Lymphomas and mesenteric panniculitis: causative relationship depending on histological type and treatment.

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Purpose

To assess if the occurrence of mesenteric panniculitis (MP) in patients with lymphomas is related to the histological type and/or to the received treatment.

MP is a rare benign disorder characterized by chronic nonspecific mesenteric inflammation. The process usually involves the mesentery of the small bowel, especially at its root, but can occasionally involve the mesocolon.

The etiology is unclear; it may occur independently or in association with other disorders, such as retroperitoneal fibrosis, sclerosing cholangitis, Riedel thyroiditis, and orbital pseudotumor. Infection, trauma and ischemia have also been suggested as possible causative factors. Abdominal surgery or mesenteric trombosis, conditions that may compromise the vascular supply of the mesentery, were also associated with MP.

An association of MP with malignancy, mainly lymphoma, breast cancer, lung cancer, melanoma and colon cancer has been reported. In one series, MP was reported to coexist with malignancy in up to 69% of the patients (1).

It is unclear whether MP precedes or follows a malignant disease. The pathogenetic mechanism linking MP with malignancy is also unknown. It was suggested that mesenteric panniculitis is a nonspecific response to an underlying abdominal malignancy, but in many patients with MP and malignancy, the disease is extraabdominal (as breast or lung carcinoma).

CT is the gold standard imaging technique for the diagnosis of MP. The CT appearance of MP may vary from subtle increased attenuation of the mesentery to a solid soft-tissue mass that envelops the mesenteric vessels with or without tumoral pseudocapsule, mesenteric calcifications, mesenteric cystic components, enlarged mesenteric or retroperitoneal lymph nodes.

Several mesenteric diseases (such as carcinomatosis, carcinoid tumor, lymphoma, desmoid tumor, mesenteric edema and primary mesenteric mesothelioma) can mimic the CT appearance of MP. Lymphoma may manifest as a nodal mass in the root of the mesentery, but it will not contain calcifications, unless it has been previously treated. Both conditions can encase mesenteric vasculature, but lymphoma will almost never result in ischemia. The "fat ring sign" is more characteristic of MP. If large, discrete lymph nodes are visualized, lymphoma is the more likely diagnosis; treated lymphoma may also produce a misty mesentery (FIGURE 1).
When MP is suspected from the clinical or imaging findings, surgical excisional biopsy and pathologic analysis are usually necessary to make the definitive diagnosis.
Fig. 1: Mesenteric panniculitis in a patient with stage IV-A follicular Non-Hodgkin Lymphoma. A, B - CT at diagnosis. Large mesenteric lymph nodes, retroperitoneal lymphadenopathies and splenomegaly. Axial contrast-enhanced abdominal CT. C,D - Post-chemotherapy CT (one year later). Residual "misty mesentery" in a treated lymphoma and disappearance of the other radiological findings. Axial contrast-enhanced abdominal CT.

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Methods and Materials

We performed a retrospective study of patients diagnosed with lymphoma in the last 12 years (between January 2000 and December 2012) in our hospital, starting from the Hematology Department records, and retrieving the abdominal CT examinations carried out in our Radiology Department (at the moment of diagnosis and the control examinations) and the patients' medical histories afterwards.

All CT examinations were revised in the work stations, splitting them between five general radiologists with experience in abdominal imaging (although not with exclusive dedication to it), in order to assess the existence of MP. Each one of them performed a new and independent evaluation of the CT images, regardless of the original radiological report (previously elaborated by others radiologists of our department). They also selected the most illustrative cases.

The same radiologists were the ones who noted down, by consensus, the findings suggestive of MP, according to the accepted diagnosis criteria described in literature:

- Increased attenuation of the mesentery (with attenuation values higher than those of the retroperitoneal fat) (FIGURE 2).
- Preservation of fat around the mesenteric vessels (the so-called "fat ring sign" or fatty halo), commonly observed (FIGURE 3), which may help distinguish MP from other mesenteric processes.
- Displacement of adjacent small-bowel loops with no evidence of invasion (FIGURE 4).
- Envelopment of superior mesenteric vessels by a well-delineated fatty mass without vascular involvement (FIGURE 5).
- Presence of a hyperattenuating stripe (tumoral pseudocapsule) surrounding the mass, as a characteristic CT finding (FIGURE 6).
- Mesenteric calcifications, usually in the central necrotic portion of the mass, probably related to the fat necrosis.
- Mesenteric cystic components.
- Enlarged mesenteric or retroperitoneal lymph nodes (seen as well-defined soft-tissue nodules less than 5 mm) (FIGURA 7).
- Increased attenuation in the mesentery with small nodes but without evidence of a discrete soft-tissue mass ("misty mesentery" (FIGURE 8), as a frequent but not specific of MP finding; any process that infiltrates the mesentery (such as hemorrhage, edema or tumor) can result in a misty mesentery.

The patient's medical histories were revised by three other radiologists (supervised by a hematologist), who noted down the received treatment (chemotherapy regimen - drugs and number of cycles - and /or radiotherapy), and also the lapse of time between the
beginning of the treatment and the MP apparition, in order to establish the temporal relationship.
**Fig. 2:** Increased attenuation of the mesentery. Mesenteric panniculitis in a patient with stage III-A diffuse large B-cell Non-Hodgkin Lymphoma. Axial contrast-enhanced abdominal CT.

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**Fig. 3:** "Fat ring sign" (arrow). Mesenteric panniculitis in a patient with stage II - AE classic nodular sclerosing Hodgkin Lymphoma. Axial contrast-enhanced abdominal CT.

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**Fig. 4:** Displacement of adjacent small-bowel loops with no evidence of invasion. Mesenteric panniculitis in a patient with stage I Hodgkin Lymphoma. Axial contrast-enhanced abdominal CT.

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**Fig. 5:** Envelopment of mesenteric vessels by a well-delineated fatty mass without vascular involvement. Mesenteric panniculitis in a patient with stage IV-A follicular Non-Hodgkin Lymphoma. Axial contrast-enhanced abdominal CT.

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Fig. 6: Hyperattenuating stripe (tumoral pseudocapsule) surrounding the mass, as a characteristic CT finding of MP (same patient as in Figure 5, 18 months post-chemotherapy). Axial contrast-enhanced abdominal CT.

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Fig. 7: Enlarged mesenteric lymph nodes (seen as well-defined soft-tissue nodules less than 5 mm). Mesenteric panniculitis in a patient with stage IV-A diffuse large B-cell Non-Hodgkin Lymphoma. Axial contrast-enhanced abdominal CT.

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Fig. 8: Increased attenuation in the mesentery with small nodes but without evidence of a discrete soft-tissue mass ("misty mesentery"). Mesenteric panniculitis in a patient with stage III-A diffuse large B-cell Non-Hodgkin Lymphoma. Axial contrast-enhanced abdominal CT.

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Results

All CT examinations were performed on a GE High Speed LX helical one-detector scanner, with axial 7-mm-thick contiguous section after bowel opacification, using oral contrast (Gastrografin® 370 mgI/ml, diluted at 1.5%). Endovenous non-ionic iodinated contrast agent (Ioversol®) at a dose of 120 ml was administered to the great majority of the patients (with the exception of the ones with renal failure or iodine contrast allergy).

Of the 48 patients with lymphoma included in the study, 26 were men (54.2%) and 22 were women (45.8%); their ages ranged from 20 to 88 years, with a mean age at diagnosis of 61 years. The average follow-up time was of 38.4 months (min. 2 - max. 96).

We revised an average number of 8 CT studies per patient (min. 2 - max. 17); a total of 383 CT examinations were checked over.

As regards the histological type, 11 (23%) were Hodgkin (HL) (5 classic nodular sclerosing HL, 2 mixed cellularity HL, 2 lymphocyte-rich HL and 2 non-specified) and 37 (77%) Non-Hodgkin Lymphomas (NHL) (27 diffuse large B-cell NHL, 8 follicular lymphoma, 1 gastric MALT lymphoma and 1 polymorphic B-cell NHL).

At the time of lymphoma diagnosis, the stages were: stage I in 7 patients (14.6%), stage II in 5 patients (10.4%), stage III in 11 patients (23%) and stage IV in 15 patients (31.2%). In 10 patients (20.8%) the stage at diagnosis was not mentioned in the medical history.

16 (33%) of the 48 analyzed patients showed MP: 7 of them (43.75%) at the time of diagnosis and the remaining 9 patients (56.25%) later.

Out of the 7 patients with MP at the onset of the disease, 3 were follicular NHL, 2 were HL, 1 had a gastric MALT NHL and 1 had a diffuse large B-cell NHL. The stages at diagnosis were IV in 4 patients (57%), II in 2 patients (28.6%), and I in one patient (14.3%).

Of the 9 patients who developed MP during the disease evolution, 5 had NHL (2 follicular lymphoma and 3 diffuse large B-cell NHL) and 4 had HL (2 nodular sclerosing HL - FIGURE 9 - and 2 lymphocyte-rich HL). The stage at diagnosis was II B in 1 patient, III in 6 and IV in 2 patients.

The chemotherapy regimen they received was R-CHOP (Rituximab - Cyclophosphamide, Doxorubicin (or Adriamycin), Vincristine (Oncovin) and Prednisolone) in 5 patients (55.55%), ABVD (Adriamycin, Bleomycin, Vinblastine and Dacarbazine) in 3
patients (33.33%) and ABVD + BEACOPP-14 (Bleomycin, Etoposide, Adriamycin, Cyclophosphamide, Oncovin, Procarbazine and Prednisone) + ESHAP (Etoposide, Methylprednisolone, Cytarabine and Cisplatin) in 1 patient (11.11%).

The average time between the chemotherapy onset and the apparition of MP was of 14.3 months (min. 3 - max. 27).

Only 3 of the 16 patients with MP had also received radiotherapy (in addition to the chemotherapy); in one of them the MP was present at the time of diagnosis, and in the other two it appeared during the disease evolution.

All the MP were localized in the root of the small-bowel mesentery.

Regarding the radiological findings, of the 16 patients with MP, enlarged mesenteric lymph nodes (less than 5 mm), were found in 10 patients, increased attenuation of the mesentery in 9 patients, displacement of adjacent small-bowel loops with no evidence of invasion in 9 patients, fatty mass in 9 patients, pseudocapsule in 4 patients, "misty mesentery" in 3 patients and the "fat ring sign" in 2 patients. None of the patients presented mesenteric calcifications or mesenteric cystic components.

We would like to mention that after being observed for the first time in a patient, no MP had completely disappeared (FIGURE 10), although in some of them it did present mild improvement or worsening, depending mainly on the lymphoma evolution.
Fig. 9: Patient with nodular stage III - EB sclerosing Hodgkin Lymphoma who developed mesenteric panniculitis during the disease evolution. A, B - Axial plain abdominal CT at diagnosis. No mesenteric panniculitis is observed. C, D - Post-chemotherapy (2 years later) axial contrast-enhanced abdominal CT. Mild mesenteric panniculitis: displacement of adjacent small-bowel loops with no evidence of invasion, small mesenteric lymph nodes and mild increased attenuation in the mesentery.

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Fig. 10: Patient with stage IIIA follicular B Non-Hodgkin lymphoma and mesenteric panniculitis: increased mesenteric attenuation, fatty mass, pseudocapsule (B, D, E) and "fat ring sign" (E). Axial contrast-enhanced abdominal CT. A, B - Mesenteric panniculitis present at diagnosis. C, D - Persistent mesenteric panniculitis 3 years post-chemotherapy, without significative changes.

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Conclusion

When present at diagnosis, MP was specially related with follicular NHL (42.9%), and with HL (28.6%), with higher prevalence in advanced stages of the disease (85.7% in stages III and IV).

Regarding the chemotherapy regimen, MP was more frequent in patients who received R-CHOP (55.55%) and ABVD (33.33%).

A limitation of this study is the lack of histologic proof of MP in our patients. The pathologic analysis is usually necessary to make the definitive diagnosis, because it is imperative to exclude an underlying infection or malignancy. All our patients were already diagnosed of lymphoma, so no patient underwent needle aspiration, open biopsy or other means of histologic confirmation. In all the patients, the diagnosis was based on the CT appearance and on follow-up CT studies that revealed no additional findings or changes.
References


