ORIGINAL ARTICLE / Gastrointestinal imaging

Mesenteric panniculitis: Still an ambiguous condition

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KEYWORDS
Mesenteric panniculitis; Mesentery; CT; Neoplasia; Paraneoplastic

Abstract
Purpose: To study the possible relationship between mesenteric panniculitis (MP) visible on computed tomography (CT) and the presence of an underlying neoplastic disease.
Patients and methods: A retrospective analysis of 158 patients with CT examinations that revealed the presence of MP was performed. CT images were analyzed by two different radiologists using morphological criteria validated in the radiological literature. The presence, frequency and type of neoplastic lesions associated with MP were assessed.
Results: MP was asymptomatic in 96/158 patients (61%). Fat halo sign and pseudocapsule were visible on CT in 89/158 (56%) and 93/158 (59%) patients, respectively. Underlying neoplastic disease was present in 88/158 patients (56%). The neoplastic diseases most often associated with MP were lymphoma (28%), melanoma (18%), colorectal cancer (15%) and prostate cancer (13%).
Conclusion: MP has typical CT appearance and is associated with underlying neoplastic disease in 56% of patients. Such levels of association might suggest that MP may be considered as a paraneoplastic condition. Hence, incidental depiction of MP on CT in a patient without known neoplastic disease should incite radiologists to further scrutinize CT examination for presence of synchronous neoplastic lesions.

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Mesenteric panniculitis (MP) is a rare, benign and non-specific inflammatory condition of the adipose tissue of the mesenteric root. Except for a few exceptions, the prevalence of MP is estimated to range from 0.16 to 3.4% [1–4]. Although the etiology of MP remains to be clearly established, the possible involvement of autoimmune, ischemic and even neoplastic mechanisms is now debated. First reported in 1924 by Jura as retractile mesenteritis, the disease was renamed mesenteric panniculitis in 1960 by Ogden et al. [5]. The condition is diagnosed as an inflammatory disorder of the mesenteric root with two distinct pathological subgroups: mesenteric panniculitis and retractile mesenteritis. The differential diagnosis of these two conditions is based on histological criteria: fat necrosis predominates in MP whereas fibrosis and retraction predominate in retractile mesenteritis [1,6]. Although discussed by some authors, no relationships or shifts between the two forms have been evidenced in the literature [1,7]. However, there is still a considerable amount of confusion between the two forms of the disease. Typically silent and non-specific to both clinical and laboratory assessment, MP is frequently diagnosed incidentally during computed tomography (CT) performed for a completely different indication. The ongoing debate regarding the possible association of MP with various neoplastic conditions [1–5,8,9] and the absence of well established guidelines as how to manage and follow-up MP patients still raise many questions and have led us to further investigate the disease by means of this preliminary retrospective study.

The aim of our study was therefore to study the possible relationship between MP visible on CT and the presence of an underlying neoplastic disease.

Materials and methods

Our retrospective study was carried out over a 9-year period (2004–2013). MP patients were identified by searching the CT reports stored in the department’s computerized database (SIR) using the term ‘‘mesenteric panniculitis’’. All patients known to present a condition with a CT appearance similar to that of MP (i.e., mesenteric edema, acute pancreatitis, recent mesenteric trauma, portal hypertension or mesenteric lymphoma) were excluded from our study.

Patients

Following retrospective analysis of the CT examinations of the patients identified in the previous step, 158 patients (121 men and 37 women) were included as MP patients for our study period. The median age at diagnosis was 63 years (range: 27–98).

At the time of CT examination, the same indications and notions were recorded for all patients (i.e., abdominal pain, nausea, vomiting, diarrhea or on the contrary constipation, anorexia, asthenia, fever, ascites or even pleural effusion as well as increased levels of C-reactive protein). Past medical records, in particular a history of abdominal surgery, were documented (Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Demographics in 158 patients with mesenteric panniculitis on CT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>No. of patients (%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>121 (77)</td>
</tr>
<tr>
<td>Women</td>
<td>37 (23)</td>
</tr>
<tr>
<td>Median age</td>
<td>63 (27–98)</td>
</tr>
<tr>
<td>History of abdominal surgery</td>
<td>69 (44)</td>
</tr>
<tr>
<td>Patients with neoplasia</td>
<td>88 (56)</td>
</tr>
<tr>
<td>Men (% of men in cohort)</td>
<td>65 (54)</td>
</tr>
<tr>
<td>Women (% of women in cohort)</td>
<td>23 (62)</td>
</tr>
<tr>
<td>Known neoplasia at time of MP diagnosis</td>
<td>84 (53)</td>
</tr>
<tr>
<td>Subsequently identified neoplasia</td>
<td>4 (3)</td>
</tr>
<tr>
<td>Death</td>
<td>6 (4)</td>
</tr>
</tbody>
</table>

CT protocol

All CT examinations were performed using multidetector row scanning technology (Brilliance 64, Philips Healthcare, Netherlands and Somatom Definition AS 64, Siemens, Germany). All patients underwent CT from the diaphragm to the symphysis pubis. One hundred and forty-nine patients received iodinated contrast agent (Iomeron 300°, Bracco, Italy or Xenetix 300°, Guerbet, France) by intravenous route. Eight patients did not receive IV contrast agent because they had either renal failure and/or a known major allergic disposition. CT examinations were performed 70 to 90 s after the start of the IV injection of 1.5 mL/kg of iodinated contrast agent at 2–4 mL/s using an automatic injector. Oral opacification was not performed. All CT images were reconstructed using an algorithm suited to soft tissue analysis.

CT analysis

CT images were retrospectively interpreted until consensus was reached by 2 radiologists specialized in abdominal and digestive imaging. The CT features assessed for our study were those previously described for cases of MP in the literature [1–3,10–13], i.e. hyper-attenuation of mesenteric fat known as ‘‘misty mesentery’’, presence of subcentimeter lymph nodes in the mesenteric fat, fat halo sign surrounding vessels and/or nodules, pseudocapsule, mesenteric vessel integrity, mass effect on adjacent digestive structures and leftward orientation of MP.

In our study, the diagnosis of MP was considered positive when both hyper-attenuated mesenteric fat and subcentimeter mesenteric fat lymph nodes were detected (Figs. 1–3), the two most specific criteria described for MP in the literature [1,3,4,14–16].

In patients with follow-up CT scans, signs of MP were analyzed using the same criteria on all of the patient’s CT scans and compared with one another.

Any PET-CT scans carried out as part of the course of treatment of neoplasia for patients of our population were not reanalyzed; the initial accompanying notes were however recorded.
Mesenteric panniculitis: Still an ambiguous condition

Results

Patients

The indications resulting in the prescription of CT scans for the MP patients of our population were abdominal pain (62/158 patients, 39%) and staging of known neoplastic disease (96/158 patients, 61%).

Pathological associations

The association and histological type of known neoplastic conditions or those detected during the CT scan that led to diagnosis of MP were recorded for all patients of our population. Other concomitant chronic, non-tumoral, inflammatory or autoimmune conditions were also listed.

CT features

CT scan analysis revealed that, besides the hyperattenuation of mesenteric fat and the presence of subcentimeter lymph nodes that were the criteria defined for diagnosis, all cases (100%) evidenced a mass effect on neighbouring digestive structures, mesenteric vessel integrity and a leftward orientation of MP.

Pseudocapsules were detected for 93/158 patients (59%). A fat halo sign surrounding abdominal vessels and nodules was found for 89/158 patients (56%).

Sixty-nine patients (44%) had follow-up CT scans to monitor their MP or an associated neoplastic condition. For 15 of these patients (22% of the patients with follow-up scans), mesenteric fat was found to become less hyperattenuated as MP progressed and the number and size of subcentimeter lymph nodes within the mesenteric fat decreased. For 43 of these patients (48% of the patients with follow-up scans), the appearance of MP did not change at all. Finally, for 11 of these patients (16% of the patients with follow-up scans), the number and size of lymph nodes within the mesenteric fat increased as the disease progressed.

In patients with both diagnosed MP and a neoplastic condition who underwent a PET-CT scan, no hypermetabolic features were evidenced in the region affected by MP. No PET-CT scans were performed for MP patients of our study who did not have an associated condition.

None of the patients of our population showed a shift towards the clinical picture characterizing retractile mesenteritis.

Nearly half of the patients had a history of abdominal surgery (69/158 patients, 44%). Abdominal pain was reported for 61/158 patients (39%) and episodes of diarrhoea for 3/158 patients (2%). None of the other symptoms (nausea, vomiting, constipation, asthenia, fever, ascites and pleural effusion) or increased CRP levels were reported for our MP patients.

Figure 1. A 54-year-old woman with atypical right-sided abdominal pain. CT scan in the axial plane after IV injection of iodinated contrast agent shows pronounced hyper-attenuation of the mesenteric root in which a few subcentimeter lymph nodes are visible (arrow). Also note the mass effect on adjacent digestive structures and the fat halo sign surrounding the vessels (arrowheads) highly suggestive of MP.

Figure 2. A 46-year old man with epigastric pain. CT scan in the axial plane after IV injection of iodinated contrast agent shows thin rim of soft tissue density (<3 mm thick) surrounding a hyper-attenuated mesenteric region. This pseudocapsule structure (arrowheads) is typical of MP.

Figure 3. A 62-year old man undergoing colorectal cancer staging. CT scan in the axial plane after IV injection of iodinated contrast agent shows the features of MP with a leftwards orientation of the mesenteric root (arrowheads) as well as two liver metastases (arrows) suggestive of secondary lesions from colorectal cancer.
Associated conditions

Neoplasia was evidenced in 88 patients with MP in our population (56%; 65 men and 23 women).

The main neoplastic conditions detected in our population were, by decreasing order of frequency: lymphoma (25 patients), melanoma (16 patients) and colorectal cancer (13 patients). A detailed list of all the cases of neoplasia evidenced in our population is provided in Table 2.

Out of the 88 patients with MP and neoplasia, neoplasia had either been previously diagnosed or was diagnosed concomitantly with MP in 84 cases (95%). For 4 patients (5%), neoplasia was diagnosed clinically and/or following laboratory testing or further imaging in the weeks or months subsequent to the diagnosis of MP. It should be noted that all neoplastic conditions identified after MP were diagnosed within the year following the diagnosis of MP. More specifically, out of the 4 patients in this category, 2 developed prostate cancer, 1 colorectal cancer and 1 lymphoma.

Nine MP patients of our population (9%) presented a known chronic non-tumoral condition at the time of diagnosis of MP (giant cell arteritis [3 patients], polymyalgia rheumatica [1 patient], psoriasis [1 patient] and severe chronic eczema [1 patient]). In addition, a case of Factor V deficiency, a patient with a history of abdominal aortic aneurysm and a case of peripheral neuropathy were also observed among the patients of our population.

Discussion

Mesenteric panniculitis is a rare inflammatory disease of mesenteric adipose tissue. The prevalence of the disease reported in the literature ranges from 0.16 to 0.6%. This particularly low prevalence is attributable to the rarereness of MP, but probably also to the fact that it is most often diagnosed by CT [1,3,4]. Given our method for forming a patient population based on keyword-based searches in our database, we did not measure the prevalence of MP in our study. There were more men in our population than women (ratio 3.3:1), which is in line with previous reports (3:1) [2,4,17], except for the study carried out by Daskalogiannaki et al. [3] who described a higher prevalence in women (65% of cases). The onset of MP generally occurs between the age of 50 and 70 years [1–3,8–10,17,18], as found in our study.

There are no pathognomonic clinical signs for MP and the disease can be either entirely asymptomatic, or characterized by numerous non-specific symptoms, such as abdominal pain [14], nausea, vomiting, episodes of diarrhoea or on the contrary constipation, anorexia, asthenia, fever, ascites and even pleural effusion [1,16,18–20]. The most frequent clinical sign described in our population was abdominal pain (44% of patients). Among the other expected clinical signs, only diarrhoea was reported for three patients. It has previously been reported that levels of C-reactive protein (CRP) are increased in MP [4], however, no such increase in this biological marker was evidenced in our study.

It is still not known exactly what causes MP. Some predisposing factors have nevertheless been suggested in the literature, foremost of which is a history of abdominal trauma and/or abdominal surgery. In fact, 44% of the patients with MP in our study had a history of abdominal or pelvic surgery. Some authors therefore suggest that, in such cases, MP might be an unbecoming response of the organism to surgical or accidental trauma [4,18]. Associated inflammatory disorders, such as vasculitis or chronic rheumatic conditions have also been reported [1,18]. We also observed an association of MP with such disorders in our study since three of our patients also had giant cell arteritis, and another was followed for polymyalgia rheumatica. Surprisingly, Göxebakan et al. could not demonstrate any statistical relationships between MP and these predisposing factors [8].

Abdominal CT scans with IV injection of iodinated contrast agent are at present the best imaging strategy to confirm a diagnosis of MP. MP is most often evidenced on CT scans by the presence of a region of hyperattenuated mesenteric fat surrounding the mesenteric vessels [1,3,4,8,15]. This hyper-attenuation of mesenteric fat (misty mesentery) is consistently reported as a CT feature of MP in the literature, and indeed was observed for all of the patients of our population [1,3,4,14–16]. Nevertheless, it is advisable to note that hyper-attenuated mesenteric fat can also be observed in other disease-related circumstances, such as portal hypertension, mesenteric oedema, mesenteric trauma or even neoplastic infiltration of the mesenteric root, to mention only the most common [15,17,18,20]. In most cases, the misty mesentery observed in MP is combined with a generally left-sided mass-like lesion that causes displacement of neighbouring bowel loops. Calcifications have been reported in some cases of MP [1], but were not observed in our population. A few very rare cases of panniculitis affecting the mesosigmoid have also been reported in the literature [3].

Another very frequently observed CT feature for MP is the presence of subcentimeter lymph nodes within the mesenteric fat infiltrated by inflammatory cells. This feature was observed in all of our cases (100%) as well as in all of the cases reported by Coulier et al. [2], even if it was only found in 79.5% of the cases described by Daskalogiannaki et al. [3]. Unfortunately, the presence of subcentimeter lymph nodes is not a specific feature of MP and can be an issue when differentially diagnosing between MP and a condition with lymphomatous mesenteric involvement or with the sequelae

<table>
<thead>
<tr>
<th>Type of neoplasia</th>
<th>No. of patients (%)</th>
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<tbody>
<tr>
<td>Lymphoma</td>
<td>25 (28)</td>
</tr>
<tr>
<td>Melanoma</td>
<td>16 (18)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>13 (15)</td>
</tr>
<tr>
<td>Prostate</td>
<td>11 (13)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Breast</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Sarcoma</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Lung</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Kidney</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Endometrium</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Ovary</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Bladder</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Parotid</td>
<td>1 (1)</td>
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</tbody>
</table>
of chemotherapy-treated lymphoma [15]. This tricky issue was analyzed and discussed at length by Zissin et al. [21] who suggested that PET-CT scans should be performed systematically for thorough differential diagnosis. The authors of that study maintained that the lack of hypermetabolic features observed in MP would enable radiologists to completely rule out any tumoral involvement of the lymph nodes and/or mesenteric infiltration [21]. In our population, 36 patients (i.e. 23% of the patients of our population) underwent PET-CT scans as part of the staging process of their neoplastic disease. None of the patients showed any hypermetabolic activity in the region affected by MP.

In most cases of MP, the traversing mesenteric vessels and/or lymph nodes are not affected by the hyperattenuation of the mesentery and have a spared hypodense fat halo, described in the literature as the fat halo sign. This fat halo sign was observed in 56% of the MP patients of our population. This is strictly consistent with data from previous studies in which the fat halo sign is observed in 65—85% of MP cases [18,21—24]. Although not always observed, the fat halo sign is critical for confirming the diagnosis of MP because it is never observed in other diseases of the mesentery with infiltration and/or tumoral involvement which do not spare the regions surrounding vessels [13,15,17,25,26].

The possible presence of a pseudocapsule surrounding the region affected by MP can be added to the findings described above. On CT scans, this pseudocapsule is visible as a thin rim that is less than 3 mm thick. Interestingly, no histological significance can be determined for this pseudocapsule when biopsies are collected at surgery. In the literature, the pseudocapsule is reported as being observed in approximately 60% of cases [18,21—24], which is in line with its observation in 59% of cases in our study. It should be noted that some authors consider that the presence of both the fat halo sign and a pseudocapsule are sufficient for positive diagnosis of MP [11,12,17,18,22,23,26,27].

MP is a rare, non-specific condition of yet unknown etiology. Nevertheless, it is frequently and significantly associated with neoplastic disease [3,4,13,28,29]. Such significant association between MP and neoplasia was evidenced again in our study. It is therefore legitimate to assume that some MP cases might be of paraneoplastic nature, even if the subject is largely debated. For example, in their population of 48 patients, Coulier et al. [1,2] observed that only 7% of cases of MP were associated with neoplasia and were quite opposed to the idea of a relationship [2]. In a more explicit way, Gögebakan et al. recently rejected the idea of a paraneoplastic phenomenon based on their match-paired analysis of 77 cases of MP [8]. Nonetheless, although results are variable, most published studies tend to support such association. In the first report on the matter by Daskalogiannaki et al. [3], MP was found to coexist with tumor diseases in 69.4% of cases in a population of 46 patients. Similarly, Kiffer et al. [30] provided evidence for 16 cases of neoplasia in a population of 53 patients with MP (30% of cases). In 2012, Wilkes et al. [4] described 46 cases of association between MP and neoplasia in a population of 118 patients (39%). Finally, a very impressive prospective Dutch study based on match-paired analysis of 3820 patients with MP was published last year and reported, in contrast to the results described by Gögebakan et al. [8], a significantly higher prevalence of neoplasia associated with MP and even, over a 5-year follow-up period, a clear increase in the prevalence of future cancer development [31]. Our results are entirely in line with the results of this most recent study, with 56% of the patients of our population with the CT features of MP also presenting known or concomitantly diagnosed neoplastic lesions. In the literature, the neoplastic conditions the most often associated with MP are lymphoma, colorectal cancer and prostate cancer [2—5,18,29—33]. In our study, the association between MP and lymphoma was consistent with this data (28% of cases). However, more surprisingly, we found a strong association with melanoma (18% of cases), although this could perhaps be explained by the presence of a centre focusing on melanoma treatment within our facilities.

The pathophysiological mechanisms underlying of the coexistence of MP and neoplasia still remain to be uncovered [3,15,16]. In an attempt to explain this, Kiffer et al. suggested that MP could represent a reaction (in all likelihood non-specific) to the synchronous development of subjacent neoplasia [30]. In the vast majority of cases in our population, the patients diagnosed with MP were already known to have neoplastic disease. For the 4 patients of our population for whom neoplasia was diagnosed after MP, it was detected shortly after diagnosis of MP. It is therefore highly probable that neoplastic disease was present at the time of MP diagnosis, even if not actually diagnosed.

Previous studies generally state that both the clinical signs and CT appearance of MP remain stable in patients with neoplasia [2,3]. The results of our study are slightly different since 22% of our patients tended to show an improvement in the absence of any specific treatment, with in particular a decrease in the size and number of subcentimeter lymph nodes and a relatively lesser mistiness of mesenteric fat. As in previous studies [11,34—37], it should be noted that we did not observe any shifts from MP towards retraction mesenteritis, including in patients with the most unfavorable courses (as determined by the appearance of their CT scans).

Our study has certain limitations. First of all, some cases of MP were probably not retrieved when searching the CT database using keywords; we could therefore not provide an estimate of the prevalence of MP. Second, our study was retrospective and the results obtained need to be confirmed by implementing a prospective study. This study is currently underway in our centre and focuses in particular on comparing the features of MP depending on its symptoms and association with other diseases. We are also investigating the relevance and methods for follow-up patients with isolated MP.

**Conclusion**

MP remains a rare disorder even though it is now detected with increased frequency due to the indispensable use of CT imaging as a tool for diagnosing tumors and acute abdominal disorders. Although often entirely isolated, the synchronous association of MP with some neoplastic diseases, such as lymphoma, colorectal cancer and, in our study, melanoma is far from negligible. For this reason, and as confirmed by the recent statistical study [31], in a certain number of situations MP should doubtlessly no longer be considered
to be idiopathic, but as a potential paraneoplastic syndrome. Upon incidental diagnosis of MP in a patient without known neoplastic disease, radiologists should take great care when analyzing the patient’s CT scans and look for signs of neoplastic disease. The findings of the retrospective study reported in the present paper are now being confirmed in the context of a prospective study. Work is currently underway and is aimed not only at confirming the results of our study, but also at investigating the relevance of systematically undertaking further clinical assessment and imaging when MP is diagnosed by CT in patients without known neoplastic disease.

**KEY POINTS TO CONSIDER**

Diagnosis of MP by CT is often incidental.

MP is easy to diagnose by CT due to its extremely characteristic features.

MP is frequently associated with neoplastic disease. For this reason, MP could, in some cases, be a potential paraneoplastic syndrome.

Incidental diagnosis of MP by CT in a patient without known neoplastic disease should incite radiologists to analyze the scans for signs of an underlying neoplastic condition.

**Disclosure of interest**

The authors declare that they have no conflicts of interest concerning this article.

**References**


