Provisional Stenting of the Iliac Arteries

This technique may provide a more cost-effective and patient-specific option.

BY JOHN H. RUNDBACK, MD

Percutaneous revascularization of the common and external iliac artery using percutaneous transluminal angioplasty (PTA) and stents is a well-established, minimally invasive technique, and has supplanted aortofemoral bypass for the majority of patients who have symptomatic iliac atherosclerosis. Despite more than a decade of experience with these techniques, debate remains regarding the optimal strategy for flow restoration: are stents always needed, or only in selected cases? Even in an era of multiple stent designs, this remains a relevant question. Historical results of iliac angioplasty alone are quite favorable, with reported technical success rates ranging from 50% to 96%, and 2- and 5-year patency rates averaging 81% and 72%, respectively.[1] Outcomes are particularly promising for short stenoses and occlusions,[2] and for lesions localized to the common iliac artery, which together comprise nearly half of all iliac lesions referred for treatment.

STUDY DATA

The utility of selective provisional stenting to salvage iliac lesions after failed or unsatisfactory PTA due to elastic recoil, flow-limiting dissection or residual gradient is well established and incontrovertible. In a series of 250 patients undergoing either PTA alone or PTA with provisional stenting, the provisional stent arm was associated with more than a 2.5-fold reduction in immediate failures,[3] although cumulative 4-year patency in the two groups were similar (primary, 58% and 64%; secondary, 68% and 74%). Unsatisfactory PTA more commonly occurs with multisegmental disease and long-segment iliac occlusions, an observation that has prompted at least several operators to recommend primary placement of stents in these cases.[4-7] However, other investigators have suggested that complex multilevel iliac occlusive disease treated with stenting is simi-

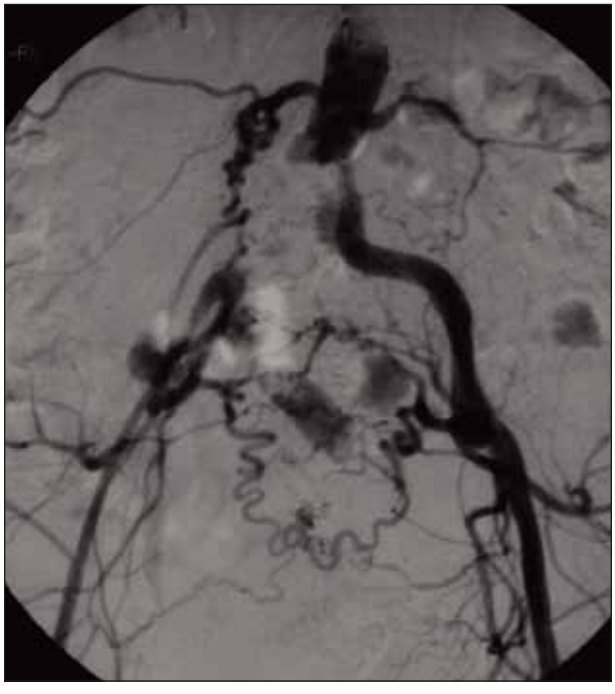

Figure 1. Chronic right common iliac occlusion.

larly prone to failure, particularly when there is involvement of the external iliac artery (Figures 1 and 2).[4,8,9] In fact, failures from angioplasty alone in these cases may be overestimated, and predominantly due to the inability to cross an occluded vessel that would not be salvageable with stenting. In a series of patients with chronic iliac artery occlusions undergoing angioplasty alone or with thrombolytic therapy, Leu et al described technical success of nearly 90%, with 4-year primary patency of 57% and 4-year secondary patency of 81%,[10] with successfully treated patients remaining stable on observation out to 10 years.

Several prospective trials and meta-analyses have systematically examined the comparative effectiveness of iliac PTA and stenting. The first of these, the multicenter Palmaz stent trial, evaluated 486 patients receiving 587 iliac stents, and found 2-year clinical success in 84% and 43-month success in 69% of patients.[11] The multicenter Wallstent trial studied the outcomes after provisional placement of the self-expandable Wallstent (Boston Scientific Corporation, Natick, MA) in 171 iliac arteries (140 patients) with patent ipsilateral femoral runoff, with 6-month angiography and biannual clinical examinations. One- and 2-year clinical patency was noted in 81% and 71% of patients, although 91% of the lesions treated were stenoses rather than occlusions. Two-year assisted primary patency was 84% and secondary patency was 86%.[12] These results are not substantially different from previous reports for PTA alone in comparable patient populations.[1]

The Dutch iliac stent trial directly compared a strategy of primary stenting to a strategy of PTA with selective stenting for hemodynamic angioplasty failures, strictly defined as a residual mean arterial trans-stenotic gradient >10 mm Hg after PTA, with or without pharmacologic vasodilation.[13] In this study, 279 claudicants with predominantly focal iliac stenoses were treated with either primary Palmaz stent placement (Cordis Endovascular, a Johnson & Johnson company, Miami, FL; n=143 patients, 187 lesions, 208 stents) or selective stent placement (n=136), with 43% of the selective group receiving stents (65 lesions, 77 stents). Pharmacologic vasodilation prior to pressure determinations tripled the number of lesions receiving stents compared to using pressure gradients measured without pharmacologic provocation. The initial results, as well as 2-year clinical success (76% to 78%), reintervention (4% to 7%), and hemodynamic success as measured by ankle-brachial index (85%) were essentially the same in both treatment groups.[13] Although 10 of the 12 patients with iliac occlusions initially treated with PTA required selective stenting, the small number of patients in this category made interpretation of this finding difficult.

Figure 2. Right iliac artery after recanalization and balloon angioplasty.

In another study, the utilization of duplex rather than clinical criteria for determination of restenosis has also failed to show a difference between iliac PTA alone and primary stenting.[14] Becqeumin et al compared 214 lesions undergoing PTA to 67 treated with stents, and found no differences between the groups at 2 years; patency was lower for longer lesions and occlusions regardless of the type of treatment.[14] Finally, in a meta-analysis of PTA and stenting for aortoiliac occlusive disease, stent placement reduced technical failures by 39% and long-term failures of 22% to 56% for patients with either claudication or limb salvage.[15] The majority of stents placed in this analysis were inserted selectively after PTA failures.

The free lumen area after endovascular treatment is an important determinant of long-term success. Lesions undergoing either PTA or stenting with similar resulting postprocedural free lumen areas have equivalent 1-year patency rates.[16] The application of stents in lesions successfully treated with PTA alone may theoretically reduce lumen size due to incomplete vessel wall apposition, a phenomenon also associated with delayed endothelialization and restenosis. Subtotal contact of an iliac stent with the arterial wall has been demonstrated to be a cause of late failure.[17] This is particularly true in

calcified eccentric stenoses and in smaller-caliber vessels, such as the external iliac artery.

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COST-EFFECTIVENESS

Selective iliac stenting is likely to be cost effective. In the Dutch iliac stent trial, this approach prevented stent use in 57% of patients, without affecting outcomes.[13] An economic analysis of the treatment of iliac stenoses by Bosch et al utilizing meta-analytical and prospective trial datasets concluded that primary stenting has almost $1,000 more incremental costs at analysis 1 year after treatment (including the impact of reinterventions) compared with selective stenting.[18] Even if selective stenting is applied to more complex chronic occlusive disease, the 10% to 15% of cases that may avoid stenting yield a cost-effectiveness over a strategy of primary stent placement.[19] Considering a 12% to 30% 5-year cardiovascular mortality for patients with iliac disease, and the recently proven durability of selective stenting out to more than 5 years,[20] the late-term cost-effectiveness of a selective stenting approach is likely to be even further enhanced.

COMPLICATIONS

Complications resulting from angioplasty of focal stenoses occur in only 4% of cases, but may be as high as 24% when treating longer segment occlusions, predominantly due to the risk of embolic events.[8,10] However, chronic total occlusions of the iliac artery comprise only 13% of lesions in larger series of iliac interventions,[21] and newer methods of clot removal prior to angioplasty may theoretically lower embolic risks.

CONCLUSION

Decisions regarding the appropriateness of stenting for a patient with iliac atherosclerosis will naturally need to be individualized. Existing data suggest that angioplasty alone or with strictly defined provisional stenting is expected to have similar initial results and late-term durability compared with primary stenting in most scenarios, and may in fact, be a cost-effective strategy. The primary use of stents for occlusions exceeding 5 cm in length may be justified to reduce procedural complications or risks of thrombolytic therapy. However, long-segment chronic occlusions comprise a minority of treated iliac lesions, and in these cases, the major determinant of successful therapy is an ability to traverse the obstruction rather than the mode of therapy. The impact of evolving technologies including cryoplasty, drug-elution platforms, and stent grafts will undoubtedly continue to fuel future controversies regarding the optimal management of iliac disease. ■

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1. Becker GJ, Katzen BT, Dake MD. Noncoronary angioplasty. Radiology. 1989;170:921-940.
2. Dormandy JA, Rutherford RB. Management of peripheral arterial disease (PAD): TASC Working Group – Transatlantic Inter-Society Consensus (TASC). J Vasc Surg. 2000;31:S1-S296.
3. Hassen-Khodja R, Sala F, Declemy S, et al. Value of stent placement during percutaneous transluminal angioplasty of the iliac arteries. J Cardiovasc Surg. 2001;42:369-374.
4. Powell RJ, Fillinger M, Walsh DB, et al. Predicting outcome of angioplasty and selective stenting of multisegment iliac artery occlusive disease. J Vasc Surg. 2000;32:564-569.
5. Murphy TP, Webb MS, Lambiase RE, et al. Percutaneous revascularization of complex iliac artery stenoses and occlusions with the use of Wallstents: three-year experience. J Vasc Interv Radiol. 1996;7:21-27.
6. Vorwerk D, Gunther RW, Shurmann K, et al. Primary stent placement for chronic iliac artery occlusions: follow-up results in 102 patients. Radiology. 1995;194:745-749.
7. Henry M, Amor M, Ethevenot G, et al. Percutaneous endoluminal treatment of iliac occlusions: long-term follow-up in 105 patients. J Endovasc Surg. 1998;5:228-235.
8. Labord JC, Palmaz JC, Rivera FJ, et al. Influence of anatomic distribution of atherosclerosis on the outcome of revascularization with iliac stent placement. J Vasc Interv Radiol. 1995;6:513-521.
9. Powell RJ, Fillinger M, Bettman M, et al. The durability of endovascular treatment of multisegment iliac occlusive disease. J Vasc Surg. 2000;31:1178-1184.
10. Leu AJ, Schneider E, Canova CR, et al. Long-term results after recanalisation of chronic iliac artery occlusions by combined catheter therapy without stent placement. Eur J Vasc Endovasc Surg. 1999;18:499-505.
11. Palmaz JC, Laborde JC, Rivera FJ, et al. Stenting of the iliac arteries with the Palmaz stent: experience from a multicenter trial. Cardiovasc Intervent Radiol. 1992;15:291-297.
12. Martin EC, Katzen BT, Benenati JF, et al. Multicenter trial of the Wallstent in the iliac and femoral arteries. J Vasc Interv Radiol. 1995;6:843-849.
13. Tetteroo E, van deer Graaf Y, Bosch JL, et al. Randomised comparison of primary stent placement versus primary angioplasty followed by selective stent placement in patients with iliac-artery occlusive disease. Lancet. 1998;351:1153-1159.
14. Becquemin JP, Allaire E, Qvarfordt P, et al. Surgical transluminal iliac angioplasty with selective stenting: long-term results assessed by means of duplex scanning. J Vasc Surg. 1999;29:422-429.
15. Bosch JL, Hunink MGM. Meta-analysis of the results of percutaneous transluminal angioplasty and stent placement for aortoiliac occlusive disease. Radiology. 1997;204:87-96.
16. Vogt KH, Rasmussen JG, Schroeder TV. Effect and outcome of balloon angioplasty and stenting of the iliac arteries evaluated by intravascular ultrasound. Eur J Vasc Endovasc Surg. 1999;17:47-55.
17. Arko F, Mettauer M, McCollough R, et al. Use of intravascular ultrasound improves long-term clinical outcome in the endovascular management of atherosclerotic aortoiliac occlusive disease. J Vasc Surg. 1998;27:614-623.
18. Bosch JL Tetterro E, Mali WPTM, et al. Iliac arterial occlusive disease: cost-effectiveness analysis of stent placement versus percutaneous transluminal angioplasty. Radiology. 1998;208:641-648.
19. Bosch JL, Haaring C, Meyerovitz MF, et al. Cost-effectiveness of percutaneous treatment of iliac artery occlusive disease in the United States. AJR. 2000;175:517-521.
20. Klein WM, van der Graaf Y, Seeger J, et al. Long-term cardiovascular morbidity, mortality, and reintervention after endovascular treatment in patients with iliac artery disease: the Dutch Iliac Stent Trial study. Radiology. 2004;232:491-498.
21. Johnston KW. Iliac arteries: re-analysis of results of balloon angioplasty. Radiology. 1993;186:207-212.