Left Retroperitoneal Versus Midline Transperitoneal Approach for Abdominal Aortic Aneurysms (AAAs) Repair

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Objective: *The purpose of this prospective randomized study was to compare the left retroperitoneal approach (RPA) with the midline transperitoneal approach (TPA) for infrarenal abdominal aortic aneurysms (AAAs) repair with operative details, postoperative complications, and total cost comparision.*
Material and Method: *Between January 2000 and December 2003,36 patients undergoing elective surgery for infrarenal AAAs were included in the prospective comparison of transperitoneal approach (TPA) with retroperitoneal approach (RPA). Thirty-six patients were analyzed, with 18 in group 2 (TPA) and 18 in group I (PRA). There was no significant differences between the groups in patient demographics. (p value > 0.05)*
Results: *There was no significant differences in the aortic cross clamp time, operative time, estimated blood loss and intraoperative blood transfusion between the two groups (p value > 0.05); however, significantly more intraoperative fluid needs and bowel function onset had a statistically longer return in group II (TPA) than in group I (RPA). Statistically reduction in postoperative ileus (> 4 days) and total length of hospital stay was observed in group I (RPA) (p value < 0.05). Postoperative cardiopulmonary complications were statistically significantly more increased in group II (TPA) than in group I (RPA). Wound complications were more in group I (RPA) (1 hematoma, 4 abdominal wall hernia, and 4 chronic wound pain) than in group II (TPA) (2 chronic wound pain). Total cost payment was not significantly different in both groups.*
Conclusion: *The left retroperitoneal approach for infrarenal AAAs repair, with fewer cardiopulmonary complications and shorter hospital stay has more unsatisfactory postoperative wound complications than the midline transperitoneal approach.*

Keywords: *Abdominal aortic aneurysms, Retroperitoneal approach, Transperitoneal approach*

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Midline transperitoneal approach (TPA) by Creech has been the standard approach for open infrarenal AAAs repair since 1966[1]. The operative outcome of AAAs patients is improving due to advances in operative techniques and perioperative management, the mortality rate with elective repair of infrarenal AAAs has been reported at less than 5%[2-4]. Most of the previous reports have delinated some differences between TPA and RPA[5-10]. Although TPA did not differ between surgeons, RPA was not standardized. However, it remains controversial in this area of vascular surgery whether surgery for AAAs is best performed via transperitoneal approach (TPA) or via retroperitoneal approach (RPA). In the present paper, the authors compared the left RPA with standard midline TPA for AAAs graft replacement to evaluate the usefulness of the authors' approach and total cost payment.

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Material and Method

Between January 2000 and December 2003, 36 consecutive randomized nonruptured infrarenal AAAs patients undergoing surgical repair at Chiang Mai University Hospital and nearby private hospitals by the authors were divided into two groups, group II (n = 18) underwent surgery using TPA, while group I (n = 18) underwent surgery using RPA. The RPA was performed through the left retroperitoneal space by

the long oblique incision along the course of the 11th and 12th ribs which is started at the posterior axillary line and carried anteriorly to the lateral border of the rectus abdominis. The patient demographics summarized in Table 1 were compared with Fischer's exact test. The preoperative, operative and postoperative parameters including the mortality rates, risk factors, operation time, aortic cross-clamp time, blood loss, intraoperative fluid need, blood transfusion, gastrointestinal function, length of hospital stay and total cost payment were analyzed in these two groups. Operative parameters were compared with a 2-tailed Student t test. The average time interval to resume a regular diet, Intensive Care Unit (ICU) stay, and length of hospital stay were compared by using the Wilcoxon's rank sum test. The incidence of 30 days postoperative morbidity and mortality were compared between the two groups. All patients had a regular follow up at the out patient clinic between 3-6 months. Results were expressed as mean $\pm$ standard deviation (SD) and statistical comparisons were performed using either the Student t-test/Mann-Whitney U-test or Fisher's exactest the Chi-squared test. A value of *p* less than 0.05 was considered to be significant.

Operative Technique for Left Retroperitoneal Approach of AAAs

After epidural block and induction of general anesthesia, the patient was placed in a right lateral decubitus position with thorax held at 60 degree angle relative to the plane of the table; the pelvis was rotated to the left and held at 30 degrees to the table. An oblique incision along the course of the 11th and 12th ribs which was started at the posterior axillary line and carried anteriorly to the lateral border of the rectus abdominis (Fig. 1). After division of the three muscular layers of the abdominal wall, the retroperitoneal space was entered: the peritoneum contained with abdominal viscera was retracted medially to expose the abdominal aorta and its branches. The right common iliac artery could also be approached easily by mobilizing the right lower peritoneum medially. A Dacron graft of appropriate size was selected, the patient was systemically anti-coagulated with heparin 100 units/kg/dose, after that the infrarenal aortic neck and the aortic branches are cross-clamped with arterial clamps. The aneurysmal sac was opened, its contents removed, and back-bleeding lumbar vessels were sutured and ligated. Proximal and distal anastomoses were performed with 2-0 polypro-pylene sutures. When the aneurysmal sac was extended to the iliac arteries,the surgeons had to decide whether the iliac or femoral vessels at the groins should be selected for distal graft placement (Fig. 2). A self retaining retractor is used for maintaining the intended exposure throughout the operation.

The Standard Midlinetransperitoneal Approach

The standard transperitoneal approach technique entails a xyphoid-to-pubis midline incision after epidural block and induction of general anesthesia.The transverse colon is retracted cephalad and the small bowel displaced laterally, either in a bowel bag or operative towel wrap. Systemic heparinization 100 units/kg/dose is used before cross-clamping the aortic branches and neck of the aorta.Grafts were placed with hand sewn vascular anastomoses.

The patients undergoing retroperitoneal and transperitoneal approach are extubated in the operating or recovery room. Nasogastric tubes were removed as soon as the patients have a return of bowel

Fig. 1 Left retroperitoneal approach (RPA) incision

Fig. 2 Retroperitoneal incision which was extended to both groins for femoral anastomoses

function. Epidural blocks are used routinely in group I (RPA) and group II (TPA) that results in late removal of urethral catheters and late ambulation.

Results

The patient demographics are summarized in Table 1. There was no difference a between group I (RPA) and group II (TPA) patients regarding age, sex distribution, aneurysm size, or body weight. There was male sex prevalence in both groups. Previous abdominal operation was more in group I (RPA) (6/18 [33.3%]) than in group II (TPA) patients (3/18 [16.6%]). The significant differences were the length of incision and intraoperative fluid needs (p value < 0.05). But the aneurysmal size, the operative time, aortic cross-clamp time, estimated blood loss and blood transfusion were similar in both groups (Table 2). Use of a tube graft for reconstruction was more often in group II (TPA) (9/18) than in group I (RPA) (8/18). Surgical exposure of the common femoral arteries was more oftenly required in group I (RPA) (3/18) than in group II (TPA) (1/18).

The details of recovery are shown in Table 3. Return to general dietary feeding occurred significantly earlier in group I (RPA) than in group II (TPA). (2.3 ± 0.8d vs 6.9 ± 1.4d). The hospital stay was significantly shorter in group I (RPA) than group II (TPA). (10.2 ± 1.3 d vs 14.5 ± 2.1 d). There was one postoperative death from fatal myocardial infarction in group II (TPA) which did not recover after medical management. The postoperative complications are shown in Table 4.

The incidence of major complications in group II (TPA) group I was higher than that in group I (RPA), with a significant difference in cardiorespiratory complications (myocardial infarction, atelectasis), and postoperative ileus between the two groups. There was no prolonged ileus (> 4 days) in group I (RPA), while there was 44.4% (8 of 18) in group II (TPA). There were more wound complications in group I (RPA) (4 instances of late abdominal wall hernia, 4 chronic wound pain and 1 wound hematoma) than in group II (TPA) (2 instances of chronic wound pain). Finally, the mean total hospital cost was not significantly different in the TPA and RPA groups (US $ 3,750 and US $ 3,625).

Table 1. Patient demographics

Demographics data	Retroperitoneal Group I (n =18)	Transperitoneal Group II (n =18)
Age	77.6±6.4	75.3±5
M/F	12/16	11/7
Body weight (kg)	54.3±8.8	55.8±8.6
Hypertension	8 (44.4%)	10 (55.5%)
Hyperlipidemia	6 (33.3%)	6 (33.3%)
Previous MI	5 (27.7%)	6 (33.3%)
COPD	12 (66.6%)	13 (72.2%)
Renal dysfunction (Cr>2.0 mg/dl)	2 (11.1%)	2 (11.1%)
Smoking	13 (72.2%)	14 (77.7%)
Diabetes	3 (16.6%)	4 (22.2%)
Previous abdominal operations	6 (33.3%)	3 (16.6%)

COPD = Chronic Obstructive Pulmonary Disease,
MI = Myocardial Infarction
Data represented mean ± SD

Discussion

Endovascular repair (EVR) for AAAs is used in the United States, Europe and Australia, it is not used routinely in Thailand because of cost

Table 2. Intraoperative data

Intraoperative data	Retroperitoneal Group I (n = 18)	Transperitoneal Group II (n = 18)	p-value
Aneurysm size (cm)	5.6±0.8	5.9±0.7	0.9180
Abdominal incision (cm)	29±2.9	25±1.8	0.0000
Operative time (min)	209±38	205±41	0.7633
Aortic cross clamp time (min)	60.3±21	62±18	0.7958
Intraoperative fluid need (ml)	2800±350	3500±30	0.0000
Estimated blood loss (ml)	1150±430	1246±615	0.5908
Intraoperative PRBC (units)	0.9±1.5	0.8±1.6	0.8487
Graft type			
Tube grafting	8 (44.4%)	9 (50%)	NS
Bifurcation grafting			
Aortoiliac	7 (38.8%)	8 (44.4%)	NS
Aortobifemora	13 (16.6%)	1 (5.5%)	0.2890

Data represented mean ± SD; NS, Not significant

Table 3. Details of recovery

Details	Retroperitoneal Group I (n =18)	Transperitoneal Group II (n =18)	p-value
Mortality rate	-	1 (5.5%)	0.3100
ICU stay (d)	2.1±1.2	2.4±1.5	0.5121
Liquid diet (d)	1.6±0.8	4.9±1.3	0.0000
Solid diet (d)	2.3±0.8	6.9±1.4	0.0000
Ambulation (d)	2.6±0.7	4.3±2.3	0.0050
Hospital stay (d)	10.2±1.3	14.5±2.1	0.0000

Data represented mean ± SD

Table 4. Postoperative complications

Complications	Retroperitoneal Group I (n=18)	Transperitoneal Group II (n =18)	p-value
Myocardial Infarction(MI)			
Nonfatal	1	1	1.0000
Fatal	-	1	0.3100
Atelectasis	-	2	0.1460
Ileus > 4 days	-	8	0.0019
Wound pain	4	2	0.3710
Abdominal wall hernia	4	-	0.0340
Hematoma	1	-	0.3100

NS , Not significant ; Fatal MI means myocardial infarction without recovery after medical management;Chronic wound pain means incisional wound pain durring 2-4 weeks follow up at the outpatient department that can be relief by Tylenol 500 mg/dose

considerations[11]. Here, the authors studied two approaches used in the elective surgical repair of infrarenal AAAs between midline transabdominal approach group II (TPA) and group I left retroperitoneal approach (RPA).

Dubost et al[12] introduced the RPA in AAAs repair in 1952. Rob's curved incision with muscle division is the widely accepted approach for retroperitoneal repair of AAAs[13]. More recently the others have stated that the RPA has more advantages over the TPA[4,8-10], is associated with decreased pulmonary complications, less postoperative ileus as well as a shorter hospital stay. The average total hospital cost in the present series is not significantly different between group 2 (TPA) and group 1 (RPA) (US $ 3,750 vs US $ 3,625).

This flank approach, however is clearly not perfect. This operative method has frequently been reported to cause postoperative wound complications. Chronic wound pain, incisional hernia and abdominal bulge have been described with variable frequency of this exposure[14,15]. This has been attributed to the injury caused to the neurovascular segments by muscle division during the operative procedure which results in flat muscle atrophy, subsequently leading to the development of an incisional hernia and wound bulging (flaccid flank) were observed because muscle division was not necessary[16-18]. Although the left flank oblique incision was mostly used in the retroperitoneal approach, midline and pararectal retroperitoneal incision healed well with fewer wound complications[7,16,18].

Conclusion

The authors found that the use of left retroperitoneal approach for infrarenal AAAs has fewer gastrointestinal and cardiopulmonary complications with a shorter hospital stay, but this operative method has frequently reported to cause postoperative wound complications. Midline retroperitoneal and pararectal retroperitoneal approach should be the better approach to decrease wound complications. There was no significant difference in total cost payment between group II (TPA) and group I (RPA) repair of infrarenal AAAs.

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วิธีการผ่าตัดเอออร์ต้าโป่งพองทางรีโทรเพอริโตเนียมด้านซ้าย เปรียบเทียบกับวิธีการผ่าตัดเปิดช่องท้อง

กำพล เลาหเพ็ญแสง, กิตติพันธ์ ฤกษ์เกษม, นเรนทร์ โชติรสนิรมิต

วัตถุประสงค์: *เป็นการศึกษาเปรียบเทียบ ย้อนหลังการผ่าตัดรักษาเอออร์ต้าโป่งพองใต้ต่อหลอดเลือดแดงของไต ระหว่างการผ่าตัดเข้าทางรีโทรเพอริโตเนียมด้านซ้าย เปรียบเทียบกับการผ่าตัดเปิดเข้าช่องท้อง ในแง่ของวิธีการผ่าตัด ภาวะแทรกซ้อน และความคุ้มทางเศรษฐกิจ*

วัสดุและวิธีการ: *ทางคณะผู้วิจัยได้รวบรวมผู้ป่วยเอออร์ต้าโป่งพองใต้ต่อหลอดเลือดแดงของไต ที่ได้รับการผ่าตัดรักษาแบบไม่ฉุกเฉิน จำนวนทั้งหมด 36 ราย ตั้งแต่เดือน มกราคม พ.ศ. 2543 ถึงเดือน ธันวาคม พ.ศ. 2546 18 รายผ่าตัดเข้าทางช่องท้อง 18 ราย ผ่าตัดผ่านเข้าทางเรโทรเพอริโตเนียม ด้านซ้าย ผู้ป่วยทั้ง 2 กลุ่ม ไม่มีความแตกต่างกันในด้านอายุ ขนาดของเอออร์ต้า เพศ น้ำหนักตัว และโรคที่เป็นอยู่ก่อนแล้ว*

ผลการศึกษา: *ไม่พบว่ามีความแตกต่างอย่างมีนัยสำคัญ ทางสถิติระหว่างวิธีการผ่าตัดรักษาผู้ป่วยทั้ง 2 กลุ่ม ในแง่ของระยะเวลา การเสียเลือด หรือ ระยะเวลาในการพักฟื้นในหออภิบาลผู้ป่วยหนัก ในกลุ่มที่ผ่าตัดเปิดช่องท้อง พบว่าต้องให้สารน้ำทางหลอดเลือดดำขณะผ่าตัดมากกว่า ลำไส้ทำงานช้ากว่า ทำให้รับประทานอาหารได้หลังผ่าตัดช้ากว่า กลุ่มผ่าตัดเข้าทางเรโทรเพอริโตเนียมด้านซ้าย ภาวะแทรกซ้อนทางโรคปอดและหัวใจมากกว่า ทำให้อยู่ในโรงพยาบาลนานกว่า สำหรับกลุ่มที่ผ่าตัดเปิดเข้าทางเรโทรเพอริโตเนียม มีแผลผ่าตัดยาวกว่า ภาวะแทรกซ้อนจากแผลผ่าตัดพบได้บ่อยกว่าตั้งแต่การเกิดลิ่มเลือดคั่ง 1 ราย ปวดแผลเรื้อรัง 4 ราย ผนังหน้าท้องหย่อนเป็นถุง 4 ราย จากการกระทบกระเทือนต่อเส้นประสาทที่ต้องได้รับการผ่าตัดแก้ไขภายหลัง สำหรับค่าใช้จ่ายทั้งหมดในการผ่าตัดโดยเฉลี่ยทั้ง 2 กลุ่ม ไม่แตกต่างกัน*

สรุป: *วิธีการผ่าตัด ทั้ง 2 วิธีการ ไม่มีความแตกต่างกัน ในแง่ระยะเวลาการผ่าตัด และการเสียเลือด การผ่าตัดเปิดช่องท้องผู้ป่วย พบว่าต้องอยู่โรงพยาบาลนานกว่า ภาวะแทรกซ้อนทางระบบทางเดินอาหาร โรคปอด และหัวใจมากกว่า ส่วนการผ่าตัดทางเรโทรเพอริโตเนียมด้านซ้าย มีปัญหามากเรื่องแผลผ่าตัด ในแง่ค่าใช้จ่ายไม่ต่างกัน ดังนั้นการผ่าตัดเข้าทางเรโทรเพอริโตเนียม จึงควรวางแนวทางลงแผลผ่าตัดใหม่เป็นแผลตรงกลางหรือข้างช่องท้องไม่ใช้ผ่านทางด้านสีข้าง จะลดภาวะแทรกซ้อนแผลจากการกระทบกระเทือนต่อเส้นประสาท*