The Retroperitoneal Approach for Abdominal Aortic Aneurysms

KAMPHOL LAOHAPENSANG, M.D.*,
ARAM PONGCHEOWBOON, M.D.*,
KITTIPAN RERKASEM, M.D.*

Abstract

Graft replacement has become the reliable and effective form of treatment for abdominal aortic aneurysms (AAA). Operative therapy remains the major undertaking with significant rates of postoperative morbidity and mortality. The use of retroperitoneal approach has been proposed as an alternative to standard midline transabdominal approach. Over a 5 year period, 43 consecutive nonrandomized infrarenal AAA patients underwent elective surgical correction by the authors. 32 patients with the mean age of 75 underwent transabdominal reconstructive procedures for AAA. The average size of AAA was 5.9 cm and operative time was 3 hours and 25 minutes. The mortality rate was 6.25 per cent (2 of 32). The cause of death was myocardial infarction 1, and acute renal failure 1. There are many complications in the transabdominal group. 11 had prolonged ileus, 2 MI, 2 wound dehiscence, 2 atelectasis, 1 acute renal failure and 1 chylous ascites. In 11 patients with retroperitoneal approach, the average size of AAA was 5.6 cm and operative time was 3 hours and 29 minutes. No operative mortality, the only 1 complication was retroperitoneal hematoma.

The most notable difference between the retroperitoneal group and transabdominal group was the speed and ease of postoperative recovery. The patients in the retroperitoneal group needed a shorter period of intubation, nasogastric drainage, stay in the intensive care unit and hospital. Patients in the retroperitoneal group also resumed oral alimentation sooner, shorter and smoother postoperative course. The patients in the retroperitoneal group had less blood loss and fewer transfusions than in the transabdominal group.

Findings from our experience using the left retroperitoneal approach for a reconstructive procedure of AAA indicate that it results in fewer overall physiologic disturbances of the patients. We believe that the left retroperitoneal approach is a useful surgical access of choice for the elective repair of AAA.

* Department of Surgery, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand.

Table 1. Demographics and risk factors of patients.

	Transperitoneal	Retroperitoneal
Number	32 (Male 25, Female 7)	11 (Male 8, Female 3)
Mean age (years)	75 (54-90)	77 (52-88)
Smoking	22	7
Diabetes	4	-
COPD	18	8
Previous MI	8	4

Graft replacement has become the reliable and effective form of treatment for abdominal aortic aneurysms (AAA). Operative therapy remains the major undertaking with significant rates of postoperative morbidity and mortality[1-3]. The use of retroperitoneal approach has been proposed as an alternative to standard midline transperitoneal approach[4-7]. Several reports showed decreased rates of postoperative morbidity; cardiac stress may be reduced by this approach[8-10]. Details below are our experience with the elective operative management of AAA transperitoneal and retroperitoneal approach. Comparison is limited to infrarenal AAA because these can be performed by either retroperitoneal or transperitoneal approach, whereas juxtarenal and suprarenal as well as thoracoabdominal aneurysmal repair requires an extraperitoneal or thoracoabdominal technique. All operations were performed by the authors.

MATERIAL AND METHOD

A total of 43 consecutive nonrandomized infrarenal AAA patients underwent elective surgical correction during a 63 month period from January 1990 through March 1996 at Chiang Mai University Hospital and private hospitals by the authors. In the transperitoneal group, there were 25 men and 7 women with the mean age of 75 years. In the retroperitoneal group, there were 8 men and 3 women with the mean age of 77 years. The mean aneurysm size as measured by preoperative ultrasonography was similar for the transperitoneal and retroperitoneal groups, being 5.9 and 5.6 cm, respectively. Associated disease in each group are listed in Table 1 and 2. Preoperative preparation included the use of ultrasonography, computerized tomography or aortography for all patients. Cardiologic consultation was obtained when necessary. The reconstructive procedures were similar the transperitoneal *versus* the retroperitoneal group and included aortic tube grafts (5 transperitoneal, 6 retroperitoneal); aortoiliac grafts (21 transperitoneal, 3 retroperitoneal); and aortobifemoral grafts (6 transperitoneal, 1 retroperitoneal). (Table 3).

Operative techniques

After insertion of urinary drainage catheter and nasogastric tube, the patient is placed under general endotracheal anesthesia. The patient is then put in a right lateral decubitus position with thorax held at 60 degrees angle relative to the plane of the table; the pelvis is rotated to the left and held at 30 degrees to the table. (Fig. 1).

Table 2. Associated diseases in 43 patients operated on for infrarenal AAA.

	Transperitoneal (n=32) no (%)	Retroperitoneal (n=11) no (%)
Hypertension	9 (28.1)	4 (36.4)
Previous MI	8 (25)	4 (36.4)
COPD	18 (56.2)	8 (72.7)
Diabetes	4 (12.5)	- (0)

Table 3. Operative procedures in 43 patients with infrarenal AAA.

	Transperitoneal (n=32)	Retroperitoneal (n=11)
Graft configuration		
Tube aortic	5	6
Aortoiliac	21	3
Aortobifemoral	6	1
Average postoperative stay (days)	10	8
Postoperative mortality	2 (6.25%)	-
Diameter of AAA	5.9	5.6
Operative time (minutes)	215	219

Fig. 1. **The patient is placed in a right lateral decubitus position with thorax held at 60 degrees angle relative to the plane of the table; the pelvis is rotated to the left and held at 30 degrees to the table. The incision runs from midway between the umbilicus and the symphysis pubis in a curvilinear manner into the flank posteriorly towards the 12th rib or 11th intercostal spaces.**

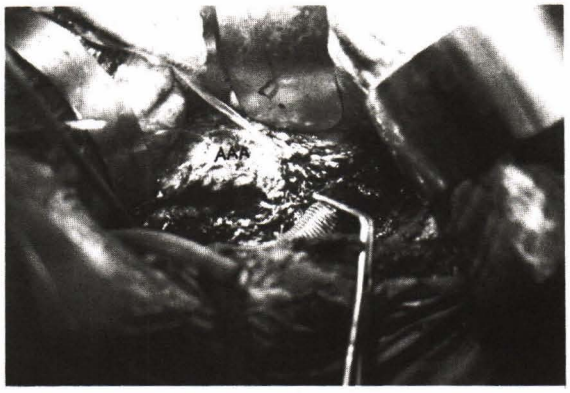

Fig. 2. **The infrarenal abdominal aortic aneurysm has been exposed by mobilization of the peritoneum superiorly and medially.**

Table 4. Intraoperative and postoperative measurements for 43 patients operated on for infrarenal AAA.

	Transperitoneal (n=32)	Retroperitoneal (n=11)
Intraoperative		
Crystalloid infused (ml)	3,500 ± 300	2,800 ± 350
Operative time (h)	3 h 25 min	3 h 29 min
Postoperative		
Nasogastric intubation (h)	78 ± 6	46 ± 5.1
Initial alimentation (days)	5 ± 0.2	3 ± 0.2
Hospitalization (days)	14 ± 2	10 ± 1

After skin preparation and draping, an oblique incision along the course of the 11st and 12th rib is started at the posterior axillary line and carried anteriorly to the lateral border of the rectus abdominis. After division of the three muscular layers of the abdominal wall, the retroperitoneal space is entered; the peritoneum is retracted medially to expose the aorta. (Fig. 2) A self retaining retractor is used for maintaining the intended exposure throughout the remainder of the operation. After systemic heparinization, the common iliac vessels are isolated and occluded. The lumbar branch of the left renal vein, a reliable marker for the common iliac vessels, is isolated and occluded. The lumbar branch of the left renal vein is a reliable marker for the neck of the aneurysm. After division of this vein and underlying lymphovascular tissue, the aortic neck is exposed and cross-clamped. At this point if a tube or bifurcate graft is neccessary the aneurysm may be opened for the placement of an appropriate size graft by open conventional inclusion techniques. The flank wound is then closed with three layers of continuous suture for the muscular layers of the abdominal wall.

RESULTS

There was no difference in operative time between the retroperitoneal group (3 hours 29 minutes) and transperitoneal group (3 hours 25 minutes). The intraoperative and postoperative meassurements evaluated are listed in Table 4. The retroperitoneal approach was associated with lower intraoperative crystalloid fluid requirements when compared with the transperitoneal approach. The intraoperative blood loss and blood requirements were high in the transperitoneal group. (Table 5) In the transperitoneal group, the length of stay in the intensive care unit and the duration of endotracheal intubation were longer than in the retroperitoneal group. The duration of nasogastric intubation as well as the delay before initiation of oral intake was considerably prolonged in patients operated on by the transperitoneal approach. The postoperative hospital stay was longer in the transperitoneal group than in the retroperitoneal group. (Table 6).

In the transperitoneal approach, there were many complications. (Table 7) Eleven patients had prolonged ileus (greater than 4 days), 2 atelectasis, 2 myocardial infarction, 2 wound dehiscence and 1 acute renal failure. One patient of the transperitoneal group had chylous ascites, which was successfully treated with surgical ligation of the lymph channels and interval peritoneal drainage of the lymphocele. One patient in the retroperitoneal group had a retroperitoneal hematoma, which underwent re-exploration for evacuation of the hematoma. Four patients in the retroperitoneal group had pain in the incisional scar which subsided on the following 3 months.

The operative mortality rate was 4.6 per cent. (2 of 43) overall; there was no mortality in the retroperitoneal group. The mortality rate of transperitoneal group was 6.25 per cent (2 of 32). The cause of death was myocardial infarction in one patient and acute renal failure in the other patient. (Table 8)

DISCUSSION

The standard operative approach of AAA still consists of midline abdominal exposure for graft replacement. Postoperatively, patients usually have prolonged period of ileus (>4 days) and require ventilatory support for relatively long periods of time. Operative mortality and morbidity rates remain high[1-3]. Rob reported the first series of patients operated *via* retroperitoneal approach re-

Table 5. Intraoperative blood loss and transfusion required.

	Transperitoneal (n=32)	Retroperitoneal (n=11)
Blood loss (ml)	1,320 ± 200	1,250 ± 250
Transfusion (Unit)	3.2 ± 0.2	2.4 ± 0.4

Table 6. Parameters of postoperative recovery.

	Transperitoneal (n=32)	Retroperitoneal (n=11)
Intubation (h)	74 ± 10	24 ± 8
NG drain (h)	78 ± 6	46 ± 5.1
ICU stays (h)	84 ± 12	32 ± 10
Postoperative hospitalization (days)	14 ± 2	10 ± 1

Table 7. Postoperative complications in 43 patients operated on for infrarenal AAA.

	Transperitoneal (n=32)	Retroperitoneal (n=11)
Atelectasis	2	-
Prolonged ileus (>4 days)	11	-
Myocardial infarction	2	-
Retroperitoneal hematoma	-	1
Wound dehiscence	2	-
Chylous ascites	1	-
Acute renal failure	1	-

Table 8. Postoperative morbidity and mortality.

Number	Transperitoneal (n=32)	Retroperitoneal (n=11)
MI		
Nonfatal	1	-
Fatal	1	-
Acute renal failure (fatal)	1	-
Atelectasis	2	-
Ileus > 4 days	11	-
Wound dehiscence	2	-
Wound pain	-	4
Hematoma	-	1

commending this procedure for low-lying and smaller aneurysms[4]. More recently, the others have presented the retroperitoneal approach as a less traumatic alternative in the treatment of AAA in high-risk patients[1-8]. Technically advantages of retroperitoneal approach include minimum dissection, minimum blood loss and a stable operation. Dissection of tissue around the duodenum is avoided, which may help decrease the incidence of graft-enteric fistula[4-6]. Further advantages of the retroperitoneal exposure include excellent exposure of the entire visceral aorta for clamping and graft replacement if the aneurysm extends up to or past the renal arteries[11,12]. The protective effects of the peritoneal envelop simply avoiding prolonged exposure of the intraperitoneal contents account for less evaporative fluid loss, decreased intestinal traction reduces postoperative adynamic ileus and permits an earlier return of intestinal functions [9,10]. Furthermore, especially with the use of the exclusion technique, operative blood loss is decreased[8,15]. A recent study of the retroperitoneal exposure of AAA has documented less pain, decreased intraoperative parameter cardiac system, decreased need for intubation, decreased incidence of ileus, and decreased total hospital stay like our experience[2,3,8-10]. Generally the patients recover more quickly and with less morbidity than those undergoing the midline transperitoneal approach [1-3]. Although the retroperitoneal approach is appropriate for nearly all patients with AAA, there are certain circumstances in which this approach is excellent, including redo operation, inflammatory aneurysm, aneurysm associated with horseshoe kidney, patients with pulmonary insufficiency, obese patients and patients who have had multiple intra-abdominal operations[5,8,15].

Disadvantages of the retroperitoneal approach include the relative inaccessibility of the right renal artery and kidney. Also, intraperitoneal pathology is not examined at the time of the operation. Routine use of ultrasonography, CT scanning and aortography in the preoperative evaluation of AAA should decrease the incidence of unsuspected intra-abdominal pathology. There was no significant difference in operative time between transperitoneal and retroperitoneal group in our experience. This operation is unable to evaluate the inferior mesenteric artery. We did not reimplant the inferior mesenteric artery in all patients with retroperitoneal approach. There was no instance of transmural colonic ischemia in those with elective aneurysm repair. If the colonic ischemia is suspected, opening of the peritoneal sac to observe the colon could be performed. There were 4 patients with wound pain and incisional bulge (Flaccid flank) due to nerve injury to the flat muscle of the abdomen. If the retroperitoneal incision is higher, dividing the 10th or 11th intercostal nerves, there are more problems than with a lower incision[16].

Selective use of right retroperitoneal approach for low-lying AAA and iliac aneurysm has been reported[17-19]. There are also reports about extensive left retroperitoneal exposure for ruptured and leakage AAA[20,21].

SUMMARY

We found that routine use of a retroperitoneal approach for surgical therapy of intrarenal AAA has decreased our rate of postoperative morbidity and led to a more rapid recovery for our patients. As one becomes more familiar with this approach, the limitation of this exposure becomes less with a shorter operative time.

(Received for publication on July 15, 1996)

REFERENCES

1. Sicard GA, Freeman MB, Van Der Woude JC, et al. Comparison between transabdominal and retroperitoneal approach for reconstruction of the infrarenal abdominal aorta. J Vasc Surg 1987; 5: 19-27.
2. Leather RP, Shah DM, Kaufman JL, et al. Comparative analysis of retroperitoneal and transperitoneal aortic replacement for aneurysm. Surg Gynecol Obstet 1989; 168: 387-93.
3. Cambria RP, Brewster DC, Abbot WM, et al. Transperitoneal versus retroperitoneal approach for aortic reconstruction: a randomized prospective study. J Vasc Surg 1990; 11: 314-25.
4. Rob C. Extraperitoneal approach to the abdominal aorta. Surgery 1963; 53: 87-90.
5. Williams GM, Ricotta JJ, Zimmer M, et al. The extended retroperitoneal approach for the management of extensive atherosclerosis of the aorta and renal vessels. Surgery 1980; 88: 846-55.
6. Sharp WV, Donovan DL. Retroperitoneal approach to the abdominal aorta : revisited. J Cardiovasc Surg 1987; 28: 270-2.
7. Shepard AD, Tollefson DFJ, Reddy DJ, et al. Left flank retroperitoneal exposure: a technical aid to complex aortic reconstruction. J Vasc Surg 1991; 14: 283-91.
8. Shepard AD, Scott GR, Mackery WC, et al. Retroperitoneal approach to high risk abdominal aortic aneurysm. Arch Surg 1986; 121: 444-9.
9. Hudson JC, Wurm WH, O' Donnell TF, et al. Advantages of the retroperitoneal approach in reducing myocardial stress during aortic surgery; abstract. Chicago, Illinois, U.S.A. Presented at the Society of Vascular Surgery. June 9, 1987.
10. Gottileb A, Shrinska VA, O'Hara P, et al. The role of prostacycline in the mesenteric traction syndrome during anesthesia for abdominal aortic reconstructive surgery. Ann surg 1989; 209: 363-7.
11. Poulias GE. Juxtarenal Abdominal Aneurysmectomy. J Cardiovasc Surg 1992; 33: 324-30.
12. Nypaver TJ, Shepard AD, Reddy DJ, et al. Repair of pararenal abdominal aortic aneurysms: An analysis of operative management. Arch surg 1993; 128: 803-13.
13. Corson JD, Leather RP, Shah DM, et al. Extraperitoneal aortofemoral bypass with exclusion of the intact infrarenal aortic aneurysm. J Cardiovasc Surg 1987; 29: 274-5.
14. Shah DM, Chang BB, Paty PSK, et al. Treatment of abdominal aortic aneurysm by exclusion and bypass: An analysis of outcome. J Vasc Surg 1991; 13: 15-20.
15. Metcalf RK, Rutherford RB. Inflammatory abdominal aortic aneurysm: an indication for the retroperitoneal approach. Surgery 1991; 109: 555-7.
16. Rosenbaum GJ, Arroyo PJ, Sivina M. Retroperitoneal approach used exclusively with epidural anesthesia for infrarenal aortic disease. Am J Surg 1994; 168: 136-9.
17. Honig MP, Mason RA, Giron F. Wound complications of the retroperitoneal approach to the aorta and iliac vessels. J Vasc Surg 1992; 15: 28-34.
18. Landvater LE, Giodana JM, Trout HH. Transperitoneal approach and right retroperitoneal dissection of abdominal aortic aneurysm. Surg Gynecol Obstet 1986; 162: 595-7.
19. Chang BB, Paty PSK, Shah DM, et al. The right retroperitoneal approach for abdominal aortic aneurysm. Am J Surg 1989; 158: 156-8.
20. Davidson BR, Gardham R. Selective use of a right retroperitoneal approach to AAA. Br J Surg 1992; 79: 639-40.
21. Chang BB, Paty PSK, Shah DM, Leather RP. Selective use of retroperitoneal aortic exposure in the emergency treatment of ruptured and symptomatic aortic aneurysms. Am J Surg 1988; 156: 108-10.
22. Chang BB, Shah DM, Paty PSK, et al. Can the retroperitoneal approach be used for ruptured abdominal aortic aneurysm. J Vasc Surg 1990; 11: 326-30.

การผ่าตัดเอออร์ต้าโป่งพองโดยทางรีโทรเพริโตเนียม

กำพล เลาหเพ็ญแสง, พ.บ.,*
อร่าม พงศ์เชียวบุญ, พ.บ., กิตติพันธ์ ฤกษ์เกษม, พ.บ.**

การผ่าตัดเปลี่ยนหลอดเลือดเทียมสำหรับเอออร์ต้าโป่งพองในช่องท้อง ใต้ต่อหลอดเลือดแดงของไต โดยทั่วไปแล้วศัลยแพทย์มีความเคยชินกับการผ่าตัดเปิดช่องท้องเข้าไปถึงเอออร์ต้า ทางคณะผู้จัดทำเสนอวิธีการผ่าตัดเข้าถึงเอออร์ต้าโดยไม่ผ่านช่องท้อง เข้าทาง retroperitoneam โดยวิธีการของศัลยแพทย์ทางยูโร เพื่อเข้าถึงไตและท่อปัสสาวะ พบว่าสามารถเข้าถึงเอออร์ต้าและแขนงหลอดเลือดแดงที่สำคัญ ทำการผ่าตัดซ่อมแซมเปลี่ยนหลอดเลือดเทียมได้ง่าย เสียเลือดน้อย อวัยวะภายในช่องท้องไม่มาบังบริเวณที่ผ่าตัด วิธีการผ่าตัดนี้เหมาะสมสำหรับผู้ป่วยที่มีปัญหาทางโรคหัวใจและปอด พบว่าหลังผ่าตัดผู้ป่วยฟื้นตัวได้เร็ว ไม่ต้องใช้เครื่องช่วยหายใจนาน, ท้องไม่อืดจากลำไส้ไม่ทำงาน สามารถรับประทานอาหารได้เร็ว ไม่ต้องอยู่ในแผนกดูแลผู้ป่วยหนักนาน กลับบ้านได้เร็ว ภาวะแทรกซ้อนและอัตราตายน้อยกว่าการผ่าตัดเปิดช่องท้อง จึงควรจะนำมาใช้ในการผ่าตัดหลอดเลือดเอออร์ต้าโป่งพองในช่องท้องใต้ต่อหลอดเลือดแดงของไต

* ภาควิชาศัลยศาสตร์, คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่, จ.เชียงใหม่ 50200