Review

Clinical and radiological features of mesenteric panniculitis: a critical overview

Giuseppe Buragina[1], Alberto Magenta Biasina[2], Gianpaolo Carrafiello[2]
[1]Postgraduate School of Radiology, University of Milan, Milan, Italy; [2]Department of Radiology, San Paolo Hospital, Milan, Italy

Summary. The mesenteric panniculitis is a rare form of inflammation that mainly involves the mesenteric adipose tissue. The etiology remains unknown and the disease has been associated with various conditions such as cancer, abdominal trauma, previous surgery, autoimmune diseases and obesity. Mesenteric panniculitis can be divided into two main groups: the mesenteric panniculitis with only the inflammation and degeneration of the mesenteric fat, and the retractile panniculitis, mainly fibrotic, with retraction of the surrounding structures. From a radiological point of view, there are two main signs: the fat ring sign, which is the presence of normal fat around vessels and lymph nodes, and the pseudocapsula around the lesion. In this paper, we present the imaging and clinical features of mesenteric panniculits with particular reference to the differential diagnosis and the possible etiological associations. (www.actabiomedica.it)

Key words: mesenteric panniculitis, CT, MRI, chronic inflammation of the mesentery

Introduction

The mesenteric panniculitis is a rare and chronic inflammatory disease which involves primarly the mesentery and rarely other sites like omentum and mesocolon. The etiology of the disease remains understood but it recurs in association with various conditions like abdominal surgery, mesenteric ischemia, trauma, obesity, abdominal and extra-abdominal cancer and abdominal inflammatory disease. The disease is often asymptomatic but it may produce symptoms like abdominal pain, constipation or diarrhoea, and dyspepsia. Sometimes it appears as an abdominal mass and may produce bowel obstruction or ischemia, requiring urgent surgery. The two main form of mesenteric panniculitis are: the classical type with inflammation, necrosis and degeneration of fat, and the retractile panniculitis with a prominent fibrosis of mesentery with rectraction of the surrounding structures. The diagnosis is mainly radiological, and the computed tomography (CT) and magnetic resonance imaging (MRI)

are the most useful methods to detect the disease. To assess the diagnosis, in general, the radiologist must consider some morphological manifestations like the presence of a circumscribed mass in mesentery with a fibrotic pseudocapsule, vessels and lymph nodes inside the mass and a preserving rim of fat around them, the so-called fat ring sign. However, the mass with a prominent fibrotic component with o without retraction of the surrounding structures may appear as a solid mass.

In this paper, we aim to review the clinical and radiological manifestations of the disease on the basis of our direct experience and the literature data. Indeed, we want to present some ideas on the etiology of this disease.

Clinical manifestations and associated disorders

The mesenteric panniculitis is a non specific inflammatory process of mesentery which produces

degeneration, necrosis and fibrotic proliferation of mesenteric fat (1). The mesenteric panniculitis rarely involves the omentum, the peritoneum of the large intestine, the retroperitoneal and pelvic fat (2). It is more common in men, with a male-to-female ratio of 2-3:1, and it is more common in Caucasian men (3). The disease is more frequent between the 6th and 7th decades of life (4), but some pediatric cases were described (5). The mesenteric panniculitis is a rare disease and the prevalence reported in the scientific literature ranges between 0,16-3,3% (6).

The mesenteric panniculitis is usually asymptomatic and when symptomatic, the clinical manifestations are not specific, depending on the size and location of the mass and its relationship with the bowel, vessels and lymphatics (7). However, the mesenteric panniculitis may be the cause of abdominal pain, nausea, vomiting, diarrhoea, constipation, fever, weight loss, chylous ascites (8). In a recent clinical study, the major complaint was abdominal pain, which was present in the 72% of patients with mesenteric panniculitis. Other mesenteric panniculitis related symptoms were nausea and vomiting and diarrhoea (9). Akram et al. reported in a case series of 92 patients that the most common symptoms were abdominal pain (70%), bloating and distention (26%), diarrhoea (25%) and weight loss (23%). Only 10% were asymptomatic at the time of diagnosis (10). In a study of Nyberg et al. 5 of the 27 patients were asymptomatic, 13 had symptoms without signs of systemic inflammation, five were symptomatic with signs of systemic inflammation and four had severe disease with multiple hospitalisation, chronic, refractory or complicated disease. However, the 4 patients with high clinical score had a concomitant chronic disease (Bechet's, Crohn's, psoriasis arthritis and hereditary spastic paraparesis) and for 3 of them, the concomitant disease caused the major morbidity. In the same study the abdominal pain was reported by 21 patients and was the most common symptom. Six patients specifically reported symptoms at night and symptoms related to body posture. In addition, nausea, weight loss, flatulence and diarrhoea were reported. Tenderness in the left hypochondrium and sometimes a tender palpable mass were described. Most symptomatic patients had chronic discomfort but some patients had acute episodes with intense pain (11).

In mesenteric panniculitis patients, the blood tests results are often normal. The erythrocyte sedimentation rate and C-reactive protein level may be elevated in response to the inflammatory state and may serve as markers of response to medical therapy (8). The course of the disease is usually benign but sometimes the mesenteric panniculitis may be the cause of bowel perforation, bowel occlusion (small bowel obstruction was present in 24% of patients in the study of Akram et alt.), bowel ischemia and renal failure due to ureteral stenosis and may be therefore a potentially lethal disease requiring urgent medical or surgical treatment (10, 12, 13). The correct evaluation of the symptomatology, therefore, appears to be a fundamental step in the clinical and therapeutic framework of this disease to identify the most critical situations.

The mesenteric panniculitis is a disease with an understood etiology but, in the scientific literature, it was associated with various conditions such as mesenteric thrombosis, mesenteric arteriopathy, autoimmune disease, such as IgG4 related disease, pancreatitis, urinary system diasease and infection (14, 15). Other factors, such as urinary gallstones, abdominal aortic aneurysm, prior abdominal trauma, peptic ulcer, or chylous ascites, have also been linked to this disease (16).

However, the most common conditions associated with mesenteric panniculitis are the abdominal surgery and cancer (3). The most common types of cancer associated with mesenteric pannicultis are the abdominal lymphoma, melanoma, colon carcinoma and prostate cancer (3, 17). Various studies have attempted to understand the correlation between mesenteric panniculitis and cancer. In particular, a possible paraneoplastic nature of mesenteric panniculitis was assessed, but this association is widely discussed. In an analysis by Gögebakan Ö et al., the authors rejected the hypothesis of a paraneoplastic etiology of the disease (18). Buchwald carried out a cohort study in which no statistically significant association was found between the course of mesenteric panniculitis and cancer, considering the pathology as an epiphenomenon and not as a true paraneoplastic event. In fact, one of the reasons why CT and MRI are most frequently required is neoplastic disease, which could explain the high incidence of mesenteritis in cancer patients (19). However, in the Van Puttie study, a significantly higher prevalence of

neoplastic disease was found in patients with mesenteric panniculitis (20). The same authors reported an increase in the prevalence and risk of future cancer during a 5-year follow-up (20), while Scheer described a five-fold higher risk of malignancy in the presence of mesenteric panniculitis (21). It has also been proposed that mesenteric panniculitis may be caused by the ischemic or inflammatory effect of chemotherapy (22). Among tumors, is interesting the association with lymphomas. Various authors have hemphasized the correlation between abdominal lymphomas, which is the most frequent neoplasia with an intraperitoneal and extraperitoneal localization, and the mesenteric panniculitis. In a study of Khasminsky et al., the authors, on a total of 166 patients who were diagnosed with non-Hodgkin lymphoma over a period of 5 years, found a prevalence of mesenteric panniculitis among patients with lymphoma of 1.8%, which corresponds to the range of its prevalence in the general population (23). However, Coulier B. et al. reported that the abdominal lymphoma occurs in the 15,1% of patients with a history of cancer while in the experience of Daskalogiannaki M. et al. the association between mesenteric panniculitis and lymphoma was found in 25 of 88 patients. Interesting, Fatahi Bandpey et al. reported that 16 (33%) of the 48 analyzed patients with abdominal lymphoma showed mesenteric panniculitis: 7 of them (43.75%) at the time of diagnosis and the remaining 9 patients (56.25%) later. Of the 9 patients who developed mesenteric panniculitis during the disease evolution, R-CHOP (55.55%) and ABVD (33.33%) were the most frequent regimens associated with the onset of the diasease. Of the 7 patients with the mesenteric panniculitis at the diagnosis, the follicular non-Hodgkin lymphoma (42.9%), and the Hodgkin lymphoma (28.6%) were the most common lymphoma types associated with the mesenteric panniculitis (4, 15, 24).

The most common surgical treatments associated with mesenteric panniculitis are the cholecystectomy, appendicectomy, hysterectomy and colectomy (25). Emory reported a series in which 84% of patients had a history of trauma or abdominal surgery (8). Durst et al. stated that the recent surgery was related to 17% of its cases, constituting a predisposing factor (25, 26). In recent reports the mesenteric panniculitis was observed in patients treated with bariatric surgery. In these patients the mesenteric panniculitis was observed after surgery and the disease may be considered a truly surgical complication (27, 28).

In addition, Mahafza et al. reported a prior history of abdominal surgery in 44 (49%) of the 90 patients with MP of whom 9 (10%) had more than one abdomino-pelvic surgery. The prevalence of the disease in patients with a history of previous abdominal surgery was 9.2% (44/476) while it was of 1.1% (46/4282) in patients without prior abdomino-pelvic surgery, a statistically highly significant difference (p=0.0001) (29).

In our clinical experience, the mesenteric panniculitis was associated with abdominal cancer, mainly lymphoma, colon cancer and genito-urinary system cancer, abdominal surgery, urinary lithiasis and abdominal inflammatory conditions, like reported in literature.

At this point it is interesting to discuss these possible etiological correlations. The mesenteric panniculitis is a chronic inflammatory disease of the mesentery whose cause is little known today. If it is true that mesenteric panniculitis is occasionally diagnosed with radiological methods and that most radiological computed tomography and magnetic resonance examinations of the abdomen are carried out in patients with a history of cancer or abdominal surgery, for which mesenteric panniculitis could be a simple epiphenomenon without any etiological correlation with the aforementioned conditions, it is also true that mesenteric panniculitis is rarely diagnosed in patients who have not a known pathology causing mesenteric inflammation. In fact, it is reasonable to think that benign or malignant conditions such as neoplasms, abdominal surgery, inflammatory processes of the abdomen, can cause a chronic fibro-inflammation of the mesentery. In these cases we could speak of secondary forms of mesenteric panniculitis. This could have important repercussions in the diagnosis and treatment of the disease because abdominal symptoms secondary to chemotherapy, radiotherapy, abdominal surgery or abdominal inflammatory process could still suspect an underlying mesenteric panniculitis, as a subacute or late manifestation or complication. This reasoning does not arise only from the experience of the authors but also from the
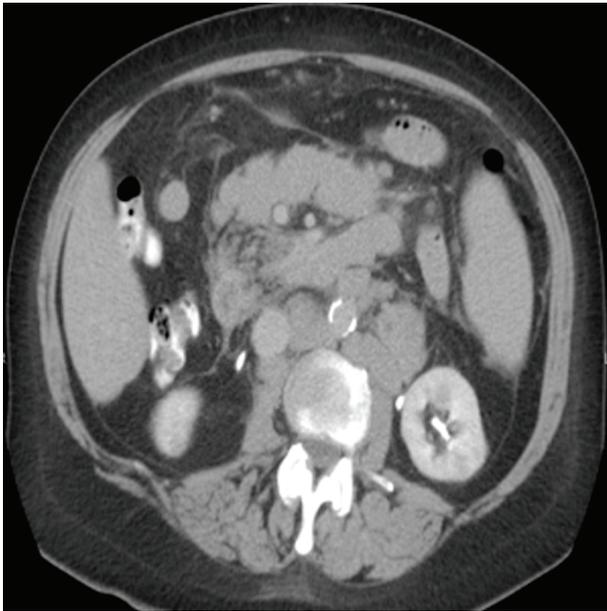
Figure 1. A case of abdominal lymphoma. The CT image shows multiple, large bulky masses in the abdomen due to coalescent lymph nodes
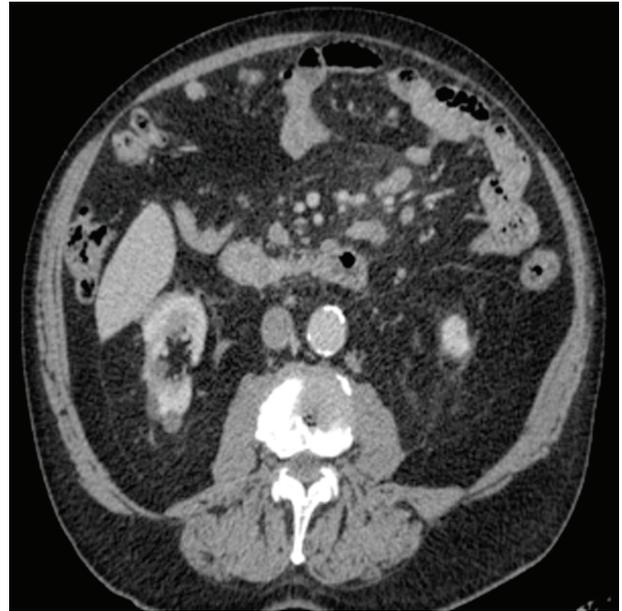
Figure 2. In the same patient of figure 1, the CT shows the presence of a mesenteric mass after the treatment for lymphoma. The lesion was stable at subsequent controls and this mass could be considered a secondary mesenteric panniculitis

literature. The already exposed correlation with radio-chemotherapy in tumors could be an example such as the rapidly progressive and aggressive panniculitis forms found after bariatric surgery in two cases or the IgG4 found in the histological specimens of mesenteric panniculitis associated with IgG4 related disease (24, 27, 30, 31) (Figure 1-2).

Treatment

About the treatment, there is no consensus among the authors. The choice of treatment depends on the symptomatology. If the disease is asymptomatic, medical treatment is usually not carried out. If the disease produces abdominal symptoms, usually abdominal pain or dyspepsia, medical treatment is the first choice to reduce the symptomatology and/or to produce a regression of the disease. When the mesenteric panniculitis is complicated by intestinal obstruction, ischemia or perforation, or when the medical treatment fails, the mesenteric mass and/or the adjacent bowel may be removed. Surgery should, however, only be performed

in patients who really need it because it involves the removal of the mesenteric mass and the bowel affected by the pathological process. In fact, the surgical removal can be difficult due to the extent of the disease and the vascular obstruction of the mesenteric vessels. We must also consider the extension of the intestinal tract involved, because the removal of a long portion of small intestine can expose these patients to short bowel syndrome. Therefore, in the absence of the aforementioned requirements that make the patient eligible for surgery, the surgical approach should be limited to performing a biopsy.

Regarding the medical therapy, the most common drugs used are the tamoxifen, prednisone, colchicine, azathioprine and other immunosoppressive drugs, and thalidomide. In particular, corticosteroids have been used as first-line therapy while immunosuppressive drugs have been used as second-line therapy in cases of symptomatic recurrence or if the first line therapy failed. However, Sahin et al. reported a good clinical response in patients with mesenteric panniculitis, unrelated with other clinical conditions, treated with NSAIDs and/or antibiotics, that, in these patients,

could indicate that the mesenteric panniculitis is of infectious origin. The response of the disease to treatment and its course is usually good and the progression is rare. In the study of Akram et al., 44 symptomatic patients of the 92 considered in the study received a treatment. Treatment included medical therapy alone in 26% of patients, surgery alone (partial or complete resection of the mesenteric mass and adiacent small bowel) in 13%, surgery followed by medical therapy in 9% of patients. Ten percent responded to surgery alone, 20% responded to medicl treatment and surgery, and 38% responded to medical therapy alone. The progression of the disease was observed only in 6 patients who received only the medical therapy.

Daskalogiannaki et al. reported the radiological stability of the disease in 20 of 21 mesenteric panniculitis patients during a follow-up period between 5 months and 3 years. Of these patients, 18 had an underlying malignancy and the mesenteric panniculitis was not treated; three patients without malignancy received a medical treatment with a clinical response in two patients and intermittent symptoms persisted in the third patient but the mass remained the same on CT images. In one patients, the authors observed a slight increase in the size of the fatty mass with mild thickening of the stripe, which was interpreted as a progression of the disease. Issa et al., reported the cases of two patients with symptomatic mesenteric panniculitis treated with prednisone with complete clinical and radiological response. The study of Buchwald et al. showed that mesenteric panniculitis was stable in 80.9% of patients and regress in the 19,1% of patients on CT follow-up.

In general, the mesenteric panniculitis is often asymptomatic and it not require a treatment and remain stable. The treatment is reserved for patients who have abdominal symptoms and the response to treatment, in our opinion, must be assessed with clinical and radiological scores. The response to treatment appears to be releated with the presentation of a symptomatic mesenteric panniculitis: if the disease shows a slight abdominal symptomatology the prognosis is good as well as the clinical response to therapy whereas worst outcomes and death may occur in patients with acute abdominal complications requiring urgent surgery (3, 10, 15, 19, 25, 27, 32-35).

Imaging

The radiological features of the mesenteric panniculitis are well known in medical literature and the radiological examinations are the keys to identify the mesenteric panniculitis. In most studies, the mesenteric panniculitis has been described on CT images. The mesenteric panniculitis is usually described as a mass heterogeneous, solitary, localized mainly in the mesentery, usually left oriented, with delocalization of the small intestine and surrounding structures. The two main radiological signs are the fat ring sign, described as a ring of normal fat around vessels and lymph nodes and the pseudocapsule sign, defined as a thin, usually <3 mm, fibrotic rim around the mass. These two signs are considered the radiological hallmarks of the mesenteric panniculitis. They recur in 70%-92% and 50%-60% of the patients, respectively. The mesenteric vessels often appear engulfed and some cases of mesenteric vessels thrombosis have been described (Figure 3-4). ystic components have also been described and may be the result of lymphatic or venous obstruction as well as necrotic change (33, 36, 37). Calcifications may be present, often in the necrotic portion of the mass. The mesenteric panniculitis is a disease of the mesentery, but it may involve the pancreatic region and the porta hepatis (33), the omentum and other part of the peritoneum such as the mesocolon (38, 39).

The mesenteric panniculitis is a chronic inflammatory disease of mesentery with a variable fibrotic component that evolves from the chronic inflammation of the mesenteric fat and may produce a retraction of the surrounding structures. In this case, we should use the term of retractile panniculitis.

About this, three progressive pathological stages of mesenteric panniculitis have been proposed in literature. In the first phase the mesenteric fat undergoes a process of diffuse degeneration (lipodystrophy panniculitis), which results in an inflammatory form (mesenteric panniculitis) and finally in a fibrotic form with retraction of the intestine and surrounding structures (retractable panniculitis). However, some authors used only the term mesenteric panniculitis to indicate the degenerative-inflammatory form and the term retractable panniculitis to identify the fibrotic form complicated by retraction of the surrounding structures (8, 15). This di-
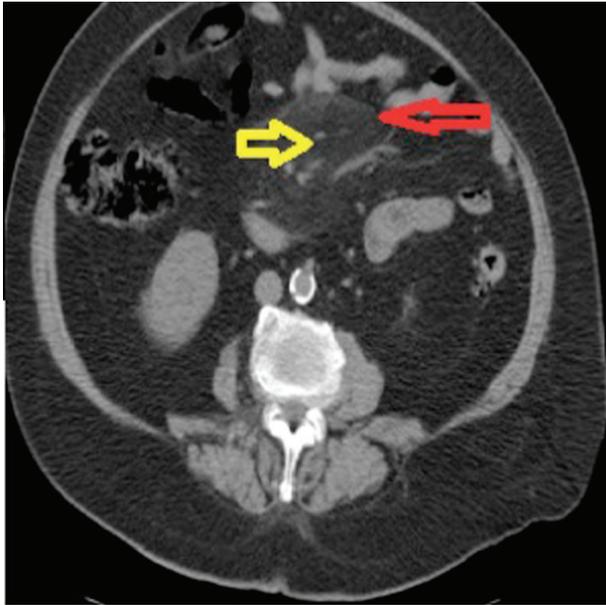
Figure 3. An axial CT image shows a mesenteric panniculitis with a fibrotic band around the mass (pseudocapsule sign/red arrow) and a rim of preserved fat around vessels and lymph nodes (the fat ring sign/yellow arrow). The mesenteric vessels are engulfed

Figure 4. The axial contrast enhanced CT image shows a large mesenteric mass with a pseudocapsule (yellow arrow), lymph nodes and vessels inside the mass and displacement of the surrounding bowel

vision is, in our opinion, very important. The retractile form may be quite different from the "classical" mesenteric panniculitis also on images. The fibrotic component may be variable and the rectractile form may have the appearence of a mass with a partial fibrotic component or a predominantly solid and fibrotic mass without the pseudocapsule and fat ring sign. The fibrotic component may also cause the infiltration of the intestinal wall and perforation of the viscera (Figure 5-6).

Indeed, in one case in literature, the mesenteric panniculitis appeared as a multiple, fibrotic masses in the peritoneal cavity, mimicking a peritoneal carcinomatosis (40).

At this point, we must remember the usefulness of imaging to identify the complications of mesenteric panniculitis. In fact, the radiological methods allow to define the extent of the disease and the possible occlusive, perforative and ischemic intestinal complications more frequently related to the fibrotic infiltration or traction. In this context, the correct radiological evaluation of the pathology and the relationships with neighboring structures is fundamental for a correct therapeutic planning.

In the medical literature the radiological features of mesenteric panniculitis are described mainly on computed tomography images. Few are the articles in which the mesenteric panniculitis is described on magnetic resonance images. In general, the intensity of the signal at MRI varies depending on the histological components and stage of the disease. The inflammatory form of mesenteric panniculitis is usually hypointense in T1 weighted images and hyperintense in T2 weighted sequences. When the fibrosis is predominant, the disease appears as a localized mass of fibrous tissue, hypointense in both T1 and T2 sequences. The pseudocapsule appears usually as a hypointense sharp around the mass. Delayed contrast enhancement is characteristic and indicates the presence of fibrous tissue (39, 41) (Figure 7-8).

In our experience the mesenteric panniculitis on MRI images appeared as a mesenteric mass hypointense in T1 and hypointense to hyperintense in T2 sequences. The pseudocapsule appeared as a hypointense fibrotic sharp around the mass. The best sequence to detect the mesenteric panniculitis was the fat saturated T2 sequences in which the mesenteric panniculitis was

Figure 5. An axial contrast enhanced CT image shows a mesenteric mass with a fibrotic portion with mild retraction of small bowel (red arrow). The mass is compatible with the retractile form of mesenteric panniculitis

Figure 6. The CT image shows a retractile panniculitis. In this case the fibrotic portion of the mass cause an important retraction on the adiacent small bowel (red arrow). The description of small bowel retraction due to fibrotic mesenteric panniculitis is the most important aspect of the disease because it can influence the prognosis and treatment of the disease in relation to the symptomatology of intestinal obstruction
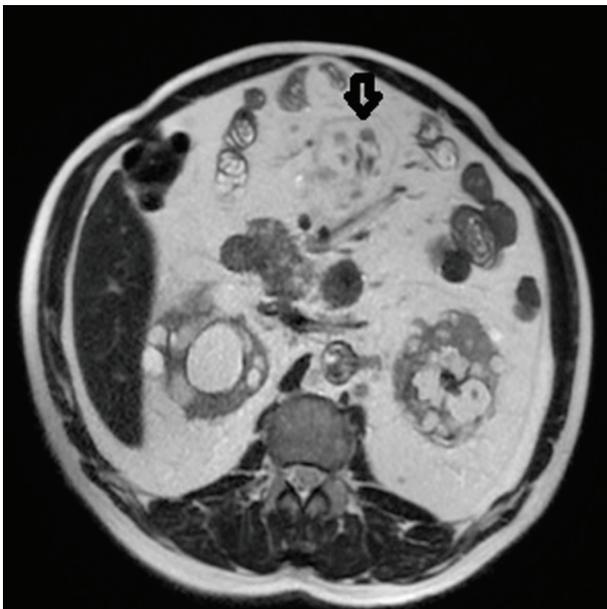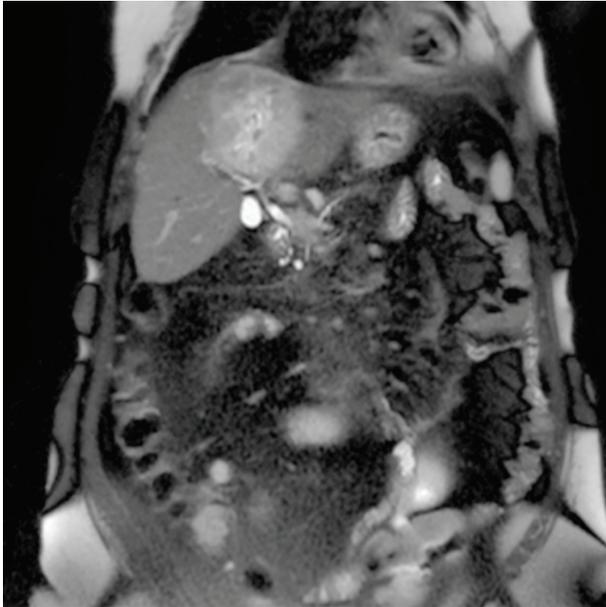

Figure 7. An axial T2 weighted image showed the presence of a mass with a hypointense pseudocapsule (black arrow). Note the enlarged lymph nodes inside the mass
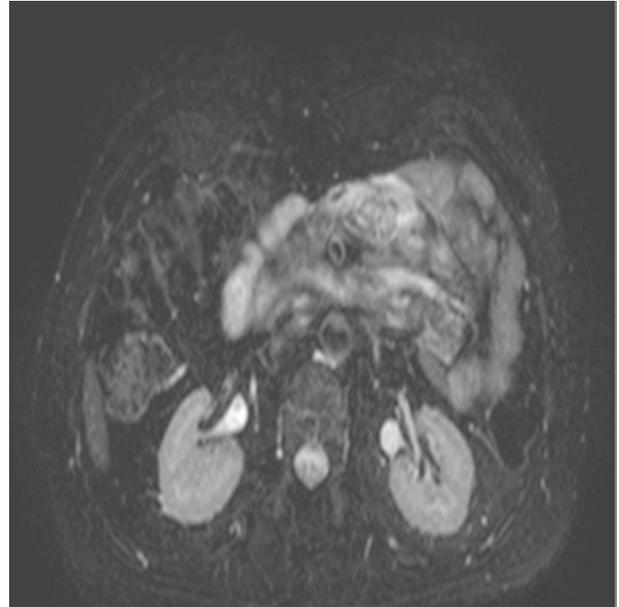

Figure 8. An axial T1 weighted image shows the presence of a hypointense mesenteric mass with the classical hypointense, fibrotic pseudocapsule around the mass (red arrow). The fat around vessels and lymhp nodes within the mass has the same intensity of the normal fat (the fat ring sign)

easily identified after the saturation of the mesenteric fat as a high signal mass (Figure 9-10). The mesenteric panniculitis did not show a significant restriction of diffusion on diffusion weighted images (DWI) and ADC

map (Figure 11-12). Although, the mesenteric mass showed a delayed enhancement after injection of gadolinium due to its predominant or partial fibrotic nature, like reported in literature (Figure 13).

Figure 9. An axial T2 fat saturated image of abdomen shows the presence of a hyperintense mesenteric mass in the root of mesentery with a pseudocapsule around the mass

Figure 10. An axial T2 fat saturated image shows the presence of a large, hyperintense mesenteric panniculitis. The solid component is preponderant and the pseudocapsule and the fat ring sign are not clearly visible in this case
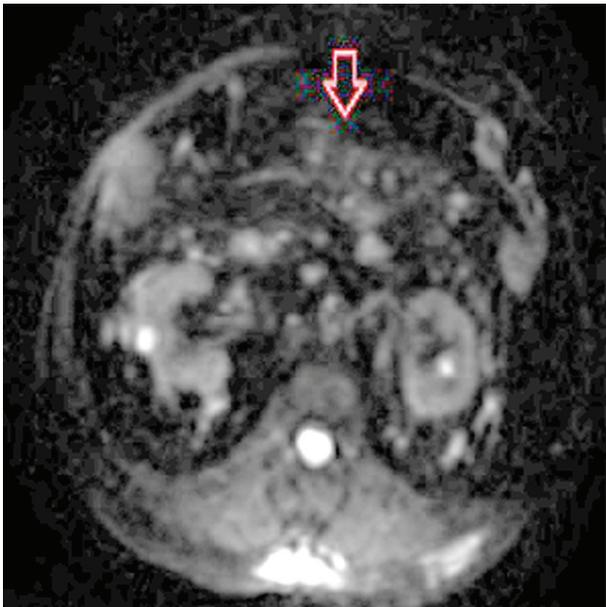
Figure 11. The mesenteric panniculitis does not show a restriction of diffusion on DWI image (red arrow)
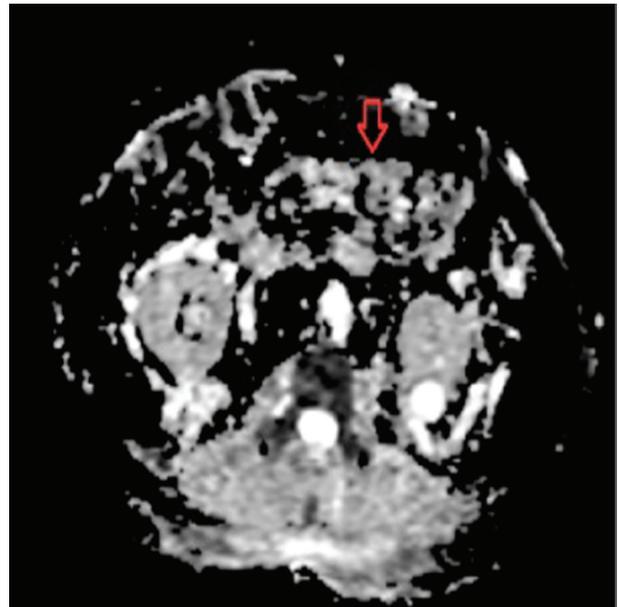
Figure 12. The ADC map in the same patient confirmed the absence of a significant restriction of diffusion (red arrows)
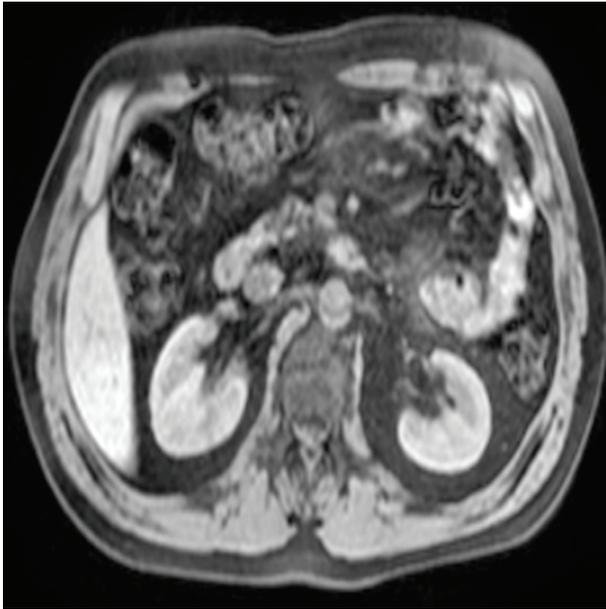
Figure 13. This axial contrast enhanced MRI image of abdomen during the late phase shows the presence of a mesenteric mass with contrast enhancement. The contrast enhancement is typically more evident in the late phase and more evident in the forms with a greater fibrotic component or in the fibrotic portions of the mass such as the pseudocapsula

Differential diagnosis

The differential diagnosis of mesenteric panniculitis includes various conditions. Mesenteric oedema, hemorrhage, lymphedema, inflammation and mesenteric neoplasia may mimick mesenteric panniculitis (37). The mesenteric oedema occurs in patients with hepatic cirrhosis, cardiac failure, renal failure, hypoproteinemia, bowel ischemia, venous thrombosis and primary or secondary tumors involving the mesentery or abdominal inflammatory disease such as pancreatitis, appendicitis and diverticulitis (37). The mesenteric oedema may be associated with subcutaneous fluid and ascites and, in these cases, the mesenteric oedema is usually related to a systemic disease. When the mesenteric oedema is associated with venous thrombosis, the oedema is usually focal and localized around the vessels occluded (42). However, it is interesting to note, that the conditions of acute inflammation could lead to chronic inflammation and chronic degeneration of the mesentery that could be considered a secondary form of mesenteric panniculitis.

The mesenteric hemorrhage is usually traumatic, iatrogenic or may be related with intraperitoneal tumor rupture. However, the differential diagnosis is not difficult because the mesenteric hemorrhage shows a density between 40-60HU and a high signal intensity in T1 weighted images.

Another disease which may mimick the mesenteric panniculitis is the peritoneal tuberculosis. The disease usually appears as a multiple nodularities of the mesenteric fat, thickening of the peritoneum with ascites and enlarged lymph nodes. However, the tuberculosis usually involves various part of the peritoneum like the omentum, spleen and liver, and the lymph nodes have a hypodense necrotic core, sometimes calcific (42, 43).

Among the tumors, the most common neoplastic process of mesentery is non Hogdkin lymphoma and 30-50% of non Hogdkin lymphoma harbouring in the mesenteric lymph nodes (44). The non Hogdkin lymphoma presents three main radiologic pattern due to coalescence of lymphomatous lymph nodes and/or mesenteric lymphomatous infiltration, which may mimick the mesenteric panniculitis: multiple, rounded, mildly enhancing, homogeneous masses that often encase the mesenteric vessels and produce the "sandwich sign"; a large heterogeneous mass with low-attenuation areas of necrosis; an ill-defined infiltration of the mesenteric fat with sometimes the fat ring sign around the vessels (37, 42, 44, 45). However, if multiple, large lymph nodes are visualizable with diffuse and irregular fat infiltration, which increase at imaging follow-up, the lymphoma must be the first hypothesis. In this context, the use of PET/CT is included in the differential diagnosis between mesenteric panniculitis and abdominal lymphoma with mesenteric involvement. In the study of Zissin et al., 33 PET/CT were evaluated in 19 oncological patients with mesenteric alterations morphologically due to mesenteric panniculitis and the uptake of mesenteric nodules was studied. In 11 patients, fluorodeoxyglucose uptake (FDG) was negative and remained negative at subsequent controls and therefore the authors concluded with certainty for a condition of benignity possibly due to a mesenteric panniculitis. The remaining 8 patients had a suspected FDG uptake and in 7 patients an underlying neoplasia was found (6 with abdominal lymphoma and 1 with

relapsing metastatic cervical tumor) (46). Along the same lines are Coulier B et al., according to which the absence of FDG uptake at PET/CT has a high accuracy in excluding a lymphomatous or carcinomatous neoplastic disease. In fact, the PET/CT is useful for the identification of mesenteric deposits or manifestations of neoplastic pathologies even in patients with a mesenteric panniculitis-like pathology and it is also useful for evaluating a possible subsequent onset of the disease. However, it must be considered that PET can be non-specific and an increase in uptake can be due to inflammatory forms such as sarcoidosis (47).

The appearance of carcinoid tumor and rectractile panniculitis can be identical. Both can appear as an ill-defined, infiltrating soft-tissue mass with calcification and desmoplastic reaction. However, the preservation of the fat around vessels and lymph nodes directs the diagnosis towards the mesenteric panniculitis. Although, the carcinoid tumor may be associate with a hypervascular bowel mass or hepatic metastasis (36).

The peritoneal carcinomatosis and peritoneal mesothelioma may simulate the sclerosing mesenteritis when soft tissue implants and lymphadenomegaly are localized in the mesentery. Calcifications may be present in both tumors. However, in these conditions we observe usually an extensive involvement of the peritoneum, with peritoneal thickening and ascites. These features are not typical for mesenteric panniculitis (36).

Conclusion

The mesenteric panniculitis is a rare disease of the mesentery. In most cases it is asymptomatic and its identification is occasional and occurs during the execution of diagnostic exams, performed for other reasons. When the disease is symptomatic, the symptoms are mainly abdominal pain and dyspepsia, however, in a small percentage it may produce intestinal obstruction and requiring surgery.

From a radiological point of view, the diagnosis of mesenteric panniculitis can be suspected whenever a mass is found in patients with abdominal symptomatology or not, in the root of the mesentery, characterized by dislocation of the surrounding structures, in-

flammation and variable fibrosis of the mesenteric fat, with a selective sparing of the fat around the vessels and the lymph nodes and with a fibrotic pseudocapsule around the lesion itself. This mass may also have a predominantly fibrotic and solid appearance and may determine traction or infiltration of the intestinal loops with their occlusion or perforation.

Therefore, it is important for the radiologist to know how to recognize this disease and evaluate its relationships with the surrounding structures.

Regarding the etiology, it is our opinion, endorsed by some experiences in literature, that mesenteric panniculitis may be secondary to various conditions causing chronic inflammation of the mesentery.

References

1. Ferrari TC, Couto CM, Vilaça TS, Xavier MA, Faria LC. An unusual presentation of mesenteric panniculitis. Clinics (Sao Paulo) 2008 Dec; 63(6): 843-4.
2. Emory TS, Monihan JM, Carr NJ, Sobin LH. Sclerosing mesenteritis, mesenteric panniculitis and mesenteric lipodystrophy: a single entity? Am J Surg Pathol 1997; 21(4): 392-8.
3. Issa I. Baydoun H. Mesenteric panniculitis: various presentations and treatment regimens. World J Gastroenterol 2009 Aug 14; 15(30): 3827-30.
4. Coulier B. Mesenteric panniculitis. Mesenteric panniculitis. Part 2: prevalence and natural course: MDCT prospective study. JBR-BTR 2011; 94(5): 241-6.
5. Oztan MO, Ozdemir T, Uncel M, Diniz G, Koyluoglu G.Isolated omental panniculitis in a child with abdominal pain: case report. Arch Argent Pediatr 2016 Dec 1; 114(6): e425
6. Protin-Catteau L, Thiéfin G, Barbe C, Jolly D, Soyer P, Hoeffel C.Mesenteric panniculitis: review of consecutive abdominal MDCT examinations with a matched-pair analysis. Acta Radiol 2016 Dec; 57(12): 1438-1444.
7. Hussein MR, Abdelwahed SR: Mesenteric panniculitis: an update. Expert Rev Gastroenterol Hepatol 2015; 9: 67-78.
8. Emory TS, Monihan JM, Carr NJ, Sobin LH. Sclerosing Mesenteritis, Mesenteric Panniculitis and Mesenteric Lipodystrophy: a single entity. The American Journal of Surgical Pathology 1997; 21(4): 392-8.
9. Sahin A, Artas H, Eroglu Y, Tunc N, Demirel U, Bahcecioglu IH, Yalniz M. An Overlooked Potentially Treatable Disorder: Idiopathic Mesenteric Panniculitis. Med Princ Pract 2017; 26(6): 567-572.

10. Akram S, Pardi D S, Schaffner JA, Smyrk TC. Sclerosing mesenteritis: clinical features, treatment and outcome in ninety-two patients. Clin Gastroenterol Hepatol 2007 May; 5(5): 589-96.

11. Nyberg L, Björk J, Björkdahl P, Ekberg O, Sjöberg K, Vigren L.Sclerosing mesenteritis and mesenteric panniculitis-clinical experience and radiological features. BMC Gastroenterol 2017 Jun 13; 17(1): 75.

12. Sharma P, Yadav S, Needham CM, Feuerstadt P. Sclerosing mesenteritis: a systematic review of 192 cases.Clin J Gastroenterol 2017 Apr; 10(2): 103-111.

13. Huei-Wen Lim D, E, F, Keith S. Sultan E. Sclerosing Mesenteritis Causing Chylous Ascites and Small Bowel Perforation. Am J Case Rep 2017; 18: 696-699. Published online 2017 Jun 22.

14. Delgado Plasencia L, Rodríguez Ballester L, LópezTomassetti Fernández EM, Hernández Morales A, Carrillo Pallarés A, Hernández Siverio N. Mesenteric panniculitis: experience in our center. Rev Esp Enferm Dig 2007; 99: 291-297.

15. Daskalogiannaki M, Voloudaki A, Prassopoulos P, Magkanas E, Stefanaki K, Apostolaki E, Gourtsoyiannis N. CT evaluation of mesenteric panniculitis: prevalence and associated diseases. AJR Am J Roentgenol 2000; 174: 427-431.

16. Patel N, Saleeb SF, Teplick SK. General case of the day. Mesenteric panniculitis with extensive inflammatory involvement of the peritoneum and intraperitoneal structures. Radiographics 1999; 19: 1083-1085.

17. Badet N, Sailley N, Briquez C, Paquette B, Vuitton L, Delabrousse É. Mesenteric panniculitis: still an ambiguous condition.. Diagn Interv Imaging 2015 Mar; 96(3): 251-7.

18. Gögebakan Ö, Albrecht T, Osterhoff MA, Reimann A. Is mesenteric panniculitis truely a paraneoplastic phenomenon? A matched pair analysis. Eur J Radiol 2013 Nov; 82(11): 1853-9.

19. Buchwald P, Diesing L, Dixon L, Wakeman C, Eglinton T, Dobbs B, Frizelle F. Cohort study of mesenteric panniculitis and its relationship to malignancy. Br J Surg 2016; 103(12): 1727-1730.

20. Van Putte-Katier N, van Bommel EF, Elgersma OE, Hendriksz TR. Mesenteric panniculitis: prevalence, clinicoradiological presentation and 5-year follow-up. Br J Radiol 2014 Dec.; 87(1044): 20140451.

21. F. Scheer, P. Spunar, P. Wiggermann, C. Wissgott, R. Andresen. Georg Thieme Verlag KG Stuttgart. Rofo. 2016 Oct.; 188(10): 926-32.

22. Gray EJ, Darvishzadeh A, Sharma A, Ganeshan D, Faria SC, Lall C. Mesenteric Panniculitis (MP) in CT – A Predictor of Malignancy? Cancer therapy-related complications in the bowel and mesentery: an imaging perspective. Abdom Radiol (NY) 2016. Oct; 41(10): 2031-47.

23. KhasminskyV, Ram E, Atar E,Steinminz A, Issa N, Bachar GN. Is there an association between mesenteric panniculitis and lymphoma? A case control analysis. Clin Radiol 2017 Oct; 72(10): 844-849

24. L. Fatahi Bandpey, G. Martinez Sanz, C. Roig Salgado, E. Santa Eulalia Mainegra, F. O. Lenghel, J. Torres Nuez, E. Y. V. Bonacasa, N. González Gómez. Lymphomas and mesenteric panniculitis: causative relationship depending on histological type and treatment. Poster ECR 2013 / C-1418.

25. Francisco Irochima Pinheiro, Amália Cinthia Menezes Rêgo, Irami Araújo-Filho. Mesenteric panniculitis in the elderly − update on diagnostic and therapeutic approach. Int J Surg Med 2016; 2(3): 127-133

26. Durst AL, Freund H, Rosenmann E, Birnbaum D. Mesenteric panniculitis: a review of the leterature and presentation of cases. Surgery 1977 Feb; 81(2): 203-11.

27. Nasta AM, Patel D, Shrivastav O, Goel M, Shrimal A, Gupte A, Goel R. Mesenteric Panniculitis-First Case Series After Bariatric Surgery. Obes Surg 2018 Mar; 28(3): 881-885.

28. Irwin CP, Lee JB, Kim A, Eme I, Schofield C, Mount G. Mesenteric Panniculitis Presenting as Fever of Unknown Etiology in a Patient with History of Abdominal Surgery Case Rep Gastrointest Med 2018 Jan 29; 2018:

29. Waleed S. Mahafza, FRCR, Karam A. Manzalawi, Azza A. Gharaibeh, Omar W. Khayat, Awni D. Shahait, Malik E. Juweid. Diagnosis of mesenteric panniculitis in the multi-detector computed tomography era: Association with malignancy and surgical history. Saudi Med J 2017 Oct; 38(10): 1013-1018.

30. Seok Joo Lee, Cheol Keun Park, Woo Ick Yang, Sang Kyum Kim. IgG4-Related Sclerosing Mesenteritis. J Pathol Transl Med 2016 Jul; 50(4): 309-311.

31. Kerdsirichairat T, Mesa H, Abraham J, et al. Sclerosing mesenteritis and IgG4-related mesenteritis: case series and a systematic review of natural history and response to treatments. Immunogastroenterology 2013; 2: 119-28.

32. Kostas Fasoulas, Athanasios Beltsis, Taxiarchis Katsinelos, Eleni Dimou, Mary Arvaniti, Anna Charsoula, Victor Gourvas, Stefanos Atmatzidis, Grigoris Chatzimavroudis, and Panagiotis Katsinelos. Efficacy of Colchicine in the Treatment of Mesenteric Panniculitis in a Young Patient. Saudi J Gastroenterol 2012 Mar-Apr; 18(2): 146-148.

33. Sabate JM, Torrubia S, Maideu J, Franquet T, Monill JM, Perez C. Sclerosing mesenteritis: imaging findings in 17 patients. AJR Am J Roentgenol 1999; 172: 625-9.

34. Buyukkaya A, Gunes H, Ozaydın I, Ozel MA, Buyukkaya R, Sarıtas A.An unusual cause of acute abdominal pain: mesenteric panniculitis. Am J Emerg Med 2015 Sep; 33(9): 1328.e1-2

35. Duman M, Koçak O, Fazli O, Koçak C, Atici AE, Duman U. Mesenteric panniculitis patients requiring emergency surgery: report of three cases. Turk J Gastroenterol 2012 Apr; 23(2): 181-4.

36. Horton KM, Lawler LP, Fishman EK. CT findings in sclerosing mesenteritis (panniculitis): spectrum of disease. Radiographics 2003 Nov-Dec; 23(6): 1561-7.

37. McLaughlin PD, Filippone A, Maher MM. The "misty mesentery": mesenteric panniculitis and its mimics. AJR Am J Roentgenol 2013 Feb; 2002. 200(2): W116-23

38. Ghanem N, Pache G, Bley T, Kotter E, Langer M. MR

findings in a rare case of sclerosing mesenteritis of the mesocolon. J Magn Reson Imaging 2005 May; 21(5): 632-6.

39. Popkharitov AI, Chomov GN. Mesenteric panniculitis of the sigmoid colon: a case report and review of the literature. J Med Case Rep 2007 Oct 2; 1:1 08.

40. Watanabe T, Terai S, Tsukada T, Takeshita M, Matsui K, Amaya K, Kaji M, Maeda K, Shimizu K, Saito J, Mochizuki K, Uchiyama A. Sclerosing mesenteritis mimicking metachronous peritoneal metastases from descending colon adenocarcinoma. World J Surg Oncol 2017 Aug 1; 15(1): 142.

41. Ezhapilli SR, Moreno CC, Small WC, Hanley K, Kitajima HD, Mittal PK. Mesenteric masses: approach to differential diagnosis at MRI with histopathologic correlation. J Magn Reson Imaging 2014 Oct; 40(4): 753-69.

42. Mindelzun RE, Jeffrey RB Jr, Lane MJ, Silverman PM. The misty mesentery on CT: differential diagnosis. AJR Am J Roentgenol 1996 Jul; 167(1): 61-5.

43. HK Ha, JI Jung, MS Lee, BG Choi, MG Lee, YH Kim, PN Kimand, YH Auh. CT differentiation of tuberculous peritonitis and peritoneal carcinomatosis. AJR Am J Roentgenol 1996 Sep; 167(3): 743-8.

44 Sheth S, Horton KM, Garland MR, Fishman EK. Mesenteric neoplasms: CT appearances of primary and secondary tumors and differential diagnosis. Radiographics 2003 Mar-Apr; 23(2): 457-73.

45. Joerger M, Nuessli DF, Henz S, Zaunbauer W, Cerny T, Cogliatti SB, Gillessen S. CT-diagnosed mesenteric alterations in patients with non-Hodgkin's lymphoma: a population-based study. Onkologie 2008 Oct; 31(10): 514-9.

46. Zissin R, Metser U, Hain D, Even-Sapir E. Mesenteric panniculitis in oncologic patients: PET-CT findings. Br J Radiol 2006 Jan; 79(937): 37-43.

47. Coulier B. JBR-BTR. Mesenteric panniculitis. Part 1: MDCT--pictorial review. 2011JBR-BTR Sep-Oct; 94(5): 229-40.

Buragina Giuseppe
Via Giacinto Bruzzesi 25 - Milan, Italy
E-mail: giuseppe.buragina@unimi.it