

## Descending thoracic aorta to femoral bypass grafting for total abdominal aortic occlusion

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### ABSTRACT

Descending thoracic aorta to femoral bypass graft is an alternative procedure for revascularization of the lower extremities to conventional techniques, when the abdominal aorta is complete obstructed. In general, this technique is performed by surgeons, when abdomen is unable to be opened due to the presence of an abdominal infection, fistulas, or hostile abdomen. In this article, we present our four-year outcomes of descending thoracic aorta to femoral bypass with cross-femoral bypass in four patients. There was no mortality and all grafts were patent. Descending thoracic aorta to femoral bypass grafting has excellent overall long-term results.

**Keywords:** Abdominal aortic occlusion; aortofemoral bypass; descending thoracic.

The thoracic aorta to femoral bypass grafting is an ideal procedure for a small subgroup of patients, comprising those with an occluded old aorta to femoral bypass graft, those with a lead-pipe calcified infrarenal aorta which is unsuitable as an inflow source, and those with a hostile abdomen (i.e., ileal conduit, ileostomy or colostomy or a previous aortic graft infection). Complete obstruction of the abdominal aorta at the renal artery level is often a surgical challenge in case of a long-standing thrombosis, short suprarenal aortic space, and extensive periarterial inflammatory reaction. Therefore, a descending thoracic aorta to femoral bypass graft is used as an alternative for revascularization. Herein, we present our four-year outcomes of descending thoracic aorta to femoral bypass grafting with cross-femoral bypass in four patients.

### SURGICAL TECHNIQUE

Descending thoracic aorta to femoral bypass grafting was performed in four patients who had a juxtarenal complete obstruction of the abdominal aorta in our hospital (Figure 1). All patients were males with a mean age of 65.5 (range, 59-72) years and they had severe atherosclerotic disease and hypercholesterolemia. None of them was, however, diabetic. They had claudication and ischemic pain of the lower extremity. Two of them were ex-smokers with normal pulmonary function

test results [Forced expiratory volume in one second (FEV<sub>1</sub>) ≥75]. The patients had no renal disease, and biochemical screening results were normal. Coronary angiography revealed coronary atherosclerosis in only one patient. Coronary artery bypass surgery grafting was performed by off-pump technique to this patient before three months.

A written informed consent was obtained from each patient. Selective intubation with double-lumen tubes were performed under fentanyl anesthesia. The patients were positioned to position the hip flat; however, the torso was slightly rotated to the right. Four incisions were made: a left posterolateral thoracotomy, two groin incisions, and a lateral abdominal incision. The descending thoracic aorta was approached through the thoracotomy at the level of the sixth-seventh intercostal space. The left lung was decompressed by selective intubation, and the aorta was cleanly dissected. Common femoral arteries were obtained via two groin incisions. The psoas were reached through the lateral abdominal incisions and with an extra-peritoneal approach. A retroperitoneal tunnel was, then, fashioned for the passage of the

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graft. Once an 8 mm silver, INTERGARD collagen-coated knitted polyester vascular prosthesis graft was carried from this tunnel, the patient underwent systemic heparinization (100 U/kg). The proximal end of the graft was reached through the aortic hiatus at the diaphragm level. When the blood pressure was reduced by vasodilators, the descending thoracic aorta was controlled with side-clamp, and an end-to-side anastomosis was performed. The distal end of the graft was fashioned with an end-to-side anastomosis to the left common femoral artery. An 8 mm INTERGARD collagen-coated knitted polyester vascular prosthesis graft was, then, performed through the left femoral to the right femoral crossover bypass. The side-aortic clamp was removed and the grafts were visualized with pulsing. Finally, after the bleeding was controlled, the lung was re-inflated, and the chest was closed in a standard fashion over a chest tube.

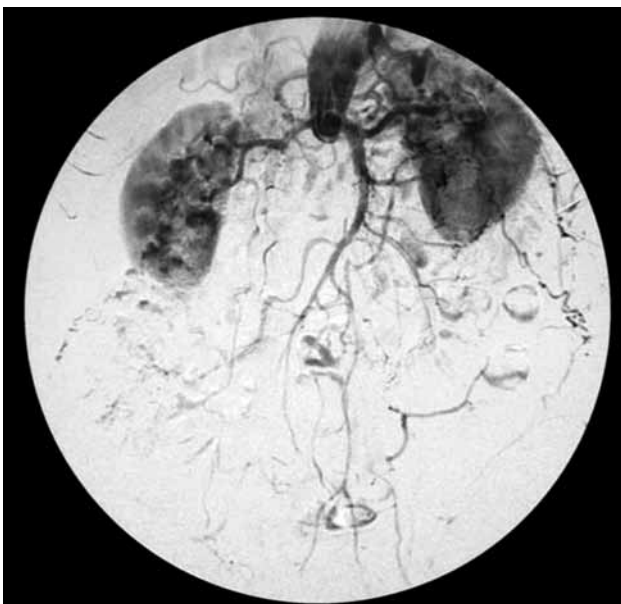
There was no postoperative mortality. Except one patient, all were extubated in the operation room without a need for respiratory support. However, one patient required respiratory support for six hours. There were no pleural effusion; however, two patients had pulmonary atelectasis for four days. Oral antiaggregant (acetylsalicylic acid) treatment was started in the postoperative third day, following prophylaxis of low-molecular-weight heparin in the postoperative early

period. The mean length of intensive care and hospital stays was two days and eight days, respectively. Distal pulses of the lower extremities were sensed at discharge. The graft failure was not seen within the first month of follow-up. Computed tomography (CT) angiography revealed that all grafts were patent at four years (Figure 2).

## DISCUSSION

Bypass grafting which originate from the descending thoracic aorta to femoral arteries are well-described, although they are not commonly used in the first-line setting. The descending thoracic aorta to femoral bypass grafting was first described in 1961 in two cases.<sup>[1]</sup> The thoracic aorta is a good inflow option, as its exposure is relatively straight forward and this segment is usually free of significant atherosclerosis.<sup>[2]</sup> Most authors have suggested that the use of the descending thoracic aorta with a retroperitoneal tunnel yields more acceptable operative risks and patency rates. Five year patency rates of the procedure has been reported as 86% in the literature.<sup>[3]</sup>

Axillobifemoral bypass is the most common first choice as an alternative to aortofemoral incomplete



**Figure 1.** Preoperatively angiography of 60-year-old male patient.



**Figure 2.** Control computed tomographic angiography of 60-year-old male patient in postoperative first month.

obstruction of the abdominal aorta at the level of renal arteries.<sup>[4]</sup> However, the long-term patency is lower, due to the longer graft length with potential compression along the superficial course.<sup>[1]</sup>

In our technique, we used the descending thoracic aorta, rather than the axillary artery. In most reports, the bifurcated graft is favored to thoracofemoral and femorofemoral crossover grafts.<sup>[5,6]</sup> We used this graft in only one patient.

Furthermore, thoracic aorta is controlled either with a side-biting clamp or with two completely occluding aortic clamps placed in close proximity to each other. One of the disadvantages of completely occluding clamping is that renal circulation can be impaired, if the time of proximal anastomosis to aorta is hold over, and spinal cord and mesenteric ischemia can develop. Partial aortic control with side-clamping is successful in most cases, although it is not recommended, when the aorta is heavily diseased and calcified. Additionally, it makes the anastomosis more difficult, as the margins of aortotomy become closely opposed.<sup>[1]</sup> A partial side-clamp was placed in our patients, and it did not complicate the anastomosis.

Baird et al.<sup>[6]</sup> described ascending aorta to femoral bypass grafting through a median sternotomy. The advantage of this technique is that concomitant coronary revascularization can be performed, when indicated. One of our patients who had coronary artery disease underwent off-pump coronary artery bypass grafting three months before thoracofemoral grafting. Subsequently, we performed revascularization of the lower extremities by descending thoracic aorta to femoral and femorofemoral crossover bypass grafting.

In the present study, all patients were eligible descending thoracic aorta to femoral bypass grafting with excellent overall long-term results. Despite pulmonary difficulties, we believe that this procedure is a satisfactory alternative for the treatment of juxtarenal

complete abdominal aortic occlusions, as the thoracic aorta is no more atherosclerotic, and there is high blood flow in this segment to the axillary artery.

In conclusion, endovascular treatment of infrarenal aortic occlusions is feasible in most cases with favorable midterm patency rates. However, due to relatively high procedurally-related complication rates, cautious selection of the patients and taking appropriate preventive measures are necessary to improve the immediate outcomes.<sup>[7]</sup>

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