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PERIPHERAL

Outcomes of Spot Stenting Versus Long Stenting After Intentional Subintimal Approach for Long Chronic Total Occlusions of the Femoropopliteal Artery

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ABSTRACT

OBJECTIVES This study sought to compare the outcomes of spot stenting versus long stenting after intentional subintimal approach for long femoropopliteal chronic total occlusions (CTO).

BACKGROUND The optimal stenting strategy following the subintimal recanalization of long femoropopliteal chronic total occlusions has not been investigated.

METHODS A total of 196 limbs in 163 patients, implanted with bare nitinol stents after subintimal approach in long femoropopliteal occlusions (lesion length 25 ± 8 cm), were retrospectively analyzed. The primary patency was compared between spot stenting (n = 129) and long stenting (n = 67).

RESULTS Baseline characteristics and immediate procedural results were similar between groups. Adjusted-primary patency (47% vs. 77%, $p < 0.001$) and adjusted-freedom from target lesion revascularization (52% vs. 84%, $p < 0.001$) at 2 years were significantly lower in the long stenting group than in the spot stenting group. The incidence of stent fracture, fracture type, and restenosis pattern did not differ between groups. Long stenting was an independent predictor of restenosis (hazard ratio [HR]: 2.0) along with other risk factors such as nonuse of clopidogrel (HR: 3.3) or cilostazol (HR: 2.2), small stent diameter (HR: 0.6), poor run-off (HR: 1.9), and post-procedural ankle-brachial index (HR: 0.1). Compared with spot stenting after adjustment using inverse probability of treatment weighting, long stenting, especially involving the P2 or P3 segment of the popliteal artery, was independently associated with 7.5-fold increases in restenosis risk ($p < 0.001$).

CONCLUSIONS The primary patency was significantly higher with spot stenting than with long stenting following subintimal approach for long femoropopliteal chronic total occlusions. The risk of restenosis was especially higher when long stenting was extended to the distal popliteal artery. (J Am Coll Cardiol Intv 2015;8:472-80) © 2015 by the American College of Cardiology Foundation.

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Recent randomized studies have revealed that stent placement is associated with improved patency and clinical improvement compared with balloon angioplasty for the endovascular treatment of superficial femoral artery (SFA) lesions of increasing lengths (1–3). However, most of these patients had stenotic lesions rather than occlusions, and long lesions were rarely included. Therefore, treatment strategies for long occlusions of the SFA have not been standardized, although these occlusions are relatively common in patients with lower extremity artery disease (4,5). Subintimal angioplasty is a widely accepted treatment approach for the recanalization of long chronic total occlusions (CTO) of the SFA with favorable immediate and late outcomes (6–10). Despite the frequent use of subintimal angioplasty for CTO lesions of the SFA, the role of stenting in the subintimal tract is unclear. Whether spot stenting, which only covers segments with flow limitations or residual stenosis >30%, or long stenting, which covers the whole subintimal tract, is superior remains unknown, and an optimal stenting strategy has yet to be determined. Therefore, the purpose of this study was to compare the outcomes of spot stenting versus long stenting after subintimal approach for long CTO of the femoropopliteal artery.

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METHODS

SUBJECTS. Between 2003 and 2013, a total of 196 limbs in 163 patients who underwent successful stenting after intentional subintimal approach for long femoral CTO (lesion length ≥8 cm) were retrospectively analyzed. The treated limbs were classified into 2 groups, according to the stenting strategies: 129 limbs (66%) in the spot stenting group and 67 limbs (34%) in the long stenting group.

Before the angioplasty procedure, all patients underwent physical examinations, ankle-brachial index (ABI) assessments, and imaging tests, including computed tomography (CT), magnetic resonance angiography, or color duplex ultrasound. The Institutional Review Board at the Severance Hospital of the Yonsei University Health System approved this study and waived the requirements for informed consent for this retrospective analysis.

ANGIOPLASTY PROCEDURE. All procedures were performed under local anesthesia supplemented with intravenous sedation and analgesia when required. Either ipsilateral or contralateral femoral puncture was performed, depending on the distance to the target lesion. A 7-F introducer sheath (Terumo, Tokyo, Japan) was used for the ipsilateral approach, whereas a contralateral sheath (6-F to 8-F, Balkin; Cook Inc., Bloomington, Indiana) was employed for the crossover approach. A 0.035-inch hydrophilic guidewire (Radifocus, Terumo) and a supporting 5-F multipurpose catheter (Torkon NB, Cook Inc.) were used to cross the totally occluded lesion. In the intentional subintimal approach, a straight hydrophilic 0.035-inch wire was introduced at the level of the proximal stump eccentrically either into the medial or lateral wall of the occluded femoral artery using a 4-F or 5-F angled catheter. The wire was advanced distally to form a loop of wire, which was then pushed into the distal lumen supported by the catheter. We considered wire passage to be subintimal when linear or spiral dissections were visible at the proximal and distal stump. The Outback LTD re-entry catheter (Cordis, Bridgewater, New Jersey) was used when the guidewire failed to enter into the true lumen. After the subintimal passage of the guidewire through the CTO, the target artery was dilated with a balloon (5 to 6 mm in diameter).

The stenting strategy was chosen by the operators' discretion. In the spot stenting group, the entire lesion length was not covered with stents after balloon dilation. At least 1 stent was routinely deployed into the proximal stump of the subintimal tract (10), and the segments with flow-limiting dissection, significant residual stenosis (>30%), or a pressure gradient >20 mm Hg were covered with additional stents. In the long stenting group, the entire lesion length was primarily covered with overlapping stents. Self-expanding nitinol stents (S.M.A.R.T. [Cordis]; Zilver [Cook]; Absolute Pro [Abbott Vascular, Redwood City, California]; Complete SE, [Medtronic, Santa Rosa, California]; or Protégé Everflex [Covidien, Plymouth, Minnesota]) of 6 to 8 mm in diameter were deployed into the subintimal channel. Deployed stents were routinely dilated with balloons for better apposition. After stenting, we routinely administered the combination of aspirin (100 mg/day) and either clopidogrel (75 mg/day) or cilostazol (200 mg/day) for at least 1 year. Thereafter, lifelong aspirin with or without cilostazol was given.

FOLLOW-UPS AND EVALUATIONS OF STENT-RELATED FACTORS FOR RESTENOSIS. All patients underwent noninvasive hemodynamic evaluations before discharge, including ABI measurements, segmental pressures, and pulse volume recordings. Patients

ABBREVIATIONS AND ACRONYMS

ABI = ankle-brachial index
CT = computed tomography
CTO = chronic total occlusion
HR = hazard ratio
SFA = superficial femoral artery
TASC = TransAtlantic Inter-Societal Consensus
TLR = target lesion revascularization