Excerpta Medica

The American Journal of Surgery

The American Journal of Surgery 191 (2006) 691–695
Scientific paper

Laparoscopic aortic reconstruction: early experience

Jim Dooner, F.R.C.S., F.A.C.S., M.B.A.*, Shung Lee, F.R.C.S., William Griswold, F.R.C.S., Peter Kuechler, F.R.C.S.

Vancouver Island Health Authority, 1952 Bay Street, Victoria, British Columbia V8R 1J8, Canada

Manuscript received November 24, 2005; revised manuscript February 3, 2006

Presented at the 92nd Annual Meeting of the North Pacific Surgical Association, Vancouver, British Columbia, November 11–12, 2005

Abstract

Background: Laparoscopic reconstruction of the abdominal aorta has been described as early as 1993. The techniques used have varied but all have been labor intensive. With advances in laparoscopic technique and the available tools, the role in aortic reconstruction is expanding. The high cost of endovascular techniques as well as the morbidity of traditional open surgery has resulted in an increased focus on the laparoscopic approach. Our goal was to determine the feasibility of this technique.
Methods: Retrospective review of the charts of patients undergoing laparoscopic aortobifemoral bypass grafting for chronic lower-limb occlusive disease.
Results: Thirteen patients were selected for the procedure. Ten were completed successfully and form the basis of the report. The average length of stay was 6.7 days compared with a historic cohort of 12 days. The average operative time was 6.5 hours, more than twice as long as the open technique. There was a tendency to lower blood replacement and less abdominal pain. One patient suffered a stroke postoperatively; no deaths occurred.
Conclusion: This procedure is technically challenging but can be performed safely and successfully with adherence to several key anatomic principles. More widespread adoption of this technique may lead to improvements in the instruments and other technologies. Our very early experience is encouraging. There appear to be benefits of reduced length of stay, but improved operative times will be required to make this technique truly valuable.

Keywords: Aorta; Laparoscopic; Aortobifemoral bypass

The expanding role of laparoscopic surgical techniques has been seen in many disciplines including general surgery, thoracic surgery, urology, and orthopedics. It has had limited acceptance in vascular surgery until recently because of the lack of enabling devices as well as a daunting learning curve. Benefits of many minimally invasive techniques have been validated in these other surgical disciplines over the past decade. The principle to be followed is to replicate the excellent outcomes of an established procedure while minimizing the trauma. In the most successful examples, the operation is essentially unchanged except for the size of the incision and the patient's metabolic response to the surgical trauma.

Abdominal aortic reconstruction generally requires a long abdominal incision, whether performed through a midline approach or a left flank retroperitoneal approach. Evisceration during aortic repair or congestion of the gut from retractors leads to ileus, and 11% of patients will have significant incisional hernias postoperatively, many requiring repair. There are potential gains to be made if laparoscopic techniques can be widely applied to abdominal aortic surgery.

One of the first reports on this technique and much of the subsequent development in this area is the result of the work of Yves Dion of Laval University. He presented an early laboratory technique in 1993 as well as successful clinical cases published as early as 1996 [1–3].

Motivated by his success, we sought to develop our expertise in this demanding procedure. We initiated a plan to develop the necessary skill and apply it to clinical cases in a study of the feasibility of the procedure. This was a nonrandomized project.

* Corresponding author. Tel.: +250-384-8154; fax: +250-384-7571.
E-mail address: james.dooner@viha.ca

0002-9610/06/$ – see front matter
doi:10.1016/j.amjsurg.2006.02.016

Patients and Methods

The lead author (JD) had experience in a full spectrum of advanced laparoscopic procedures. Attendance at a laboratory course allowed acquisition of the basic skill necessary to select and set up cases as well as perform the vascular anastomosis. Dedicated vascular clamps and instruments were obtained (Stortz, Laborie; Karl Storz, Tuttlingen, Germany). An additional laboratory was arranged to familiarize operating-room nurses with the objectives of the technique, and an initial series of proctored cases was set up. The proctored cases are not included here.

Any patients requiring aortofemoral grafting were considered possible candidates. Patients with extreme obesity; extensive previous abdominal surgery, particularly left colon resection; or severe circumferential calcification of the aorta on computed tomography scanning were excluded. The degree of calcification was important for 2 reasons: a region of "clampable "aorta was needed, and we were concerned about the ability to endarterectomize and sew the calcified aorta. Institutional review of the proposed procedure was performed and backing of the project obtained through the Vancouver Island Health Authority Quality Improvement Office. Informed consent was obtained from the patients. They were offered the opportunity to undergo laparoscopic aortofemoral grafting with the understanding that there was a possibility of completing the procedure open if necessary.

Other preparations were unchanged from our open surgical approach with regard to preoperative evaluation, risk-factor control, and anesthetic preparation. Patients had an epidural placed as well as central lines and arterial lines. A nasogastric tube was required intraoperatively but removed at the conclusion of the procedure. Nitrous oxide was avoided intraoperatively. Patients spent the first 24 hours in 1:1 nursing environment. Data were obtained retrospectively from the patient chart and compared with the average length of stay and operative times of a historic group of patients undergoing open aortofemoral grafting.

Technique

The technique followed was similar to that described by Dion et al [3]. The patient was placed in a left semilateral position at 45° on a sandbag over the flex point of the table with the left arm supported above the head. A cell saver was not used for these cases because of the nature of the suction device. The groins and full abdomen were prepped. Groin dissection and exposure of femoral vessels was usually performed first. Insufflation was carried out to 15 mm Hg pressure with a high-flow insufflator. Two monitors were placed near the head of the bed on opposite sides of the table. The camera port was created just superior to the umbilicus, and 2 dissecting/working ports were created above and below this. Dissection of the left colon commenced from the point cephalad to the internal inguinal ring, following the gonadal vessels. It extended up to the level of the splenic flexure as described by Dion et al [3], taking care to preserve a rim of peritoneum adjacent to the colon. It is critical that one avoid grasping the mesentery of the left colon while dissecting. Any hole in the mesentery allows the small bowel to herniate through into the operative field and may compromise the procedure. The dissection plane should allow identification of the entire length of the gonadal vessels to the confluence of the left gonadal vein and left renal vein. The ureter was also identified and not retracted upward but left in its bed. Once the colon was completely mobilized and the aorta visualized, the lateral ports were inserted. Fan-shaped retractors were placed and held by a table-fixed retraction system after the aorta was skeletonized. This included the clipping and dividing of lumbar and inferior mesenteric vessels. The retroperitoneal tunnels were created and a graft selected. The graft was inserted through a lateral port and oriented so that the limbs extended through the respective groin incisions (Fig. 1). Heparin was given (100 IU/kg), and the clamp was applied to the infra renal aorta. If necessary, the aorta is stapled distally using the Endo TA 30 (Tyco, Princeton, NJ). With increasing experience, the degree of endarterectomy that one could attempt improves. All calcific material must be removed to facilitate the anastomosis. A standard polypropelene suture was used. Seven inches of free suture were used with 1 inch free after tying to a pledget of graft material. A continuous anastomosis was performed starting at 6 o'clock on the graft (Fig. 2). This means that there was only 1 intracorporeal knot to tie. Before completing the anastomosis, the graft was vigorously irrigated from below to ensure that no clot had built up in the graft. The anastomosis was completed and tested. Distal anastomoses and reperfusion were completed as with open procedures. Reinspection of the proximal site should be performed to exclude excessive bleeding. Ports were removed, and the fascia was closed with absorbable. Groins were closed in standard fashion. Oral intake was usually commenced on the second postoperative day.

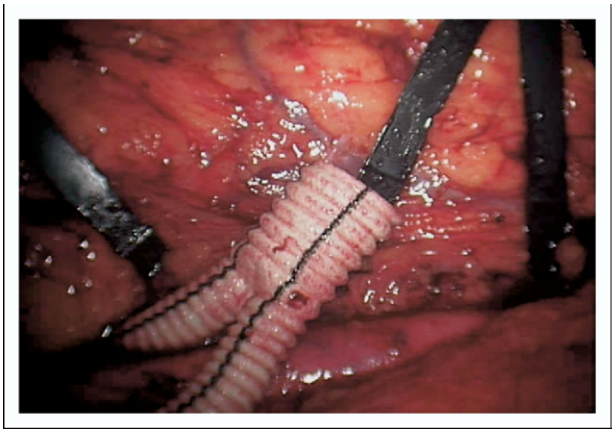

Fig. 1. Placement of graft.