

# Laparoscopic Adrenalectomy in the Treatment of Adrenal Tumours

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## **Abstract**

**Introduction and Objectives.** Adrenal pathology benefits from the advantages of laparoscopy, being a retroperitoneal organ with difficult access. The indications of the laparoscopic approach are the same as those of open surgery. The aim of this paper is to evaluate the advantages of laparoscopic approach in the adrenal gland tumour pathology.

**Materials and methods.** We retrospectively analysed 11 patients (p) between 2014 and 2017 with adrenal tumour pathology, who benefited from laparoscopic adrenalectomy via transperitoneal and retroperitoneal approaches. Average age was 52 years (43-79 years), tumour location: left - 7 p, right - 5 p. Gender: females - 8, males - 3. Body Mass Index (BMI): overweight (25-30) - 2 p, obese (30-40) - 6 p, morbid obesity (> 40) - 3 p. Approaches: anterior transperitoneal - 2 p; lateral retroperitoneal - 6 p; posterior retroperitoneal approach - 4 p.

**Results.** There were no intraoperative and postoperative complications. All interventions were completed laparoscopically, without conversion to open surgery. The average length of hospitalization was 2 days (3 ± 1).

**Conclusions.** The retroperitoneoscopic approach of the adrenal gland has many advantages: minimal dissection space, clear anatomical landmarks, it avoids pneumoperitoneum, intestinal contact with blood, rapid postoperative recovery, aesthetic superior aspect.

**Key-words:** retroperitoneoscopy, adrenal tumour, laparoscopic adrenalectomy

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## Introduction and Objectives

Adrenal pathology benefits from the advantages of laparoscopy, being a retroperitoneal organ with difficult access.

The indications of the laparoscopic approach are the same as those of open surgery.

Classical interventions require extensive skin incisions that are disproportionately large compared to the size of the gland.

Laparoscopic adrenalectomy is the treatment of choice in adrenal tumour pathology. The first laparoscopic adrenalectomy quoted in the literature was conducted by Gagner in 1992 and became a gold standard in the treatment of benign tumours up to 6 cm<sup>1,2,3</sup>.

The most common indication for laparoscopic surgery is unilateral benign adrenal tumour. It includes incidentalomas, pheochromocytomas, aldosterone-secreting tumours and Cushing's syndrome. Other uncommon indications are adrenal cysts, myelolipoma, androgen-secreting tumours, ganglioneuromas and adrenal haemorrhage. Bilateral laparoscopy was also used for cases of refractory Cushing's syndrome and bilateral adrenal neoplasms<sup>2,3</sup>.

Thanks to technological advancement, laparoscopic adrenalectomy has become the most widely used technique in the treatment of tumours larger than 6 cm<sup>4</sup>. Tumours larger than 12 cm or tumours infiltrating in other structures should be operated by open classical technique<sup>2,5</sup>.

Approaches are based on the patient's position and access pathway in the retroperitoneal space: anterior transperitoneal approach, lateral approach: transperitoneal, retroperitoneal, retroperitoneal posterior approach<sup>4</sup>. The chosen method depends on the surgeon's preference and the contraindications, if any, depending on the patient's position. The transperitoneal approach provides easier excision of large adrenal tumours, while through the retroperitoneal approach the adrenal gland is rapidly visualized without the mobilization of intraperitoneal organs. Moreover, through the retroperitoneal approach, adhesiolysis is avoided in patients with a history of abdominal surgery, while the surgeon can simultaneously treat bilateral adrenal tumours without changing the patient's position<sup>6,7</sup>.

## Materials and Methods

We retrospectively analysed 11 patients (p) between 2014 and 2017 with adrenal tumour pathology, who benefited from laparoscopic adrenalectomy through transperitoneal and retroperitoneal approach.

Average age was 52 years (43-79 years), tumour location: left - 7 p, right - 5 p. Gender: females - 8, males - 3. Body Mass Index (BMI): overweight (25-30) - 2 p, obese (30-40) - 6 p, morbid obesity (> 40) - 3 p. Approaches: anterior transperitoneal - 2 p; lateral retroperitoneal - 6 p; posterior retroperitoneal approach - 4 p.

In all patients, a central venous catheter was placed on the internal jugular vein. Following the induction of general anesthesia and oro-tracheal intubation, the patient was repositioned according to the chosen approach. The insertion of trocars for the retroperitoneal lateral approach is done with the patient in lateral decubitus (Picture 1). The access to the retroperitoneal space is done by a 1.5 cm incision at the top of the 12<sup>th</sup> rib. The subcutaneous tissue is scraped off and then the retroperitoneal fascia is penetrated with subsequent digital dissection to create the working chamber. The following trocars are mounted under digital or visual control (4 trocars) (Picture 2).



Picture 1. Position for lateral approach



Picture 2. Trocars placement

In the retroperitoneal posterior approach, the patient's position is in ventral decubitus with the legs placed on a support to allow the abdominal wall to stand unrestricted, helping, thus, to extend the retroperitoneal space (Picture 3). The access to the retroperitoneal space is made through a 1.5 cm incision at the 12<sup>th</sup> rib level with digital dissection to create the working chamber. Trocars are inserted under digital control, one at the top of the 11<sup>th</sup> rib and one in the costomuscular angle (3 trocars) (Picture 4).

Picture 3. Position in ventral decubitus



Picture 4. Insertion of trocars

Ablation of the surgical piece was performed by an incision resulting from the union of incision lines of two trocars.



Picture 5. Excision of the piece



Picture 6. Final aspect of the lateral approach



Picture 7. Final aspect of the ventral approach

Picture 8. Surgical specimen



The CO<sub>2</sub> insufflation pressure was 14 mm Hg for the transperitoneal and lateral retroperitoneal approach and 20 mm Hg for the retroperitoneal posterior ap-

proach. CO<sub>2</sub> level was monitored intraoperative by observing the capnogram and arterial Astrup on the radial artery.

## Results

Tumour sizes of the surgical parts were between 2-8 cm.

Blood loss: 50 ml on average ( $60 \pm 24$  ml), average duration of intervention 70 min ( $90 \pm 28$  min).

There were no intraoperative and postoperative complications. All interventions were completed laparoscopically, without conversion to open surgery. All patients experienced subcutaneous emphysema that resolved spontaneously within 24 hours. Early mobilization and resumption of intestinal transit occurred on the first postoperative day. The average length of hospitalization was 2 days ( $3 \pm 1$ ). Histopathological examination of the surgical piece: pheochromocytoma in 5 p, non-secretory adenoma - 5 p, adrenal metastasis of pulmonary neoplasm - 2 p.

## Discussions

Many authors have investigated the differences between the retroperitoneal and the transperitoneal approach. Rubinstein et al reported a prospective study comparing the two approaches, 57 patients were enrolled in the study having benign adrenal pathology, 25 patients benefited from the transperitoneal approach and 32 from the retroperitoneal approach. The author did not record differences between surgery duration, blood loss, length of stay or complication rate. The only statistically significant difference was the convalescence period, which, in the transperitoneal group was 4.7 months and 2.3 months in the retroperitoneal group ( $p = 0.02$ )<sup>8</sup>.

In a retrospective study, Beber et al. compared the two approaches on a group of 172 patients. They found that the retroperitoneal approach was used more frequently in patients with a history of abdominal surgery and in those with aldosterone-secreting tumours and Cushing's syndrome. They found that blood loss was greater in those operated via the transperitoneal approach ( $35 \pm 7$ , vs  $25 \pm 6$  ml,  $p = 0.005$ ), and a higher rate of hospitalization compared to the retroperitoneal group ( $43$  vs  $18\%$ ,  $p = 0.05$ )<sup>9</sup>.

In a retrospective study on 43 adrenalectomies, Lee et al. reported a lower surgical duration ( $87.2 \pm 27.6$  vs.  $108.3 \pm 34.5$  min,  $p = 0.042$ ) and a lower resumption of food intake ( $0.88 \pm 0.33$  vs.  $1.16 \pm 0.47$  days,  $p = 0.043$ ) in the retroperitoneal approach group. They also reported a less time of administration of analgesics in the retro-

peritoneal group ( $1.29 \pm 1.21$  vs  $3.84 \pm 3.28$ ,  $p = 0.004$ )<sup>10</sup>.

Ramacciato et al reported the results of the retrospective analysis on 171 laparoscopic adrenalectomies. In contrast to Berber and Lee, they recorded a surgical duration ( $110.8 \pm 40.8$  vs.  $151.5 \pm 45.2$  min,  $p < 0.001$ ) and blood loss ( $183.3 \pm 216.7$  vs.  $421.2 \pm 205.3$ ,  $p = 0.001$ ) lower in the transperitoneal approach versus the retroperitoneal one. In any case, patients resumed their diet faster in the retroperitoneal approach ( $1.2 \pm 0.5$  vs.  $1.6 \pm 0.8$ ,  $p = 0.006$ )<sup>11</sup>.

In 2008, Perrier et al. reported a series of 68 patients who benefited from retroperitoneal adrenalectomy for secretory tumours. In this study, they reported an average surgical duration of 121 minutes, a complication rate of 15.9%, and a 0% mortality rate. In 2011, they updated this study with a further 50 patients and compared the initial results. There was no difference between the two groups in terms of surgical duration (110 vs. 118,  $p = 0.29$ ), the complication rate (15.9 vs. 7.7%,  $p = 0.29$ ) or the conversion rate to open surgery (9.5 vs 1.9%  $P = 0.19$ ) and therefore, concluded that the competence/ability in laparoscopic adrenalectomy through retroperitoneal approach can be achieved within a short period of time<sup>12</sup>.

Walz et al. reported a series of 50 posterior retroperitoneal laparoscopic adrenalectomies - unique access in patients with pheochromocytoma, Cushing's syndrome and hyperaldosteronism. The technique involves the standard incision below the 10<sup>th</sup> rib, and after the creation of the retroperitoneal space, through this incision, two 5 mm ports are inserted and used to complete the surgery. This group of 50 patients was compared to a group of 47 patients, in whom retroperitoneal adrenalectomy via posterior approach was practiced, using the classical method with three ports. The single access approach was completed in 41 (86%) patients with a complication rate of 8.5% (compared with 6.4% in the standard group,  $p = \text{NS}$ ).

Although the surgical time was longer ( $56 \pm 28$  vs.  $40 \pm 12$  min,  $p < 0.05$ ), patients in the unique access group needed fewer analgesic drugs (47 vs. 75%,  $p = 0.01$ ) and reduced average of length of stay ( $2.4 \pm 0.7$  vs  $3.1 \pm 1.2$  days,  $p < 0.01$ ). The authors concluded that this technique can provide a viable new technique for posterior retroperitoneal adrenalectomy<sup>13</sup>.

## Conclusions

Laparoscopic adrenalectomy is the most effective and rapid method for surgical treatment of the adrenal gland.

The retroperitoneoscopic approach of the adrenal

gland has many advantages: minimal dissection space, clear anatomical landmarks, avoids pneumoperitoneum, intestinal contact with blood, rapid postoperative recovery, aesthetic superior aspect.

Retroperitoneal laparoscopic adrenalectomy, irrespective of the approach used, lateral or posterior, is superior to laparoscopic surgery through transperitoneal approach and to classical surgery.

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