Eur J Vasc Endovasc Surg **34**, 173–175 (2007)
doi:10.1016/j.ejvs.2006.12.032, available online at http://www.sciencedirect.com on ScienceDirect

SHORT REPORT

Totally Laparoscopic Aortohepatic Bypass for Aortic Debranching During Endovascular Thoracoabdominal Aneurysm Repair

C. Bakoyiannis,* C. Cagiannos, S. Wasilljew, L. Pinter and R. Kolvenbach

Department of Vascular Surgery and Endovascular Therapy, Augusta Hospital Düsseldorf FRG, Germany

Introduction. *Endovascular grafting of the aorta is gaining widespread acceptance for treating aortic aneurysms. Pararenal aneurysms or thoraco-abdominal aneurysms may be a relative contra-indication for endovascular aneurysm repair (EVAR) unless visceral vessels can be debranched.*
Report. *We describe a case of thoraco-abdominal aneurysm extending from the descending thoracic aorta to the level of coeliac artery. A totally laparoscopic retrograde aorto-hepatic bypass was performed in conjunction with endograft exclusion of the aneurysm and coverage of the coeliac artery ostium.*
Discussion. *Laparoscopic debranching of visceral vessels extends the indications of EVAR.*

Keywords: Laparoscopic aorto-hepatic bypass; Aortic debranching; EVAR.

Introduction

Endovascular procedures for aortic aneurysm repair (EVAR) are a well established alternative to open surgical procedures particularly in patients with increased comorbidity.[1] However limitations remain. One of the most important exclusion criteria is involvement of visceral arteries in the sac of the aneurysm. Recently, hybrid techniques with open visceral artery revascularization have emerged as alternatives to reduce contraindications for EVAR.[2] Laparoscopic aortic procedures can be performed in patients with aneurysmal and aortoiliac occlusive disease.[3,4] Laparoscopic adjuncts such as banding, evacuation of thrombus or clipping of lumbar arteries have been used to treat complications and improve results following EVAR.[5] Similar to conventional, open bypasses, laparoscopic revascularization of visceral arteries may be used to debranch the aorta, to expand the indications for EVAR.

*Corresponding author. C.N. Bakoyiannis, First Department of Surgery, University of Athens, Laiko Hospital, Agiou Thoma 17, Goudi, Athens, Greece.
E-mail address: bakogian@hotmail.com

Case Report

A 70 year old male had a thoracoabdominal aneurysm extending from the descending thoracic aorta to the coeliac artery. The patient had severe chronic obstructive pulmonary disease (COPD) and two recent myocardial infarctions. Endovascular repair was felt to be contra-indicated, because the coeliac artery arose from the aneurysm. To allow EVAR it was necessary to land the endograft distal to the coeliac artery. A totally laparoscopic retrograde aorto-hepatic bypass was performed in order to avoid compromising hepatic blood flow. We used a 14×7 mm bifurcated Dacron graft and oversewed the origin of one limb in order to have a large main body for the laparoscopic aortic anastomosis. Next a 6 mm PTFE graft was anastomosed to the 7 mm free leg of bifurcated graft. The PTFE graft was tunnelled anteriorly to the pancreas and anastomosed to the common hepatic artery (CHA). We chose these conduits because the PTFE graft is better manipulated laparoscopically for anastomosis to small vessels and Dacron significantly decreases bleeding during declamping of the aorta.

To exclude the aneurysm, 2 thoracic aortic stent grafts, (Talent, Medtronic Vascular, Santa Rosa, Calif, 42 mm diameter) were deployed through the right femoral artery (Fig. 1).

1078–5884/000173 + 03 $32.00/0

Fig. 1. Totally laparoscopic retrograde aortohepatic bypass (yellow arrow) to the common hepatic artery (blue arrow). On the right side preoperative angiography of the aneurysm (white arrows: celiac trunk and superior mesenteric artery).

Laparoscopic Approach

The patient was placed on a beanbag with the left side uppermost and tilted 20° to the right. By tilting the operating table, the patient could be rotated almost 70 degrees facilitating the visceral rotation to the right. We used the modified Apron technique as described by Dion[3] to expose the infrarenal aorta. The left hemicolon and splenic flexure were mobilized and Gerota's fascia overlying the kidney was exposed. The splenocolic attachments were divided to allow safe rotation of the left colon medially and inferiorly. Using the ultrasonic dissector (Tyco, Healthcare), the lesser sac was entered in the avascular plane along the greater curvature of the stomach. This allowed assessment and blunt dissection of the anterior surface of the pancreas. Laparoscopic exposure of the CHA was performed by incising the lesser omentum. The manoeuvre was performed with the patient supine, the table rotated 20° to the left with the surgeon standing on the right. The lesser sac was entered next to the lesser curve. After retraction of the stomach inferiorly and the liver superiorly using a laparoscopic retractor, the CHA was gently dissected and controlled with doubled vessel loops. A flexible laparoscopic tunneler (Carl Storz, Germany) was inserted diagonally to traverse the lesser sac in front of the pancreas to the CHA (Fig. 2).

The aortic anastomosis was performed first with 3-0 prolene sutures using a laparoscopic partial occlusion aortic clamp (Carl Storz, Germany). The hepatic anastomosis was performed with 6-0 prolene sutures (10 cm length). By using doubled vessel loops secured with laparoscopic clips, the CHA was controlled proximally and distally without obscuring the field or suture with vascular bulldogs. Finally the proximal CHA was ligated using laparoscopic clips.

Discussion

Conventional open repair of pararenal or thoracoabdominal aneurysms, even though well established, is associated with significant morbidity and mortality.[6,7] This paper describes the first case of totally laparoscopic debranching of the celiac artery. A combined surgical approach to restore perfusion of visceral vessels is necessary for EVAR in cases with complex aortic aneurysms. EVAR combined with surgical revascularization of visceral arteries allows successful minimally invasive exclusion of the aneurysm.[8] Many methods have been described for revascularization,

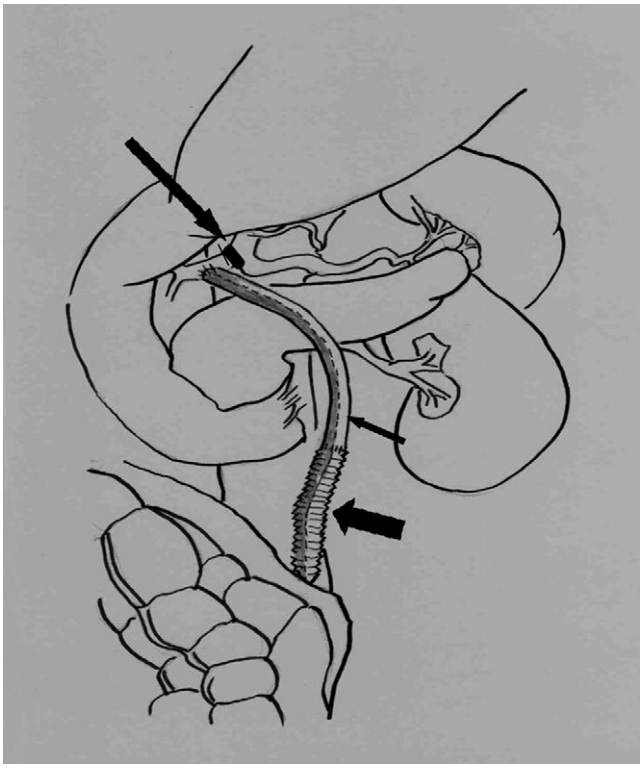

Fig. 2. Schematic representation of laparoscopic aorto-hepatic bypass (fat arrow: Dacron graft, thin arrow: PTFE graft, long arrow: laparoscopic clips to the common hepatic artery).

which require a long midline or extended bilateral sub-costal incisions. Branched stent grafting is a possibility but this is expensive and should be regarded as experimental until new technology becomes commercially available.[9]

Totally laparoscopic aorto-mesenteric bypass has previously been described by Coggia *et al*.[10] We believe that laparoscopic debranching of visceral arteries, albeit technically demanding, is feasible. Limitations include the need for advanced laparoscopic training with the ability to perform intracorporeal suturing quickly, availability and expense of laparoscopic instruments. The advantage of laparoscopic aortic surgery is the avoidance of long incisions. By achieving extensive exposure without the pulmonary derangements caused by midline laparotomy, laparoscopy reduces the complications associated with conventional open management of complex aneurysms.

Conclusion

With improved laparoscopic technology, total laparoscopic debranching of visceral arteries may become used more widely, however, surgeons must acquire advanced laparoscopic skills to be able to perform these procedures safely and with acceptable clamp times. Further studies are required to prove the utility and durability of these hybrid techniques.

References

1 Sicard GA, Zwolak RM, Sidawy AN, White RA, Siami FS. Endovascular abdominal aortic aneurysm repair: long-term outcome measures in patients at high-risk for open surgery. *J Vasc Surg* 2006 Aug;**44**(2):229–236.

2 Lin JC, Kolvenbach R, Pinter L. Combining open and endovascular surgery for the treatment of infrarenal abdominal aortic aneurysm: a case report using a hybrid vascular graft. *J Vasc Surg* 2005 May;**41**(5):881–884.

3 Dion YM, Thaveau F, Fearn SJ. Current modifications to totally laparoscopic "apron technique". *J Vasc Surg* 2003 Aug;**38**(2): 403–406.

4 Lin JC, Kolvenbach R, Schwierz E, Wassiljew S. Total laparoscopic aortofemoral bypass as a routine procedure for the treatment of aortoiliac occlusive disease. *Vascular* 2005 Mar;**13**(2):80–83.

5 Kolvenbach R, Lin J. Combining laparoscopic and endovascular techniques to improve the outcome of aortic endografts. Hybrid techniques. *J Cardiovasc Surg (Torino)* 2005 Aug;**46**(4):415–423.

6 Rigberg DA, McGory ML, Zingmond DS, Maggard MA, Agustin M, Lawrence PF *et al*. Thirty-day mortality statistics underestimate the risk of repair of thoracoabdominal aortic aneurysms: a statewide experience. *J Vasc Surg* 2006 Feb;**43**(2): 217–222.

7 Back MR, Bandyk M, Bradner M, Cuthbertson D, Johnson BL, Shames ML *et al*. Critical analysis of outcome determinants affecting repair of intact aneurysms involving the visceral aorta. *Ann Vasc Surg* 2005 Sep;**19**(5):648–656.

8 Ballard JL, Abou-Zamzam Jr AM, Teruya TH. Type III and IV thoracoabdominal aortic aneurysm repair: results of a trifurcated/two-graft technique. *J Vasc Surg* 2002 Aug;**36**(2): 211–216 [discussion 216].

9 Semmens JB, Lawrence-Brown MM, Hartley DE, Allen YB, Green R, Nadkarni S. Outcomes of fenestrated endografts in the treatment of abdominal aortic aneurysm in Western Australia (1997-2004). *J Endovasc Ther* 2006 Jun;**13**(3):320–329.

10 Javerliat I, Coggia M, Bourriez A, Di Centa, Cerceau P, Goeau-Brissonniere OA. Total laparoscopic aortomesenteric bypass. *Vascular* 2004 Mar;**12**(2):126–129.

Accepted 1 December 2006
Available online 2 April 2007