

Comparative analysis of transabdominal and retroperitoneal approaches in adrenalectomy

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Laparoscopic adrenalectomy has been recognised as the «gold standard» approach for benign adrenal tumours. The majority of surgeons opt for transabdominal laparoscopic adrenalectomies, while retroperitoneoscopic adrenalectomies in the prone position, which were pioneered by Waltz, offer certain advantages for patients.

OBJECTIVE — to compare the effectiveness and complication rates of transabdominal and retroperitoneoscopic laparoscopic adrenalectomies.

MATERIALS AND METHODS. Between 2000 and 2021, our clinic performed 472 laparoscopic adrenalectomies. The age of the patients ranged from 19 to 79 years, with a mean age of 50.5 ± 10.2 years. The patient pool consisted of 315 women and 157 men. The primary indications for operation were as follows: incidentaloma (32.5%), pheochromocytoma (30.2%), aldosteronoma (19%), corticosteroma (10.3%), myelolipoma (3.0%), and metastatic cancer (5.0%). Tumour sizes ranged from 1 to 10 cm.

RESULTS. A total of 316 patients underwent transabdominal adrenalectomies: 206 patients had right adrenalectomies and 110 patients had left adrenalectomies. A total of 156 patients underwent retroperitoneoscopic adrenalectomies. Seven patients required a conversion to a transabdominal approach, including three patients with tumours exceeding 6 cm in size and four patients with tumours ranging from 4 to 6 cm. The conversion rate amounted to 4.9%. The retroperitoneoscopic approach showed certain advantages for patients with small tumours, including shorter surgery duration, lower operative blood loss, diminished postoperative pain intensity, a lower incidence of shoulder-tip pain, a faster transition to oral intake, and shorter hospital stays.

CONCLUSIONS. Both approaches were equally safe. In patients with small tumours, retroperitoneoscopic adrenalectomies outperformed the transabdominal approach in terms of shorter surgery duration, lower blood loss, lower postoperative pain, faster recovery, and favourable cosmetic results. In patients with large tumours, the transabdominal approach demonstrated better outcomes, with lower complication and conversion rates.

KEYWORDS

retroperitoneoscopic adrenalectomy; transabdominal adrenalectomy; minimally invasive adrenal surgery; adrenalectomy.

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Adrenal tumours appear in an estimated 0.2–10.0% of people worldwide [11]. Since 1992, the preferred method of treating small adrenal gland tumours has been laparoscopic adrenalectomy, which was first performed by the American surgeon Gagner [13]. This procedure generally employs a technique called the lateral transabdominal laparoscopic approach. It involves removing either the right or left adrenal gland, depending on the tumour's position, with the patient lying on their side [4].

Another technique, known as the anterior transperitoneal technique, has also been documented in a study by Lezoche E, Guerrieri M, Crosta F, and others [17].

However, carrying out a transabdominal laparoscopic adrenalectomy (TLA), especially when removing the left adrenal gland, can be complex. In response to this challenge, German surgeon M. Walz from Essen proposed a different method. This method, a minimally invasive posterior retroperitoneal

approach, uses endoscopic techniques and requires the patient to lie face-down on the operating table [16]. While this approach offers some significant advantages over TLA, it is also technically demanding. There is a limited amount of research on this approach, leading to a lack of agreement in the medical literature about its benefits [9, 22].

OBJECTIVE – to compare the effectiveness and complication rates of transabdominal and retroperitoneoscopic laparoscopic adrenalectomies.

Materials and methods

We conducted a retrospective analysis of laparoscopic adrenalectomies performed on 472 patients at our clinic from January 2000 to December 2021. The patients ranged in age from 19 to 79 years, with an average age of 50.5 ± 10.2 years. The cohort consisted of 315 women and 157 men. The indications for surgery were as follows: incidentaloma (32.5%), pheochromocytoma (30.2%), aldosteronoma (19.0%), corticosteroma (10.3%), myelolipoma (3.0%), and metastatic cancer (5.0%). Tumour sizes ranged from 1 to 10 cm.

For all patients, adrenal tumours were preoperatively confirmed via abdominal spiral computed tomography (CT) and ultrasound examination. Hormonal activity was assessed in line with the current standards (urinary metoxycatecholamines, cortisol, dexamethasone suppression test, ACTH, DHEAS, blood ions, as well as serum aldosterone concentration and serum renin activity).

In this study, the criteria for unilateral adrenalectomy included hormonally active adrenal tumours up to 8 cm in diameter, nonfunctioning adrenal tumours either between 4 and 10 cm in diameter, or smaller tumours demonstrating progressive enlargement on follow-up CT scans (an increase of > 1 cm within 6 months). Patients with pheochromocytoma were preoperatively administered a high-dose alpha-adrenergic blockade (phenoxybenzamine 2–4 mg/kg body weight orally). Patients with aldosteronoma were preoperatively prescribed oral potassium-sparing diuretics and potassium.

Surgical procedures

All procedures in this study were unilateral total adrenalectomies, executed by two seasoned endocrine surgeons under general anaesthesia. The same anaesthesia protocol was utilised for all patients.

Endoscopic adrenalectomies were conducted as described by Gagner [14, 15]. In laparoscopic transabdominal adrenalectomy (LTA), the patient was placed on the operating table in a lateral decubitus position, opposite to the tumour side,

with a moderate inclination at the lower rib level. A pneumoperitoneum was created using a Veress needle for both left and right adrenalectomy, and the $p\text{CO}_2$ was maintained at 12 mm Hg. The initial 10 mm trocar was inserted 2 cm below the rib arch in the anterior axillary line, followed by the placement of another 10 mm trocar and a 5 mm trocar at least 5 cm away from the first one, under the ribs. An additional fourth trocar was used for retraction in select left-sided adrenalectomies and in all right-sided adrenalectomies. The peritoneal space was inspected using a 30° laparoscope. After mobilising the spleen and splenic flexure of the colon or the liver, depending on the operated side, the left renal vein or inferior vena cava was identified. The main adrenal vein was ligated using a bipolar dissecting instrument (LigaSure, Covidien). Polymer clips were used in rare cases when vessels exceeded 7 mm. Once completely resected, the adrenal gland, along with the surrounding fat, was placed in an extraction bag. The operative field was inspected, and any visible blood was aspirated. The area was then flushed with a warm 0.9% saline solution and aspirated again. Wounds of 10 mm or larger were closed using a laparoscopic port site closure device.

For posterior retroperitoneal adrenalectomy (PRA), the patient was positioned prone on a frame-shaped foam pad, with the lower limbs bent at the hip and knee joints. The procedure began with a skin incision at the tip of the 12th rib, followed by a blunt penetration into the retroperitoneal space. Three trocars, with diameters of 5, 5, and 10 mm, were inserted into the retroperitoneal space. CO_2 was insufflated to achieve a pressure of 25 mm Hg. Similar to LTA, PRA was performed using a 30° laparoscope. After penetrating Gerota's fascia, the upper pole of the kidney was identified. The subsequent steps were similar to those in the LTA. Drains were inserted in certain patients following the removal of large tumours (those exceeding 6 cm in size).

Outcome parameters

The primary outcome parameter in this study was the surgical duration. The secondary outcomes comprised intraoperative blood loss, conversion to open surgery rate, intensity of postoperative pain, incidence of shoulder-tip pain, additional requests for analgesia, episodes of nausea and vomiting, the time span to resumption of oral intake, time taken to achieve ambulation, length of hospital stay, and postoperative complications. These complications included the occurrence of long-term surgical access site hernias, the necessity for hernia repair, and, for cases involving hormonally active tumours, the biochemical and clinical cure rates were also considered.

Follow-up procedure

Postoperative complications were assessed during hospitalisation and at subsequent outpatient department visits scheduled at intervals of 10–14 days and 1, 3, 12, 24, 36, 48, and 60 months post-surgery. Surgical complications were classified as per the Dindo-Clavien classification [10]. Herniation was evaluated during follow-up visits through a physical examination conducted by the attending surgeons. If there were any indications such as bulging, localised pain and/or tenderness, or any equivocal findings, an ultrasonography using a 7.5 MHz linear-array probe was performed to confirm or exclude the presence of a hernia.

The duration of surgery was measured from the time of skin incision to skin closure. Intraoperative blood loss was estimated based on the hematocrit evaluation of the saline fluid utilised for irrigation relative to the blood hematocrit. Pain intensity was assessed using the visual analogue scale (VAS) at intervals of 6, 12, and 24 hours postoperatively. Patients were informed that the scale was intended solely for the analysis of pain intensity, inclusive of any shoulder-tip pain, and did not represent their overall postoperative discomfort. A nurse-controlled analgesia

(NCA) protocol was employed in this study, using paracetamol as the standard analgesia, administered intravenously at a dose of 1 g every 6 hours, not exceeding 4 g/day. Any additional requests for NCA were recorded, and for such requests, oral ketoprofen was administered at a dose of 0.1 g.

For surgeries involving hormonally active tumours, serum metanephrine, aldosterone, potassium, and cortisol levels were measured. Additionally, blood pressure, the number or dosage of antihypertensive medications, and the requirement for substitution therapy for adrenocortical hormones were evaluated at intervals of 6, 12, 24, and 36 months post-surgery.

The statistical significance of categorical variables was determined using the χ^2 test, while continuous variables were analysed using the Student's t-test. Postoperative pain scores, assessed using the VAS, were treated as parametric data. All statistical analyses were performed using Statistica 8.0 for Windows.

Results

Over a span of 20 years, we performed 472 laparoscopic adrenalectomies. Table 1 presents the demographic and clinical characteristics of the patients

Table 1. Characteristics of operated patients with adrenal gland tumours

Index	LTA (n = 316)	PRA (n = 156)	p
Men	89 (28.2%)	68 (43.6%)	< 0.05
Women	227 (71.8%)	88 (56.4%)	< 0.001
Age, years	48.4 (19–72)	51.2 (28–79)	0.410
BMI, kg/m ²	29.0 (16.5–42.3)	28 (18.2–37.8)	0.475
Tumour localisation			
Right	206 (65.2%)	42 (26.9%)	< 0.001
Left	110 (34.8%)	114 (73.1%)	> 0.05
Type of tumours			
Pheochromocytoma	84 (26.6%)	59 (37.8%)	0.012
Aldosteroma	52 (16.5%)	38 (24.4%)	0.039
Corticosteroma	27 (8.5%)	22 (14.1%)	0.062
Incidentaloma	124 (39.2%)	29 (18.6%)	6.516
Myelolipoma	8 (2.5%)	6 (3.8%)	0.428
Metastatic cancer	21 (6.7%)	2 (1.3%)	0.010
Tumour size, cm	5,2 (1,7–10,0)	4,0 (1,0–8,0)	< 0,001
Previous abdominal surgery			
Upper open abdominal operation	8 (2.5%)	15 (9.6%)	< 0,001
Lower open abdominal operation	14 (4.4%)	6 (3.8%)	> 0,05
Upper laparoscopic abdominal operation	7 (2.2%)	8 (5.1%)	> 0,05
Lower laparoscopic abdominal operation	10 (3.2%)	5 (3.2%)	> 0,05

Note. Categorical variables are presented as the number of cases and percentage, while quantitative indicators are presented as mean and 95% CI. * χ^2 test was used for categorical variables; t-test was used for quantitative variables.

included in the study. The group of patients who underwent a retroperitoneal approach (RPA) was slightly older and had a higher body mass index (BMI; $p < 0.05$). There were more men in this group. Additionally, the number of left adrenalectomies was higher in the second group ($p < 0.05$). Both groups had a similar number of hormonally active tumours. However, the incidence of larger tumours, such as myelolipoma and metastatic cancer, was higher in the first group (LTA).

In the first group, there were a significant number of patients with large tumours. The distribution of tumour sizes was as follows: 1–2 cm in 110 patients, 3–4 cm in 98 patients, 4–6 cm in 81 patients, and over 6 cm in 27 patients. Among those who underwent RPA, the size distribution was: 1–2 cm in 96 patients, 3–4 cm in 39 patients, 4–6 cm in 18 patients, and over 6 cm in 3 patients.

For patients who had undergone previous abdominal surgery, the RPA procedure was used more frequently.

Table 2 presents the results of the different approaches to laparoscopic adrenalectomies. The duration of operation was shorter for the RPA group

(56.4 vs. 82.5 min, $p < 0.01$). Blood loss was minimal in both groups but lower in the RPA group (80 vs. 110 cm³, $p < 0.05$).

The frequency of conversion was slightly higher in the RPA group (4.5 vs. 2.5%). However, conversion in the RPA group occurred in 6 patients due to large tumour sizes and in one patient due to bleeding from the left adrenal vein. In all cases, we switched from the RPA approach to the lateral transabdominal approach. Among the LTA patients, there were 8 conversions: 4 due to heavy adhesions in the abdominal cavity after previous operations, 2 due to large tumour sizes, and 2 due to spleen damage and tail of pancreas injury during transabdominal adrenalectomy. In all cases, we converted to open procedures. Thus, conversions after PRA were less traumatic and devoid of serious complications.

Postoperative pain was significantly less in the PRA group (see Table 2). Shoulder-tip pain was more frequent and severe in the LTA group. Recovery was quicker after the PRA approach, with patients resuming eating on the day of the operation. The incidence of nausea and vomiting was lower in

Table 2. **Primary and secondary outcomes**

Outcomes	LTA (n = 316)	RPA (n = 156)	p
Duration of surgery, min	82.5 (70.0–98.0)	56.4 (46.0–62.0)	<0.001
Intraoperative blood loss, cm ³	110 (75–200)	80 (60–120)	<0.05
Conversion	8 (2.5%)	7 (4.5%)	0.254
Postoperative pain at rest, points ¹			
6-h postoperatively	5.2 (3.0–7.0)	2.8 (2.0–4.0)	<0.001
12-h postoperatively	4.8 (3.0–6.0)	2.4 (1.0–4.0)	<0.001
24-h postoperatively	3.6 (2.0–5.0)	1.6 (1.0–3.0)	<0.001
Shoulder-tip pain after surgery	96 (30.4%)	1 (0.6%)	<0.001
Nausea	89 (28.2%)	31 (19.9%)	<0.001
Vomiting	48 (15.2%)	9 (5.8%)	<0.001
Time to oral intake of solid diet, h	15.2 (14.0–15.5)	8.0 (7.5–9.0)	<0.001
Length of hospital stay, day	4.5 (4.0–5.0)	3.0 (2.5–4.0)	<0.001
Surgical complications (short-term) ²	28 (8.9%)	19 (12.2%)	0.257
Grade I	11	14	0.005
Grade II	14	5	0.104
Grade III	3	0	0.140
Grade IV	0	0	1.000
Grade V	0	0	1.000

Note. Categorical variables are presented as the number of cases and percentage, while quantitative indicators are presented as mean and 95% CI. * χ^2 test was used for categorical variables; t-test was used for quantitative variables.

¹ Postoperative pain was assessed on a visual analogue scale (0: no pain, 100: maximum pain).

² Surgical complications according to Dindo-Clavien classification.

the PRA group. The rate of complications did not differ significantly between the two groups.

Normalisation of functional tests in patients with hormonally active tumours was comparable in both groups and exceeded about 80% in both groups of patients. There were no hernias in the group of patients after PRA. After LTA, herniation was identified in 4 patients who underwent surgical hernia repair.

Discussion

The laparoscopic approach to adrenalectomy has been widely accepted as the standard of care due to its minimally invasive nature, which is less traumatic compared to open surgeries [2, 8, 16, 20, 28]. Our investigation, in alignment with previous reports, confirms the safety and efficacy of this technique. The comparison between the retroperitoneal and transperitoneal laparoscopic adrenalectomies performed in three prospective studies revealed no significant divergence [12, 18, 23].

The proposition of the retroperitoneal approach by Walz, a German surgeon, and its application by Polish surgeons have led to a compelling discourse. Although it is not explicitly established whether retroperitoneal interventions are less traumatic than transabdominal ones, the complexity of anatomical landmarks has been a hindrance to many surgeons [3, 27].

In our study, we present strong evidence supporting the distinct benefits of the posterior retroperitoneal approach in certain cases. A significant advantage of PRA includes the elimination of the need for intra-abdominal dissection of neighboring organs and adhesions to expose the adrenal gland, as this technique allows direct access to the retroperitoneum [7, 19, 27].

Among patients who underwent LTA, conversions were required in 4 patients due to dense adhesions following prior abdominal surgeries. Conversely, although 21.8% of patients undergoing PRA had a history of previous abdominal surgeries, there were no conversions necessitated by adhesions. This suggests that PRA could be an advantageous choice for patients with a history of abdominal surgeries [21, 25].

Avoidance of intraabdominal dissection in PRA led to a shorter operative time compared to the LTA group ($p < 0.001$). There was also a notable reduction in blood loss (80 vs. 110 cc, $p < 0.05$) [6]. The primary advantage of the PRA approach was the faster and less painful recovery. Remarkably, patients were able to ambulate and consume solid foods on the day of surgery itself [24]. Patients in the PRA group experienced significantly less

shoulder-tip pain postoperatively, along with fewer instances of nausea and vomiting. The length of hospital stay was shorter for PRA patients (3 vs. 4.5 days, $p < 0.001$) [7, 24].

The direct access to the retroperitoneum provided by the PRA technique via trocar port placement in the lumbar region was correlated with a nullified risk of surgical access site herniation and subsequent hernia repair. In a 3-year follow-up, no herniations were noted in the PRA patient group. In contrast, herniation was observed in the LTA group, particularly in patients with a BMI above 30 kg/m² and larger tumours necessitating an expanded abdominal incision for removal [7, 19].

Acknowledging the potential limitations of our study, it is a retrospective, non-blinded design implemented at a single institution. Nevertheless, our large patient cohort undergoing laparoscopic adrenalectomy offers persuasive evidence supporting the retroperitoneal approach's merits, notably for patients with small adrenal tumours ranging from 1–4 cm in size. For larger tumours exceeding 6 cm, our data suggests the LTA approach is preferable.

One significant observation is the extended «learning curve» associated with the posterior retroperitoneal approach, which some surgeons argue requires the execution of at least 20 operations to achieve proficiency. This extended learning phase must be taken into account when considering this surgical approach [3, 5, 26].

Despite its potential limitations, such as demographic discrepancies within the patient groups that could introduce bias, the potential influence of surgeons' learning curves on operative outcomes, and unequal patient cohort sizes, our study delivers valuable insights. The robustness of our study stems from its extensive clinical data, a substantial postoperative observation period, and diverse surgical experience with different types and sizes of tumours in both the left and right adrenal glands.

While our findings should be interpreted with these limitations in mind, we believe that our study offers significant insights into adrenal surgery, specifically the benefits of PRA in managing small adrenal tumours. It provides a foundation for future research to further refine surgical technique selection based on tumour size, patient history, and other individual characteristics.

Although the posterior retroperitoneal approach exhibits clear advantages, it also has its limitations, meaning it cannot entirely supplant the LTA approach. As such, it is pivotal that both techniques are included in the surgical repertoire of surgeons routinely performing adrenalectomies. This diverse armamentarium enables surgeons to tailor the

surgical approach to individual patient characteristics and tumour specifics.

Indeed, the success of minimally invasive adrenal surgery hinges on several critical factors. First, a strong foundation in endoscopic surgery is crucial, allowing surgeons to proficiently navigate the complexities of these minimally invasive techniques. Secondly, careful patient selection, taking into account the patient's medical history, the size and location of the tumour, and other individual characteristics, is key in determining the most appropriate surgical approach. Lastly, a high patient volume can contribute to enhancing the surgeon's expertise and skill, thereby reducing complications and enhancing patient outcomes [1].

Conclusions

For small tumours, retroperitoneoscopic adrenalectomy showed significant benefits over the transabdominal method in surgery duration, blood loss, post-op pain, and recovery time. For patients with a history of abdominal surgeries, the benefits of the retroperitoneal method are further amplified. However, managing a large tumour via the retroperitoneal approach can pose challenges due to the small size of the space and technical problems with anatomical orientation. Moreover, if complications arise during the retroperitoneal procedure, surgeons can transition to the laparoscopic transabdominal approach.

DECLARATION OF INTERESTS

The authors declare that they have no conflicts of interest.

AUTHORS CONTRIBUTIONS

Conception and design: V.V. Grubnik, Y.V. Grubnik; collection and processing of materials: R.S. Parfentiev, V.V. Grubnyk, V.V. Slepov; analysis of data: V.V. Grubnik, R.S. Parfentiev, V.V. Grubnyk, Y.V. Grubnik, V.V. Slepov; drafting the article: R.S. Parfentiev, V.V. Slepov.

REFERENCES

- Agcaoglu O, Sahin DA, Siperstein A, Berber E. Selection algorithm for posterior versus lateral approach in laparoscopic adrenalectomy. *Surgery*. 2012 May;151(5):731-5. doi: 10.1016/j.surg.2011.12.010. Epub 2012 Jan 18. PMID: 22261293.
- Arezzo A, Bullano A, Cochetti G, Cirocchi R, Randolph J, Mearini E, Evangelista A, Ciccone G, Bonjer HJ, Morino M. Transperitoneal versus retroperitoneal laparoscopic adrenalectomy for adrenal tumours in adults. *Cochrane Database Syst Rev*. 2018 Dec 30;12(12):CD011668. doi: 10.1002/14651858.CD011668.pub2. PMID: 30595004; PMCID: PMC6517116.
- Barczyński M, Konturek A, Nowak W. Randomized clinical trial of posterior retroperitoneoscopic adrenalectomy versus lateral transperitoneal laparoscopic adrenalectomy with a 5-year follow-up. *Ann Surg*. 2014 Nov;260(5):740-7; discussion 747-8. doi: 10.1097/SLA.0000000000000982. PMID: 25243546.
- Berber E, Tellioglu G, Harvey A, Mitchell J, Milas M, Siperstein A. Comparison of laparoscopic transabdominal lateral versus posterior retroperitoneal adrenalectomy. *Surgery*. 2009 Oct;146(4):621-5; discussion 625-6. doi: 10.1016/j.surg.2009.06.057. PMID: 19789020.
- Broome JT, Solorzano CC. Impact of surgical mentorship on retroperitoneoscopic adrenalectomy with comparison to transperitoneal laparoscopic adrenalectomy. *Am Surg*. 2013 Feb;79(2):162-6. PMID: 23336655.
- Brunaud L, Nguyen-Thi PL, Mirallie E, Raffaelli M, Vriens M, Theveniaud PE, Boutami M, Finnerty BM, Vorselaars WM, Rinkes IB, Bellantone R, Lombardi C, Fahey T 3rd, Zarnegar R, Bresler L. Predictive factors for postoperative morbidity after laparoscopic adrenalectomy for pheochromocytoma: a multicenter retrospective analysis in 225 patients. *Surg Endosc*. 2016 Mar;30(3):1051-9. doi: 10.1007/s00464-015-4294-7. Epub 2015 Jun 20. PMID: 26092019.
- Chai YJ, Kwon H, Yu HW, Kim SJ, Choi JY, Lee KE, Youn YK. Systematic Review of Surgical Approaches for Adrenal Tumors: Lateral Transperitoneal versus Posterior Retroperitoneal and Laparoscopic versus Robotic Adrenalectomy. *Int J Endocrinol*. 2014;2014:918346. doi: 10.1155/2014/918346. Epub 2014 Dec 17. PMID: 25587275; PMCID: PMC4281398.
- Chen W, Li F, Chen D, Zhu Y, He C, Du Y, Tan W. Retroperitoneal versus transperitoneal laparoscopic adrenalectomy in adrenal tumor: a meta-analysis. *Surg Laparosc Endosc Percutan Tech*. 2013 Apr;23(2):121-7. doi: 10.1097/SLE.0b013e3182827b57. PMID: 23579504.
- Conzo G, Tartaglia E, Gambardella C, Esposito D, Sciascia V, Mauriello C, Nunziata A, Siciliano G, Izzo G, Cavallo F, Thomas G, Musella M, Santini L. Minimally invasive approach for adrenal lesions: Systematic review of laparoscopic versus retroperitoneoscopic adrenalectomy and assessment of risk factors for complications. *Int J Surg*. 2016 Apr;28 Suppl 1:S118-23. doi: 10.1016/j.ijso.2015.12.042. Epub 2015 Dec 18. PMID: 26708860.
- Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg*. 2004 Aug;240(2):205-13. doi: 10.1097/01.sla.0000133083.54934.ae. PMID: 15273542; PMCID: PMC1360123.
- Fassnacht M, Arlt W, Bancos I, Dralle H, Newell-Price J, Sahdev A, Tabarin A, Terzolo M, Tsarakis S, Dekkers OM. Management of adrenal incidentalomas: European Society of Endocrinology Clinical Practice Guideline in collaboration with the European Network for the Study of Adrenal Tumors. *Eur J Endocrinol*. 2016 Aug;175(2):G1-G34. doi: 10.1530/EJE-16-0467. PMID: 27390021.
- Fernández-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 Dec;224(6):727-34; discussion 734-6. doi: 10.1097/0000658-199612000-00008. PMID: 8968227; PMCID: PMC1235468.
- Gagner M, Lacroix A, Bolté E. Laparoscopic adrenalectomy in Cushing's syndrome and pheochromocytoma. *N Engl J Med*. 1992 Oct 1;327(14):1033. doi: 10.1056/NEJM199210013271417. PMID: 1387700.
- Gagner M, Pomp A, Heniford BT, Pharand D, Lacroix A. Laparoscopic adrenalectomy: lessons learned from 100 consecutive procedures. *Ann Surg*. 1997 Sep;226(3):238-46; discussion 246-7. doi: 10.1097/0000658-199709000-00003. PMID: 9339930; PMCID: PMC1191015.
- Gagner M. Laparoscopic adrenalectomy. *Surg Clin North Am*. 1996 Jun;76(3):523-37. doi: 10.1016/s0039-6109(05)70459-x. PMID: 8669012.
- Lee CR, Walz MK, Park S, Park JH, Jeong JS, Lee SH, Kang SW, Jeong JJ, Nam KH, Chung WY, Park CS. A comparative study of the transperitoneal and posterior retroperitoneal approaches for laparoscopic adrenalectomy for adrenal tumors. *Ann Surg Oncol*. 2012 Aug;19(8):2629-34. doi: 10.1245/s10434-012-2352-0. Epub 2012 Apr 20. PMID: 22526902.
- Lezoche E, Guerrieri M, Crosta F, Paganini A, D'Ambrosio G, Lezoche G, Campagnacci R. Perioperative results of 214 laparoscopic adrenalectomies by anterior transperitoneal approach. *Surg Endosc*. 2008 Feb;22(2):522-6. doi: 10.1007/s00464-007-9555-7. Epub 2007 Aug 19. PMID: 17705067.
- Mohammadi-Fallah MR, Mehdizadeh A, Badalzadeh A, Izadseresh B, Dadkhah N, Barbod A, Babaie M, Hamedanchi S. Comparison of transperitoneal versus retroperitoneal laparoscopic adrenalectomy in a prospective randomized study. *J Laparosc Adv Surg Tech A*. 2013 Apr;23(4):362-6. doi: 10.1089/lap.2012.0301. PMID: 23573882.
- Nigri G, Rosman AS, Petrucciani N, Fancellu A, Pisano M, Zorcolo L, Ramacciato G, Melis M. Meta-analysis of trials comparing laparoscopic transperitoneal and retroperitoneal adrenalectomy. *Surgery*. 2013 Jan;153(1):111-9. doi: 10.1016/j.surg.2012.05.042. Epub 2012 Aug 30. PMID: 22939744.

20. Oh JY, Chung HS, Yu SH, Kim MS, Yu HS, Hwang EC, Oh KJ, Kim SO, Jung SI, Kang TW, Park K, Kwon D. Comparison of surgical outcomes between lateral and posterior approaches for retroperitoneal laparoscopic adrenalectomy: A single surgeon's experience. *Investig Clin Urol*. 2020 Mar;61(2):180-187. doi: 10.4111/ ICU.2020.61.2.180. Epub 2020 Feb 5. PMID: 32158969; PMCID: PMC7052412.
21. Ottlakan A, Paszt A, Simonka Z, Abraham S, Borda B, Vas M, Teleky B, Balogh A, Lazar G. Laparoscopic transperitoneal and retroperitoneal adrenalectomy: a 20-year, single-institution experience with an analysis of the learning curve and tumor size [lap transper and retroper adrenalectomy]. *Surg Endosc*. 2020 Dec;34(12):5421-5427. doi: 10.1007/s00464-019-07337-1. Epub 2020 Jan 17. PMID: 31953726; PMCID: PMC7644518.
22. Prager G, Heinz-Peer G, Passler C, Kaczirek K, Scheuba C, Niederle B. Applicability of laparoscopic adrenalectomy in a prospective study in 150 consecutive patients. *Arch Surg*. 2004 Jan;139(1):46-9. doi: 10.1001/archsurg.139.1.46. PMID: 14718275.
23. Rubinstein M, Gill IS, Aron M, Kilciler M, Meraney AM, Finelli A, Moizadeh A, Ukimura O, Desai MM, Kaouk J, Bravo E. Prospective, randomized comparison of transperitoneal versus retroperitoneal laparoscopic adrenalectomy. *J Urol*. 2005 Aug;174(2):442-5; discussion 445. doi: 10.1097/01.ju.0000165336.44836.2d. PMID: 16006861.
24. Shiraishi K, Kitahara S, Ito H, Oba K, Ohmi C, Matsuyama H. Transperitoneal versus retroperitoneal laparoscopic adrenalectomy for large pheochromocytoma: Comparative outcomes. *Int J Urol*. 2019 Feb;26(2):212-216. doi: 10.1111/iju.13838. Epub 2018 Nov 14. PMID: 30430653.
25. Tiberio GA, Solaini L, Arru L, Merigo G, Baiocchi GL, Giulini SM. Factors influencing outcomes in laparoscopic adrenal surgery. *Langenbecks Arch Surg*. 2013 Jun;398(5):735-43. doi: 10.1007/s00423-013-1082-5. Epub 2013 Apr 30. PMID: 23624880.
26. Treter S, Perrier N, Sosa JA, Roman S. Telementoring: a multi-institutional experience with the introduction of a novel surgical approach for adrenalectomy. *Ann Surg Oncol*. 2013 Aug;20(8):2754-8. doi: 10.1245/s10434-013-2894-9. Epub 2013 Mar 20. PMID: 23512076.
27. Walz MK, Alesina PF, Wenger FA, Deligiannis A, Szuczik E, Petersenn S, Ommmer A, Groeben H, Peitgen K, Janssen OE, Philipp T, Neumann HP, Schmid KW, Mann K. Posterior retroperitoneoscopic adrenalectomy—results of 560 procedures in 520 patients. *Surgery*. 2006 Dec;140(6):943-8; discussion 948-50. doi: 10.1016/j.surg.2006.07.039. PMID: 17188142.
28. Zhang M, Wang H, Guo F, Xue W. Retroperitoneal laparoscopic adrenalectomy versus transperitoneal laparoscopic adrenalectomy for pheochromocytoma: a systematic review and meta-analysis. *Wideochir Inne Tech Maloinwazyjne*. 2023 Mar;18(1):11-19. doi: 10.5114/wiitm.2022.120419. Epub 2022 Oct 19. PMID: 37064558; PMCID: PMC10091911.

Порівняльний аналіз трансабдомінального та ретроперитонеального доступу під час адреналектомії

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Лапароскопічна адреналектомія визнана золотим стандартом доступу для лікування доброякісних пухлин наднирників. Більшість хірургів віддають перевагу трансабдомінальним лапароскопічним адреналектоміям, тоді як ретроперитонеальні адреналектомії в положенні лежачи на животі, вперше запропоновані Вальцом, мають певні переваги для пацієнтів.

Мета — порівняти ефективність трансабдомінальних та ретроперитонеальних ендоскопічних адреналектомій і частоту ускладнень, асоційованих з ними.

Матеріали та методи. Із 2000 до 2021 р. у нашій клініці виконано 472 ендоскопічні адреналектомії. Вік пацієнтів становив від 19 до 79 років, середній вік — $(50,5 \pm 10,2)$ року. Серед пацієнтів було 315 жінок ≥ 157 чоловіків. Основні показання для операції: інциденталома (32,5%), феохромоцитома (30,2%), альдостеронома (19,0%), кортикостерома (10,3%), мієлоліпома (3,0%), метастатичний рак (5,0%). Розміри пухлин варіювали від 1 до 10 см.

Результати. Трансабдомінальні адреналектомії виконано 316 пацієнтам (справа — у 206, зліва — у 110), ретроперитонеальні адреналектомії — 156. У 7 (4,9%) пацієнтів здійснено конверсію в трансабдомінальний доступ (у 3 із пухлинами розміром понад 6 см ≥ 4 із пухлинами розміром 4–6 см). У пацієнтів із пухлинами маленького розміру ретроперитонеальний підхід мав певні переваги (менша тривалість операції, менший об'єм крововтрати під час операції, менша інтенсивність післяопераційного болю, менший ризик виникнення болю в плечовому суглобі, швидший перехід на оральний прийом їжі та коротший термін перебування в стаціонарі).

Висновки. Обидва підходи були однаково безпечними. У пацієнтів із пухлинами маленького розміру ретроперитонеальні адреналектомії були кращими за трансабдомінальний підхід завдяки зменшенню тривалості операції, об'єму крововтрати, меншому післяопераційному болю, швидшому відновленню, добрим косметичним результатам. У пацієнтів із пухлинами великого розміру слід віддавати перевагу трансабдомінальному підходу через меншу частоту ускладнень і конверсій.

Ключові слова: ретроперитонеальна адреналектомія, трансабдомінальна адреналектомія, малоінвазивна хірургія наднирників, адреналектомія.

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