants initially with SFA interventions as the long-term clinical outcomes are not much better than medical treatments. The treatment of claudicants is usually reserved for patients who have not improved on noninvasive therapies and have lifestyle-limiting symptoms.

Percutaneous Transluminal Angioplasty

PTA remains the most traditional interventional technique used in the treatment of SFA disease (Fig. 1), and its long-term effectiveness is less than ideal. In a cohort of 307 patients gathered from the control arm of 6 high quality trials, the primary patency after PTA in the SFA was 33% in 1 year. When taking lesion length into account, lesions between 11.1 and 15 cm had a 1 year patency of 16%, lesions between 5.6 and 11 cm had a 1 year patency of 38%, and lesions between 4 and 5.5 cm had a 1 year patency of 28%.[6] Given these poor results, PTA is used primarily in minimally calcified, focal, TASC A lesions.[7]

When performing balloon angioplasty, choosing the correct balloon is critical. While all angioplasty balloons are by definition, noncompliant, their degree of noncompliance varies. More

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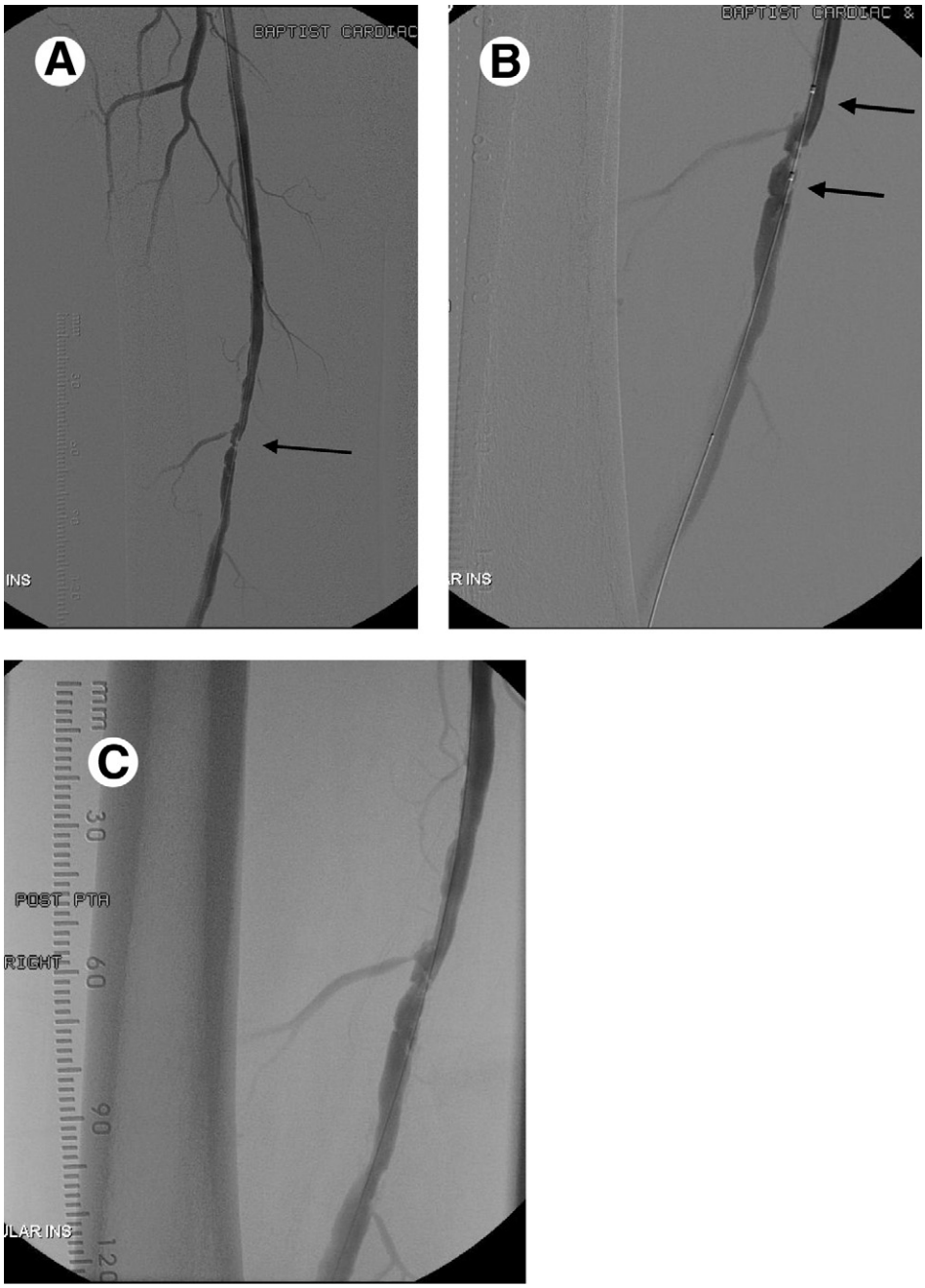

Figure 1 (A) Seventy-two–year-old man with lifestyle limiting claudication. Digital subtraction angiogram (DSA) demonstrates a focal mid superficial femoral artery (SFA) with severe stenosis (black arrow). (B) The lesion was crossed with the aid of a wire and catheter and treated with a 5 mm by 20 mm balloon catheter (black arrows). (C) Postangioplasty DSA demonstrates resolution of stenosis without flow limiting dissection.

compliant balloons will stretch beyond their predetermined length when the radial pressure of the balloon reaches a balloon-specific force that may not be sufficient to dilate a stenosis, causing the balloon to conform to the vessel lumen instead of dilating a stenosis. Less compliant balloons should not stretch beyond the predetermined diameter of the balloon catheter, but the applied pressure creates an outward radial force without affecting the applied pressure in the longitudinal direction regardless of the amount of inflation pressure applied. Noncompliant balloon catheters should be used in heavily calcified lesions as the wall stress is relatively constant in these balloons compared to the more compliant balloons. Selected balloon diameters should be based on the vessel diameter and error, if any, should be on the smaller side to lessen the risk of vessel rupture. The proper length of the balloon is important to minimize trauma to the adjacent nondiseased vessel. Long balloons should be used to minimize the total number of inflations in patients for long segment disease. However, the compliance of these larger balloons may require a shorter balloon for persistent focal residual disease following long segment angioplasty. Inflation time should be prolonged (2 or 3 min) as it may help decrease the risk of flow limiting dissections. Because of the