



Aorto-Bifemoral Bypass via Retroperitoneal Approach: Our Clinic's Experience

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Abstract

Background: Occlusive disease of the aortoiliac segment is a relatively common condition, and several surgical approaches to the aortoiliac segment have been described. This study reports our clinical experience with extra-anatomic aorto-bifemoral bypass performed through a retroperitoneal approach, including the postoperative outcomes of our patient cohort and a representative clinical case.

Aim: To evaluate the advantages of the retroperitoneal approach in patients with occlusive disease of the aortoiliac segment.

Materials and Methods: Over a two-year period, 40 patients with aortoiliac occlusive disease or aneurysms of the abdominal aorta and iliac arteries were treated at our clinic; 30 underwent a transperitoneal approach and 10 a retroperitoneal approach, all with aorto-bifemoral bypass. All patients in the retroperitoneal-approach group had a history of previous midline laparotomy. We additionally present one illustrative case of a patient with Leriche syndrome, prior midline laparotomy, and a history of bladder neoplasm, in whom an extra-anatomic aorto-bifemoral bypass was performed via a retroperitoneal approach.

Results: Patients were followed for up to three years postoperatively. Mean hospital stay and intensive care unit stay were shorter in the retroperitoneal group than in the transperitoneal group. In the illustrative case, intestinal passage was restored on the second postoperative day, the patient was discharged from intensive care on the second postoperative day, and was discharged from hospital in good general condition with palpable pedal pulses.

Conclusion: Extra-anatomic aorto-bifemoral bypass performed via a retroperitoneal approach is a favorable option in patients with previous laparotomies and oncological disease of the abdominal cavity or pelvis. Patients undergoing the retroperitoneal approach have shorter hospital and intensive care unit stays.

Keywords: Aorto-Bifemoral Bypass; Retroperitoneal Approach; Aortoiliac Occlusive Disease; Extra-Anatomic Bypass; Aorta

Introduction

Aortoiliac occlusive disease is among the most common forms of chronic obliterating atherosclerosis. The atherosclerotic process typically develops initially around the aortic bifurcation, and its clinical presentation depends on the rate at which the obstruction develops. Atherosclerosis accounts for approximately 90% of cases of aortoiliac occlusive disease; the remaining cases are due to chronic thrombosis or late embolism of the iliac arteries.

In this article we present a retrospective analysis of the surgical outcomes of patients who underwent a retroperitoneal surgical approach compared with a transperitoneal approach via midline laparotomy for the treatment of aortoiliac occlusive disease.

Standards for the treatment of aortoiliac occlusive disease were presented and adopted as part of the Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II), published in 2007 [2].

Materials and Methods

Patients

Over a two-year period, 40 patients with aortoiliac occlusive disease and aneurysms of the abdominal aorta and iliac arteries were treated at the Clinic of Vascular and Endovascular Surgery, UMHAT "St. Ekaterina". A transperitoneal approach was used in 30 patients and a retroperitoneal approach in 10 patients; all patients underwent aorto-bifemoral bypass. All patients in the retroperitoneal-approach group had a history of previous midline laparotomy for various conditions.

We additionally present one illustrative clinical case of a patient with Leriche syndrome and previous midline laparotomy, operated on for a bladder neoplasm, in whom an extra-anatomic aorto-bifemoral bypass was performed via a retroperitoneal approach.

The preoperative characteristics of the patients are summarized in Table 1.

The main indications for the retroperitoneal approach were: (1) previous midline laparotomy; (2) presence of a stoma (colostomy, ileostomy, or gastrostomy); (3) oncological processes within the abdominal cavity or pelvis; and (4) severe chronic obstructive pulmonary disease (COPD) or cardiac disease that could lead to postoperative complications.

Variable	Transperitoneal Approach (n = 30)	Retroperitoneal Approach (n = 10)
Male/Female	20/10 (66%/33%)	6/4 (60%/40%)
Age (years)	53–88	52–74
Hypertension	13 (43%)	5 (20%)
Diabetes mellitus	9 (30%)	2 (20%)
Smokers	25 (83%)	8 (80%)
Ischemic heart disease	20 (66%)	8 (80%)

Table 1: Preoperative characteristics of the patients.

The main indication for the transperitoneal approach was bilateral aortoiliac occlusive disease without previous laparotomy.

Patients with risk factors and symptoms of ischemic heart disease were evaluated by a cardiologist and assessed with preoperative electrocardiography, echocardiography, and coronary angiography. All patients in both groups underwent computed tomography angiography; iliac lesions were included after being judged unsuitable for percutaneous transluminal angioplasty.

Surgical technique

All operations performed via the transperitoneal approach were carried out under general anesthesia. In the retroperitoneal-approach group, 8 patients received regional (epidural and spinal) anesthesia, while 2 patients underwent general anesthesia because of contraindications to spinal or epidural anesthesia due to spinal disease.

The common femoral artery, superficial femoral artery, and profunda femoris artery were dissected and evaluated in all patients scheduled for aorto-bifemoral bypass. The retroperitoneal approach was performed through a vertical 7–8 cm incision, approximately 6 cm to the left of the midline, extending from 1–2 cm above the left inguinal ligament. The retroperitoneal space was then dissected using a combination of sharp and blunt technique to expose the aorta, the iliac arteries, and the aortic bifurcation. In contrast, patients in the transperitoneal group underwent an upper and lower midline laparotomy (Figure 1).

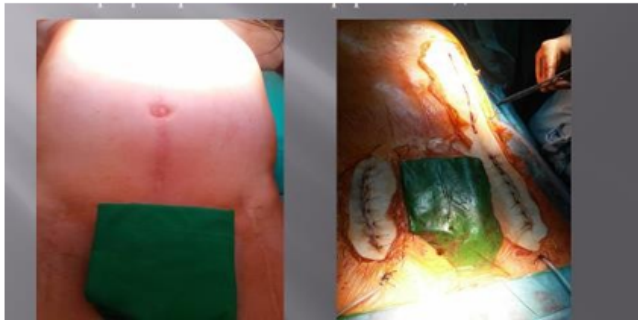


Figure 1: Postoperative photograph showing the left retroperitoneal pararectal incision and the femoral surgical access sites.

Silver-coated 16–20 mm bifurcated prostheses were used in all patients. Anticoagulation was achieved with heparin at 1 mg/kg body weight, averaging 5,000 IU. The proximal anastomosis was end-to-side, except in cases of aneurysm, where an end-to-end anastomosis was performed. Seven patients had extensive infrainguinal occlusive disease requiring additional femoropopliteal segment surgery ($P = 0.528$).

Statistical analysis

Preoperative characteristics and perioperative data were analyzed using SPSS statistical software, version

10.0. A P value of less than 0.05 was considered statistically significant.

Results

Comparative outcomes

Two patients died postoperatively: one from myocardial infarction and the other from pulmonary complications. Surgical success was confirmed in all patients by physical examination and ankle-brachial index measurement. Mean hospital stay was 5 ± 2 days (range, 3–7 days) in the retroperitoneal group versus 9 ± 3 days (range, 6–12 days) in the transperitoneal group. Mean intensive care unit (ICU) stay was 3 ± 1 days (range, 2–4 days) in the retroperitoneal group versus 5 ± 2 days (range, 3–7 days) in the transperitoneal group (Table 2).

Indicator	Midline Laparotomy	Retroperitoneal Approach
Hospital stay (days)	7 ± 2 (range 7–9)	5 ± 1 (range 5–6)
ICU stay (days)	4 ± 2 (range 4–6)	2 ± 1 (range 2–3)
Preoperative hemo-globin (g/L)	140 ± 20	142 ± 10
Postoperative hemo-globin (g/L)	110 ± 10	120 ± 10
Blood transfusion (units)	3	2
Restored intestinal passage (days)	1–2	3 ± 1
Mortality (exitus)	1	0

Table 2: Perioperative and postoperative data.

No intraoperative complications occurred. Five patients required reoperation: two in each group for acute distal embolism, and one in the retroperitoneal group for prolongation of a femoropopliteal bypass. All patients were discharged on antiplatelet and antithrombotic therapy, and no complications related to the surgical approach itself occurred.

Graft patency was assessed by physical examination and Doppler ultrasonography; patency of the aorto-bifemoral bypass was 100% at discharge. Follow-up was conducted in 10 patients in the retroperitoneal group for a mean of 15.9 ± 11.9 months (range, 1–24 months) and in 24 patients in the transperitoneal group for a mean of 10.3 ± 11.5 months (range, 1–24 months). Four patients in the retroperitoneal group required reoperation during follow-up: two for acute graft occlusion and two for femoropopliteal disease; thrombectomy and femoropopliteal bypass were performed successfully in these patients.

Case Report

A 67-year-old male (case history No. 97/2018) presented with Leriche syndrome. His history included claudication after 100 meters for 3 years, affecting the left lower limb. On examination, femoral pulses were absent bilaterally and distally, hemodynamics were compensated, and the right leg was atrophic.

Doppler ultrasonography showed: brachial artery, 140 mm/s (patent); right anterior tibial artery, 70 mm/s (patent); right posterior tibial artery, 80 mm/s (patent); right ankle-brachial

index (ABI), 0.57; left anterior tibial artery, 90 mm/s (patent); left posterior tibial artery, 80 mm/s (patent); left ABI, 0.64.

Preoperative computed tomography (CT) angiography is shown in Figure 2.

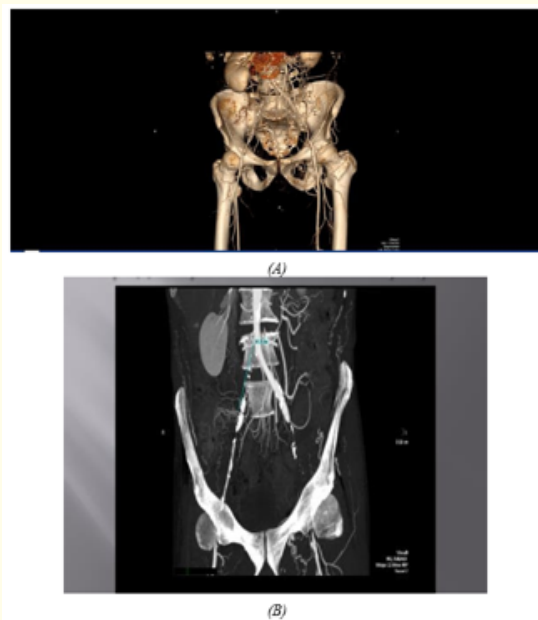


Figure 2: Preoperative CT angiography of the case patient. (A) Three-dimensional volume-rendered reconstruction of the aorto-iliac segment. (B) Coronal CT angiogram showing the diseased aortoiliac segment with vessel-diameter measurements.

Comorbidities included: (1) grade 2 hypertension; (2) bladder carcinoma; (3) urethral stricture following transurethral resection; (4) childhood paralysis with an atrophic right leg; and (5) myocardial infarction in 2015.

Per operative protocol No. 97 (06.02.2018), an aorto-bifemoral bypass with a 16×8 mm vascular prosthesis was performed under general endotracheal anesthesia. A suprapubic (Cystofix) catheter was placed. Through a retroperitoneal approach, the abdominal aorta was exposed and clamped below the level of the renal arteries. A 16×8 mm Silver Graft bifurcated prosthesis was used. Because of adhesions, the right limb of the graft was tunneled atypically along the pelvic floor (Figure 3).

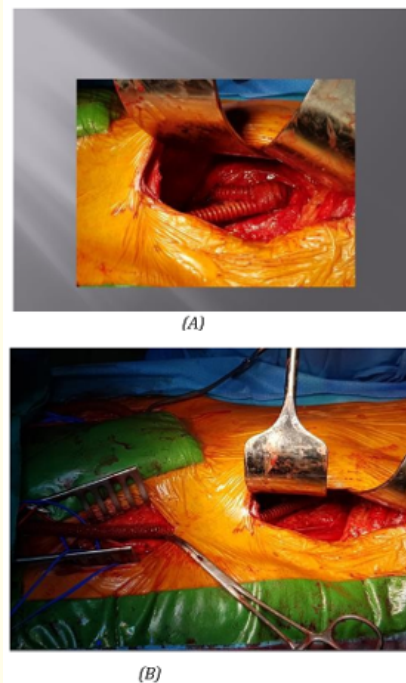


Figure 3: Intraoperative photographs showing retroperitoneal exposure of the abdominal aorta (A) and placement of the aorto-bifemoral bifurcated graft (B).

Postoperatively, the patient spent 2 days in the intensive care unit. Intestinal passage was restored at 30 hours, and the patient was mobilized at 24 hours. Postoperative angiological status showed palpable pedal pulses. Total hospital stay was 4 days. At the 6-month follow-up visit, the patient reported no complaints, no claudication, and bilateral palpable pedal pulses. Postoperative CT angiography is shown in Figure 4.

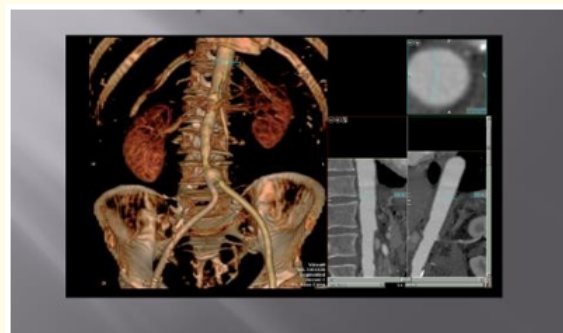


Figure 4: Postoperative CT angiography at 6-month follow-up, showing a patent aorto-bifemoral graft.

Discussion

In recent years, surgeons have increasingly favored the retroperitoneal approach for aortic surgery, as it may reduce cardiac stress, respiratory complications, postoperative ileus, and complications associated with midline laparotomy and opening of the abdominal cavity [6]. The retroperitoneal approach has proven advantageous in patients with multiple previous intra-abdominal surgical procedures, peritonitis, and previous aortic operations. Technical difficulties can arise in obese patients, and control of the right iliac artery can be challenging through a left retroperitoneal approach [7]. We did not encounter such complications in our series; only one patient in the retroperitoneal group had grade 3 obesity.

We observed no postoperative hernias among patients treated via the retroperitoneal approach. All patients were mobilized and discharged wearing an abdominal binder for a minimum of 3 months. Division of the intercostal nerves likely causes denervation of the rectus abdominis muscle [8]; however, none of our patients experienced complications related to muscle atrophy during follow-up.

Postoperative complications and mortality in both of our groups were within acceptable limits. In our analysis, the duration of ICU and hospital stay was significantly longer among patients in the transperitoneal group, all of whom underwent aortobifemoral bypass. The controversies surrounding midline laparotomy are well recognized: prolonged ileus, a higher incidence of pulmonary complications, longer ICU and hospital stays, and increased hospitalization costs [9]. Aortobifemoral bypass can be performed via a left retroperitoneal approach, as we did in 10 patients in our study group. A further advantage of the retroperitoneal approach is that it can be performed under regional anesthesia in awake patients, as we did in 5 of our patients, which may shorten hospital stay.

Although the retroperitoneal approach tends to result in fewer postoperative complications, shorter hospital and ICU stays, and lower costs, no difference in the incidence of postoperative hernia was found between the two groups. Nevertheless, the retroperitoneal approach is preferable for the treatment of infrarenal aortic disease. Regional anesthesia may provide additional postoperative pain relief in patients operated on under epidural anesthesia.

The retroperitoneal approach via a paramedian incision provides easy access and rapid exposure of the retroperitoneal vascular structures.

Arteriosclerosis is often a generalized process, and obliterative disease of the aortoiliac segment is frequently combined with changes in the vessels below the inguinal ligament. However, aortoiliac disease is usually distributed segmentally, and effective treatment is therefore possible [7]. In our study, both groups included patients with extensive infrainguinal lesions that were revascularized during additional femoropopliteal bypass procedures. Another consideration is that progression of disease in the aorta or in an untreated contralateral iliac artery may eventually require reoperation in patients initially treated for apparently unilateral disease; however, the frequency of this phenomenon remains controversial [13]. We did not observe contralateral disease progression among patients operated on for unilateral occlusive disease; however, one patient whose disease progressed to the infrainguinal arteries required revascularization by femoropopliteal bypass.

Biochemical marker levels were similar between our two study groups, suggesting that both procedures may lead to comparable outcomes. Although we did not use cell salvage in our study population, its use could potentially reduce transfusion requirements. In our study, the transperitoneal group had a higher rate of surgical site infections, which likely contributed to longer hospitalization. Although the difference in mortality between groups did not reach statistical significance, two patients died in the retroperitoneal group; both were 73 years old and had several comorbidities.

Distal embolism occurred in 4 patients during the early postoperative period. Follow-up in the retroperitoneal group revealed graft occlusion in 2 patients with mildly stenotic superficial femoral arteries. These occlusions, detected 1 and 2 years postoperatively and treated by thrombectomy, may have been related to the use of end-to-side anastomoses; end-to-end anastomoses may provide more favorable hemodynamics.

The main limitations of this study include the small number of patients in each group and the limited duration of postoperative follow-up.

We believe that the retroperitoneal aortoiliac approach via a paramedian incision is a feasible surgical option for the treatment of aortoiliac occlusive disease. The approach is associated with few postoperative complications and is well tolerated; it can also be applied in patients with bilateral lesions. These advantages have made this approach our preferred technique for the treatment of most such lesions.

Conclusions

- The retroperitoneal approach to the aortoiliac segment is associated with fewer postoperative complications.
- It is associated with a shorter hospital and intensive care unit stay.
- It is more cost-effective.
- The retroperitoneal approach can be considered a valid surgical option for occlusive diseases of the aortoiliac segment.

Acknowledgements

None declared.

Conflict of Interest

The author declares no conflict of interest.

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