

## Minimal Incision with Retroperitoneal Approach for Abdominal Aortic Surgery

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### Abstract

We report our experiences in use of a minimal incision with retroperitoneal approach for treatment of patients with abdominal aortic aneurysm (AAA) and arteriosclerosis obliterans (ASO) in the aortoiliac area. Between January 2000 and March 2002, nineteen consecutive patients with the AAA or ASO underwent operation with a minimal incision technique (<10cm, group M), were compared with 25 patients treated in the same time period with conventional incision (>20cm, group C). There were no significant differences in operation time and cross-clamping time. There was no hospital death in both groups. With the advantages of minimal skin incision, less abdominal muscle dissection, optimal aortic exposure, early resumption of ambulation and shorter hospitalization time, we believe that this technique is a safe and less invasive method for use in abdominal aortic surgery.

**Key words;** minimally invasive surgery, retroperitoneal approach, abdominal aortic aneurysm, arteriosclerosis obliterans

### Introduction

Minimally invasive surgery has been used in several fields and became a routine application for some kinds of operations recently. In the abdominal aortic

surgery, although the retroperitoneal approach has the benefits of reducing drawbacks in transperitoneal approach<sup>1)</sup>, impairing of massive abdominal wall develops the postoperative pain and incisional hernia<sup>2,3)</sup>. In order to reduce the wound morbidity, with the concept of minimally invasive surgery, we have adopted a minimal incision with retroperitoneal approach for treatment of patients with abdominal aortic aneurysm (AAA) and arteriosclerosis obliterans (ASO) in the aortoiliac area. In this study, we report our experiences of this technique and compare it with the conventional procedure to determine its usefulness.

### Materials and Methods

Between January 2000 and March 2002, a total 43 consecutive patients with the AAA or ASO underwent operation with a retroperitoneal approach in Koshigaya Hospital Dokkyo University of Medicine. In the early half of the study period the incision was performed by a conventional fashion (>20cm, group C, n=25) and in the late half by a minimal incision technique (<10cm, group M, n=18).

### Technique of Minimal incision with Retroperitoneal Approach:

The patient was placed in the supine position with a 20 degrees ipsilateral tilt. In conventional approach, the incision around 30cm was made from the tip of the ninth or tenth rib to the ipsilateral edge of the pubis. The external and internal oblique muscles and transverse abdominal muscle were dissected with electrocautery. The peritoneum was divided carefully from the abdominal wall to avoid laparotomy. The full length of the abdominal aorta including the aneurysm

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and the all branches in the iliac portion were exposed and clamped for repair the aorta.

In the minimal approach, the patient was placed in the same position and an ultrasonography was performed to determine the location of skin incision before draping. A limited transverse incision was made at midposition between anticipated proximal and distal anastomosis site. The average length of the incision was 8.2cm (ranged 6 to 10cm).

The external oblique muscle was divided in the direction of its fibers with blunt dissection then the internal oblique and transverse abdominal muscle was dissected with electrocautery. The peritoneum was divided carefully from the abdominal wall to avoid laparotomy. The proximal site of aorta was cross-clamped by a conventional aortic clamp, and the distal sites of iliac arteries were clamped by tightening the tourniquets or insertion of an inflated balloon clamp.

## Results

Group M consisted of 18 patients (15 males and 3 females with a mean age of  $65.9 \pm 14.3$  years), and group C of 25 patients (20 males and 5 females with a mean age of  $70.0 \pm 7.6$  years). The preoperative data are described in **Table 1**. The two groups were not significantly different in terms of body height,

body weight, performed operation, concomitant operation, or proximal anastomosis site. The diameter of AAA was  $50.3 \pm 8.9$ mm in group M and  $61.9 \pm 14.4$ mm in group C ( $p=0.0143$ ).

There were no significant differences in operation time and cross-clamping time. In group M, the procedure was successfully performed in all cases with only one case (5%) needed to enlarge the incision over than 10cm.

The number of transfused blood volume was significantly smaller in group M than group C ( $0 \pm 0$ ml in group M and  $545 \pm 819$ ml in group C,  $p=0.0076$ ) (**Table 2**). The period of walking initiation post-operatively was significantly shorter in group M than group C ( $1.4 \pm 0.9$  days in group M and  $3.8 \pm 4.0$  days in group C,  $p=0.0185$ ). The duration of hospital stay was significantly shorter in group M than group C ( $13.7 \pm 5.5$  days in group M and  $25.1 \pm 12.3$  days in group C,  $p=0.001$ ). There was no hospital death in both groups.

## Discussion

Recently, some authors reported a small incision for exposure of abdominal aortic aneurysm (AAA), but most are approaching the abdominal aorta by transperitoneal method <sup>4,5</sup>. In general, retroperitoneal

**Table 1 Preoperative patient demographics**

	Group M n=18	Group C n=25	p value
Age (year)	$65.9 \pm 14.3$	$70.0 \pm 7.6$	NS
Body height (cm)	$161.5 \pm 9.2$	$160.1 \pm 7.7$	NS
Body weight (kg)	$5.77 \pm 9.5$	$57.1 \pm 6.9$	NS
Diameter of AAA (mm)	$50.3 \pm 8.9$	$61.9 \pm 14.4$	0.0143
Angiographic profile			
AAA (case/%)	13/72%	21/84%	NS
ASO (case/%)	5/28%	4/16%	NS

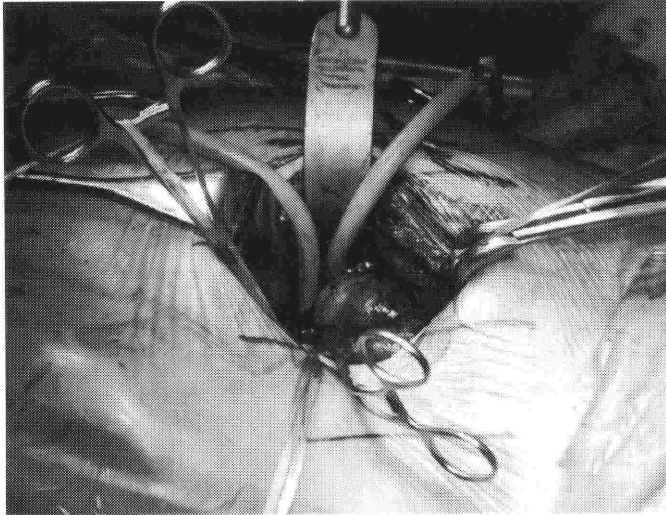
AAA: abdominal aortic aneurysm, ASO: arteriosclerosis obliterans

**Table 2 Surgical results**

	Group M n=18	Group C n=25	p value
Operating time (min)	$282 \pm 64$	$280 \pm 114$	NS
Aortic crossclamp time (min)	$99 \pm 41$	$91 \pm 35$	NS
Blood transfusion (ml)	0	$545 \pm 819$	0.0076
Walking initiation (day)	$1.4 \pm 0.9$	$3.8 \pm 4.1$	0.0185
Hospital stay (day)	$13.7 \pm 5.5$	$25.1 \pm 12.3$	0.001
Revascularization procedure			
Bifucated graft (case/%)	12/67%	17/68%	NS
Straight graft (case/%)	6/33%	8/32%	NS

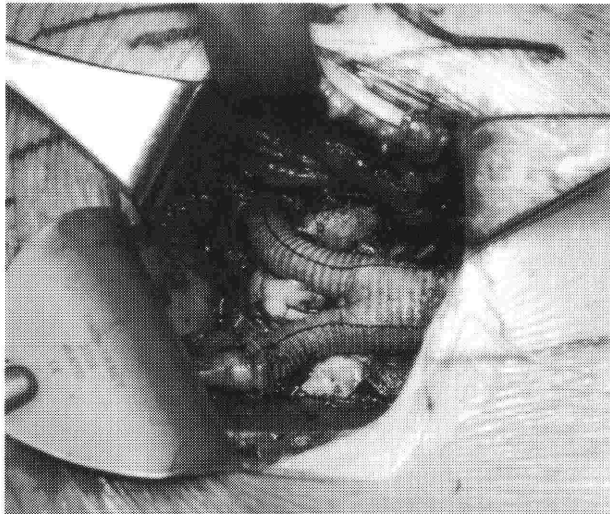
exposure on the abdominal aortic surgery has the benefits of reducing drawbacks in transperitoneal approach by allowing rapid recovery postoperatively<sup>1)</sup>. Under the concept of minimally invasive surgery, we combined the small incision and retroperitoneal approach to be a less invasive procedure. In order to achieve an adequate operating field, a flexible retractor is the most important element of this operation. A Stoney vascular retractor (Omni-Tract Surgical, Minneapolis, MN, USA) that has several kinds of arms and tips in different width, length and angle was useful in this series<sup>6)</sup>.

In a small operating field, since a conventional cross clamp for proximal aorta was the priority, alternative options were used when a conventional clamp was not suitable at the distal site. The case shown in the **Fig. 1**, conventional cross clamps were used in the proximal aorta and both left internal and external iliac arteries, while the right internal and external iliac arteries were clamped by tightened the tourniquets to squeeze the tapes surrounded the arteries. With whole feeding vessels of the aneurysm clamped, manipulation of the aneurysm and anastomosis of the bifurcated graft could be done ordinarily (**Fig. 2**).

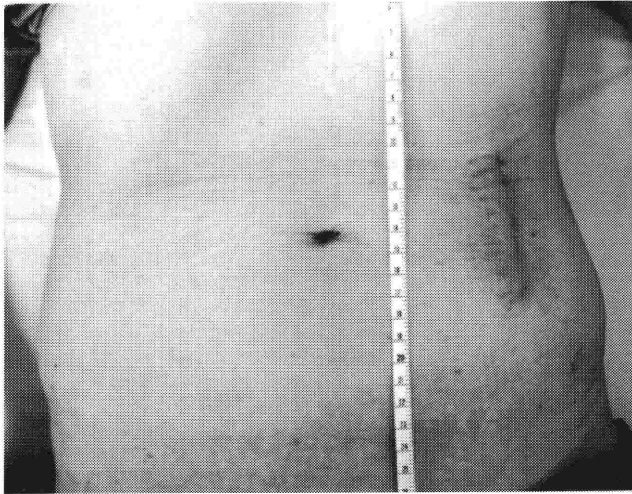


**Figure 1** Abdominal aortic aneurysm was exposed by an 8cm incision

The proximal aorta, left internal, and external iliac arteries are clamped by a conventional clamp; right internal and external iliac arteries are clamped by squeezing the tape surrounded.



**Figure 2** A bifurcated graft was completely sutured to the aorta and both common iliac artery



**Figure 3** Postoperative appearance of an 8cm left flank incision

Although there were no significant differences in operation time and cross-clamping time, but the period of walking initiation and the duration of hospital stay were significantly shorter in group M postoperatively (**Table 2**).

In this first report of our experience with small incision of abdominal aortic surgery, the average diameter of the aneurysm was small ( $50.3 \pm 8.9\text{mm}$ ). However, since the patient was placed in the same position as conventional approach, if it was necessary, the incision could be extended and even reached the full length of the aorta. It encouraged us to indicate more difficult case. We now have initial experience with repair of AAA larger than 60mm in diameter, and with the aneurysm extended to common iliac artery. This small incision technique is steadily becoming part of our routine practice in all cases of infra-renal AAA. However, definition of the ultimate potential and limitations of this technique will require a prospective, randomized trial of larger series of patient evaluation.

In conclusion, with the advantages of minimal skin incision, less abdominal muscle dissection, optimal aortic exposure, early resumption of ambulation and shorter hospitalization time, we believe that the

minimal incision with retroperitoneal approach is a safe and less invasive method for use in abdominal aortic surgery.

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