Ultrasound findings in the omental bursa: a short pictorial essay

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Abstract The omental bursa is a complex and important anatomical region. It serves as a barrier to block pathological processes, but it is also a channel for disease spread in the abdominal cavity. It is a large recess of the peritoneal cavity formed by a double-layered fold of serous peritoneum situated inferiorly to the liver, posteriorly to the lesser omentum and the stomach and anteriorly to the pancreas. Ultrasound (US) has an important role in the study of the omental bursa, as it is generally the first examination to be performed in the presence of abdominal pain. US is inexpensive, widely available and able to identify many of the alterations that may occur in the abdomen. However, US findings are often varied and unspecific, ranging from fluid collections to diffuse infiltration. Familiarity with the various diseases that may affect the omental bursa is essential in order to be able to identify them during US examination of the abdomen. US imaging is useful in the follow-up after treatment and to guide *drainage* of fluid collections.

Keywords Omental bursa · Epiploic retrocavity · Ultrasound

Riassunto La borsa omentale è una regione anatomica complessa e importante; funge da barriera per contenere processi patologici, ma anche da via per la diffusione di

malattie nella cavità addominale. Essa è un ampio recesso della cavità peritoneale, costituito da una riflessione a doppio strato di sierosa peritoneale, localizzato al di sotto del fegato, posteriormente al piccolo omento e allo stomaco e anteriormente al pancreas. L'ecografia può avere un ruolo importante nello studio della retrocavità degli epiploon, essendo spesso il primo esame in presenza di dolore addominale, relativamente poco costoso, facilmente accessibile e in grado di identificare molte delle alterazioni che possono manifestarsi in tale sede, anche se spesso con segni piuttosto vari e non specifici, che vanno dalla raccolta liquida alla diffusa infiltrazione. La conoscenza delle diverse patologie della retrocavità degli epiploon è fondamentale per il loro riconoscimento durante lo studio ecografico dell'addome; l'ecografia può poi essere usata nel follow-up e come guida per il drenaggio di raccolte.

Introduction

The omental bursa (also referred to as the omental retrocavity) is a complex and important anatomical region. It serves as a barrier to block pathological processes, but it is also a channel for disease spread in the abdominal cavity. The omentum is often involved in infectious, inflammatory and neoplastic processes or trauma involving the surrounding organs such as liver and pancreas.

Diagnosis of the different pathological conditions of the omental bursa is difficult as clinical features and radiological characteristics are unspecific. The physician must therefore be thoroughly familiar with the anatomy of this region, the various diseases that may affect it and their characteristics in order to make an accurate diagnosis and start an appropriate treatment [1].

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Table 1 Topographical relationships between the omental bursa and the surrounding structures

Omental bursa	Surrounding structures
Anterior side	Bounded by the posterior gastric wall
Posterior side	Bounded by the posterior parietal peritoneum
Superior margin	Located between the esophagus and the venous ligament of the liver
Inferior margin	Bounded the transverse mesocolon
Right margin	Bounded by the peritoneum between the pancreas and the duodenum, where the foramen of Winslow is located; through this foramen the omental bursa communicates with the greater sac
Left margin	Starts from the left end of the root of the transverse mesocolon, where the lienal recess is located; it is bounded anteriorly by the gastrolial ligament and posteriorly by the posterior lienal ligament

Normal anatomy

The omental bursa is a large recess of the peritoneal cavity, formed by a double-layered fold of serous peritoneum located inferiorly to the liver, posteriorly to the lesser omentum and the stomach and anteriorly to the pancreas [2]. It originates from the dorsal mesentery, which connects the stomach to the posterior abdominal wall during embryonic life [3]. In the developing embryo, the stomach undergoes its first 90° rotation along the axis of the embryo, moving the posterior structures to the left and the structures anterior to the stomach to the right. As a result, the dorsal mesentery folds back on itself, forming a cavity with its blind end on the left side of the embryo. During a second 90° rotation of the stomach, this time in the frontal plane, those structures which were originally to the left of the stomach are moved inferiorly, and those structures which were originally to the right of the stomach are moved superiorly. The blind end of the omental bursa, formed by the dorsal mesentery, is thus moved inferiorly where it finds its final position.

The omental bursa includes a main cavity (situated posteriorly to the stomach) and three recesses: the superior omental recess (between the caudate lobe of the liver and the front part of the diaphragm), the inferior omental recess (lying between the anterior and posterior layers of the *greater omentum*) and the lienal recess (near the spleen). The omental bursa communicates with the large peritoneal cavity through a foramen measuring 2–3 cm, referred to as the epiploic foramen or the foramen of Winslow. It is bounded by different portions of the hepatoduodenal ligament (a ligament which is part of the lesser omentum). On the right, the epiploic foramen is in continuity with the peritoneum of the greater sac. On the left, after the

foramen, the vestibule of the omental bursa leads to a narrow duct referred to as the *isthmus* of the *bursa omentalis*, which in turn leads into the omental bursa (Table 1).

Ultrasound (US)

Computed tomography (CT) is no doubt the imaging method of choice in the study of the omental bursa thanks to the panoramic field of view. Also magnetic resonance imaging (MRI) is a valuable tool because of the high contrast resolution, but the elevated costs and the reduced availability on the territory restrict its use. US has an important role in the study of the omental bursa, as this diagnostic method is generally employed as a first-line examination in the presence of abdominal pain. US is inexpensive, widely available and able to identify numerous changes that may occur in the abdomen [4], thereby helping the physician to decide on an appropriate management.

Like most other US examinations of the upper abdomen, also the study of the omental bursa requires the patient to fast for several hours. An adequate bowel preparation may furthermore be useful to reduce bloating.

US study of the omental bursa and the peritoneum in general is carried out with the patient in the supine position using a standard low-frequency convex probe (3.5–5 MHz). Also the organs surrounding the omental bursa should be evaluated. The field of view is adjusted so that the full depth of the abdominal cavity is included in the image. Some dynamic maneuvers may be useful during the examination, e.g. the patient may be asked to change the position, and/or the area of interest may be gently compressed using the probe.

Under physiological conditions the omental bursa is poorly visualized, both because it is situated deeply in the abdomen and because the cavity is merely a potential one containing only a small amount of liquid, which acts as a lubricant. However, the omental bursa may become clearly visible in the presence of disease.

The pathological conditions of the omentum are varied, and findings may range from fluid collection to widespread infiltration. Ascites (regardless of the cause), pancreatic necrosis during and after acute pancreatitis, chronic pancreatitis, surgery involving the pancreas or trauma may cause peripancreatic fluid collections. The omental bursa may therefore present noninflammatory or inflammatory fluid collections in different phases, pancreatic pseudocysts and hematoma [5].

In the presence of ascites, the omental bursa is enlarged due to fluid collections and may appear hypo-anechoic with an echoic wall of variable thickness depending on the fat

Fig. 1 US image shows the omental bursa which is enlarged due to ascites. In the presence of ascites, the omental bursa may appear as a moderately echoic complex containing anechoic ascitic fluid (a).

Contrast-enhanced CT image in the axial plane obtained in the same patient showing the presence of hypodense liquid which enlarges the omental bursa situated anteriorly to the pancreas (b)

Fig. 2 US image shows the omental bursa enlarged by a newly formed hematoma which appears anechoic with corpuscular material (a); the walls of the omental bursa appear thickened and hypervascularized (b, c)

contents (Fig. 1). US sometimes allows differentiation between ascites (anechoic), newly formed blood collections (anechoic with corpuscular material) (Fig. 2) and organized hematoma (Fig. 3). It should be kept in mind that organized hematoma may also appear as a heterogeneous mass containing cystic areas with septa and debris deposits. Neoplastic ascites may be associated with solid nodules of

peritoneal carcinomatosis. Also carcinomatous infiltration of the omental fat may be associated with nodules or hypoechoic masses with irregular margins (Fig. 4).

US imaging can also be used as a guiding tool for diagnostic and therapeutic paracentesis as it allows evaluation of the volume of drained fluid. US can furthermore detect fatty omentum, which is seen in obesity, Cushing's

Fig. 3 US image shows the omental bursa with organized hematoma which appears as a heterogeneous mass containing small cystic areas (a) anterior to the pancreas and the portal vein (P.v.). Contrast-

enhanced CT image in the axial plane showing a large inhomogeneously hypodense mass with small calcifications developing in the omental bursa (b)

Fig. 4 Pancreatic lymphoma involving the omental bursa. US shows infiltration of the omental fat: hypoechoic nodules with irregular margins invading the deep portion of the omental bursa (arrows) (P.v. portal vein)

syndrome and during long-term steroid treatment. However, also fatty omentum is an unspecific finding, as this condition may be associated with inflammation, cancer or trauma involving the omentum [6].

Conclusions

The US operator carrying out an abdominal US examination should take the possible involvement of the omental bursa into consideration and be able to identify the different pathologies affecting it; however, a specific CT or MRI study of this region is usually required. US is also

useful for *US-guided biopsy and drainage* of fluid collections and in the follow-up after treatment in order to eliminate or minimize radiation exposure in connection with CT examinations.

Conflict of interest S. Alessi, C. Bortolotto and L. Carone declare that they have no conflict of interest related to this article.

Informed consent No patient information was included in this study. However, the authors have the patients' consent to the publication of images that could potentially lead to their identification.

Human and animal studies In connection with this article, the authors did not carry out any procedures involving humans or animals.

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