

Laparo-endoscopic single-site left adrenalectomy using conventional ports and instruments

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Abstract Laparo-endoscopic single-site adrenalectomy (LESS-A) is commonly performed using specialized access devices and/or instruments. We report a LESS-A in a 47-year-old woman with a left aldosteronoma via a subcostal approach utilizing conventional laparoscopic ports and instruments. The feasibility and cost-effectiveness of this approach are highlighted and the literature on the subject is reviewed.

Key Words: Adrenalectomy, aldosteronoma, laparo-endoscopic single-site

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INTRODUCTION

Laparoscopic adrenalectomy (LA) has been the treatment of choice for aldosterone-producing adenoma because of its high success rate, minimal morbidity, and rapid convalescence. LESS-A is gaining wide popularity but is considered technically more challenging than LA. Castelluci *et al.* performed the first LESS-A using three standard 5 mm ports introduced through a supraumbilical incision.^[1] We describe a LESS-A for left aldosteronoma using conventional laparoscopic ports and instruments. The literature is reviewed to highlight the various techniques of LESS-A, the technical challenges faced and solutions utilized, the pros and cons of the transperitoneal versus retroperitoneoscopic LESS-A and data comparing LA with LESS-A.

CASE REPORT

A 47-year-old hypertensive woman upon investigation was found to have hypokelamnia, elevated serum aldosterone of 360 pg/mL and plasma renin activity of 0.02 ng/mL/hour. Computerized tomography revealed a 2cm left adrenal tumor [Figure 1]. She was counseled for a LESS-A. The surgery was performed under general anaesthesia in right lateral decubitus position. A 2 cm incision was made below the costal margin in the left upper quadrant and three ports (a central, 10 mm and two lateral, low-profile, 5 mm) were placed through separate fascial incisions [Figure 2]. A 5 mm, 30 degree, 51 cm long laparoscope (Karl Storz, Tuttlingen, Germany) was placed in the central port and standard laparoscopic instruments were introduced through the other ports. The steps of the LESS-A were identical to that of a LA, viz. mobilization of the spleen and tail of pancreas, dissection, clipping and division of the adrenal vein and dissection of the adrenal gland from the surrounding structures using an ultrasonic shears (Ethicon Endosurgery, Mumbai, India). The specimen was retrieved in a bag. The fascia at the site of the incision was approximated with non-absorbable suture and the skin with an absorbable subcuticular suture [Figure 3]. The operative time was

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Figure 1: CT scan showing a 2 cm left adrenal tumor

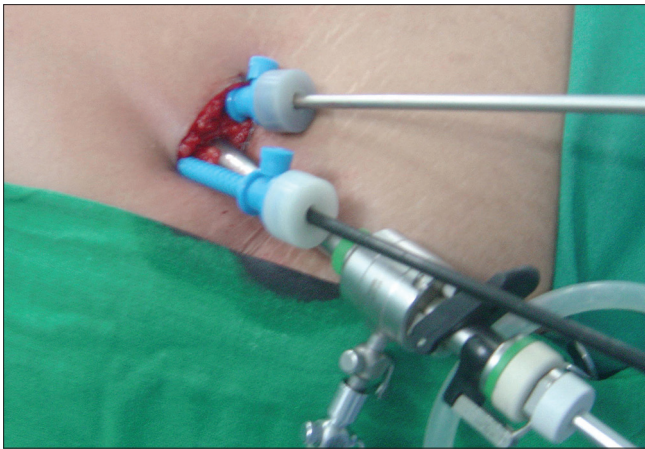


Figure 2: Three ports introduced side-by-side through a 2cm incision



Figure 3: Postoperative appearance of the short subcostal incision and specimen (inset)

70 minutes and blood loss less than 5 ml. The patient tolerated diet the day after surgery and was discharged on the second postoperative day. She was administered intravenous

analgesia whilst in the hospital but required no oral analgesics after discharge. Histopathology confirmed the tumor to be an adrenal adenoma. Her serum potassium levels normalized within two weeks of surgery and she remains well 20 months later.

DISCUSSION

In this case we demonstrated that LESS adrenalectomy could be carried out safely without the use of specialized access ports or instruments such as roticulating graspers and dissectors. Use of the latter may entail a substantial learning curve and require more time for adjustment of the roticulating instruments.^[2] Also, using only conventional instruments makes the procedure cost-effective. We preferred to use a 51 cm long telescope as it allowed the cameraperson's hand to move away from the abdominal wall, thus minimizing the crowding. As the ports entered the abdomen via fascial incisions each separated by a fascial bridge, there was a reasonable degree of freedom of movement. We chose to use one 10 mm port so that a reusable, 10 mm clip applicator could be used for clipping the adrenal vein. Also, in our experience having one 10 mm port in place allows for rapid introduction of a gauze piece for compression in the event of bleeding during surgery.

Both retroperitoneoscopic (R-LESS-A) and transperitoneal (T-LESS-A) approaches to LESS-A have been described, and different variations in the technique are practiced for each. Zhang *et al.* attempted 25 R-LESS-A using a TriPort (Advanced Surgical Concepts, Bray, Ireland) through a 2.5-3 cm incision and two conventional instruments.^[3] An additional 5 mm port was required in one patient and one patient required a conversion to LA. They noticed a reduction in the mean operative time from 62 minutes in the first 10 cases to 52 minutes in the subsequent 15. Chung *et al.* reported R-LESS-A in 7 patients using a glove-port made with an Alexis wound retractor combined with standard laparoscopic trocars and instruments.^[4] Walz *et al.*^[5] on the other hand, introduce a cutting port (Visiport, Covidien, Neustadt, Germany) under vision through a 2 cm incision below tip of the 12th rib. A 5 or 10 mm scope introduced through this port is used for creating adequate retroperitoneal space. The 10 mm port is then removed and two 5 mm ports are introduced side-by-side. Using the guidance provided by a 5 mm laparoscope the adrenal gland is dissected single-handedly using a vessel-sealing device. Once the gland is free, the 10 mm port is re-introduced for extraction of the specimen. The benefits of R-LESS-A are thought to be the shorter distance between the tip of the 12th rib and the adrenal gland (as compared to the umbilicus and the adrenal) and the ability to often perform the procedure without the use of flexible laparoscopes or long/roticulating instruments.

There are two techniques of performing T-LESS-A - the transumbilical and subcostal. Cindolo *et al.* performed three LESS-A via a 3 cm subcostal incision using a Tri-Port, a 10-mm optic and two 5 mm instruments.^[6] Although it may be argued that the cosmesis is superior with the transumbilical approach, we preferred the subcostal approach as the instruments could reach the adrenal gland more easily. Also, this approach is perhaps preferable in taller patients with a longer umbilico-adrenal distance. No studies are available to compare the superiority of the transumbilical versus the subcostal approach of LESS-A and the choice would essentially remain a matter of surgeon preference.

Miyajima *et al.* performed 12 T-LESS-A using a SILS port, roticulating instruments and Opti4 electrodes (Covidien, Mansfield, USA).^[7] In their series, which had both left and right sided tumors, the mean operative time for was 121.2 ± 7.8 min, which was slightly longer than their previous LA cases (110.2 ± 7.3 min). Side of the tumor and patient BMI did not affect surgical morbidity and there was no significant difference between T-LESS-A and LA in terms of blood loss, analgesic requirement, hospital stay, and scar satisfaction. Sumino *et al.* performed two T-LESS-A using a 10 mm and a 5 mm port at the umbilicus and a 3 mm port in the left upper quadrant.^[8] The initial part of the dissection was carried out using a hook electrode passed through the 3 mm port and the steps of clipping of the vessels and dissection of the gland were carried out using 5 mm instruments through the umbilical port. The authors felt that by providing triangulation this technique may act as a bridge between conventional LA and LESS-A. Upon scanning the literature it appears that more often than not the urologist performing LESS-A prefer the retroperitoneal approach whereas general or gastrointestinal surgeons (like ourselves) choose the transperitoneal approach. The proposed advantages of the T-LESS-A approach over R-LESS-A include (a) sufficient working space and early control of the adrenal vein, (b) easier access without the need to split/divide and approximate muscle and (c) cosmetically superior scar hidden within the umbilicus.^[9] On the other hand, the challenges of this approach are the longer distance between the umbilicus and the adrenal, necessity to mobilize and retract the liver (on the right) and the spleen and pancreas (on the left) and crowding and clashing of the instruments. The proposed solutions include use of a 45 degree, flexible or long laparoscope, one roticulating and one straight instrument and standardization of the positions of the two instruments in relation to one another as described by Yoshimura *et al.*^[10] Vidal *et al.* described 20 cases of left-sided T-LESS-A through a 2.5 cm subcostal incision through which a SILS port and roticulating instruments were used.^[11]

Although there are no randomized studies comparing LESS-A with LA, there are several matched-pair comparisons. Walz *et al.* compared 51 patients undergoing single-incision retroperitoneoscopic adrenalectomy (SARA) with 47 patients undergoing conventional retroperitoneoscopic adrenalectomy (CORA).^[5] Although the operation took longer in the SARA group fewer patients required postoperative analgesics and the mean hospital stay was shorter. Similarly, Wang *et al.* compared 13 patients undergoing T-LESS-A with 26 patients in whom LA was performed.^[12] Although the mean operative time in the was longer in the LESS-A group their pain scores were lower, fewer patients required analgesics and the patients had a greater cosmetic satisfaction scores.

Interestingly, many series reporting right-sided LESS-A have utilized the retroperitoneoscopic technique, as retraction of the liver through the transperitoneal approach is challenging. Those performing right-sided T-LESS-A have described various technical modifications. Tunca *et al.* replaced the insufflation tube of the SILS port with a standard 5 or 10 mm trocar through which an extra instrument was used to retract the liver.^[13] Choi *et al.* used a Glove Port (Nelis, Seoul, Korea) with four channels and a snake retractor was introduced through one of the channels for retraction and elevation of the right lobe of liver.^[9] Miyajima *et al.*, in addition to the umbilical SILS port, used a 2 mm grasper introduced through a laterally placed 2 mm Miniport (Covidien, Mansfield, USA) along with a small gauze to retract the liver.^[7]

LESS-A, whether transperitoneal or retroperitoneoscopic, is a challenging procedure. Ishida *et al.* compared the intraoperative technical difficulty in 10 patients undergoing T-LESS-A with 10 patients having LA.^[14] They found the mean operative time to be higher in the T-LESS-A group. This was attributed to the time needed for adjusting the roticulating grasper, which was significantly higher in this group. However, after subtracting time needed for this adjustment, the operative times were comparable in both groups. The need to re-grasp tissues was observed more frequently in the T-LESS-A group.

Certain points have to be kept in mind by surgeons wishing to perform LESS-A. Firstly, they should have adequate expertise in LA and experience with other LESS procedures. For the first few operations small (<4 cm) and preferably left-sided benign tumors other than pheochromocytomas should be chosen. Also, adopting a subcostal approach (that may prove easier than a transumbilical one) and addition of a lateral 3 or 5 mm port and instrument from the beginning or at the first hint of technical difficulty is likely to result in safe completion of the procedure. At all times, a low threshold should be maintained for conversion to a standard LA in order to adhere to the principle of “primum non nocere”-above all, do no harm.

CONCLUSION

LESS-A is a valuable addition to the armamentarium of the surgeons performing LA. It can be safely undertaken in patients with small benign adrenal tumours and performed with conventional laparoscopic ports and instruments. It offers superior cosmesis and has the potential to reduce postoperative pain and accentuate the recovery as compared to LA. However, further studies are required to clarify the role of LESS-A in the management of large tumors as well as pheochromocytoma.

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