Patency of Direct Revascularisation of the Hypogastric Arteries in Patients with Aortoiliac Occlusive Disease

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Abstract
Objectives: Various indications for internal iliac artery (IIA) revascularisation have been reported. Revascularisations for gluteal ischaemia and buttoc k claudication remain controversial and uncommon. The objective of the study was to assess the patency of direct conventional revascularisations (CRs) of the IIA in patients with aortoiliac occlusive disease because few studies have focussed on this specific topic.

Materials and methods: The charts of all patients who underwent CR of the IIA, between August 2000 and January 2009, were retrospectively reviewed. We recorded for each patient preoperative vascular work-up. All patients were tested for patency on January 2009. A computed tomography (CT) scan was requested if the duplex scan casts any doubt with regard to patency. If non-patent, the last date for confirmed patency was kept for the analysis.

Functional outcomes at the proximal level were also collected.

Results: We studied 40 patients with occlusive disease. Buttock claudication was observed in 27 patients (66%), including eight (20%) in whom these symptoms were isolated. The 13 other patients had distal claudication or rest pain and documented proximal ischaemia, justifying the IIA revascularisations. We performed 44 conventional direct revascularisations of the IIA concomitant to aorto- or iliofemoral bypasses in these patients. The overall postoperative patency rate was 89%. Five early occlusions of the IIA remained asymptomatic. The median duration of follow-up was 39 months (3–86 months). The survival rate was 95% at 1 year and 86% at 5 years. The primary patency rate of the IIA was 89% at 1 year and 72.5% at 5 years. Buttock claudication disappeared in 23 of the 27 patients (85%), who were symptomatic at the proximal level prior to surgery.

Conclusion: Direct IIA concomitant revascularisation has an acceptable patency rate in patients undergoing aorto- or iliofemoral bypasses for occlusive disease. When feasible, this technique appears to be safe for the treatment and prevention of buttock claudication.

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Various indications for internal iliac artery (IIA) revascularisation have already been reported in the literature. These indications of IIA revascularisations are for the treatment of aortoiliac aneurysmal diseases, vasculogenic impotence, critical limb ischaemia and limb salvage, reduction of colonic ischaemia after aortic surgery and the management of primitive or postoperative buttock claudication.1–5 Proximal ischaemia and its clinical presentations are characterised by substantial interindividual variability and differential diagnosis with neurologic (lumbar spine syndrome) or osteoarticular (coxarthrosis) symptoms. The condition represents a poorly recognised problem and is often ignored or left undiagnosed.6–9 Indeed, its confirmation and surgical treatment remain difficult. There are very few data in the literature concerning direct revascularisation of the IIA in peripheral arterial occlusive disease (PAOD), especially regarding the patency of such revascularisations.10–13 We have validated a technique using transcutaneous oxymetry (TcPO2) to confirm the diagnosis of gluteal ischaemia during exercise.14 Using this technique, we have shown that proximal ischaemia in selected patients is not uncommon.15–18

The purpose of the present study was to assess short- and long-term patency of direct concomitant conventional revascularisations (CRs) of the IIA in patients undergoing aorto- or iliofemoral revascularisations for aortoiliac occlusive disease.

Materials and Methods

Population

We retrospectively reviewed the charts of patients with PAOD, identified with our institutional hospital database, who underwent direct CR of the IIA at the Angers University Hospital between August 2000 and January 2009. This study period begins from the time we started our researches on proximal ischaemia and was primarily decided. Surgeries were indicated according to the Fontaine and Transatlantic Inter Societal Consensus on Peripheral Occlusive Disease (TASC) classifications. Further, direct revascularisation of the IIA was defined as any type of open procedure involving the IIA itself that was expected to result in creation of increased antegrade blood flow in this vessel. Revascularisation procedures performed for aneurysmal disease were excluded.

We recorded for each patient preoperative work-up that included duplex examination, measurement of ankle–brachial index (ABI), maximal walking distance (MWD) and vascular imaging by arteriography and/or computed tomography (CT) scan. Revascularisations of the IIA, per se, were performed in cases of buttock claudication or documented gluteal ischamia associated with homolateral IIA suitable for bypass implantation. Exercise induce gluteal ischaemia was documented by TcPO2 using a cut-off value of −15 mmHg for the DROP index as previously validated.14

Follow-up

Postoperative mortality and morbidity occurring within the first 30 days after revascularisation were recorded. Patency of the revascularised IIA was checked by CT scan prior to discharge in all cases. All patients were proposed to be re-examined at 3 and 9 months and yearly thereafter. Follow-up consisted of clinical examination and detection of buttock claudication, duplex scan of the pelvic region and measurement of ABI through routine vascular lab data demonstrating the evolution of the PAOD. All patients were tested for patency in January 2009. CT scan was requested if the duplex scan cast any doubt with regard to patency. If non-patent, the last date for confirmed patency was kept for the analysis.

Although erectile dysfunction was observed in men, information concerning erectile function was not included because it was not consistently collected and because it was not relevant to the hypogastric circulation.20

Statistical analysis

Measured values were expressed as percentages, means ± standard deviation or medians (5th–95th centiles), when appropriate. Survival and patency rate were calculated using the Kaplan–Meier method and Statistical Package for Social Sciences (SPSS) software. Comparison of pre- to post-surgical MWD and ABI was done with the Wilcoxon test. Differences were considered significant if p < 0.05 for bilateral tests.

Results

Population

A series of 40 patients (38 men) with a mean age of 60 ± 9 years was retrospectively reviewed. Cardiovascular risk factors and comorbidities are presented in Table 1. A total of 37 patients (92%) were classified as stage II according to the Fontaine classification, two (5%) as stage III and one (3%) as stage IV. Buttock claudication was present in 27 patients (66%), including eight (20%) in whom these symptoms were isolated, that is, not associated with distal symptoms. MWD and preoperative homolateral ABI were 127 m (5–426 m; n = 27) and 0.64 (0.20–0.89; n = 36), respectively. Transcutaneous oxygen pressure (TcPO2) at the buttock level during treadmill was measured preoperatively in 21 patients (51%), and it confirmed the diagnosis of gluteal ischaemia in 18 (86%) of the patients tested. In this series, 22 IIA (50%) exhibited stenosis >70% and four IIA (9%) exhibited occlusion in the initial segment of the vessel.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Cardiovascular risk factors, comorbidities.</th>
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<tbody>
<tr>
<td>Number</td>
<td>Percentage</td>
</tr>
<tr>
<td>Active smoker</td>
<td>37</td>
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<tr>
<td>Arterial hypertension</td>
<td>20</td>
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<tr>
<td>Dyslipidemia</td>
<td>17</td>
</tr>
<tr>
<td>Coronary artery diseases</td>
<td>11</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>4</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2</td>
</tr>
<tr>
<td>Chronic renal insufficiency</td>
<td>2</td>
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The other revascularised IIA did not present significant lesions but were located downstream from aortoiliac occlusive lesions requiring surgical treatment.

Operative techniques

In the 40 patients, a total of 44 revascularisations were performed, including 23 on the left and 21 on the right side. The left retroperitoneal approach was used in 28 cases (64%), the right retroperitoneal approach in 10 (23%) and the transperitoneal approach in six (13%). Direct IIA revascularisations were associated with unilateral common iliac artery-to-femoral bypasses in 18 patients (41%) and aortobifemoral bypasses in the 26 other patients (59%). Revascularisation of the inferior mesenteric artery was observed in seven cases (16%).

Postoperative period

One death (2.5%) occurred during the postoperative period. The patient was a 58-year-old male, who underwent aortobifemoral bypass with left IIA revascularisation for Leriche syndrome with left-buttock claudication. Death occurred on the 29th postoperative day due to multiple organ failure, despite colectomy for colonic ischaemia on day 15. His revascularised IIA was considered occluded.

Re-operation was required in four other cases. In three cases, the procedure consisted of draining retroperitoneal haematomas on days 0, 2 and 10. In the remaining case, the procedure consisted of viscerolysis for occlusion on day 19 after a transperitoneal approach. Thus, the global postoperative morbidity rate was 9%.

Regular postoperative examination to determine patency status of the IIA revealed asymptomatic early thrombosis in five cases. The overall postoperative patency rate for IIA was 89%.

Follow-up

The median duration of follow-up was 39 months (3–86 months), with no patient lost during follow-up. Six deaths were observed during that time. All were due to intercurrent causes: two cases of myocardial infarction, one case of respiratory decompensation and three cancers. The survival rate was 95% at 1 year and 86% at 5 years (Fig. 1).

In one case, during follow-up, a large false aneurysm involving the anastomosis of a left IIA bypass was discovered. The patient was treated by embolisation of the IIA and coverage of the ostium using a covered stent and remained asymptomatic.

Furthermore, seven cases of thrombosis of the IIA were observed during follow-up. The cumulative primary patency rates were 89%, 82% and 72.5% at 1 year, 3 years and 5 years, respectively (Fig. 1).

Functional improvement was evaluated in relation to reported symptoms, MWD and ABI. MWD and ABI on operated side were 1000 m (265–1000, \( n = 31 \)) and 0.90 (0.41–1.08, \( n = 38 \)), \( p < 0.05 \), respectively. Buttock claudication disappeared in 23 of the 27 patients (85%), who were symptomatic at this level prior to revascularisation. Symptoms persisted in four cases (15%), including two patients in whom postoperative TcPO2 exercise testing became normal.

Discussion

The IIA is the main artery supplying the muscular walls and viscera of the pelvis and buttocks. There can be important collateralisation between the hypogastric branches from one side to the other and/or to the lower extremities via the deep femoral artery branches. This explains why obstruction of one or both IIA can remain asymptomatic or lead to severe ischaemic complications, including colonic and spinal ischaemia or buttock necrosis in case of acute occlusion and development of buttock claudication in case of progressive stenosis.6,21–26 Among various indications of IIA revascularisation, treatment of vasculogenic impotence has been largely abandoned. Some cases of critical limb ischaemia treatment and limb salvage were reported. Treatment of aorto-iliac aneurysmal disease, which currently represents the main indication for IIA surgery to prevent colonic ischaemia, has been described extensively in the literature.1–5,27–30

Buttock claudication is a frequent occurrence after surgical occlusion of one IIA for endovascular treatment of aorto-iliac aneurysm. Proximal ischaemia, in this aneurysmal context, has been reported as an early postoperative complication in up to 44% of cases, with an additional 15% of cases exhibiting proximal ischaemia during the first year of follow-up in cases of occlusion of...
both IIA. By contrast, perusal of the relevant literature suggests that gluteal exertional ischaemia due to IIA progressive stenosis or occlusion is much less common in patients with PAOD. However, we have reported a high incidence (28%) of exertional buttocck claudication after aorto-bifemoral bypass was indicated for treatment of Leriche syndrome. This problem has been investigated by Rutherford et al. since the 1980s. Surprisingly, this issue has never had significant implications for therapeutic management involving pelvic revascularisation techniques until now. None of the studies demonstrating the feasibility of CR have specifically focussed on the large populations of patients presenting PAOD, and data are missing concerning the patency of such IIA revascularisations. Surgical management of primitive or postoperative buttock claudication in aorto-iliac occlusive disease remains uncommon. Thus, the need for IIA revascularisation in patients with PAOD remains controversial because of the perception that proximal ischaemia is uncommon even when clinical symptoms are already present, and due to the belief that deep femoral artery revascularisation should always lead to proximal ischaemia relief. We have recently demonstrated that better functional outcomes at the buttock level can be achieved by direct (IIA) rather than indirect (femoral) revascularisation and that increased perfusion in the deep femoral artery after revascularisation cannot guarantee gluteal ischaemia and buttock claudication relief.

Proximal symptoms are often masked by distal symptoms of ischaemia (calf pain) that usually appear sooner and limit exercise capacity. Documented proximal ischaemia, even asymptomatic and preoperative buttock claudication, supported the use of concomitant IIA revascularisation during an aorto-bifemoral or equivalent procedure, if the targeted IIA seemed pre- and perioperatively suitable for revascularisation, thus, the interest in TcPO2 in some of the patients, specifically those with isolated distal symptoms during exercise.

In our series, and in others, IIA revascularisations do not increase the morbidity/mortality rate of open aortic surgery for Leriche syndrome. The only death in our series was a patient in whom IIA revascularisation failed to prevent fatal colonic ischaemia. Thus, the mortality rate (2.5%) after CR is comparable to rates reported after simple aorto-bifemoral bypass or with retroperitoneal procedures during endovascular abdominal aortic aneurysm repair.

Endovascular procedures should lead to even lower complication rates, but they are typically performed on patients with limited arterial lesions. All indications for open surgery in this series were based on the aorto-iliac lesions and never on the IIA itself.

The patency rate of the treated IIA remained acceptable and may be correlated to the technical difficulties and to the evolution of the occlusive disease. Lack of data regarding the literature limits any comparison, as previous studies mixed patients with PAOD and aneurysmal diseases. Late asymptomatic thrombosis may also reflect the development of collateral pathways resulting from a notable improvement in MWD in all patients.

The absence of a control group is a major limitation of this study that is also at risk for all potential flaws of retrospective studies. Due to its small population, the question whether hypogastric revascularisation is justified and efficacious for patients with buttock claudication cannot be answered satisfyingly with this sole study, neither regarding the literature. Nevertheless, our acceptable results support our specific policy of screening and treatment of IIA in patients with PAOD. Despite the limitations of the study, these results are, to our point of view, meaningful because this study is one of the largest to report the patency of direct IIA revascularisation for occlusive arterial disease. A prospective multicentric study should be designed to confirm our findings. Thus, the emphasised problem of the proximal ischaemia management in such patients could lead to a TASC classification evolution that does not take into account to date, possible lesions of the IIA.

Direct IIA concomitant revascularisations have an acceptable patency rate in patients undergoing aorto-ilio-femoral bypasses for occlusive disease. When feasible, this technique also appears to be safe for the treatment and prevention of buttock claudication.

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None.

Conflict of Interest
None.

References


