Cysts are a rare pathology of adrenal glands. As the development of new diagnostic techniques takes place, the occurrence of adrenal cystic lesions has been rapidly increasing. The majority of them are solid adrenal lesions, but localized fluid collections are also more frequently diagnosed. In case of solid adrenal lesions, there are straight indications for surgery, but on the other hand there are no clear guidelines and recommendations in case of adrenal cysts.

**The aim of the study** was to analyze surgical methods and evaluate treatment effects in patients who were qualified for laparoscopic adrenalectomy due to adrenal cystic lesions.

**Material and methods.** Identical criteria were used to qualify patients with solid and cystic lesions of the adrenal gland for surgery. Out of the whole number of 345 patients who underwent laparoscopic surgery for adrenal tumors, 28 had adrenal cysts. 16 of them (57%) were women and 12 (43%) men. The average age of the studied group was 46.4 years (25-62 years). The average cyst diameter in CT was 5.32 cm (1.1-10 cm). Most of the lesions were hormonally inactive (22 patients), but in 6 cases increased level of adrenal hormones was observed.

**Results.** Pathological analysis revealed 4 (14%) pheochromocytomas and 2 (7%) dermoid cysts. In case of 22 (79%) patients, the postoperative material was profiled by pathologists as insignificant according to potential neoplasmatic transformation risk: 5 (17.5%) – endothelial vascular cysts, 3 (11%) endothelial lymphatic cysts, 7 (25.5%) pseudocysts, 3 (11%) simple cysts, 2 (7%) bronchogenic cysts, 1 (3.5%) – cortical adenoma and 1 (3.5%) cyst was of myelolipoma type.

**Conclusions.** Based on the performed research and previous experience in treating patients with adrenal lesions we can conclude that application of the same evaluating algorithm for both cystic and solid lesions is valid.

**Key words:** cystic adrenal lesions, laparoscopic adrenalectomy, endocrinological surgery, minimally invasive surgery, adrenal gland surgery, indications for surgery
symptoms of uncontrolled release of hormones. In hormonally inactive tumors, qualification for surgery depends on oncological vigilance. The main criterion is the size of tumor > 4 cm. Smaller tumors, growing over the period of observation, or those that do not fulfill the criteria of benign adenoma in imaging studies should also be excised (6-9).

The above surgical criteria have been developed for solid adrenal lesions. There are no clear recommendations in case of adrenal cysts or solid-cystic lesions in the current literature (10). It is argued, though this is purely intuitive reasoning, that as the size, enlargement or non uniform picture on imaging studies of a cystic lesion result from the fluid component, oncological risk should be lower than in solid lesions. Therefore, are the current criteria of qualification for surgery in adrenal tumors sufficient? Or should the treatment of cystic tumors be based on different recommendations?

The aim of the study was analysis of indications for surgical treatment and evaluation of treatment results in patients who underwent laparoscopic adrenalectomy due to adrenal cystic lesions in the 2nd Department of General Surgery, Jagiellonian University Collegium Medicum in Cracow. We have tried to address the question whether qualification for laparoscopic adrenalectomy in patients with cystic lesions requires a different evaluating algorithm to that employed in solid adrenal lesions treatment.

**MATERIAL AND METHODS**

We have performed a retrospective analysis of patients operated for adrenal lesions between March 2003 and October 2011, in whom laparoscopic adrenalectomy due to adrenal cystic lesions in the 2nd Department of General Surgery, Jagiellonian University Collegium Medicum in Cracow. We have tried to address the question whether qualification for laparoscopic adrenalectomy in patients with cystic lesions requires a different evaluating algorithm to that employed in solid adrenal lesions treatment.

In case of adrenal cysts (fluid collections) patients were qualified for surgery according to the very same criteria. We have evaluated those qualification criteria, results of surgical treatment, and character of excised lesions in histopathology. All patients were operated in the same center by the same team. In all cases the procedure was performed using laparoscopy and lateral transperitoneal approach. In 13 (3.7%) patients the procedure was done via a single abdominal incision. Histopathologic evaluation was performed in the Clinical and Experimental Pathology Department, Jagiellonian University Collegium Medicum in Cracow. All data were collected retrospectively in the Excell database and the analysis was performed after all information on operated patients had been collected.

Between March 2003 and October 2011 in 2nd Department of General Surgery, Jagiellonian University Collegium Medicum in Cracow, the total of 345 patients (mean age 53.6 years, range 18-81 years) were operated on for adrenal tumors. The group comprised 221 females (mean age 53.5 years, range 18-81 years) and 124 males (mean age 53.7 years, range 19-77 years). Among 345 patients who underwent adrenalectomy (study group), the most common diagnosis preoperatively was hormonally inactive incidentaloma (130 cases) and pheochromocytoma (98 cases). Table 1 presents details on preoperative diagnoses in the study group.

**RESULTS**

Among 345 patients operated on for adrenal tumors, cysts were found in 28 patients, which constitutes 8.2% of the study group. The majority of lesions were detected preoperatively – 25 (89%) cases. In the others, adrenal cyst was found on pathological examination. In the group of patients with adrenal cysts, women slightly prevailed (16 females vs. 12 males). Mean age of these patients was 48.6 years (range 25-68 years). Mean age of females and males was similar (47.5 vs. 50 years).

It is noteworthy that on average patients with cysts were 5 years younger than the rest of the study group (48 years vs. 53 years). In the majority of cases lesions determined as cysts by the pathologist were hormonally inactive (22 patients, 78%). These patients were qualified for operative treatment if the
size of tumor on CT was > 4 cm (mean 5.3 cm, range 4.7-9.2 cm). In 9 of those patients the size of cysts was initially > 4 cm, and in 13 patients cysts significantly enlarged over the period of observation 6 months – 3 years. Next 6 (21.5%) patients with adrenal cysts were qualified for surgical treatment because the lesion was hormonally active. In 5 patients the activity was characteristic for pheochromocytoma (secretion of catecholamines), and in 1 case the tumor produced aldosterone which caused symptomatic Conn syndrome (tab. 2).

In 22 patients laparoscopic adrenalectomy was performed, removing adrenal gland with the tumor. In 4 (14%) cases only the cysts was excised, and part of the adrenal gland was spared. One of these procedures was performed through a single abdominal incision. In other 2 cases the cyst was located close to the adrenal gland, but not connected with the gland. It was removed, leaving the adrenal gland in situ. There were no significant complications in the postoperative period. There was no need for reoperation. There were no deaths. Hospitalization after surgery in patients with adrenal cysts was 3.26 days (range 1-13 days) and did not differ from that of the whole analyzed group of 345 patients.

In case of 22 (79%) patients, the postoperative material was profiled by pathologists as insignificant according to potential neoplastic transformation risk: 5 (17.5%) – endothelial vascular cysts, 3 (11%) endothelial lymphatic cysts, 7 (25.5%) pseudocysts, 3 (11%) simple cysts, 2 (7%) bronchogenic cysts, 1 (3.5%) – cortical adenoma and 1 (3.5%) cyst was of myelolipoma type. In 6 (21%) cases pathological analysis revealed lesions of significant oncological risk: 4 (14%) pheochromocytomas and 2 (7%) dermoid cysts. All cases in which the level of techolamines was increased preoperatively, were qualified as potentially malignant (tab. 3).

DISCUSSION

Cysts constitute a small proportion of adrenal pathology (11). In 1908 in the British Medicine Journal Doran published a description of a study by an Italian anatomist Greiseliusa from 1670. He presented a case of a 45-year old woman who died as a consequence of rupture of a large, possibly 4 kg, adrenal tumor, filled with fluid and blood clots. It constitutes the first documented description of an adrenal cyst (12). Since that time, during over 100 years, there have been only about 600 cases of adrenal cysts described in literature (13). In the studied group of 345 patients who underwent laparoscopic adrenalectomy, cystic lesions were found only in 28 cases (8.2%). Kuruba and Gallagher, Vilar et al., Song et al. and Guo et al. in their work determined the occurrence of adrenal cysts at the level of 4 to 22% (14-17). In the Polish material, Otto et al.
described the occurrence of adrenal cysts as 11.3% (34). The largest studies from a single centre were conducted in Europe by Erickson et al. in 2004 (41 patients with adrenal cysts) and by Ping-Chien et al. in 2008 (25 patients) (18, 19). The material of 2nd Department of General Surgery, Jagiellonian University Collegium Medicum in Cracow constitutes one of the largest groups of patients with adrenal cysts from a single centre. In the current Polish literature there are no data on the occurrence of cystic lesions among patients qualified for adrenalectomy. Case reports were accompanied by classification systems for adrenal cysts. In 1906 Temer and Lecence described 5 types of adrenal cysts, and in 1959 Absehouse et al. significantly changed the earlier classification. Later, changes were introduced by Foster, and again by Absehouse and Sroujieh (20, 21, 22). Yet another classification was suggested by Barron and Emanuel in 1961, according to which adrenal cysts can be divided into: haemorrhagic, endothelial, glandular, congenital and pseudocysts (23).

In our study there were 6 (21%) cases of cysts important from the point of oncological risk. In 22 (79%) patients lesions were clinically insignificant. Similar percentage of cysts (17%), which eventually turned out malignant, was presented by Ericsson (23). In the study by Foster neoplastic cysts constituted 7% of the studied lesions (22). The same percentage is described by Neri et Nance (33). However, Chien et al. found neoplastic cysts in over 44% of their patients (13). Such high percentage of clinically significant lesions among patients operated on for adrenal cysts suggest the need for surgery in patients with fluid filled lesions of the adrenal gland. The development of surgical technique has led to changes in the optimal operative approach. In 1992 Gagner performed the first laparoscopic adrenalectomy, which has finally led to acceptance of laparoscopic approach as the preferred one. Currently it is regarded as the golden standard in the treatment of adrenal tumors (24, 25).

Recently, minimally invasive procedures have become popular, which is reflected in the number of operations performed from a single abdominal incision (26). There have been no detailed randomized studies and no systematic, uniform classification of adrenal cystic lesions, which gives rise to controversies concerning methods of treatment of this rare pathology of adrenal glands (19). Some authors opt for surgical treatment – laparoscopic adrenalectomy in all patients with adrenal cysts. Others suggest less radical procedures such as resection of the cyst with saving of the gland tissue. There have been attempts at transcervical biopsy and aspiration of the cyst, sclerotherapy or even just long-term observation without any surgical intervention (27). Bellantone et al. and Lal et al. in their reports recommend surgical treatment in patients with symptomatic, hormonally active adrenal cysts, and cysts > 5 cm, due to the risk of rupture and bleeding. Moreover, haemorrhagic cysts and cysts suspected of potential malignant transformation, are also qualified for surgery (10, 27). According to Klingler et al., asymptomatic adrenal cysts not exceeding 4 cm do not require operative treatment. However, systematic ultrasound control is mandatory, preferably with CT control (28). Pradeep et al. basing on conducted studies suggested an algorithm according to which patients with hormonally active adrenal cysts and cysts exceeding 6 cm should be oper-
lated on (29). Scheible et al. described the technique of transcutaneous drainage of adrenal cysts.

There are reports in literature on using this method in patients in whom malignant lesions have been excluded (30). According to current studies, diagnostic methods such as ultrasound, computed tomography or magnetic resonance imaging do not allow for reliable differentiation of adrenal cysts according to their malignant potential (31). Magnetic resonance seems to be superior in differentiation between hormonally active and inactive adrenal adenomas, pheochromocytomas and intraadrenal bleeding. However, there are no studies on the application of this diagnostic method in differential diagnostics of particular types of adrenal cysts (32). Therefore, as there is no method reliably excluding potentially malignant cysts, the concept of adrenal cysts drainage appears improper.

Based on the performed research and previous experience in treating patients with adrenal lesions we can conclude that the evaluation algorithm presented in 2002 by the American National Institutes of Health for surgical treatment of adrenal tumors can be applied for cystic lesions. If the patient is qualified for surgery, the procedure should be minimally invasive, performed in a centre with appropriate technical capabilities and by educated personnel with sufficient operative experience in advanced videosurgical techniques.

REFERENCES


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Address correspondence: 31-501 Kraków, ul. Kopernika 21