Laparoscopic Transperitoneal Lumbar Sympathectomy : A New Approach

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Abstract

A report of five sympathectomies for the treatment of vasospastic symptoms of coldness, rest pain and trophic lesions at the affected feet. Three patients had a right-sided sympathectomy done and the other two had left-sided done *via* laparoscopic surgery. This report has advocated original techniques : Under general anesthesia, a patient is put into a lateral position with the table broken between the ribs and iliac crest. The telescope port is inserted horizontally at the edge of the rectus sheath in line with the umbilicus. Two secondary ports (5 mm, 10 mm) are inserted under direct vision in the midclavicular line. The peritoneal reflection lateral to the colon is incised down to the pelvic brim. The use of the lateral position facilitates medial displacement of the colon and the kidney by virtue of gravity. The L_2, L_3, L_4 sympathetic ganglia are then doubly clipped and divided between clips. When such a small piece of the sympathetic trunk has been removed, a laparoscopic transperitoneal lumbar sympathectomy should be a very reasonable, safe, minimally invasive alternative to the traditional operation.

Lumbar sympathectomy is the treatment of choice for vasospastic symptoms of coldness and rest pain of the lower extremities[1,2]. It causes a relaxation of the arteriovenous anastomoses, vasodilatation of the skin and blocks the pain-afferent pathways. In addition to dramatic postoperative response of local warmth and capillary vasodilatation, lumbar sympathectomy still plays an important role in the treatment of thromboangiitis obliterans (TAO) and some vascular problems[3]. The standard approach to remove the lumbar sympathetic chain includes retroperitoneal dissection *via* the flank incision, starting at the lateral border of rectus abdominis and extending laterally toward the tip of the 12th rib[1]. The surgical approach has the disadvantage of causing significant patient discomfort postoperatively at the incision required to gain access. We have illustrated a new clinical application of video-laparoscopy in the resection of sympathetic chain.

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Table 1. Clinical data from the four patients who underwent laparoscopic transperitoneal lumbar sympathectomy.

Clinical data	Case 1	Case 2	Case 3	Case 4	
Age (yr) / sex	54M	60M	22M	75M	
Duration of smoking (yr)	35	32	13	48	
Underlying disease	TAO	ASO	TAO	ASO	
Affected limb	left	right	right	right	left
Vasospastic symptoms					
- rest pain & coldness	severe	severe	severe	severe	severe
- dry gangrene of big toe	+	+	+	+	+
- hyperhidrosis	+	-	+	-	-
Angiographic findings					
- femoral occlusion	+	-	+	+	+
- popliteal occlusion	+	+	+	+	+
- cork-screw appearance	+	-	+	-	-
- distal runoff artery	-	+	-	-	-
Concomittent procedures					
- prior bypass surgery	-	done	-	-	-
- postop amputation	big toe	big toe	big toe	BK	big toe
Operative time (min.)	140	95	105	75	80
Result					
- foot pain	absent	absent	absent	present	present
- warm, dry skin	present	present	present	absent	present
Follow-up (mo.)	20	19	16	2	2

Note : TAO = Thromboangiitis obliterans (Buerger's disease),
ASO = Atherosclerosis obliterans, BK = Below-knee amputation.

MATERIAL AND METHOD

From June 8, 1994 until February 5, 1995, four patients with peripheral vascular diseases were admitted to our surgical service. Their clinical information is summarized in Table 1. All were men with the mean age of 52.75 years (22-75 years). Although they had previously been treated by conservative means (medication, rest and general support), they did not have relief of their pedal pain. One patient (case 2) had had femoro-peroneal bypass done previously, but it gave him pain relief for only a few weeks in spite of patent anastomosis.

Laparoscopic technique

The layout of equipment for a laparoscopic transperitoneal lumbar sympathectomy should be planned (Fig. 1A). Under a general anesthetic with muscle paralysis and assisted ventilation, the patient is put into a lateral position with the table broken between the ribs and iliac crest (Fig. 1B). The patient should be held by straps or, preferably, supported on a rest with a slight tilt of 15° backwards (Fig. 1C). A urethral catheter is required. A Veress needle (Ethicon, Someville, New Jersey, U.S.A.) is inserted horizontally at the edge of the rectus sheath in line with the umbilicus. This site will also be sited for the telescope port. The infusion and drop tests are performed to verify correct placement of the Veress needle. A pneumoperitoneum is acheived with carbon dioxide : 13 mmHg pressure with 4 litres instilled. The skin incision is lengthened horizontally and a disposible 10 mm port with grip inserted. Two secondary ports (10 mm, 5 mm) are inserted under vision in the midclavicular line. If required, a fourth port (5 mm) should be placed in the midline half way between the umbilicus and pubic symphysis (Fig. 1D). This port will be used for the fan retractor that will displace the kidney and colon medially. We established a new minimal access in composed of four important technical aspects as shown in Table 2.

Left-sided sympathectomy

The left line of Toldt lateral to the descending colon is grasped and incised from the hepatic flexure down to the pelvic brim. The left colon is reflected medially by virtue of gravity. The

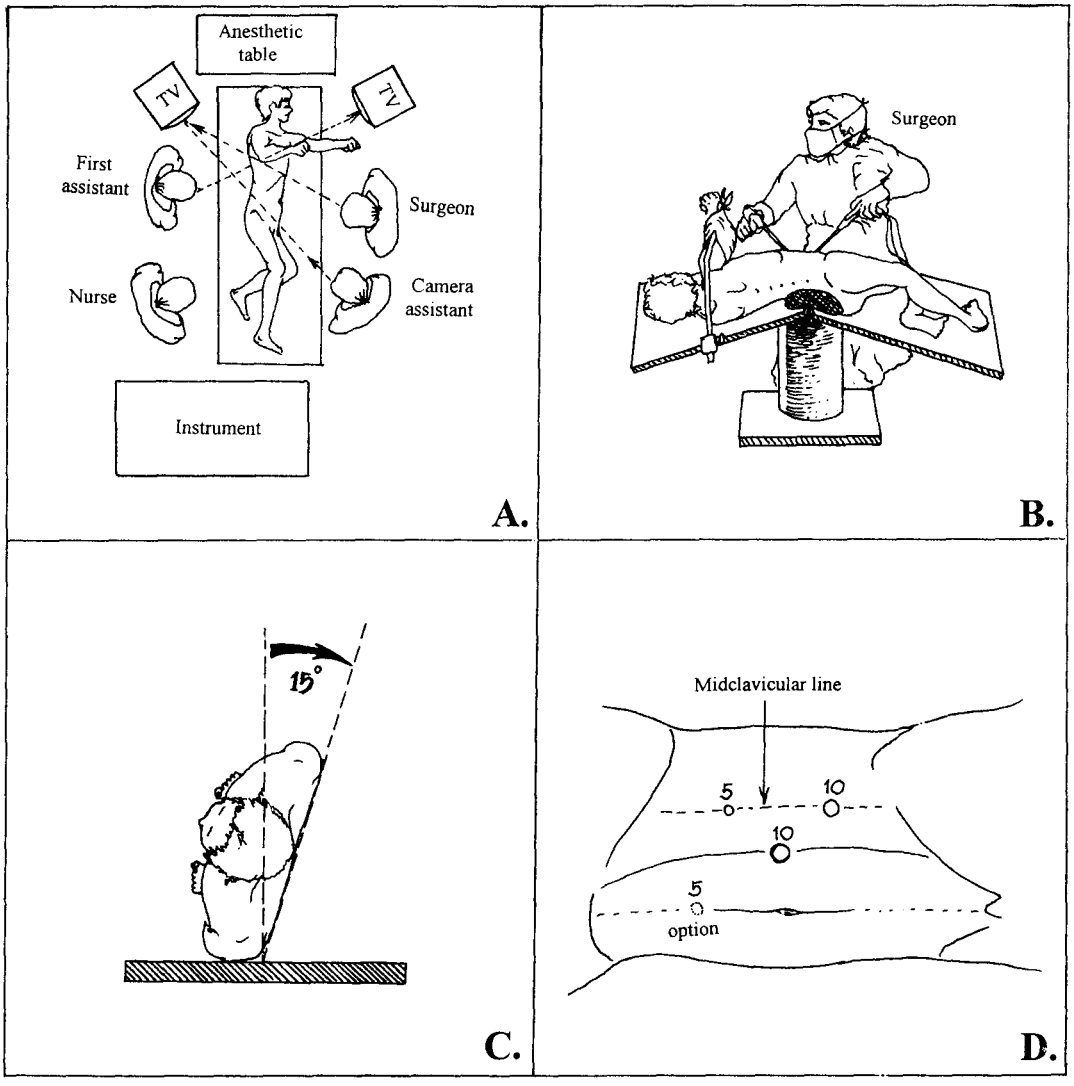

Fig. 1. The layout of equipment for a laparoscopic transperitoneal lumbar sympathectomy (A), lateral position with the table broken between the ribs and iliac crest (B), tilted 15° backwards (C), the sites of ports (D).

left kidney, including the perirenal fat, adrenal gland, Gerota's fascia is dissected from the abdominal sidewall. The kidney is medially displaced, thereby exposing the renal pedicle and the left common iliac artery. By dissecting along the vertebral bodies, the left-sided sympathetic trunk can be found between the medial border of psoas muscle and abdominal aorta. Due to the proximity of the dissection to the medial border of the kidney the L_2-sympathetic chain can be identified. The upper end of the sympathetic chain is subsequently clipped and transected with 5 mm scissors. The rami communicantes are dissected and secured with ligature clips. Dissection of the chain then proceeds distally to the left common iliac artery which is surrounded with para-aortic lymph nodes. The vascular supply to nodal tissue can be divided between clips. The distal end of dissected chain is achieved at the cross of the left common iliac artery. The sympathetic chain from L_2 to L_4 can be removed *via* the midclavicular line 10 mm laparoscopic sheath.

Table 2. Laparoscopic accessibility of the sympathetic chain.

Technical access	Utility
1. **Patient position :** Lateral position with the table broken between ribs and iliac crest with support on a rest and slight tilt of 15° backwards.	1. Reflection of the colon results in medial place of small and large bowels. Tilted 15° backwards will facilitate the best exposure of the vertebral bodies.
2. **Sites of ports :** Telescopic port is inserted horizontally at the edge of the rectus sheath in line with the umbilicus. Two secondary ports (5 mm and 10 mm) are inserted in the midclavicular line. A 5 mm port is sited in the midline half way between the umbilicus and pubic symphysis.	2. The first three ports are lined as an equal-sided triangle rendering the convenient two-handed dissection. The operator can also access the upper pole of the kidney down to the pelvic brim. The last port is used for the fan retractor to displace the colon and the kidney more medially.
3. **Mobilization of the kidney :** Dissect the loose avascular aereolar tissue and reflect all of them medially.	3. It is a useful access of the upper part of lumbar sympathetic ganglia (L_{1-2}). The ureter and perinephric tissue are easily mobilized by this procedure.
4. **Visual landmarks of sympathetic chain :** It lies behind the lower border of renal pedicle (L_2) down to the cross of common iliac artery (L_4). It can be found at the medial border of the psoas muscle.	4. The surgeon should be confident of fulfilling a dissection of sympathetic chain under solely direct visualization. Based on the basic gross anatomy, it can be easily differentiated from the genito-femoral nerve.

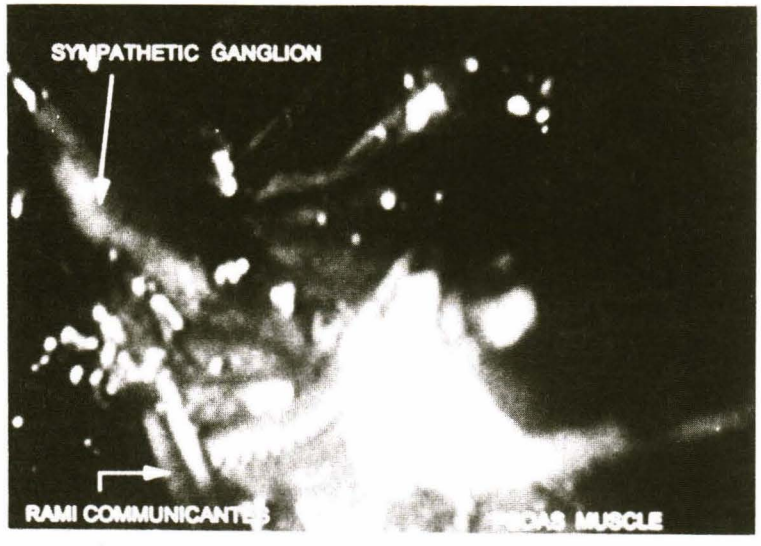

Fig. 2. Laparoscopic exposure of the right-sided sympathectomy.

Right-sided sympathectomy

The perioneal reflection lateral to the ascending colon was incised from the hepatic flexure down to the pelvic brim. The right kidney was also separated from the retroperitoneal wall and displaced medially. The use of lateral position facilitated medial displacement of the colon, kidney and ureter by virtue of gravity. Dissection of the para-aortic tissue along the medial border of the psoas muscle disclosed the right-sided sympathetic chain. The rami communicantes were dissected (Fig. 2) and secured with ligature clips. The chain was similarly dissected and divided between clips. The upper and lower ends of dissection was the same as the left-sided fashion.

RESULTS

All but one patient had immediate warming of affected limbs and resolution of all extremity pain (Table 1). No analgesics either oral or parenteral were requested or administered. First oral feeding was started on the morning of postoperative day 1. The vacuum drain was removed within 48 hours postoperatively. Those three cases resumed all normal activity two weeks after laparoscopy. They were satisfied with their minimal scars on the abdominal wall. The pathological reports documented removal of sympathetic ganglia and chains. The successful laparoscopic removal of the L_2, L_3, L_4 ganglia (cases 1, 2) were achieved, and demonstrated by the clips location on the plain abdomen film. In case 3, only one ganglion (L_2) was resected, however, he showed some clinical improvement. There was no operative mortality. After a median follow-up of 18 months (range 16-20 months), three patients remained completely free of pain. One patient (case 4) had no improvement on his lower extremities after bilateral sympathectomies were performed. He died from ischemic heart disease two months later.

DISCUSSION

Thoracoscopic dorsal sympathectomy has been proposed by many authors[4,5]. Due to the recent popularization of laparoscopic cholecystectomy[6], it is possible to perform the surgical dissection accurately, even very complex procedures can be performed laparoscopically. Further extension of minimally invasive surgical techniques will permit surgical therapy in the abdominal cavity. According to anatomical familiarity, its application to correct the extraperitoneal lesion is usually first made by means of transperitoneal approach including nephrectomy[7], ureteral lithotomy[8], inguinal herniorraphy[9] and para-aortic node dissection[10].

It is noted that this new minimal access surgical technique is designed as layout of laparo-

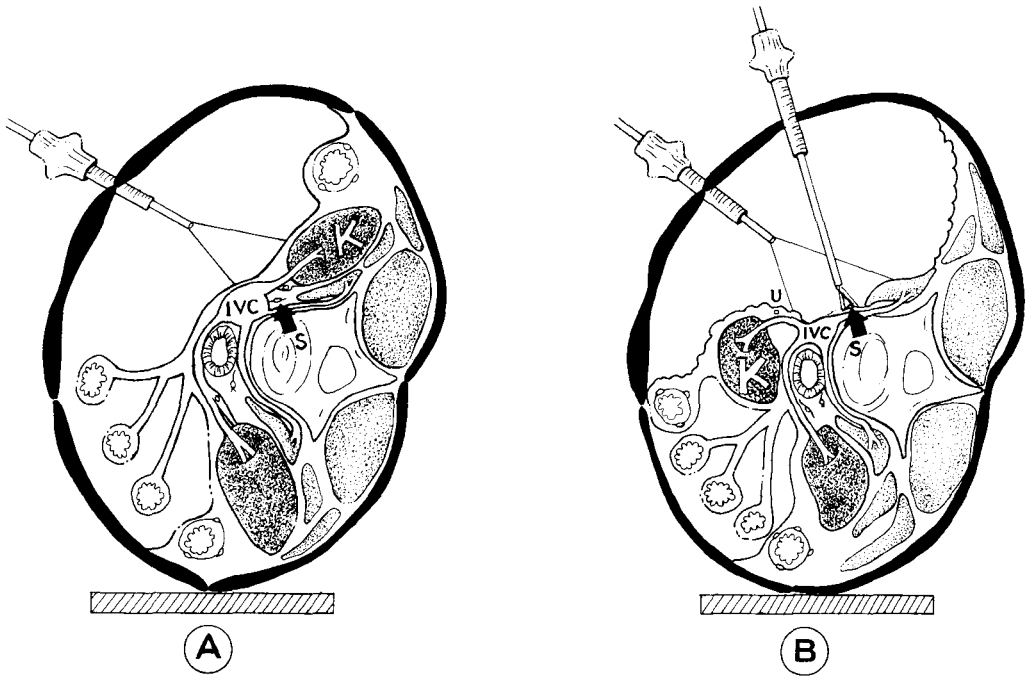

Fig. 3. Diagrammatic representation of laparoscopic view of before (A) and after (B) medial displacement of the colon and the kidney. It provides the better exposure which is not obscured by the ureter (U), paranephric tissue and sidewall of inferior vena cava (IVC). K, right kidney and S, sympathetic chain.

scopic instruments, patient position, laparoscopic technique. The patient should be placed in the ordinary full flank position as for kidney approach. Tilted 15° backwards (Fig. 1C) will facilitate the best exposure of the vertebral bodies because of the bulky psoas muscle (Fig. 3A, B). This is now the authors' preferred position because it allows greater manoeuverability and is better for 0° forward-viewing telescope to obtain an overall scan of the peritoneal cavity. The first three cannula sites are arranged as the tips of an equilateral triangle rendering the convenient two-handed dissection. The surgeon can also access the upper pole of the kidney down to the pelvic brim.

A fourth cannula, if needed, should be inserted under vision prior to mobilization of the colon and the kidney. The exposure of the sympathetic chain from L_1 to L_4 is achieved by mobilizing the kidney[11], which pushed the abdominal viscera by its weight and more likely to result in medial displacement of the ureter. Contrary to the open[1] and endoscopic[12,13] retroperitoneal approach, we strongly recommend reflecting the kidney medially because it provides a wider space between the medial edge of the psoas muscle and the great vessel and the view is not at times obscured by the ureter and perinephric tissue (Fig. 3B). The resulting exposure is ideal for either side of laparoscopic lumbar sympathectomy.

When compared with endoscopic extraperitoneal lumbar sympathectomy[12,13], the transperitoneal approach obtains much clearer, cleaner anatomy which is useful for dissection of the chain. However, with either open or laparoscopic approach, it is important to stress that a thorough appreciation of the anatomy of the sympathetic chain is crucial to the safe dissection. It has also to be differentiated from the ilioinguinal and genitofemoral nerves, especially the latter which closely simulates the sympathetic chain. These nerves have neither ganglionated structure nor rami. Likewise, the long rami of the third and fourth ganglia and caudal direction should be recognized especially in a case of non-ganglionic formation of the lower portion (case 3). A ganglion can also imitate a lymph node surrounding the para-ortic region. For this reason, if suspected, it should be confirmed by frozen section. Knowledge of these anatomical variations may be helpful in performing correctly a lumbar sympathectomy. Injury to a lumbar vessel during detachment of the great vessel from the medial edge of the ilio-psoas muscle requires conversion to open surgery if control is not achieved.

According to some series[14,15], patients who are not candidates for vascular reconstruction have responsed favorably to lumbar sympathectomy. However, lumbar sympathectomy alone or in combination with reconstructive arterial bypass is an important adjunct in the management of advanced arterial insufficiency[16,17]. We believe that a laparoscopic transperitoneal lumbar sympathectomy can be performed safely and rapidly and will gain further acceptance by vascular surgeons. It is possible that it will be the procedure of choice for lumbar sympathectomy in the future.

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การผ่าตัดเส้นประสาทซิมพาเธติคระดับเอวโดยใช้กล้องส่องเข้าช่องท้อง : วิธีผ่าตัดแบบใหม่†

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รายงานผู้ป่วย 4 รายที่ได้รับการผ่าตัดเส้นประสาทซิมพาเธติคระดับเอวโดยใช้กล้องส่องเข้าช่องท้องเพื่อรักษาและบรรเทาอาการปวดเนื่องจากเส้นเลือดตีบตันที่ขา โดยทำผ่าตัดข้างขวา 2 ราย, ข้างซ้าย 2 ราย และทั้งสองข้างอีก 1 ราย ได้เสนอเทคนิคการผ่าตัดแบบใหม่ โดยเริ่มจากให้ผู้ป่วยดมยาแล้วจัดท่าตะแคงและปรับเตียงให้ชายโครงกับขอบเชิงกรานแยกจากกัน ใส่กล้องเข้าที่ขอบของกล้ามเนื้อเร็คตัสระดับเดียวกับสะดือ และเจาะอีกสองรู (5 มม, 10 มม.) เข้าที่แนวกึ่งกลางของกระดูกไหปลาร้าสำหรับทำผ่าตัด โดยเริ่มเลาะลำไส้ใหญ่ ได หลอดไตให้เลื่อนมาที่ส่วนกลางของช่องท้องโดยอาศัยแรงโน้มถ่วงร่วมด้วย เมื่อพบปมประสาทระดับ L_{2-3-4} ซึ่งอยู่บนกระดูกสันหลัง ให้ใส่คลิบลวดก่อนการตัดทุกครั้ง เนื่องด้วยวิธีผ่าตัดที่ไม่ยากและชิ้นเนื้อที่ตัดเป็นชิ้นส่วนเล็ก จึงถือได้ว่าเป็นการผ่าตัดที่ปลอดภัยและได้ผลเป็นที่น่าพอใจ และอาจแทนวิธีการผ่าตัดแบบดั้งเดิมได้ในอนาคต

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