

Editorial

Laparoscopic Adrenalectomy: Transabdominal or Retroperitoneal

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Adrenalectomy is indicated for treatment of various functioning and non-functioning adrenal tumours or diseases. Majority of adrenalectomy is performed for relatively small functioning tumours. There had been continuous evolution of the open surgical approaches from the transabdominal to lateral and then posterior retroperitoneal approach in the pre-minimally invasive era. The posterior approach was adopted as the procedure of choice for the majority of patients with benign small adrenal tumours based on reduced invasiveness until the report of first successful laparoscopic adrenalectomy in 1992 (1). Despite the lack of randomized controlled trials to document its advantages over open surgical approach, subsequent experience has confirmed the advantages of minimally invasive adrenalectomy in terms of decreased blood loss, less morbidity, reduced hospital stay and a shorter recovery time as well as a greater patient satisfaction (2,3,4,5,6). Since then, laparoscopic adrenalectomy has become the standard surgical approach for patients with benign or relatively small adrenal tumours requiring adrenalectomy although the application of this technique for large or malignant tumours remains a controversial issue for its routine application.

Each operative procedure, despite how safe and effective it seems to be at one time, has still potential room for improvement. In similarity to open adrenalectomy that can be performed through different approaches, the minimally invasive approach has been undergoing continuous technical modifications to the best approach with least surgical invasiveness, quickest postoperative recovery and maximal patients' satisfaction. Shortly following the documentation of the laparoscopic transabdominal lateral adrenalectomy

(LTLA), an alternative minimally invasive endoscopic retroperitoneal adrenalectomy was described (7). Subsequent modification has resulted in two distinct retroperitoneoscopic approaches, either retroperitoneal posterolateral (RPLA) or true supine retroperitoneoscopic posterior adrenalectomy (RPA). In addition, the laparoscopic transabdominal approach can also be achieved in supine position but did not gain popularity because of its inferior exposure requiring additional retraction and dissection compared with LTLA. For laparoscopic transabdominal lateral and retroperitoneoscopic approaches, each of them has its own applications, advantages, potential risks and benefits as well as limitations. The retroperitoneal approach was mostly reported by urologists in the beginning of its introduction (8,9) and was slow to gain wide application compared with transabdominal approach because of its unfamiliar anatomy to the general or endocrine surgeons. The expected longer learning curve for a relatively "rare" or uncommon procedure has also limited its wide adoption. However, this surgical approach has continued to gain popularity because of its perceived direct access with reduced invasiveness requiring minimal dissection and avoiding peritoneal dissection. The true supine posterior approach has also gained momentum for its wider application because of the excellent results after cumulative experience reported by surgical masters in specialized surgical centres (10,11).

With various different routes available for minimally invasive adrenalectomy, controversies exist with reference to the least or best minimally invasive approach: whether laparoscopic or retroperitoneoscopic approaches. The additional use of

single-port technique or the adoption of robot may have made the issue complicated but does not seem to offer additional benefits to warrant consideration for their routine applications. Advocates for the laparoscopic and retroperitoneoscopic approaches cite the advantages of each technique, but there is no strong or convincing evidence that supports the superiority of one over the other. Most of the published literature is retrospective with inadequate or no controls and with potential biases. Surgical excellence reported on each approach is probably based on cumulative experience. Comparative outcome studies of different approaches performed by the same group may be more objective in confirming their superiority in certain applications (12,13). There is also a lack of randomized well-structured outcomes comparisons performed in a prospective fashion to provide a definitive answer to the best approach. Two recent meta-analyses were published almost simultaneously to address the potential outcome superiority of either approach based on analyzing pooled data from these comparative and prospective studies (14,15). Both studies analyzed similar numbers of studies and patients. One compared the laparoscopic with the retroperitoneoscopic approach (14) while the other compared the transabdominal approach individually with the 2 retroperitoneoscopic approaches (15). The former study confirmed that there was no statistically significant difference between laparoscopic and retroperitoneal adrenalectomy in terms of operative time, blood loss, hospital stay, time to oral intake, overall and major morbidity, and mortality. Both approaches were associated with equally low complication rates. The hospital stay was 6.4 days for laparoscopic versus 5.5 days for retroperitoneal approach without any statistical significance. On the other hand, the other meta-analysis comparing RPLA and RPA with LTLA showed that both retroperitoneal approaches were associated with a shorter hospital stay. RPLA and RPA were associated with a reduced length of stay of 1.45 days ($P = 0.034$) and 0.54 days ($P = 0.041$) respectively compared with LTLA but significant heterogeneity was observed. On the other hand, neuralgia was reported only in patients undergoing RPA, at a rate of 3.4 % (5 of 146). Studies looking at time to oral intake, ambulation and dosage of analgesic did not show any difference between these different

approaches. There are 2 randomized controlled trials comparing RPA with LTLA but reported on small numbers of patients only (16,17). Both did not show any difference in outcome with reference to duration of operation, blood loss, complication rates, analgesic requirement and length of hospital stay although one study showed a reduced duration to convalescence in favor of RPA (2.3 weeks vs 4.7 weeks; $p=0.02$) (17).

Based on these objective analyses and the best available evidence, which approach should we adopt? Perhaps there is no best answer. Both laparoscopic and retroperitoneoscopic approaches have been shown to be feasible, safe, and effective and to guarantee better short-term outcomes than open surgery for benign or small adrenal lesions. Most authors would agree that laparoscopic approach has the advantages of providing a more familiar landmark and view of adrenal anatomy, resulting in a shorter learning curve, allowing for the resection of larger tumors and treatment of other concomitant intra-abdominal conditions. However, incision of peritoneum followed by retraction and mobilization of intra-abdominal organs is needed before obtaining adequate exposure of the adrenal gland. The retroperitoneal approach is useful in patients who may have scarring or adhesions from previous abdominal surgery. It is considered as a direct approach without requiring much dissection to expose the adrenal gland. Incision of the peritoneum is not required and bowel handling or the potential for injury to the intra-abdominal viscera can be avoided. It could be advantageous in bilateral lesions, because this approach does not require changing the position of the patient on the operating table. Disadvantages are the smaller maneuvering space and fewer anatomic landmarks, which restrict its application to larger lesions and may cause a longer learning curve. In case of conversion, this approach may have drawback in repositioning of patients and resulting in delay but was not described very much in the reports (15). For obese patients or patients with high BMI, it is still controversial which approach is more advantageous but the retroperitoneal approach seems to be more in favor (14,15).

Despite a lack of strong evidence that the retroperitoneal approach is a better approach, there seems to be increasing popularity for the adoption of

this technique based on expected reduced operating time, less analgesic requirement and shorter hospital stay. However, studies addressing operating time, analgesic requirement, time to oral intake and ambulation did not show any difference. In the meta-analysis showing difference in hospital stay (15), the large variation noted between studies with significant interstudy heterogeneity reflects differences in surgical practice, experience and outcome. Although few reported studies comparing these approaches showed significantly reduced hospital stay of both LPLA and RPA and no study reported a significantly reduced length of stay in the LTLA group (15), biased based decision remains likely in these observational studies and may not be reflected by individual study level or even meta-analysis. The effect of operative volume and experience of the surgeon needs to be taken into consideration. Proficiency can be achieved after a moderate numbers of cases while experience will continue to add benefit and improve outcome. Dedicated specialist endocrine surgical units with the appropriate perioperative set-up and surgeons proficient in this technique may result in a shorter hospital stay for the retroperitoneal approach (15). However, considering the volume of adrenal surgery in an average surgical unit or even specialized endocrine surgical centre (18), the learning curve of 30 retroperitoneal adrenalectomies (11) may need to take few years to achieve. It is also important to be aware that the superiority of this approach with reference to decreased in hospital stay observed in specialized centre may not be readily reproduced by them even after the learning curve.

In summary, both laparoscopic and retroperitoneoscopic approaches are procedures of choice for the majority of patients with benign adrenal tumours requiring adrenalectomies. Both are associated with low-complication rates and faster recovery compared with traditional open surgery. The selection of the approach should rely on the experience and preference of the surgeon or specialized centre, or, if the surgeon is skilled in both techniques, on patient characteristics. Laparoscopic transabdominal adrenalectomy is suitable for patients of all body build and for most adrenal pathologies except extremely large or malignant tumours. Concomitant abdominal pathologies can be dealt with. It is also relatively easy

to learn, master and teach. On the other hand, the retroperitoneal approach is indicated for patients with slightly smaller tumours and for patients with previous abdominal surgery as well as bilateral tumours. This approach may be associated with potential added recovery benefit such as reduced analgesic requirement and shortened hospital stay but should require cumulative experience and surgical proficiency. Both approaches are complementary, not competitive, to each other when certain patient selection criteria are followed. Since there may be circumstances where one approach may be preferable, considerations should be made to include both techniques in the armamentarium of surgeons who performed adrenalectomy routinely. Surgeons in individual endocrine surgical centres should manage their patients according to their existing surgical expertise and there should be no pressing need to shift from one technique to another based on the expected benefit of one over the other. The cumulative experience of individual surgeon remains the single most important factor accounting for the surgical excellence of patients undergoing minimally invasive adrenalectomy: whether transabdominal or retroperitoneal.

References

1. Gagner M, Lacroix A, Bolté E. Laparoscopic adrenalectomy in Cushing's syndrome and pheochromocytoma. *N Engl J Med* 1992; 327(14): 1033.
2. Ting AC, Lo CY, Lo CM. Posterior or laparoscopic approach for adrenalectomy *Am J Surg* 1998; 175(6): 488-90.
3. Imai T, Kikumori T, Ohiwa M, Mase T, Funahashi H. A case-controlled study of laparoscopic compared with open lateral adrenalectomy. *Am J Surg* 1999; 178(1): 50-3.
4. Thompson GB, Grant CS, van Heerden JA, et al. Laparoscopic versus open posterior adrenalectomy: a case-control study of 100 patients. *Surgery* 1997; 122(6): 1132-6.
5. Dudley NE, Harrison BJ. Comparison of open posterior versus transperitoneal laparoscopic adrenalectomy. *Br J Surg* 1999; 86(5): 656-60.

6. Brunt LM, Doherty GM, Norton JA, Soper NJ, Quasebarth MA, Moley JF. Laparoscopic adrenalectomy compared to open adrenalectomy for benign adrenal neoplasms. *J Am Coll Surg* 1996; 183(1): 1–10.
7. Gaur DD. Laparoscopic operative retroperitoneoscopy: use of a new device. *J Urol* 1992; 148(4): 1137-9.
8. Baba S, Miyajima A, Uchida A, Asanuma H, Miyakawa A, Murai M. A posterior lumbar approach for retro-peritoneoscopic adrenalectomy: assessment of surgical efficacy. *Urology* 1997; 50(1): 19–24.
9. Gasman D, Droupy S, Koutani A, et al. Laparoscopic adrenalectomy: the retroperitoneal approach. *J Urol* 1998; 159(6): 1816-20.
10. Walz MK, Peitgen K, Walz MV, et al. Posterior retroperitoneoscopic adrenalectomy: lessons learned within five years. *World J Surg* 2001; 25(6): 728–34.
11. Walz MK, Alesina PF, Wenger FA, et al. Posterior retroperitoneoscopic adrenalectomy – results of 560 procedures in 520 patients. *Surgery* 2006; 140(6): 943–8.
12. Duh QY, Siperstein AE, Clark OH, et al. Laparoscopic adrenalectomy. Comparison of the lateral and posterior approaches. *Arch Surg* 1996; 131(8): 870–5.
13. Berber E, Tellioglu G, Harvey A, Mitchell J, Milas M, Siperstein A. Comparison of laparoscopic transabdominal lateral versus posterior retroperitoneal adrenalectomy. *Surgery* 2009; 146(4): 621-5.
14. Nigri G, Rosman AS, Petrucciani N, et al. Meta-analysis of trials comparing laparoscopic transperitoneal and retroperitoneal adrenalectomy. *Surgery* 2013; 153(1): 111-9.
15. Constantinides VA, Christakis I, Touska P, Palazzo FF. Systematic review and meta-analysis of retroperitoneoscopic versus laparoscopic adrenalectomy. *Br J Surg* 2012; 99(12): 1639–48.
16. Fernandez-Cruz L, Saenz A, Benarroch G, Astudillo E, Taura P, Sabater L. Laparoscopic unilateral and bilateral adrenalectomy for Cushing's syndrome. Transperitoneal and retroperitoneal approaches. *Ann Surg* 1996; 224(6): 727–34.
17. Rubinstein M, Gill IS, Aron M, et al. Prospective, randomized comparison of transperitoneal versus retroperitoneal laparoscopic adrenalectomy. *J Urol* 2005; 174(2): 442–45.
18. Kwan TL, Lam CM, Yuen AW, Lo CY. Adrenalectomy in Hong Kong: a critical review of adoption of laparoscopic approach. *Am J Surg* 2007; 194(2): 153-8.