Laparoscopic transperitoneal renal cyst decortication

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The aim of this study was to report our experience with the laparoscopic transperitoneal treatment of simple renal cysts, to analyze the immediate and long-term clinical outcomes, and to evaluate the efficacy and safety of this minimally invasive surgical technique. Between 2009 and 2014 we diagnosed and treated a total of 48 patients with symptomatic simple renal cysts. The diagnosis was set up by ultrasound (US) and/or computed tomography (CT) examination. All cases were managed by transperitoneal laparoscopic cyst decortication. Demographic data, perioperative blood loss, duration of operative procedure, length of hospital stay and peri- and postoperative complications were analyzed. Follow-up included clinical examination and renal US, performed at 3-monthly intervals during the first year and yearly thereafter. Patient age ranged from 32 to 68 years (mean age 52.4 years), 27(56.2%) of the patients were males and 21 (43.8%) - females. 42(87.5%) of the cysts were peripheral, and 6(12.5%) – peripelvic; 28(58.3%) were localized to the left and 20 (41.7%) – to the right; and they ranged by size from 5 to 30 cm (mean 9.8 cm). 45 (93.8%) of the cysts were identified as category I, and only 3 (6.2%) - as category II, according to the Bosniak classification. None of the cases required conversion to open surgery. There were no peri- and postoperative complications. The average duration of the laparoscopic procedure was 55 min, and the average perioperative blood loss - 50 mL. All patients had negative cytological and histological findings indicative for malignancy. The follow-up period ranged from 5 to 52 in months (average - 25.4 months). In 47 cases (97.9%) excellent therapeutic results were reported: complete relief of clinical symptoms, fast recovery of physical activity and patient quality of life. There were three recurrences (6.2%) met in patients with multiple cysts, but only one of them required repeated surgery. Laparoscopic transperitoneal decortication is a minimally invasive, highly effective and safe method of treatment of symptomatic renal cysts. The immediate relief of clinical symptoms, the short period of convalescence, the excellent quality of life after surgery, and the low relapse rate confidently define it as the surgical method of choice.

Key words: kidney, cyst, treatment, minimally invasive surgery

INTRODUCTION

Simple renal cysts are the most common renal lesions. They are found in 5% of the common population. Rare in children, they increase with age and reach 25-33% in patients above 50 years of age. They comprise 65-70% of all accidentally found renal lesions. The benign renal cysts are more common in males than in females (male/female ratio 2:1). They may be solitary or multiple; unilateral or bilateral. The renal cysts vary in size, but rarely become so large to be palpated across the abdominal wall.

With regard to the differential diagnosis, simple renal cysts should be differentiated from the cystic variant of the renal cell carcinoma. The ultrasound (US) findings, supporting the diagnosis of a simple renal cyst, include the presence of an anechoic round mass, with smooth and clearly distinguished wall, followed by a hyperechoic signal on the posterior wall. If the US data are suspicious or equivocal, computed tomography (CT) scan should be performed in addition. The CT criteria for a benign cyst include: 1) a cyst with strictly distinguished borders, with a smooth and thin wall; 2) presence of a homogeneous liquid content (usually with density <20 HU, although higher values might be established in benign cysts rich in protein, or with a hemorrhage within the cyst); 3) the cyst does not enhance the contrast medium.

In 1986 M. Bosniak published a classification to categorize the renal cysts, based on CT findings, determining the need for additional diagnostic or therapeutic procedures. This classification rapidly gained popularity and nowadays is used throughout the whole world (Table 1).
The accidently found (especially small) asymptomatic renal cysts do not require surgical treatment.

The main indications for surgical treatment are: pain, hematuria, infection, hypertension or obstruction of the kidney (category III and IV, according to the Bosniak classification) 8.

The therapeutic options of the symptomatic renal cysts include: aspiration with instillation of sclerotic agents; percutaneous marsupialisation; open or laparoscopic decortication or fenestration 1, 8-10.

The technique of the laparoscopic decortication of a simple renal cyst was first described by Hulbert et al. in 1992, as an alternative to open surgery11. The laparoscopic approach may be either transperitoneal or retroperitoneal.

The aim of the present study was to report our experience with the laparoscopic transperitoneal treatment of simple renal cysts, to analyze the immediate and long-term clinical outcomes, and to evaluate the efficacy and safety of this miniminvasive surgical procedure.

MATERIAL AND METHODS

Between 2009 and 2014 a total of 48 patients with symptomatic simple renal cysts were diagnosed and treated in our clinic. The diagnosis was set up by US and/or CT examination, used to distinguish the eventual communication between the cyst and the pyelocalyceal system of the kidney (Figure 1).

All cases were managed by transperitoneal laparoscopic cyst decortication.

SURGICAL TECHNIQUE

After induction into general anesthesia, the patient remained in a supine position, with a slight (30°) elevation of the body on the side of the renal cyst. A total of 4 trocars were used: 1 10-mm paraumbilical port for the 30° camera; 1 10-mm port 5-7 cm laterally, close to the lateral border of m. rectus abdominis; 1 5-mm midline port located 5-7 cm above the umbilicus, and 1 5-mm port, located on the respective midaxillary line.

After initial inspection of the abdominal cavity and identification of the main anatomical markers and other concomitant pathology, localization of the renal cyst was done. In most cases it appeared immediately in the visual field as a blue cupola, protruding above the surface of the kidney (Figure 2). There were 2 approaches to the cyst: indirect, with incision of the posterior peritoneal layer followed by mobilization of the bowel medially, or direct, directly to the cyst, without mobilization of the bowel, which remained on site. The dissection was done in an acute and blunt manner, using a grasper and monopolar scissors or a harmonic scalpel (Figure 3).

After mobilization of the roof of the renal cyst, the latter was punctured by an 18-gauge needle, and the cyst’s content was aspirated. After the initial decompression, the puncture site was enlarged to allow insertion of the aspiration pump into the lumen of the cyst. This maneuver was used to enhance the aspiration of the cyst’s content (Figure 4).

In case of suspicious imaging and/or clinical signs of a malignancy, the aspirated liquid was sent for cytopathological analysis (for conventional cytology and for immu-
TABLE 1

THE BOSNIAK CLASSIFICATION OF RENAL CYSTIC DISEASE

<table>
<thead>
<tr>
<th>Bosniak category</th>
<th>Characteristics</th>
<th>Malignant risk (%)</th>
<th>Work up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category I (uncomplicated, simple benign cyst)</td>
<td>Thin wall, without septations, calcifications or rigid components; homogeneous water content (&lt;20 HU); sharp delineation with the renal parenchyma; no contrast enhancement</td>
<td>&lt;1%</td>
<td>No follow up</td>
</tr>
<tr>
<td>Category II (minimally complex cyst)</td>
<td>Thin wall (&lt;1 mm), with fine calcifications and/or septations; &lt;3 cm in diameter; no contrast enhancement</td>
<td>&lt;3%</td>
<td>No follow up</td>
</tr>
<tr>
<td>Category II F (cystic lesion with increased abnormal findings)</td>
<td>Slightly thick and irregular wall; multiple thin septum; presence of calcifications or dense lesions; = 3 cm in diameter; no contrast enhancement</td>
<td>5-10%</td>
<td>US/CT follow up</td>
</tr>
<tr>
<td>Category III (more complicated renal cyst)</td>
<td>Uniform wall thickening/nodularity; multiple thick septa; thick/irregular calcifications; contrast enhancement</td>
<td>40-60%</td>
<td>Surgical excision</td>
</tr>
<tr>
<td>Category IV (malignant cyst)</td>
<td>Large cystic components; irregular margins/prominent nodules; solid enhancing elements (&gt;10 HU), independent of septa</td>
<td>&gt;80%</td>
<td>Surgical excision</td>
</tr>
</tbody>
</table>

nocytotochemical examination of CA9 – a powerful tumor marker, supporting the diagnosis of renal cell carcinoma)\(^2\).

After complete evacuation of the cyst’s content and meticulous inspection of the walls to exclude malignancy, the roof of the cyst was excised by monopolar scissors at 5-mm distance from the renal parenchyma (Figure 5). The specimen was sent for definite pathohistological examination. The hemostasis was easily done by electrocoagulation of the edges of the cyst, without fulguration of its basis that might affect the renal parenchyma. The abdominal cavity was then inspected again and a 16 Fr polyethylene drain was inserted via the lateral 5-mm trocar. The operation ended with desufflation and cosmetic closure of the abdominal ports.

The demographic data, the perioperative blood loss, the duration of the operative procedure, the length of the hospital stay and the peri- and postoperative complications were analyzed.

The follow-up included clinical examination and renal US, performed at 3-monthly intervals during the first year and yearly thereafter.

RESULTS

The demographic data of the patients and the basic parameters, characterizing the renal cysts and the surgical method applied, are exposed on Table 2.

Patient age ranged from 32 to 68 years (mean age 52.4 years). 27 (56.2%) of the patients were males and 21 (43.8%) – females.

The leading clinical symptom, being the main indication for the implementation of surgery, was pain in the lumbar area, found in 42 (87.5%) of the patients. In 1 patient only (2.1%) there was obstruction /hydrocalycosis/, due to compression of the cyst. Hypertension was found in 2 cases /4.2%/; hematuria – also in 2 cases /4.2%/; and uroinfection with E. coli /10%/ - in 1 case /2.1%/.

Most of the cysts - 42 (87.5%) were peripheral, and 6 (12.5%) – peripelvic; 28 (58.3%) were localized to the left 0 (41.7%) – to the right; and they ranged by size from 5 to 30 cm (mean 9.8 cm). 45 (93.8%) of the cysts were identified as category I, and only 3 (6.2%) - as category II, according to the Bosniak classification.

None of the cases required conversion to open surgery. There were no peri- and/or postoperative complications, directly related to the surgical procedure.

The average duration of the laparoscopic procedure was 55min (range 30 - 95 min), and the average perioperative blood loss - 50 mL (range 0 - 90 mL).

“One shot” preoperative antibiotic prophylaxis was applied in all cases. Postoperatively, analgetics were needed during the first 12 – 24 hours only. The urethral catheters were usually removed on the first morning after the procedure. The mean hospitalization period was 4.2 days (range 3 - 7 days). All patients had negative cyto- and histological findings indicative for malignancy. The follow-up period ranged from 5 to 52 months (average-25.4 months)

Excellent therapeutic results were reported in 47 cases (97.9%): complete relief of the clinical symptoms, cosmetic wound healing with fast recovery of the physical activity and the previous patient quality of life (Figure 6).

The follow-up US and CT examinations confirmed the complete restoration of the anatomy of the operated kidneys (Fig. 7). There were three recurrences (6.2%) met in patients with multiple cysts, but only one of them required repeated surgery.

DISCUSSION

Due to their small dimensions and lack of clinical symptoms, the great majority of the simple renal cysts do not require treatment. Surgery is indicated with cyst enlargement and appearance of clinical signs (pain, hematuria, hypertension, renal obstruction, cyst rupture,
recurrent uroinfections, progressively growing intraabdominal tumor mass, etc.\textsuperscript{13,15}.

Treatment of simple renal cysts usually focuses on symptom control and on the prevention of additional complications. It is commonly accepted that in terms of long-term perspective open decortication is the most successful, although the most morbid, therapeutic procedure, compared to the other minimvasive treatment methods—percutaneous needle aspiration (with or without sclerotherapy) and laparoscopic decortication.

Prior to introduction of the laparoscopic decortication, the percutaneous needle aspiration, with or without instillation of sclerotic agents, was the first line of diagnosis and treatment. The clinical experience accumulated with time rapidly showed, however, that the aspiration and sclerosation of the renal cysts was not always an effective method of treatment\textsuperscript{11}. Besides, the recurrence rate after cyst aspiration and sclerosation is within the range of 40-100\%, unlike the reported success rate of laparoscopic decortication that is ranging from 90 to 100\%\textsuperscript{1,2,16,17}.

Therefore, laparoscopic decortication of simple renal cysts has been recently established as a highly effective and safe minimvasive method of treatment. Most of the authors, applying this method, report a high satisfaction rate (both of the patients and their physicians); high success rate; low recurrence rate and minimum morbidity, closely related to the procedure\textsuperscript{8,13,15,18,19}.
The success rate varies among the different series, because it is closely dependent on a variety of factors, such as: the size and the location of the cyst(s), the surgical technique applied, the experience and the skill of the surgeon etc.

Using exclusively a transperitoneal approach, we achieved a radiological and symptomatic success in 97.9% of the cases. In a study, comprising 19 consecutive patients, Tefekli et al.\textsuperscript{18} reported a radiological success of 88.2% and a symptomatic success of 89.5%. It is interesting to note that in all these cases a retroperitoneal approach had been used. Shiraishi et al.\textsuperscript{15} published a series of 37 patients, who underwent laparoscopic renal cyst decortication between 1993 and 2004. In five of these patients (13.5%) the size of the cysts had increased more than 50% of the initial dimensions on the very first check up examination following the procedure. One of the possible explanations of this result is that the authors used a transperitoneal approach only in case of peripheral location of the cysts. In the rest 7 cases, a retroperitoneal approach had been used. Contrary to that, Okeke et al.\textsuperscript{20} report 100% symptomatic success in a mean follow up of 17.7 months after laparoscopic renal cyst decortication.

The transperitoneal approach, compared to the retroperitoneal one, has certain advantages: \textit{Firstly}, the anatomical markers can be identified much easier. \textit{Secondly}, the intraperitoneal space exists naturally and is much larger than the space artificially created by the retroperitoneal approach. All that offers a much larger working space, a possibility of inspection and examination of the other abdominal organs (liver, intestines, etc.), and of diagnosing of other concomitant diseases. \textit{Thirdly}, the ability of the peritoneum to reabsorb liquids available in the abdominal cavity should not be neglected. In our view, this is the most significant factor that explains the great therapeutic success of the transperitoneal approach.

Beside its distinct advantages, the transperitoneal approach has some potential disadvantages, too: it requires a significant clinical experience and bears the risk of injury of the abdominal organs and/or blood vessels in case of negligence\textsuperscript{4,12}.

Our results, however, convincingly show that the laparoscopic transperitoneal decortication of simple renal cysts is an easy, highly effective minimally invasive method that has distinct advantages over the rest of the treatment methods (minimal postoperative pain, minimal blood loss, short hospitalization, reduced postoperative convalescence, and an excellent cosmetic effect). These advantages are significantly better expressed in larger renal cysts.

\textbf{CONCLUSION}

The laparoscopic transperitoneal decortication is a minimally invasive, highly effective and safe method of treatment of symptomatic simple renal cysts. The symptomatic success, observed immediately after the procedure, the short period of convalescence, the excellent patient quality of life and the low recurrence rate clearly define it as the surgical method of choice.

\begin{table}[h]
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{Parameters} & \textbf{Value} \\
\hline
Mean age (range), years & 52.4 (32-68) \\
\hline
Gender, n(\%) & \\
males & 27 (56.2\%) \\
females & 21 (43.8\%) \\
\hline
Main indication for surgery, n(\%) & \\
pain & 42 (87.5\%) \\
hematuria & 2 (4.2\%) \\
hypertension & 2 (4.2\%) \\
infection & 1 (2.1\%) \\
obstruction & 1 (2.1\%) \\
\hline
Side n(\%) & \\
right & 20 (41.7\%) \\
left & 28 (58.3\%) \\
\hline
Location, n(\%) & \\
peripheral & 42 (87.5\%) \\
peripelvic & 6 (12.5\%) \\
\hline
Bosniak category, n(\%) & \\
category I & 45 (93.8\%) \\
category II & 3 (6.2\%) \\
\hline
Mean diameter of the cyst (range), cm & 9.8 (5-30) \\
Mean volume of the aspirated fluid (range), mL & 400 (100-1700) \\
Mean operative time (range), min & 55 (30-95) \\
Mean blood loss (range), mL & 50 (0-90) \\
Mean hospitalization period (range), days & 4.2 (3-7) \\
Mean follow up period (range), months & 25.4 (5-52) \\
Therapeutic success, n(\%) & 47 (97.9\%) \\
Recurrences, n(\%) & 3 (6.2\%) \\
\hline
\end{tabular}
\caption{MAIN PARAMETERS, CHARACTERIZING THE PATIENTS, THE RENAL CYSTS, AND THE SURGICAL METHOD APPLIED}
\end{table}
SUMMARY

Cilj studije je da prikaže naša iskustva u laparoskopskom transperitonealnom tretmanu jednostavnih bubrežnih cistih kao i da analizira neposredne, dugoročne rezultate i efikasnost ove minimalno invazivne hirurške procedure. Metode: U period od 2009. do 2014. godine dijagnostikovano je i tretirano 48 bolesnika sa simptomatskim jednostavnim renalnim cistama. Dijagnoza je postavljena ultrazvukom i/kompletiziranom tomografijom (CT). Kod svih bolesnika je uradjena transperitonealna laparoskopska dekortikacija ciste. Demografski podaci, periopterativni gubitak krvi, dužina traje na procedure, dužina hospitalizacije kao i peri i postoperativne komplikacije su praćene. Praćenje je podrazumevalo ultra-zvuk na svaka tri meseca prve godine a potom jednom godišnje. Rezultati: Starost bolesnika bila je od 32 do 68 godina (srednja vrednost 52,4). Muškaraca je bilo 27 (56,2%) dok je žena bila 42 (43,8%). U 42 slučaja cista je bila periferna (87,5%), 6 slučaja (12,5%) peripelvično. U 28 slučaja (53,8%) cista je bila lokalizovano levo dok je 20 (41,7%) bila lokalizovana desno. Veličina cisti je bila od 5 do 52 mlin (SV 25,4 meseca). Kod svih bolesnika citološki i histološki isključeno je postojanje maligniteta. Period praćenja kretao se od 5 do 52 meseca (SV 25,4 meseca). Olučen terapeutski rezultat sa kompletnim odsustvom simptoma, brzim oporavkom i dobrim kvalitetom života zabeležen je kod 47 (97,9%) bolesnika. Bilo je tri (6,2%) rekurentnih cista kod bolesnika sa multiplnim cistama od kojih je samo jedna reoperisana. Zaključak: Laparoskopska transperitonealna dekortikacija je minimalno invazivna, visoko efektivna i bezbedna procedura u tretmanu renalnih cistih. Trenutno oslobađanje simptomatologije, kratki period rekonvalescencije i odlučan kvalitet života nakon operacije definiju je kao metodu izbora u tretmanu nekomplikovanih renalnih cistih

Ključne reči: bubreg, cista, tretman minimalno-invazivna procedura

REFERENCES