A Modified Technique of Transperitoneal Direct Approach for Totally Laparoscopic Aortoiliac Surgery

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Objective. To present our modification of the transperitoneal direct approach (TDA) for totally laparoscopic aortoiliac surgery.

Methods and results. From September 2003 to August 2005 a total of 52 patients underwent laparoscopic operations for aortoiliac disease (50 aortoiliac occlusive disease; two abdominal aortic aneurysm). The modified TDA was used in 20 patients.

Conclusion. The main advantage of TDA is reduced dissection of the aorta and pelvic arteries resulting in lowered blood loss and lymphatic injury.

Keywords: Minimally invasive surgery; Total laparoscopic aortoiliac surgery; Modification of transperitoneal direct approach.

Introduction

Major developments in laparoscopic surgery in the 1990s have had an impact on vascular surgery. Minimally invasive approaches used in general surgery has gradually become a novel technique used in vascular surgery. In 1993, Dion performed a laparoscopically assisted aortobifemoral bypass and in 1996 the first laparoscopic abdominal aortic aneurysm (AAA) resection was performed. At present, the laparoscopic approach is used for vascular surgery worldwide. One of the main advantages of this approach is reduced pain, shorter hospitalization and earlier return to regular daily activities. The authors report their experience with the total laparoscopic aortoiliac bypass surgery and modification of the transperitoneal direct approach (TDA). This modified procedure was offered to 20 patients.

Material and Methods

From September 2003 to August 2005, 52 laparoscopic operations of the abdominal aorta and iliac arteries were performed at our institution. They included 16 iliofemoral (IFB), 17 aortounifemoral (AUFB) and 15 aortobifemoral bypasses (ABFB); two aortoiliac thrombendarterectomies (TEA), and two AAA resections (Fig. 1(A) and (B)). Patients with significant medical problems, morbid obesity and previous major abdominal surgery were excluded from the clinical study. Disease was classified in accordance with the American Society of Anesthesiologists (ASA) classification. Patients with ASA IV–V, significantly abnormal cardiac, pulmonary, hepatic and renal test results were not offered a laparoscopic procedure. Preoperative data are summarized in the Table (Fig. 1(C)). The laparoscopic transperitoneal approach was used in all IFB and five AUFB. Eleven patients underwent the transperitoneo-retroperitoneal approach (TRA) described by Dion and the modified TDA was offered to 20 patients.

Operative technique

The patient was placed on their right side (except for the right IFB) at a 45° angle and in mild...
Trendelenburg position (10–15°) and the left arm was elevated (Fig. 3(A)). One or two femoral bifurcations were exposed. The pneumoperitoneum was secured via a minor incision above the umbilicus with abdominal pressure of 12 mmHg and perfusion of 6 l of CO₂ per minute. A 30° laparoscope (Storz-France SA, Paris, France) was inserted through a trocar. The authors used their own modified TDA, where the small bowel and the omentum were moved towards the diaphragm. The retroperitoneum was opened on the left side of the aorta from its bifurcation to the left renal vein alongside the left gonadal vein (Fig. 2(A)). The posterior peritoneum with preaortic fat and ganglia was liberated as necessary up to the right aortic wall and stitched up to the parietal peritoneum (Fig. 2(C)). Thus, mobilization of the entire descending colon was not required. The subrenal aorta was exposed as well as both common iliac arteries; the inferior mesenteric artery (IMA) and visible lumbar arteries (LA) were temporarily clipped except for two AAA resections. In the AAA surgery cases the IMA was interrupted, LAs were clipped and the subrenal aorta was twice clamped for 5 min after heparin administration. This was followed by a 10-min reperfusion to ensure ‘ischemic preconditioning’ (IP) before the eventual aortic cross-clamping. A Dacron vascular prosthesis Albograft® (Sorin Biomedica Cardio, SpA, Italy) with attached shortened Gore 3/0® (W.L. Gore and Associates, AZ, USA) stitches length of 25 cm was inserted into the abdomen through a 10 mm trocar (Fig. 3(B)). Tunneling was performed from one or two groins under direct vision of the laparoscopic video camera using a long Debakey aortic vascular clamp. The pelvic arteries were occluded by the removable Storz® (Storz-France SA, Paris, France) arterial clamps and an aortic clamp was introduced in the sagittal line through the upper port. Two separate laparoscopic aortic clamps (Storz-France SA, Paris, France) arterial clamps and an aortic clamp was introduced in the sagittal line through the upper port. Two separate laparoscopic aortic clamps (Storz-France SA, Paris, France) arterial clamps and an aortic clamp was introduced in the sagittal line through the upper port. Two separate laparoscopic aortic clamps (Storz-France SA, Paris, France) arterial clamps and an aortic clamp was introduced in the sagittal line through the upper port.

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**Fig. 1.** (A) Laparoscopic vascular procedures. 1. Iliofemoral bypass/IF/16 (30.8%), 2. Aortounifemoral bypass/AUF/17 (32.7%), 3. Aortobifemoral bypass/ABF/15 (28.9%), 4. Abdominal aortic aneurysm/AAA/2 (3.8%), 5. Aortoiliac endarterectomy (patch) 2 (3.8%) (B) Position of trocars. (C) Demographics patient data. CAD, coronary artery disease; HTN, hypertension; DM, diabetes mellitus; COPD, chronic obstructive pulmonary disease. (D) Intraoperative and outcome data.
Fig. 2. (A) Position of colon and exposure of infrarenal aorta. (B) Central end-to-side anastomosis of an aortobifemoral bypass. (C) The posterior peritoneum is stitched up to the abdominal wall. (D) Central and peripheral anastomoses of a tube graft.

Fig. 3. (A) Patient’s position on the operating table. (B) Dacron vascular prosthesis with preattached stitches. (C) The cosmetic effect after a total laparoscopic AAA resection.
Results

There were no postoperative deaths (30-d survival 100%). The morbidity rate after laparoscopy was 8%. The mean operating time was 259 min (150–420), clamping time 69 min (35–150). The average blood loss was 395 ml (50–1500). Hospital stay was 6.6 days (3–21). Conversion to open was required in five patients (Fig. 1(D)): Injury of the adherent left hepatic lobe (one); to control bleeding from the abdominal wall as well as inside the abdominal cavity following trocar removal (one); to progress dissection of aorta in fatty retroperitoneal tissue in obese patients (three). Two patients had mild postoperative compartment syndrome and two patients had protracted lymph leak from the groin.

Discussion

Laparoscopic vascular surgery has undergone fast development from manually assisted to purely laparoscopic procedures. Typically, during TRA described by Dion in 1997, the retroperitoneum is exposed alongside the descending colon and it is, together with the colon, attached to the abdominal wall by means of several stitches. Thus, an effective barrier against the small bowel is created enabling easier approach to the infrarenal aorta. However, the exposed retroperitoneal area may result in substantial hemorrhagic or lymphatic discharge. The modified TDA which combines the advantages of the transperitoneal and transperitoneal—retroperitoneal approaches was used in 20 cases in our series. We believe that the modified TDA simplifies aortoiliac exposure. We use a peritoneal apron and patient’s position only to maintain visera during TDA. The main advantage is shorter aortic dissection time, avoidance of ureteral dissection and reduced exposure area resulting in lowered blood and lymph leak. The colon remains in its place and it is not necessary to mobilize it entirely. A theoretical drawback of the TDA is the difficulty in covering the graft in thin patients.

Abdominal aortic aneurysm repair is the most complicated and demanding procedure in laparoscopic vascular surgery. A substantial disadvantage is the long aortic cross-clamp time, which stresses the heart due to the afterload increase and, rarely, may lead to skeletal muscle necrosis or to reperfusion syndrome in the lower extremities. There is evidence demonstrating the beneficiary effect of ischemic preconditioning (IP). Repeated short-term IP before aortic clamp placement may reduce eventual muscle damage caused by long-term ischemia. The use of laparoscopic procedures in surgery has led to reduced postoperative pain, shorter hospitalization periods, faster return to standard activities and excellent cosmetic results (Fig. 3(C)). Different techniques are used to perform laparoscopic aortoiliac surgery. The modified TDA represent the next step in laparoscopic vascular technique.

References