Endovascular treatment of internal iliac artery obstructive disease

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Background: This study evaluated the therapeutic value of endovascular techniques in patients with buttock claudication caused by stenosis or occlusion of the internal iliac artery.

Methods: The records of patients with buttock claudication who had undergone endovascular treatment for internal iliac artery stenosis or occlusion were analyzed retrospectively, and any associated arterial lesions, morbidity, restenosis, or recurrent buttock claudication was noted. Outcomes were compared with published reports. Iliac artery duplex scans and aortoiliac angiography were performed to detect and confirm the internal iliac artery obstructive disease. The iliac duplex scanning surveillance protocol was set at 3, 6, and 12 months and yearly thereafter to detect eventual restenosis or occlusion.

Results: Between September 2006 and September 2008, 21 consecutive patients (19 men; mean age, 67 years) with 22 cases of buttock claudication (1 bilateral localization) underwent percutaneous transluminal angioplasty alone (14 cases) or additional stent placement in case of elastic recoil (8 cases). Buttock claudication was associated with impotence, thigh claudication, or calf claudication in seven patients. The endovascular approach was successful in all patients, without morbidity or mortality. During a mean follow-up of 14.7 ± 5.7 months, 50% restenosis occurred in one 80-year-old patient. The patient had a pain-free walking distance of 110 meters and was treated conservatively.

Conclusions: To our knowledge, the present study is the largest published report concerning endoluminal treatment of buttock claudication due to internal iliac artery obstructive disease. The midterm results are very encouraging and underscore the value of stent-supported angioplasty as first-line treatment. The procedure can be repeated should significant restenosis occur and does not compromise the option of surgical repair of the lesions. (J Vasc Surg 2009;49:1447-51.)

Buttock claudication is an uncommon complication after surgery for occlusive or aneurysmatic aortoiliac lesions, occurring in only 2.1% and 1.5% of patients, respectively.1 It can also occur as the result of atherosclerotic iliac stenosis or occlusion.2,3 In patients with severe IIAs stenosis or occlusion, the surgical decompression (resection of arcade of Bouisson and piriformis muscle) is demanding and hazardous because of the deep pelvic localization of these vessels and the closeness of lumbar sacral trunk.

Endovascular techniques would be beneficial and avoid a challenging invasive open repair with high-risk of possible complications. However, the endovascular experience with IIA stenosis or occlusion and coexisting severe buttock claudication is still limited and any conclusion for the moment premature. The present report attempts to estimate the effect of stent-supported angioplasty as first-line therapeutic option, highlighting the midterm outcomes of 22 cases of buttock claudication and relevant IIA stenosis or occlusion treated by endovascular means.

MATERIALS AND METHODS

Between September 2006 and September 2008, 21 consecutive patients (22 cases, 1 bilateral localization) with buttock claudication related to obstructive IIA disease were treated with PTA at our department. The study conducted at St. Franziskus Hospital Munster, Germany excluded patients with buttock claudication after endovascular repair of an abdominal aortic aneurysm and IIA embolization as well as patients with aortic and common iliac atherosclerotic disease. To exclude patients with spine or hip and peripheral nerves diseases, patients were evaluated clinically and with computed tomography (CT) scan by an independent orthopedic surgeon and neurologist. In addition, three of these patients had undergone a previous spinal operation with sustained symptoms of buttock claudication. Clinical signs and vascular examination of these patients revealed a typical vascular in origin claudication, and they were included in the common diagnostic protocol of patients with suspected atherosclerotic IIA stenosis or occlusion.

The vascular examination included records of pain-free walking distance on a standardized treadmill test at 3.2 km/h and 0° with the flat ground. Fig 1 shows the algorithm of diagnosis and treatment of patients with complaints of buttock claudication in our institution.
The common diagnostic protocol included assessment and modification of atherosclerotic risk factors and comorbidities, physical examination, and ankle-brachial index (ABI) measurements. Noninvasive imaging study included color flow duplex scanning of the aortoiliac axis and lower limbs. The IIA was considered normal when the waveform was biphasic or triphasic. Severe IIA stenosis was diagnosed in case of spectral demodulation with systolic damping and duplication of peak systolic velocity (PSV) compared with the nondiseased proximal IIA segment. The IIA was considered occluded when no arterial flow was detected, even if flow in the veins were recorded. In cases with spectral demodulation but with an increase of PSV of <100%, the sensitivity of iliac duplex scanning in the PSV evaluation was optimized by exercise, with 20 lower-limb flexions in the upright position.

All patients with suspected atherosclerotic IIA stenosis or occlusion underwent a diagnostic angiogram in an operating theater equipped with an angiography suite. Oblique projections were obtained of their hypogastric and superior gluteal arteries. In patients with confirmed IIA involvement, the decision for IIA PTA was made on the table, and the characteristics of the lesion were meticulously analyzed. This series of IIA PTAs consisted of 19 men and 2 women with a mean age of 67 ± 4.3 years (range, 42-80 years). The Table summarizes the demographic and clinical characteristics of the patients.

A contralateral femoral approach was used for all procedures. Five patients had evidence of isolated IIA stenosis and one of occlusion. Angiography encompassing the iliac arteries was performed after the injection of 15 mL of contrast agent through a 5F pigtail catheter placed above the iliac bifurcation (Fig 2).

A crossover technique was used to place a 6F 45-cm sheath in the ipsilateral common iliac artery, and the recan-
alization of the involved IIA was achieved by a straight 0.035-inch hydrophilic guidewire (Terumo Europe, Leuven, Belgium). Subsequently, a 5F multipurpose angled guiding catheter (MPA, Cordis Endovascular Systems, Miami Lakes, Fla) or vertebral guiding catheter (Terumo Europe, Leuven, Belgium) was placed in the anterior trunk of the IIA. The IIA PTA was performed using a 3- to 5-mm-diameter and up to 40-mm-long balloon catheter (Admiral, Sailor, and Submarine, Invatec, Roncadelle Italy).

Stent placement in the IIA was not systematic and was reserved in case of flow-limiting dissection or elastic recoil. We used four balloon-expandable stents (Palmaz-blue, Cordis Endovascular Systems, Miami Lakes, Fla) in cases of dissected and calcified ostial lesions. In the other four cases, elastic recoil occurred and >30% restenosis was present at the middle IIA segment, and we used four self-expanding stents (Protege Everflex, ev3 Inc, Plymouth, Minn or SMART, Cordis Endovascular Systems). Figs 2 and 3 show the procedure.

Postprocedural treatment included double antiplatelet therapy with aspirin (100 mg/d) and clopidogrel (75 mg/d) for 8 weeks, and then lifelong monotherapy with aspirin.

All patients were set in a clinical observational program with lifestyle and atherosclerotic risk factors modification as well as in an iliac duplex scanning surveillance protocol at 3, 6, and 12 months and yearly thereafter to detect eventual restenosis or occlusion. The mean follow-up was 14.7 ± 5.7 months (range, 3-18 months).

Statistical analysis of collected data was done with SPSS 13.0 software (SPSS Inc, Chicago, Ill). The persistence of iliac patency during the follow-up was evaluated by Kaplan-Meier life-table analysis. The preprocedural and postprocedural pain-free walking distance and ABI were compared by nonparametric Wilcoxon tests as appropriate. Statistical significance was taken at $P < .05$.

RESULTS

Primary PTA was performed for 16 IIA stenoses and six IIA occlusions. Six of the 21 patients had an isolated IIA obstructive lesion, nine had seven associated obstructive but not significant lesions of the external iliac (2 patients had bilateral associated iliac lesions), and six had IIA stenosis with ipsilateral superficial femoral artery (SFA) stenosis or occlusion. The IIA balloon PTA in 14 patients and the elective stent placement in eight procedures were successful.

All patients had complete alleviation of the buttock claudication symptoms. The median preinterventional walking distance with buttock claudication was 85 meters (range, 20-110 meters) on flat ground and increased significantly at 225 meters (range, 100-500 meters, $P < .001$). The median ABI on the ipsilateral limb was 0.62 and increased nonsignificantly (0.73, $P > .05$) after the interven-
tion. During the follow-up, a sustained nonsignificant improvement of the ipsilateral ABI was recorded (0.75, \( P > .05 \)).

Duplex IIA imaging showed an 80-year-old patient, who continued smoking, had a 50% restenosis of the treated segment at 6 months after the initial IIA PTA. The patient had moderate buttock claudication at 110 meters and was treated conservatively by continuation of physical exercise. The cumulative primary patency rate with 100% lumen preservation of the PTA segment was 95.5% (Fig 4).

**DISCUSSION**

Buttock claudication is frequent after IIA interruption. During endovascular and open aortoiliac aneurysm repair with bilateral IIA interruption, buttock claudication developed in 44% of patients postoperatively, and 15% complained of buttock claudication at 12 months of follow-up.\(^6\)

Buttock claudication due to IIA or SGA stenosis appears exceptional because only a limited number of reports have been published.\(^7,8\) However, its prevalence is probably underestimated.

The midterm results of our study are very encouraging and underscore the utility of these less invasive procedures. The primary patency rate of the treated segments was 95.5%, and there was no evidence of related mortality or morbidity at 14.7 ± 5.7 months of mean follow-up. Especially in context with the only published report to date (in French)\(^7\) of a successful stent placement after post-IIA PTA dissection, we recorded a similar satisfactory result in eight cases of IIA stent placement, without evidence of residual stenosis, migration, or fracture during the follow-up.

We prefer balloon-expandable stents in cases of ostial heavy calcified IIA stenosis because they perform better in “hard” IIA plaques due to enhanced radial force and placement accuracy. On the other hand, a self-expanding stent on hard calcified lesions may lead to incomplete deployment of its edges, without secure treatment of the lesion, and may result in less safe balloon catheter advancement. In cases of stenosis in the middle portion of the IIA, self-expanding stents may be preferable due to their lower risk for intimal dissection and vessel rupture compared with balloon-expandable stents. However, the risk of a stent being crushed or fractured in the deep IIA in the osseofascial muscular gluteal canal\(^8\) is relevant and thus should be avoided in this portion of the IIA.

Arteriography remains the gold standard for the diagnosis of IIA stenosis and the frequently associated iliac lesions. In the absence of oblique projections, the diagnosis might be missed because the IIA is masked at the level of the gluteal canal by the external iliac artery on anteroposterior views.\(^9\) In patients with unclear buttock pain, gluteal duplex scanning is rapidly available. Bruninx et al\(^5\) found it to be an effective tool to exclude a vascular disease, with 100% sensitivity, 96% specificity, and 100% negative predictive value. However, the demonstration of the IIA in the entire segment is technically demanding, depends on the experience of the physician who performs the examination, and is often impossible, especially in obese patients.

Several techniques have been described for the detection of buttock ischemia. ABI measurements are generally nonspecific for its detection. In context with the experience of Batt et al,\(^8\) our patients had a reduced ABI before the intervention and nonsignificant benefit after the intervention, despite the complete alleviation of the symptoms. Although near-infrared spectroscopy had a low sensitivity and accuracy,\(^10\) transcutaneous oxygen pressure measurements on the buttocks during exercise seems to be more specific to detect gluteal ischemia. The technique has 83% sensitivity and 82% specificity for the detection of obstructive IIA lesions. Magnetic resonance angiography can be another option for the noninvasive diagnosis of IIA stenosis or occlusion, but no published reports were found.

Our study has two limitations. Transcutaneous oxygen pressure measurements on the buttocks were not performed in our institute. The outcome would be more valid and specific for the IIA than the ABI and the conclusion about the effectiveness of the endovascular techniques more robust. Moreover, our retrospective study with prospectively collected data analysis lacks patient randomization and comparison with the surgical repair of IIA lesions.

**CONCLUSIONS**

To our knowledge, the present study is the largest report in the literature concerning PTA for the treatment of buttock claudication and the first experience reported in English of stent-supported angioplasty of IIA obstructive disease. The midterm results are very encouraging and underscore the value of endovascular means as first-line treatment. The procedure can be repeated if significant restenosis occurs during follow-up and does not compromise the option of surgical repair of the lesions. Owing to the risk of compression at the level gluteal canal, stent placement should be reserved for suboptimal PTA.

**Fig 4.** Cumulative patency rate is shown for patients with buttock claudication and internal iliac obstructive disease treated by endovascular means during a mean period of 14.7 ± 5.7 months (standard error of the mean, 0.571).
AUTHOR CONTRIBUTIONS
Conception and design: KD, AS, GT
Analysis and interpretation: KD, AS, GP, TS, CB
Data collection: KD, AS, GP
Writing the article: KD, GP, CB
Critical revision of the article: KD, AS, GP, TS, CB, GT
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REFERENCES

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