LAPAROSCOPIC TRANSPERITONEAL APPROACH TO ADRENAL GLAND MALIGNANCIES

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Even though there is not enough good data, the use of laparoscopic approach in malignant disease is regarded by some controversial issue. On the other hand it seems that transperitoneal access to the adrenal gland allows for effective and safe oncological removal of adrenal gland neoplasms.

The aim of the study was to present our experience with the use of transperitoneal approach in patients with adrenal gland malignancies.

Material and methods. From March 2003 till May 2009 we performed 200 laparoscopic transperitoneal adrenalectomies. There were 82 hormonally silent tumors (1.5-14 cm in diameter) and 118 hormonally active (63 pheochromocytomas, 26 Conn’s syndrome, 25 Cushing’s syndrome and 4 virylizing tumors).

Results. 197 procedures were completed laparoscopically and 3 were converted (including one for inability to assess resectablility of the tumor). 14 tumors (7%) were overtly malignant; 7 arising form the adrenal (adrenal cortex – 3, pheochromocytoma – 3, lymphoma – 1) and 7 metastatic (squamous cell cancer of the lungs – 2, clear cell carcinoma of the kidney – 2, collecting duct carcinoma of the kidney – 1, hepatocellular cancer – 1, NET lung tumor – 1). Further 19 tumors (9.5%) were assessed histologically as potentially malignant (pheochromocytomas – 16, tumors of neural origin – 2, oncocyto mas – 1). One malignant tumor was unresectable other were operated radically. Progression of the cancer was observed in 3 patients with metastatic tumors.

Conclusions. Laparoscopic transperitoneal adrenalectomy allows for safe and radical removal of adrenal gland malignancies. Longer follow-up and larger patients volume are needed for better evaluation of long-term results.

Key words: adrenal tumors, laparoscopic adrenalectomy, transperitoneal approach

Various types of minimally invasive surgical adrenal gland removal have become an integral part of endocrinological surgery and are considered to be the fundamental method of treatment. Subject concerning the safety of operating malicious tumours is present among numerous discussions on optimising recommendations to execute a surgical procedure. Despite less often raised doubts regarding the relevance to use minimally invasive techniques in oncological surgery, there have been deliberations on selecting optimal surgical access. What is worth noticing in the four currently used kinds of endoscopic adrenal gland removal techniques, compared to classicis procedures, and is the excellent post-operative course. This is mainly due to favourable relation between the size of operated organ and the length of cut within layers. In case of lesions, suspected to be malicious tumours, transperitoneal lateral access has the following advantages: wide operational field allowing to evaluate other organs in the abdominal cavity, the procedure is performed within natural anatomical surfaces and maintains a wide margin of unchanged tissues, early insulation and treatment of venous vessels.
The aim of the study was to evaluate results related with the use of laparoscopic transperitoneal access during the procedure of removing adrenal tumours with particular consideration of malicious lesions.

MATERIAL AND METHODS

Classification principles

Classification to adrenalectomy is realized as a result of close cooperation of the team, including endocrinologist, surgeon and anaesthesiologist. Patients classified for laparoscopic adrenal gland removal are those with tumours of both hormonal activity and those with hormonally silent lesions, where:

- size of the tumour exceed 4 cm in the greatest dimension,
- tumour continues to increase during observations at least by 1 cm a year,
- radiological features of the so-called “malicious tumour phenotype” visible in CT or MRI examination,
- change of tumour character (radiological phenotype) visible during observation,
- lesion in the adrenal gland, which is the only focus suspected to be the metastasis after previous radical oncological surgery.

Surgical technique

Laparoscopic adrenalectomy from transperitoneal access is performed on a lateral position, opposite to the operated side. Within one of the first stages of the procedure, the operator accesses vessels, especially the venous ones, closes their lumen with clips and cuts them. These initial stages of the procedure are realised without pressing, moving or manoeuvring the gland.

When removing left adrenal gland, in order to obtain access to retroperitoneal space it is essential to actuate left colic flexure, and then the spleen. Procedure of removing right adrenal gland begins with lifting, and quite often with actuation of the right lobe of the liver.

During operations of malicious tumours (or clinically suspicious) the basic principles of the so-called “oncological aseptics” were observed. Trocars were firmly fixed, without possibility to be moved within layers. Each time the whole adrenal gland was removed, covered with undamaged sac with possibly wide margin of surrounding fatty tissue, operators avoided catching the gland itself and they used screens, to limit the contact between the tumour and the layers.

Between March 2003 and May 2009 in 2nd Department of General Surgery, Jagiellonian University Medical College 200 laparoscopic adrenalectomies from transperitoneal access were performed (including 3 conversions). This group included 139 females and 61 males. Average age of operated patients was 53.42 ± 14.02 years old (53.71 years in female group and 55.77 years in male group). The youngest operated person was 18 years old, and the oldest one was 81 years old (tab. 1).

99 patients had their right adrenal gland removed, while the remaining 101 patients had their left adrenal gland removed.

In case of 82 patients the adrenal gland was removed due to 1.5-14 cm large (on average – 4.61 cm) tumour without features of endocrine activity. In 58 patients it was the size of the tumour exceeding 4 cm (on average 5.31 cm), which constituted the indication to perform the surgery. As far as the remaining 24 tumours are concerned, smaller than 4 cm, surgical classification included: expansion of the tumour during observation at least by 1 cm a year (8 patients), condition after radical oncological surgery of another organ with single focal change in the adrenal gland (6 patients), change of tumour radiological phenotype during observation – loss of glandular features (5 patients), suspicion of malignant lesion in radiological examinations in patients without oncological history (5 patients).

In case of remaining 118 patients 1-10 cm large tumour (on average 3.51 cm) was hormonally active. Most commonly, in as much as 63 patients it was a chromaffin tumour. Other 55 tumours produced adrenal cortex hormones, causing certain set of symptoms; Conn’s syndrome (26 patients), Cushing’s syndrome (25 patients) and virilization (4 patients) (tab. 2).

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RESULTS

From among 200 patients qualified for minimally invasive surgical procedure – 197 procedures were finished by means of laparoscope. Only in 3 patients (1.5%) it was necessary to perform conversion. The reasons for conversion included: impossibility to homogeneously evaluate operations on the lesion, numerous adhesions after previous laparotomies, heart rhythm disorders in patient with atypically located, large chromaffin tumour, which could not have been removed by vascular technique.

4 patients suffered from post-operative complications (2%), which were treated laparoscopically. These complications included: damage of inferior caval vein (sutured laparoscopically), damage of splenic vein branch (clipsed laparoscopically), damage of the diaphragm with pneumothorax (sutured laparoscopically, without draining the pleura), damage of the left colic flexure (colon actuated laparoscopically and resection performed by means of minilaparotomy).

Complications during the post-operative period were observed in 9 patients (4.5%). Four patients underwent repeated operations due to bleeding. The reasons included: damage of the superior epigastric artery in the place of trocar introduction, subcapsular hepatic hematoma, subcapsular splenic hematoma and intraperitoneal hematoma without established bleeding source. In all the above cases bleeding was stopped during the following laparoscopic procedure. 3 patients had post-operative wound infection. Features of hypercortisolemia were observed in all patients during the pre-operative period, or features of Cushing’s syndrome (2 patients) or chronic steroidotherapy (1 patient) during the course. In one female patient symptomatic post-operative adrenal failure was observed, and in one female patient pleural effusion was stated. No deaths were recorded (tab. 3).

Histopathological examinations of postoperative adrenal preparations proved that in 14 (7%) patients the tumours were homogeneously diagnosed as malicious. They had an average diameter of 5.68 cm (2.3-8 cm). From among 58 tumours classified basing on the size criteria (> 4 cm) 9 had a malicious character (15.52%). This group included 5 lesions smaller than 4 cm (20.83% from 24 tumours not exceeding 4 cm classified for operational treatment). However, despite the size observed in radiological examination these tumours always had the so-called phenotype of malicious lesion. In histological evaluation of tumours evaluated as malicious in case of 3 patients it was an adrenal cortical carcinoma (in one female patient with MEN-II A syndrome coexistent with chromaffin tumour in the same adrenal gland). In 7 patients the tumour was of metastatic character. Four of them were previously treated radically due to other carcinomas, and adrenal tumour was the only, late distant focus. They were metastasis of squamous cell carcinoma of the lung (2 patients), renal adenocarcinoma (2 patients). In three patients metastatic adrenal tumour was the first symptom of neoplastic disease. In case

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of one patient this was a metastasis of hepatocellular carcinoma. During the same procedure an initial focus was observed in the left lobe of the liver, invisible during the CT and MRI examination. The lesion was operated radically during the second stage. Metastasis of collecting duct carcinoma (CDC) was detected in tumour pattern in one female patient, who later refused further diagnostics and treatment. In one female patient the adrenal gland turned out to be a metastasis of bronchial neuroendocrine tumour (NET). Because of quick progress and generalisation of the disease, it was impossible to perform radical treatment. Histopathological examination of three chromaffin tumours unambiguously proved to be malicious (features of infiltration of vessels and sac surrounding fatty tissue). One case of initial adrenal lymphoma was stated.

In 13 from 14 patients with malicious adrenal tumours it was possible to perform laparoscopic radical surgery. In case of one patient with metastasis of squamous cell carcinoma of the lung the lesion was evaluated laparoscopically as non-operative. Due to doubts related with reliability of this evaluation, a conversion was made, which confirmed the fact that the tumour is non-operative. Observation period of these patients was 6-53 months (on average 26.6 months, SD = 16.46). In 3 patients a progression of neoplastic disease was observed (two of these patients deceased). All these patients were treated due to metastatic tumours. This group included: the patient with non-operative squamous cell carcinoma of the lung, the female patient with CDC metastasis, who did not agree to undergo further treatment and female patient with neuroendocrine tumour of the lung. Others (11 patients) remain under clinical observation.

In case of 19 (9.5%) patients histopathological examination proved presence of potentially malicious lesions. Evaluation criteria included high mitotic activity, features of necrosis, suspicion of adrenal sac or vessel infiltration. This group covered 16 patients with chromaffin tumours, who were suspected of malicious lesion on the basis of high PASS (Pheochromocytoma of the Adrenal Scaled Score) index. What is more, one patient with oncocytoma, one with Schwannom tumour and one with ganglioneuroma. In these three cases laparoscopic surgery was histologically evaluated as radical. Observation period of this group was 6-72 months (on average 38.2, SD = 17.19). Renewal features or progression of the disease were not observed in these patients (tab. 4).

**DISCUSSION**

Adrenal operations have currently become the fastest developing branch of endocrinological surgery. On one hand the minimally invasive access has become increasingly popular – it is perceived as the basic technique in operating adrenal glands –and on the other hand the number of surgeries continues to grow considerably every year (1-5). This has once again brought up the problem related with recommendations to remove the adrenal gland. Adrenalectomy does not raise any doubts in patients with hormonally active tumours. Incredibly precise hormonal and imaging diagnostics enables to state an exact diagnosis concerning even the smallest lesions, which removed shall efficiently treat symp-
Laparoscopic transperitoneal approach to adrenal gland malignancies

Symptoms caused by increased secretion of the given hormone. What is more, according to majority of reports the number of operations performed due to hormonally active tumours has only slightly increased. This number depends directly on epidemiology of these hormonal complexes, whose frequency of occurrence remains constant for years. It is only the greater awareness of these illnesses among general practitioners and greater accessibility of advanced diagnostic methods, which causes that the number of adrenalectomies in patients with hormonally active adrenal tumours slightly, yet gradually increases (6-9).

The matter looks quite different as far as tumours deprived of hormonal activity are concerned. Such clinically silent, accidentally detected adrenal tumours are known as incidentaloma (or under the Polish name “przypadkowiak – accidental carcinoma”). And the annually growing number of adrenal surgeries may evoke apprehension related with the grounds for recommendations. Undoubtedly the reason for greater detection of hormonally silent adrenal tumours is the fact that imaging examinations, mainly the ultrasound examining, but also the computer tomography, are more widely accessible. Number of detected incidentalomas grows extensively and one may expect that, together with perfection and a wider accessibility of more detailed imaging methods of the whole body will continue to rise. Currently detected adrenal tumours have become an incredibly popular topic of scientific news, whose number has grown twenty times during the last three decades! (1, 3, 4, 5).

There are – which are doubtlessly justified – concerns that it is rather a disease of “modern imaging technology” and not a significant medical problem. Grifffing ironically determined it as AIDS in the world of endocrinologists, placing the following name under the commonly known acronym – Adrenal Incidentaloma Discovered Serendipitously, which can be perceived as prolongation of the name “accidental carcinoma”. Developing this joke, he said that “these two types of AIDS are similarly asymptomatic in early stages, they both cause significant increase of health care expenditures, the only difference lies in the fact that mortality due to ‘endocrine AIDS’ is insignificant” (10). Despite the ironic style of this statement, it suitably reflects hesitancy of specialists dealing with the subject of accidentally detected adrenal tumours. The greatest dilemma lies in creating the algorithm of proceedings, which would provide benefits resulting from early detection and treatment of adrenal gland diseases that may cause serious consequences, and would not evoke substantial increase in the rate of complications and costs regarding too aggressive diagnostic-therapeutic approach (1, 3, 4, 11, 12, 13).

The most important reason for removing clinically silent adrenal tumour is the apprehension that such a tumour may be of malicious tumour character or it may pose a threat with cancer development. Any diagnostic algorithms constituting fundamental classification criterion always state the size of the tumour, while the subject of the ongoing discussion is the determination of tumour dimensions.
forming indications for operative treatment. Size range stated in the literature is quite extensive; from 3 to 6 cm, whereas it is always the biggest size that is taken into consideration. Wider classification also including small tumours causes a threat with large rate of complications in comparison with the number of diagnosed malicious lesions. Higher borderline value may pose greater risk of overlooking the initial stage of carcinoma. Assertion stating that each tumour larger than 6 cm should be removed, evokes no doubts. Epidemiological examinations prove that in case of such large tumours the risk of malicious cancer exceeds 20-25% (3, 11, 14, 15).

It also seems that tumours smaller than 4 cm – unless there are other features indicating malicious character of the lesion – it may be safely observed, and recommendations to acknowledge 3 cm as the borderline value seem to have no remarkable justification. Tumours ranging between 4 and 6 cm raise the greatest doubts. In accordance with prevailing opinion, they should also be treated surgically, if the general condition of the patient does not pose substantial threat. This exact criterion was accepted in UJ CM II Surgical Department. Patients with hormonally inactive tumours, which were larger than 4 cm, regardless of criteria of the so-called radiological phenotype, are qualified for adrenalectomy. Another opinion present in literature is that the borderline value should be fluctuant and should depend on such criteria as the age of the patient and the operational risk. According to the above, in case of young and generally healthy people it would equal even 3 cm, whereas in elderly persons, suffering from various ailments, it could be 5 or 6 cm. This reasonable approach has not been proved by any clinical studies (16, 17, 18).

Classifying tumours not exceeding 4 cm for surgical operations is far more complex. In this case there are several clinical situations, where removal of the adrenal gland may be justified. One of the most commonly emphasized indications is the presence of the so-called “imaging phenotype of malicious lesion”, basing on evaluation criteria related with computer tomography or nuclear magnetic resonance imaging. Certain lesions, such as myelolipoma, haematomas may be diagnosed with probability close to certainty. From practical point of view it seems much more important to deter-
mine which lesions evoke such a noteworthy suspicion of malicious cancer that it is advisable to consider removing them. The most important features suggesting malicious lesions include: irregular outline, features of infiltration, signal heterogeneity, focus of the necrosis, calcifications, high basic density and high, heterogenous strengthening after administering contrast in CT examination, as well as high signal in T2-dependent images and low lipid content in MRI. Increase of a lesion, which was smaller than the accepted borderline value, during observation may be treated as a recommendation for surgical treatment. Increase in the greatest size of the tumour by 1 cm during a year of observation, stands as a criterion of significant change in size justifying the operational treatment (1, 3, 14, 19). In our study 24 patients were classified for operational treatment, with adrenal tumours without hormonal activity, smaller than 4 cm, 5 of which turned out to be malicious lesions. It may be stated that the criterion of malicious phenotype features and tumour increase proved to be more efficient diagnostically than the size of the tumour (20.83% vs 15.52%).

It is assumed that with the use of proper qualification criteria about 1/5-1/6 of removed incidentaloma tumours may be enumerated among pathology stating significant threat for a patient, due to potential or evident maliciousness (1, 2, 11, 20).

Tumours located in the adrenal area may origin from various tissues and organs. Benign lesions – occurring more commonly – are of much less clinical significance. The most common of the above, and moreover the most common adrenal tumour is the glandular tumour developing from the cortical layer. Yet, the less often occurring malignant tumours are much more noteworthy. Initial adrenal cortical carcinoma is a rare tumour. It constitutes about 0.05-2% of all malicious tumours. Morbidity rate equals 0.5-2 cases / million / year. Adrenal cortical carcinoma is diagnosed once on every 4000 all adrenal tumours and – depending the accepted qualification criteria – in case of several percentages (0-25%) of patients undergoing operational treatment. Probability that the tumour detected during accidental imaging examination is adrenal cortical carcinoma grows together with its size. And so cancer is diagnosed in 2% of tumours with diameter smaller than 4 cm, 6% with diameter of 4-6 cm
and even 25% in case of larger diameters. Despite the fact that this disease is quite rare, it evokes understood apprehensions, especially because of truly bad prognosis. Less than 50% of patients survive five years (21-24).

Metastatic tumours are yet another group of malignant cancers located within the adrenal area. They are rather rare in people without oncological history (0-21%) and much more often met (8-38%) in patients diagnosed and treated because of malicious cancers, which usually originate from lung cancer, alimentary tract cancer, breast cancer and melanoma. In majority of cases these are tumours of great maliciousness and the presence of distant metastases in adrenal glands considerably worsens the prognosis. Only in exceptional cases, when the original focus will be radically removed, and the tumour in the adrenal gland is the only metastasis, the removal of this tumour within limits of healthy tissues may result in healing. In case of remaining patients removal of single metastasis to the adrenal gland may prolong life even by 10-12 months (25-29). Other common clinical situations include those, when the metastasis in the adrenal gland is the first symptom of neoplastic disease. Only after removing such a tumour and obtaining result of microscopic examination, diagnostics enabling to determine the origin of the tumour may be implemented. In the presented material such a situation occurred in case of three patients. Radical treatment of original focus was possible only in one patient.

When qualifying patient to operational treatment due to lesion of potential malicious character it is advisable to consider validity related with the use of minimally invasive techniques. Currently majority of surgeons consent to the opinion that performing laparoscopic adrenalectomy is most favourable in case of benign tumours. The postoperative course is encountered among arguments particularly supporting the use of minimally invasive methods (12, 13, 30-34). There were attempts to raise certain limitations for minimally invasive techniques, such as size of the lesion and tumours secreting catecholamines, however, more and more often one can read reports documenting safe performance of laparoscopic adrenalectomy also in patients with large lesions, of several centimetres and chromaffin tumours. Nonetheless, when there is a noteworthy suspicion of adrenal tumour, quite a number of surgeons believe that removal of adrenal gland by means of classical technique is a much safer procedure. Yet there is no unequivocal evidence proving this opinion. What is more, almost all reports on laparoscopic adrenalectomy a notable proportion of postoperative pathological examinations indicate presence of malicious tumour. There are better documented publications evaluating distant results of treating malicious lesions with the use of minimally invasive techniques (24, 30, 33, 35, 36, 37).

What remains is the choice of optimal operational technique. Nowadays adrenalectomy is performed with minimally invasive techniques, mainly from three accesses: transabdominal on the side, retroperitoneal on the side and retroperitoneal from the back (lumbar). The fourth access, which is sometimes described in literature – transabdominal frontal, is practically not used these days. In both types of the retroperitoneal access is performed in artificially created area in soft tissues, without introducing tools into peritoneal cavity, hence calling this precise method a “laparoscopic” method is simply wrong. Advantages and disadvantages of various kinds of endoscopic adrenal surgeries, which are often mentioned in literature, are only personal opinions of the authors, which are not scientific proofs. It was also impossible to indicate unequivocal superiority of any of these techniques in publications meeting the criteria of Evidence Based Medicine (EBM). Hence all recommendations are mainly of intuitive character, and the choice of optimal operating method depends mainly on the experience of the surgeon (38, 39, 40).

Although in case of operating benign tumours – both the hormonally active ones and the silent ones – it is hard to find clear advantage related with the use of the described techniques, yet in case of malicious lesions the transperitoneal access seems to be the most beneficial one. Even though there are no homogenous proofs, there are certain benefits in favour of this method, such as early closure of venous vessel lumen, limitation of tumour manipulation (no touch technique), size of operating field, possibility to evaluate remaining organs within the abdominal cavity, and wide operating margins. Reliable evaluation of features such as peritoneal dissemination
or lesions in other organs seems incredibly persuasive. The above may be proved by an example of the patient, in case of whom no lesions in liver were observed in preoperational CT and ultrasound examination of the abdominal cavity. It was only during the surgery of removing left adrenal gland (as it turned out later, caused by metastasis of hepatocellular carcinoma) when the hepatic tumour was stated.

The position accepting the opinion on safety and efficiency concerning the use of minimally invasive techniques in treating malignant lesions makes it a procedure of choice in treating majority of adrenal diseases, leaving classical adrenalectomy only for conversions and failures, as well as certain extremely large tumours.

CONCLUSIONS

1. Laparoscopic adrenalectomy allows for safe and radical removal of all adrenal tumours, also the malicious ones.
2. The procedure performed from transperitoneal access meets the criterion of oncological radicalness, and access to adrenal gland from the side of peritoneal cavity may be considered as an advantage, as it creates a perfect opportunity to evaluate remaining organs within the abdominal cavity, and to simultaneously perform another procedure.
3. Despite the promising initial experiences, the short time of observation does not allow for unequivocal reference to distant results of treating malignant tumours with this technique.

REFERENCES


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KOMENTARZ / COMMENTARY

I would like to congratulate the Authors' on the selection of such an important and actual problem concerning endocrinological surgery, during the turbulent times of development of minimally invasive techniques.

The problem is connected with the qualification of patients with adrenal lesions towards videoscopic operations, especially accidentally diagnosed lesions without clinical symptoms of hyperadrenalism. The above-mentioned issue is enhanced by the fact that the laparoscopic technique is the recognized method of choice, considering the surgical management of adrenal tumors, and by some even as the golden standard. This conviction deeply rooted, both in patients and physicians leads towards an unnecessary pigeonhole of the method. Is the diagnosis of an adrenal tumor equivalent with the need to perform laparoscopic adrenalectomy? Which tumors require open surgery? Which tumors require systematic clinical observation, and does laparoscopy enable radical excision of the lesion? The above-mentioned should be considered when qualifying patients. The stereotype disqualifying malignant lesions from laparoscopy is continuously changing. It exists in case of adrenal carcinomas, both in the presence of local (surrounding tissues and lymph nodes) and metastatic lesions.

The positive experience, considering laparoscopy in case of metastatic lesions and local adrenal carcinomas, enable to qualify such patients towards minimally invasive procedures.

Anxiety in such cases concerned the radicalism of the laparoscopic procedure enabling to maintain oncological surgery principles. The presented study is such a „milestone”, considering the discussion whether invasive tumors can be operated by means of laparoscopy. The above-mentioned is especially visible in case of hormonally inactive incidentalomas, where treatment is based on fear of the possibility of malignancy. The problem is connected with the absence of clear-cut markers determining the malignancy of the lesion, with postoperative
histopathological evaluation as the only golden standard. Considering literature data the mentioned issue raises controversies concerning invasive lesions which were not diagnosed, even during qualification towards surgery. Without doubt the excision of the lesion during its early stage is a far better prognostic factor, in comparison to surgery of advanced lesions. Thus, in order to maintain oncological principles, every hormonally inactive tumor should be subject to complete excision with the adrenal glands and surrounding tissues. Does laparoscopy render possible such an extensive operation? The presented study mentioned these issues enabling to extensively answer the question.

All the above-mentioned facts contributed to the discussion on the acceptable size of the adrenal lesions, which could be qualified towards laparoscopic surgery. Laparoscopy should ensure the safety of the operation, meaning radical excision, since prognosis in case of adrenal carcinoma depends on the radicalism of the primary operation. In case of hormonally active lesions the complete excision of the tumor without damage to the capsule enables to avoid disease recurrence and regression of hormonal disturbances.

The study mentioned a very important surgical problem, which is adrenal laparoscopy, and at the same time confirmed the significant experience of the Authors in laparoscopic techniques. Evidence of the above-mentioned was confirmed by the solution of technical problems by means of laparoscopy during the procedure, as well as management of postoperative complications. I am impressed by the Authors’ knowledge of minimally invasive methods, and their application in difficult situations. Such a possibility is evidence of the versatility of the operative method, and at the same time enables to certify that the transperitoneal approach creates a greater operative potential. This is especially visible in difficult cases and in the management of resulting complications.

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