Infaction and idiopathic inflammation of intraperitoneal fat. Implications of diagnostic imaging of the acute abdomen

van Breda Vriesman, A.C.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
CHAPTER I

General introduction
Background

The term “acute abdomen” defines a pathologic abdominal condition mainly characterized by severe abdominal pain of less than one week duration, requiring the clinician to make an urgent therapeutic decision (1). This may be a challenging task, as the differential diagnosis of acute abdominal pain includes an enormous spectrum of disorders, ranging from life-threatening diseases to benign self-limiting conditions (2). The indicated management may vary from emergency surgery, e.g. in a patient with a ruptured abdominal aortic aneurysm, to reassurance of a patient with abdominal pain from gastroenteritis. Clinical misjudgement of serious conditions may result in increased morbidity and mortality, if the necessary surgery or medical treatment is delayed. On the other hand, misdiagnosis in a patient with a nonsurgical or a self-limiting disease may lead to an unwarranted laparotomy, unnecessary medical treatment or hospitalisation. A timely and accurate diagnosis is essential to avoid these unfortunate consequences (2).

Clinical assessment of patients with acute abdominal pain can be notoriously difficult, because the history, physical examination and laboratory findings in these patients are often nonspecific and nondiagnostic. Various acute abdominal conditions may present with identical findings at clinical presentation; while self-limiting diseases may simulate surgical emergencies, inversely, surgical conditions may occasionally mimic a benign illness. An accurate clinical diagnosis can be made in only about 50% of patients with acute abdominal pain (3).

In search of means to increase the diagnostic accuracy in patients with acute abdominal pain, ultrasonography (US) and computed tomography (CT) have proven to be useful and cost-effective tools, enabling a rapid triage of patients towards optimal therapy (2-5). With US or CT, a clinically presumed diagnosis can both be confirmed or excluded, and the full extent of the disease and the presence or absence of possible complications can be established. Furthermore, follow-up US or CT enables a close monitor of disease activity, allowing the natural course of a disease to be followed. Today, in many hospitals US and CT are routinely used in the evaluation of patients with abdominal pain of unknown cause.

This increased use of abdominal US and CT has brought new insights concerning the incidence and nature of several disorders that were rarely diagnosed in the era before modern imaging (5). In former days, these disorders would typically be diagnosed only if an exploratory laparotomy would be performed, and as a result their true frequency and natural history were not known. Now, due to modern diagnostic imaging, these dis-
Fig. 1 The greater omentum, and abdominal viscera (from Ref. 6).
Fig. 2 Ventral abdominal view at obduction. The omentum, an epiploic appendix (appendage), and viscera.
eases are more frequently encountered, and it has become possible to estimate their incidence and assess their clinical characteristics. Prominent examples of these ‘rediscovered’ diseases are omental infarction, epiploic appendagitis, and mesenteric panniculitis. These disorders further have in common that all three comprise an aseptic inflammation of intraperitoneal fat, due to infarction or idiopathic, with an imaging diagnosis that is essentially based on the detection of inflamed fat without any primary intestinal inflammatory focus (such as the appendix or a colonic diverticulum).

Anatomy

The omentum, epiploic appendices, and the mesentery are all composed of peritoneum, and represent the three main sites of fat deposition within the peritoneal cavity.

Omentum

The greater omentum is a large peritoneal fold, hanging down from the greater curvature of the stomach sometimes as low as the pelvis, lying in front of the intestines (Fig 1, 2) (6). The posterior aspect of the omentum is attached to the transverse colon. The omentum is composed of a double sheet of peritoneum, which is partly folded on itself to make four layers (Fig 3). It contains gastro-epiploic vessels, lymphatics, and adipose tissue which may be massive in amount in obese individuals.

The omentum serves mainly as a fat storage, for energy consumption during periods of malnourishment. Furthermore, it appears to have an ability to move toward areas of inflammation or perforation of the intestinal tract. By taking part in the inflammatory process, it helps to seal off and limit intra-abdominal disease. Because of this remarkable property, the omentum has once been nicknamed 'policeman of the abdomen' (7).

Epiploic appendices

Epiploic appendices are small pedunculated pouches of visceral peritoneum filled with fat, protruding from the external surface of the colon into the peritoneal cavity (Fig 2, 4, 5) (6). Most are about 1-2 cm thick and 2-5 cm long, and normally approximately 50-100 epiploic appendices are present, distributed from the rectosigmoid junction to the
Lesser omentum in fissure for ligamentum venosum

Caudate lobe of liver

Lesser omentum

Epiploic foramen

Hepatic artery

Neck of pancreas

Stomach

Uncinate process of head of pancreas

Duodenum, horizontal part

Transverse mesocolon adherent to posterior layers of greater omentum

Transverse colon

Mesentery

Greater omentum

Fig. 3 Diagrammatic median sagittal section of the abdomen.
Fig. 4 Epiploic appendices, the mesentery, and abdominal viscera (from Ref. 6).
Fig. 5 Normal epiploic appendices, on a resected part of the colon.
Introduction

Each epiploic appendix is supplied by one or two small endarteries branching from the vasa recta longa of the colon, and is drained by a vein twisting around the artery, both passing through its narrow pedicle (8).

Epiploic appendices are absent in many animal species, including dogs and cats, and their exact function is unknown. Similar to the omentum, they mainly serve as a fat storage, however, it has been been postulated that epiploic appendices might also act as protective cushions for the large intestine, facilitating bowel peristaltis. They probably also provide some local defense against inflammation, similar to the protective actions of the omentum (8).

Mesentery

The mesentery is a fan-shaped, double peritoneal fold that suspends ileal and jejunal small bowel loops from the posterior abdominal wall (Fig 3, 4) (6). It contains fatty tissue, nerves, vascular and lymphatic structures, and encases the bowel loops that it supports, forming the visceral peritoneal coat.

Pathology

Omental infarction

Bush, in 1896, was the first to describe infarction of the greater omentum (9). Omental infarction can be caused by mechanical torsion of an omental segment, or it may be primary idiopathic, i.e. without known etiology, occurring spontaneously. Because omental infarction is primarily venous and characteristically right-sided, it has been suggested that some anatomical malformation involving the right portion of the omental venous drainage may predispose to kinking and thrombus formation (10).

Various authors have attempted to differentiate omental torsion from idiopathic segmental infarction, implying a different pathological concept, but these disorders are now considered to be variants of the same disease (7). In either case, obstruction or thrombosis of the omental venous drainage results in congestion with hemorrhagic extravasation, fat necrosis, and a secondary inflammatory response (7,10).
**Epiploic appendagitis**

The pathological significance of epiploic appendices was first described by Virchow, in 1863 (11). He rightly suggested that a loose foreign body, which he had found in the peritoneal cavity at autopsy, was a calcified and detached epiploic appendix, representing the sequela of infarction. In 1908, the first description of a surgically proven case of an infarcted epiploic appendix appeared in the English literature, by Briggs (11).

Infarction may occur when an epiploic appendix twists along its narrow pedicle, strangulating its own blood supply. Although the actual twist of an epiploic appendix has been demonstrated at surgery in only a minority of cases (31%), and infarction may also occur due to spontaneous venous thrombosis, it is generally accepted that torsion or kinking of the pedicle is the most important cause of infarction (12).

After the blood supply of an epiploic appendix has been compromised, a cascade of events takes place similar to that in omental infarction; leading from venous congestion, hemorrhage and necrosis, to secondary inflammatory changes (12). In view of this secondary inflammation, and in order to avoid confusion with appendicitis, infarction of an epiploic appendix has been renamed 'epiploic appendagitis'. In a later phase, necrotic tissue is replaced by fibrosis and calcification, and the infarcted epiploic appendix may detach forming an intraperitoneal loose body mentioned above, which some have compared to a 'hard boiled egg' (13) or referred to as a 'peritoneal mouse' (14).

**Mesenteric panniculitis**

Mesenteric panniculitis is a relatively new entity, first described by Ogden in 1960 (15). It is defined as a nonspecific aseptic inflammation of the adipose tissue of the mesentery, and its exact cause is unknown. It has been suggested that mesenteric panniculitis probably does not represent one specific disease, but rather the result of injury to the mesenteric fat which may be inflicted in various ways (16). In this respect it may somewhat be compared to retroperitoneal fibrosis, which may also occur as a response to various primary causes.

In rare instances the inflammation in mesenteric panniculitis may proceed to fibrosis with retraction of the mesenteric fat, which is then termed fibrosing −, sclerosing −, or retractile mesenteritis.
The objectives of this thesis are

- To assess the clinical features of omental infarction and epiploic appendagitis, and to determine their natural history.
- To report diagnostic imaging findings of omental infarction and epiploic appendagitis, and to provide an imaging-based differential diagnosis.
- To assess clinical findings in patients with mesenteric panniculitis while reporting its US and CT features, and to record possible associated conditions.
- To evaluate the use of US with complementary CT in patients with presumed appendicitis.

Outline of the thesis

In chapter 2 the clinical characteristics and natural history of omental infarction and epiploic appendagitis are studied. This chapter also provides a literature-based review of the US and CT features of both disorders. In chapter 3 a general review of omental infarction and epiploic appendagitis is presented. Chapter 4 provides an imaging based differential diagnosis of omental infarction and epiploic appendagitis. A characteristic imaging sign of epiploic appendagitis is presented in chapter 5. Chapter 6 comprises two case reports; part A reporting an imaging pitfall, due to an old and new infarction of an epiploic appendix, and part B reporting the features of epiploic appendagitis at MR. In chapter 7 the clinical findings and natural course of epiploic appendagitis are studied, from a patient group much larger than in chapter 2. In chapter 8 clinical findings in patients with US and CT features of mesenteric panniculitis are evaluated, and possible associated diseases are recorded.

Right-sided epiploic appendagitis or omental infarction clinically often simulates appendicitis. In chapter 9 the value of routine diagnostic imaging in patients clinically suspected of having appendicitis is investigated, using a tandem US and CT technique.

Chapter 10 presents the summary and conclusions.

References