TRUE AND PSEUDOCYSTS OF THE SPLEEN – A DIAGNOSTIC AND THERAPEUTIC PROBLEM

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Splenic cysts are rarely diagnosed lesions. This also includes splenic pseudocysts, which usually develop as a result of a blunt abdominal cavity injury. Splenic cysts are usually diagnosed on the basis of imaging examinations, performed in case of symptomatic patients or those subject to a blunt abdominal cavity injury.

**Material and methods.** The study group comprised six patients with a positive history of blunt abdominal cavity trauma, verified by means of histopathological examinations, which were subject to surgical intervention at the Department of General and Endocrinological Surgery, Medical University in Łódź, during the period between 01.01.2006 and 31.12.2010. Before or during the surgical procedure cystic lesions were diagnosed. The efficacy of the surgical intervention was determined.

**Results.** Splenic pseudocysts were diagnosed in only two of the patients, although in all there was a reasonable suspicion of the above-mentioned lesion. One patient required three operations, due to recurrence of the lesion, which proved to be a primary epithelial cyst. Two of the patients required early explorative relaparotomy. Apart from the above-mentioned, treatment proved uneventful.

**Conclusions.** The diagnosis of a splenic pseudocyst is established in case of suspicion of the above-mentioned lesion. This is evidence that in some patients focal lesions of a different nature are present, being detected by means of diagnostic imaging examinations performed after abdominal cavity injuries.

**Key words:** splenic cysts, blunt abdominal cavity injury

The proposed Martin’s classification (tab. 1) divided cysts into two groups: true (primary) cysts with epithelium lined walls and pseudocysts (secondary) lacking the epithelial lining (1).

The formation of congenital splenic cysts results from the invagination of peritoneal mesothelial cells into the spleen during intrauterine development, followed by their proliferation and secretion of serous fluid (1, 2). Pseudocysts develop as a consequence of a blunt abdominal cavity injury, after which the subcapsular or interstitial tissue splenic hematoma is surrounded by fibrous connective tissue, and its contents liquidated and transformed into a serous form (2-14). In case of splenic pseudocysts patients usually complain of abdominal pain, located in the left epigastrium (3, 5-14). Additionally, patients complain of lack of appetite, loss of body weight (5), a feeling of fullness in the left epigastrium (10), or belching (11). The splenic pseudocyst might be responsible for the displacement of the left kidney, pancreas, stomach, and colon, as well as exert pressure on the stomach (3, 12). Features of compressing the stomach might be observed during upper gastrointestinal endos-
copy (3). Some alleged splenic pseudocysts may be palpable during the physical examination (3, 5, 10-15). Sometimes they do not cause any symptoms and are incidentally discovered during imaging examinations performed for other reasons (2, 4, 5, 13), or cause symptoms which develop after some time, since accidental diagnosis (9). The greatest danger to the patient resulting from the presence of a splenic pseudocyst is related to the possibility of its rupture and accompanying bleeding (5).

Splenic cysts are diagnosed by means of imaging examinations. X-ray images show unspecific lesions suggesting the possibility of the above-mentioned, such as calcifications in the left upper quadrant of the abdominal cavity (13, 16) or displacement of the stomach to the right (12). Therefore, X-ray images of the abdominal cavity are virtually of no diagnostic significance in case of splenic cysts. Abdominal ultrasonography and computed tomography play the major role in the diagnosis of splenic cysts (2, 3, 5, 8-16). Prior to planned surgery serological tests should be performed, in order to exclude the possible echinococcal infection (3, 8, 9, 13, 14).

MATERIAL AND METHODS

During the period between 01.01.2006 and 31.12.2010 six patients with a positive history of blunt abdominal cavity injury and possible splenic cyst lesion were treated at the Department of General and Endocrinological Surgery, Medical University in Łódź (tab. 2). Indications to perform surgery were as follows: large cystic lesions in two patients (54-year old male and 26-year old female patients), uncertain character of the lesion (intraoperatively diagnosed as a cystic tumor) in one patient (71-year old male), abdominal cavity symptoms in one case (23-year old female), growing lesion in one case (17-year old male), and suspicion of post-traumatic splenic hematoma (intraoperatively diagnosed as a cystic tumor) in one case (38-year old male). All the operations were performed by means of the classical method. In order to obtain hemostasis argon coagulation, oxidized regenerated cellulose preparations, and sponges containing fibrinogen and thrombin were used.

RESULTS

Only two patients were diagnosed with a splenic pseudocyst on the basis of the histopathological examination (tab. 3, fig. 1). In the remaining cases the following diagnosis was established: two patients with post-traumatic splenic hematoma (in one case accompanied by hamartomatic vascular proliferation) and two with primary cysts.

Table 2. Patients with a positive history of blunt abdominal cavity trauma

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (years)</th>
<th>History</th>
<th>Intraoperative image</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>23</td>
<td>6 weeks ago the patient participated in a road collision, being a belt-buckled passenger her car was hit by another vehicle; she complained of abdominal pain</td>
<td>cystic tumor filling more than half of the spleen; near the vascular hilus presence of an accessory spleen</td>
</tr>
<tr>
<td>M</td>
<td>54</td>
<td>several years ago the patient suffered an accident to the left posterior ribs area (probably due to the impact of a door); palpable spleen</td>
<td>the spleen the size and shape of a newborns head, almost entirely cystic-like</td>
</tr>
<tr>
<td>M</td>
<td>71</td>
<td>about 9 months ago the patient was hit by a ladder; asymptomatic lesion accidentally diagnosed during abdominal USG</td>
<td>cystic tumor of the lower splenic pole</td>
</tr>
<tr>
<td>M</td>
<td>38</td>
<td>the patient was urgently admitted because of left- sided rib fractures (VI and VII) and post-traumatic splenic hematoma observed on CT; the patient fell into the garage channel; several months ago the patient fell from a ladder and sustained rib fractures and splenic hematoma diagnosis (lack of medical data)</td>
<td>cystic tumor of the lower splenic pole</td>
</tr>
<tr>
<td>M</td>
<td>17</td>
<td>numerous injuries while playing soccer (goalkeeper) the most serious one year ago; 8 months ago the patient was subject to laparoscopic fenestration of the splenic cysts; 6 months ago recurrence of cysts</td>
<td>the spleen with a large hemorrhagic cyst near the vascular hilus</td>
</tr>
<tr>
<td>F</td>
<td>26</td>
<td>in the past the patient practiced basketball and suffered multiple injuries related to the specificity of the sport; the splenic cyst was incidentally detected</td>
<td>presence of a large cystic tumor, accessory spleen</td>
</tr>
</tbody>
</table>
Table 3. Surgical procedures performed and final histopathological diagnosis

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Surgical procedure</th>
<th>Histopathological examination result</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>23</td>
<td>splenectomy and excision of the accessory spleen</td>
<td>spleen: 12.5x9x5 cm in size with a cystic lesion 7 cm in diameter filled with a brownish fluid; the cystic wall created from hyalinizing fibrous connective tissue lined with squamous epithelium- dermoid cyst; the splenic parenchyma with red pulp hyperplasia and subcapsular hemorrhages; accessory spleen-1.5x1x0.6 cm in size</td>
</tr>
<tr>
<td>M</td>
<td>54</td>
<td>splenectomy</td>
<td>spleen: 14x7x4 cm in size with a 12 cm cyst; thin-walled cyst comprising multiple small cysts 0.5-2 cm in diameter, filled with a clear yellowish fluid; presence of numerous pseudocysts with fibrous wall and hemosiderin deposits</td>
</tr>
<tr>
<td>M</td>
<td>71</td>
<td>splenectomy</td>
<td>spleen: 11x9.5x6 cm in size with a 5 cm tumor in one of its poles, blood-colored with blood clots; in the splenic parenchyma- hamartomic thin and thick vascular hyperplasia</td>
</tr>
<tr>
<td>M</td>
<td>38</td>
<td>splenectomy</td>
<td>spleen: 12x6x6 cm in size, the splenic capsula partially ruptured with hemorrhagic lesions; the spleen with preserved architecture and features of passive congestion and hemorrhages</td>
</tr>
<tr>
<td>M</td>
<td>17</td>
<td>partial splenectomy</td>
<td>spleen: 17x11x6 cm in size with a cystic lesion filled with a yellowish gelatinous substance; smooth wall cyst 6.5x6x5 cm in size; minimal splenic margin (0.2cm); the spleen with preserved architecture and red pulp hyperplasia, sinus vasodilation, presence of a simple cyst resembling a primary epithelial cyst</td>
</tr>
<tr>
<td>F</td>
<td>26</td>
<td>splenectomy, the accessory spleen was not excised</td>
<td>tissue fragment measuring 15x14.5x11.5 cm consisting of the spleen and cyst (13x11x11.5 cm) filled with a yellowish, clear fluid; the cystic wall without neoplastic lesions; wall thickness-0.2 cm, the splenic parenchyma without focal lesions; the spleen with preserved architecture and presence of pseudocysts without epithelial lining; the cystic wall with features of hyalinization</td>
</tr>
</tbody>
</table>

Early postoperative complications were observed in two patients. One 54-year old male patient required reoperation 8 days after the splenectomy, due to suspicion of subdiaphragmatic abscess. The patient complained of fever (38°C) and severe abdominal pain. Intraoperatively, the subdiaphragmatic fluid reservoir observed on computed tomography (7x6.5 cm in size) was not confirmed. After eight days the patient was discharged from the hospital in good general condition. The 26-year old female patient underwent relaparotomy the day after the splenectomy, due to continuous blood outflow from the drain placed at the site of the removed spleen. Intraoperatively, the site of bleeding was located near the vascular peduncle, which was ligated and underpinned. Argon coagulation was used to control bleeding. Two units of blood before and three during surgery were transfused. The further postoperative period proved uneventful and the patient was discharged from the hospital in good general condition after 6 days. The 17-year old male patient required three operations. One year ago, while playing soccer he suffered a severe abdominal cavity injury. Imaging examinations demonstrated the presence of a splenic cyst, which proved asymptomatic. Two months after the injury the patient underwent laparoscopic cystic fenestration at the Department of General and Endocrinological Surgery, Medical University in Łódz, due to the uncertain character of the fluid reservoir. 300 ml of a brownish content was aspirated from the above-mentioned, and three petals of an oxidized regenerated cellulose preparation were placed in its lumen. After two months recurrence was observed (confirmed by CT).

Fig. 1. The wall of the splenic pseudocyst – marked by the thick arrow- formed from connective tissue, devoid of epithelial lining. Presence of blood inside the cyst- marked by the thin arrow, HE, x 40
also asymptomatic. Laparotomy showed cystic stability and no surgical procedure was performed. After yet another six months and increasing size of the cyst, although asymptomatic, partial splenectomy was performed. The postoperative period proved uneventful. In case of the remaining patients the postoperative period proved uneventful. All were discharged from the hospital in good general condition.

**DISCUSSION**

Final diagnosis of the presence of a splenic pseudocyst in two of the six patients is evidence that blunt abdominal cavity injuries might occur in patients with previously present splenic lesions, of different character and cystic-like. This may be easily explained by the fact that patients with true (primary) cysts and other focal splenic lesions are exposed too abdominal cavity injuries to the same extent as the rest of the population. Imaging examinations performed in such patients or surgical intervention can detect the presence of cystic-like lesions, which in association with the patients’ history suggest the diagnosis of a post-traumatic splenic pseudocyst. Sinha et al. presented four patients with a positive history of sustained abdominal cavity trauma, where the postoperative histopathological result revealed the presence of a splenic pseudocyst (5). Pachter et al. described seven patients with splenic pseudocysts, which suffered from abdominal cavity injuries during a five-year period before the hospitalization (7). Gianom et al. described seven patients with splenic cysts of which three suffered from abdominal cavity injuries (8). In three cases the histopathological examination of the cyst showed lack of epithelial lining, which enabled to establish the diagnosis of a post-traumatic splenic pseudocyst. Wu et Kortbeek described 6 patients, which during the period between 1998 and 2004 (near Calgary) were diagnosed with splenic pseudocysts (6). All the above-mentioned patients suffered from injuries, two were unable to determine how long ago. In one case the splenic cyst was subject to spontaneous absorption during the observation period, thus, the character of the lesion remained undetermined.

Literature data mentioned single case reports of alleged splenic pseudocysts in patients denying abdominal cavity trauma (13, 15). This does not mean that these patients did not sustain an injury. One must point to the fact that the sustained injuries in case of patients with diagnosed splenic pseudocysts were not always serious, such as motor accidents (3, 5, 8, 11), fall from a horse (5), mask of the car (5) or beam (9). They were also seemingly trivial events, such as trauma during soccer (2, 4), a “body-check” during an ice-hockey game (8), a fall when exiting the bathtub (14) – which proved to be common during everyday life and theoretically harmless.

The splenic pseudocyst, as a result of a blunt abdominal cavity trauma, might be clinically symptomatic or be diagnosed in the distant future after another sustained injury. Bravo et al. described a splenic pseudocyst rupture (without accompanying bleeding) in a 25-year old male patient, following a blunt abdominal cavity injury while playing rugby (2). After surgery the patient recalled that he had sustained blunt trauma to the upper left quadrant of the abdominal cavity eight years previously, while playing soccer. Vadalà et al. described a case of a 17-year old male patient who was admitted to the hospital, due to a blunt abdominal cavity injury sustained during a motor accident (4). Abdominal computed tomography showed an image resembling a large intraparenchymal splenic hematoma. Intraoperatively, an enlarged and distorted spleen was diagnosed filled by a subcapsular cyst. The histopathological examination of the excised spleen confirmed the diagnosis of a pseudocyst. The patient had sustained a blunt abdominal cavity injury two years ago, while playing soccer.

Morgenstern in 2002 published a classification of non-parasitic splenic cysts, based on their macroscopic features (16). The above-mentioned classification divides these lesions into congenital, neoplastic, post-traumatic, and degenerative. Considering the histopathological examination the epithelial lining (squamous, transitional, mesothelial) of the cystic wall was present in all cases. In its absence one should repeat the test more thoroughly. Therefore, the author questions the value of the above-mentioned classification, which is based on the lack of epithelial wall lining. It is believed that lesions lacking epithelial lining are macroscopically similar to non-parasitic splenic cysts. According to the
author, non-parasitic cysts are in most cases congenital lesions, which develop as a consequence of the indentation of the mesothelial lining into the splenic parenchyma during intrauterine development. Injuries are attributed a minor role in their development. Lesions which are classified as post-traumatic cysts, both macroscopically and microscopically differ from typical non-parasitic cysts. They develop from large subcapsular or interstitial hematomas, which were not subject to typical cystic organization. Thus, they are not considered as primary cysts. They do not possess lining. The above-mentioned classification should be approached with skepticism and caution. This is because it was created on the basis of only 23 cases, while just three patients presented with a positive left-sided trauma history, which might be associated with cystic development. The author mentioned that these injuries were non-specific, and occurred many years ago. Thus, Morgernstern had doubts as to whether or not the patient sustained a splenic injury. Perhaps in the whole group there was not one patient who had suffered from a blunt abdominal cavity injury, and thus, the author had not found a single splenic pseudocyst, whose wall was devoid of epithelial lining.

Splenic cysts are lesions, which only sporadically might be life-threatening. Sinha et al. presented an interesting case of clinically asymptomatic, spontaneous splenic pseudocyst rupture with accompanying peritoneal cavity bleeding, which occurred 34 years after a sustained abdominal cavity injury during a motor accident (5). This is evidence that surgery in case of an asymptomatic and incidentally diagnosed lesion might prevent the occurrence of life-threatening complications in the distant future. Treatment of splenic cysts is associated with specific problems. Most patients are eligible for surgery because of the presence of symptoms (3, 5-15). Pachter et al. proposed surgical management in case the lesion exceeded 5 cm in diameter (7), due to the high risk of splenic cystic rupture. Morgernstern recommended surgical treatment in case of symptomatic cysts or those exceeding 5 cm (16). Cystic wall calcifications are not an indication for surgery, often diagnosed in case of old cysts. The intensification of pain is yet another indication for surgery (3). Sometimes one may observe spontaneous absorption of a large post-traumatic splenic pseudocyst (6).

The clinical course of these lesions is so diverse and difficult to predict, and the choice of the appropriate moment to perform surgery is not easy. Difficulties are also associated with the choice of optimal treatment and above all, with the implementation of the procedure, which will provide radical excision of the cysts and lack of recurrence in the future, and at the same time leave the largest possible healthy parenchymal fragment of the spleen. Surgery in case of an incidentally diagnosed asymptomatic cyst seems to be justified even when suspecting the malignant nature of the lesion.

In the past, splenectomy was the method of choice, considering treatment of various splenic lesions, including true (primary) cysts and pseudocysts (2, 3, 6, 8, 16). The understanding of the function of the spleen in the immune system and increasing knowledge concerning early and distant splenectomy complications, especially septic, such as overwhelming post-splenectomy infection (OPSI), which occurs in 0.2-0.5% of patients resulted in the withdrawal from splenectomy in favor of organ-sparing operations (2, 6, 8). Considering treatment of primary splenic cysts and pseudocysts, such procedures as percutaneous drainage, alcohol injections, classical and laparoscopic fenestrations, excision of a large fragment of the cyst, cystectomy, and partial splenectomy were introduced (2, 5-10, 13-16). Percutaneous drainage of the post-traumatic splenic pseudocyst is connected with the high probability of recurrence and possible damage to surrounding organs (6). Wu et Kortbeek presented a case of colon damage complicated by splenic abscess and patient death, due to sepsis (6). Morgernstern performed one drainage procedure and one alcohol injection (16). In both cases cystic recurrence was observed, which required splenectomy. Laparoscopic fenestration might prove to be an effective method, the procedure being quite simple, especially in case of a superficial and anterior cyst (8, 15). The operation is burdened with the possibility of recurrence (6, 8). The above-mentioned procedure may also be performed by means of laparotomy (10).

McColl et al., in order to prevent recurrence of primary and pseudocysts established a method consisting in the laparoscopic marsupialization of cysts, cavity lining with Surgicel, and omentopexy (9). They applied the method in two female patients: one with a post-trau-
matic splenic pseudocyst, and one with a primary cyst. During the 25-month observation period recurrence was not observed. We performed a similar operation in our center, considering a patient with a primary epithelial cyst and observed recurrence after two months. Morgenstern in three patients performed nearly complete cystectomy only leaving the fragment connected to the splenic parenchyma (16). Advantages of this method include easy and quick implementation and less blood loss. In one case recurrence was observed and the patient underwent splenectomy. It is also possible to excise the pseudocyst maintaining the remaining part of the spleen (2, 5, 13, 16). According to Morgenstern the use of the above-mentioned method enables not to leave any fragments of the cyst (16). None of the patients subject to the method presented cystic recurrence.

In case of non-parasitic splenic cysts partial splenectomy enables to maintain a fragment of the splenic parenchyma (7, 8, 14). This procedure is possible even in case of cysts located entirely in the parenchyma (8). The above-mentioned procedure is favored by the segmental structure of the organ and separate vascularization of each segment, with collateral circulation in-between (8). Partial splenectomy has become technically easier with the introduction of novel surgical tools, such as the harmonic knife, argon coagulation, staplers or hemostatic materials-fibrin glue, oxidized cellulose, and absorbable reticulae (8, 17). In case the pseudocyst occupies nearly the entire spleen, splenectomy is the method of choice (3, 4, 5, 11, 12, 13). The above-mentioned procedure is performed in case of recurrence after treatment (16). It should also be performed when suspecting a splenic cyst of neoplastic etiology.

**SUMMARY**

Post-traumatic splenic pseudocysts are rarely diagnosed. The true frequency of their occurrence is difficult to determine, since it is not known what percentage is asymptomatic (6). The increased number of diagnosed splenic pseudocysts in recent years might result from the more widespread non-operative management of splenic injuries, and routine use of computed tomography and abdominal ultrasound, especially in patients with non-specific abdominal cavity symptoms (4, 6, 7). Surgical treatment of splenic cysts is not associated with mortality. However, it is not easy and free of complications.

**CONCLUSIONS**

1. Definitive diagnosis of a splenic pseudocyst is established only in some patients with a history of abdominal trauma and presence of cystic lesions in the spleen. Diagnosis of a splenic pseudocyst is based on the histopathological examinations, which show that the cyst is devoid of epithelial lining.

2. Diagnostic imaging examinations performed in patients due to blunt abdominal traumas or abdominal pain help identify lesions, which prove to be not only post-traumatic splenic pseudocysts, but also lesions of a different nature, which might have been present before the injury, or post-traumatic splenic hematomas.

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