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► **To cite this version:**

Jules Grégory, Jérémy Dana, Isaac Yang, Jaron Chong, Louis Drevon, et al.. CT features associated with underlying malignancy in patients with diagnosed mesenteric panniculitis. *Diagnostic and Interventional Imaging*, 2022, 103 (9), pp.394-400. 10.1016/j.diii.2022.06.009 . hal-04189669

**HAL Id: hal-04189669**

**<https://hal.science/hal-04189669v1>**

Submitted on 28 Aug 2023

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Title

**CT features associated with underlying malignancy in patients with diagnosed mesenteric panniculitis**

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Short title/Running head

Mesenteric panniculitis: CT features associated with underlying malignancy

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Title

**CT features associated with underlying malignancy in patients with diagnosed mesenteric panniculitis**

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Short title/Running head

Mesenteric panniculitis: CT features associated with underlying malignancy

**Abstract**

**Purpose**

The purpose of this study was to identify abdominal computed tomography (CT) features associated with underlying malignancy in patients with mesenteric panniculitis (MP).

**Materials and methods**

This single-institution retrospective longitudinal cohort study included patients with MP and a minimum 1-year abdominopelvic CT follow-up or 2-year clinical follow-up after initial abdominopelvic CT examination. Two radiologists, blinded to patients' medical records, conjointly reviewed CT-based features of MP. Electronic medical records were reviewed for newly diagnosed malignancies with the following specific details: type (lymphoproliferative disease or solid malignancy), location (possible mesenteric drainage or distant), stage, time to diagnosis. An expert panel of three radiologists and one hemato-oncologist, who were blinded to the initial CT-based MP features, assessed the probability of association between MP and malignancy based on the malignancy characteristics.

**Results**

From 2006 to 2016, 444 patients with MP were included. There were 272 men and 172 women, with a median age of 64 years (age range: 25–89); the median overall follow-up was 36 months (IQR: 22, 60; range: 12–170). A total of 34 (8%) patients had a diagnosis of a new malignancy; 5 (1%) were considered possibly related to the MP, all being low-grade B-cell non-Hodgkin lymphomas. CT features associated with the presence of an underlying malignancy were the presence of an MP soft-tissue nodule with a short axis >10 mm ( $P < 0.0001$ ) or lymphadenopathy in another abdominopelvic region ( $P$

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3 <0.0001). Associating these two features resulted in high diagnostic performance (sensitivity 100%; [95% CI: 57–100];  
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6 specificity 99% [95% CI: 98–100]). All related malignancies were identified.  
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## 8 9 Conclusion

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11 Further workup to rule out an underlying malignancy is only necessary in the presence of an MP soft-tissue nodule >10  
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13 mm or associated abdominopelvic lymphadenopathy.  
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19 **Keywords:** Computed tomography; Mesenteric panniculitis; Panniculitis; Peritoneal; Neoplasms;  
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## 26 Abbreviations

27  
28 <sup>18</sup>FDG PET/CT: [18F] fluorodeoxyglucose positron emission tomography/computed tomography  
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31 CI: Confidence Interval  
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33 CT: Computed tomography  
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35 IQR: Interquartile range  
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37 MP: Mesenteric panniculitis  
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## 45 1. Introduction

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47 Mesenteric panniculitis (MP) is often used as an umbrella term in radiology to describe a spectrum of incidental changes  
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49 affecting the adipose tissue of the mesentery. Although initially considered a rare entity [1], the prevalence of MP is much  
50  
51 higher than previously reported, likely because of the increased use of high-resolution computed tomography (CT) for  
52  
53 clinical work-ups [2]. Several terms such as “misty mesentery”, “liposclerotic mesenteritis”, and “mesenteric  
54  
55 lipodystrophy” have been reported in the literature to describe the same range of findings [3–5]. Although considered a  
56  
57 radiological entity encompassing a broad range of non-specific mesenteric disorders, histopathologically, MP has been  
58  
59 shown to correspond to a mixture of chronic mesenteric inflammation, fat necrosis, and fibrosis [6–9].  
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3 The pathogenesis of the MP phenomenon is uncertain, and although presumably benign, clear management guidelines for  
4 this incidental finding are lacking. Such lack of consensus is partially due to several studies that suggested the possibility  
5 of MP being a paraneoplastic syndrome or an early-stage lymphoma [10–16]. Therefore, the authors of these studies  
6 considered the finding of MP as a reason to search for malignancy or at least to perform clinical or imaging follow-up  
7 [13,14]. For other authors, MP was an insignificant discovery that did not require any further investigation [17–20].  
8 However, most of these articles are subject to significant selection biases because they did not take into consideration the  
9 clinical context of discovery and did not report patient follow-up.

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11  
12 Because an association with subsequent malignancies has been reported, patients are frequently referred for follow-up  
13 imaging on multiple occasions over an extended period [21]. The precise extent to which this occurs is unknown, but  
14 anecdotal evidence suggests that it is substantial. A systematic review concluded that no study in the existing literature  
15 could determine the proportion of idiopathic MP with subsequent malignancy [22]. The prevalence of MP is 1.7% [22], so  
16 unnecessary imaging follow-up would represent a substantial burden on the healthcare system with respect to cost and  
17 overuse of imaging resources. The value of a size criterion for soft-tissue nodules remains unclear with contradictory  
18 results [10,12,23]. Some authors reported a threshold of 12 mm in patients followed for malignancy without considering  
19 any relationship with MP, while others reported no difference between patients with or without malignancy.

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22 We hypothesized that MP should be considered a benign condition unless worrisome CT imaging features raise suspicion  
23 of an unknown underlying malignancy. Therefore, the aims of this study were to report the incidence and type of newly  
24 diagnosed malignancies in patients with MP and identify features on abdominal CT examinations of patients with MP that  
25 should raise the differential diagnosis of malignancy with mesenteric involvement.

## 26 27 28 **2. Materials and methods**

### 29 30 31 2.1. Patient selection

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34 The local institutional review board approved this retrospective, single-institution longitudinal follow-up cohort study, and  
35 informed consent was waived because of the study's retrospective design (2020-5525). An automatized research of the  
36 entire picture archiving and communication system (IntelPACS, Intelrad Medical Systems Inc.) of our tertiary-center  
37 university hospital was performed to identify patients ( $\geq 18$  year-old) who had undergone abdominopelvic CT

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3 examination with or without intravenous contrast from January 1st, 2006, to June 1st, 2016 (this period was explicitly  
4 chosen to allow for sufficient clinical follow-up to diagnose low-grade malignancies); and for whom the diagnosis of MP  
5 was mentioned in the CT report. The search was consecutive, and CT reports were searched by using the keywords:  
6 “panniculitis”, “sclerosing mesenteritis”, “misty”, “misty mesentery”, “retractile mesenteritis”, “mesenteric  
7 lipodystrophy”, “liposclerotic mesenteritis”.

8 Patients were included only if they had at least a 1-year abdominopelvic CT follow-up or 2-year clinical follow-up.  
9 Clinical follow-up included a review of medical records (physical examination and any clinical notes).

10 Patients were excluded when: (i), the MP did not meet the definition of Coulier et al. [23] (*i.e.*, the observation of at least  
11 three simultaneous signs among the presence of a well-defined “mass effect” on neighboring structures due to mesenteric  
12 fat tissue of inhomogeneous higher attenuation than adjacent retroperitoneal or mesocolon fat, containing small soft-tissue  
13 nodules, typically surrounded by a hypoattenuating fatty “halo sign”, and a hyper-attenuating pseudo-capsule surrounding  
14 the whole entity; (ii), the short axis of the MP soft-tissue nodules was  $> 2$  cm because MP is no longer a differential  
15 diagnosis [23]; and (iii), there was a history of past or ongoing solid malignancy or lymphoproliferative disease without  
16 initial abdominopelvic CT examination. If index abdominopelvic CT examination was part of the initial malignancy  
17 work-up, patients were not excluded.

## 18 2.2. Abdominopelvic CT examinations

19 Abdominopelvic CT examinations were obtained using various CT scanners from different vendors (General Electric  
20 Healthcare; Siemens Healthineers, Philips Healthcare) with 16- to 64-row detectors. Because of the retrospective nature of  
21 our study and multiple examination indications, CT protocols varied and included both intravenous contrast-enhanced and  
22 unenhanced examinations. Pitch varied from 0.8 to 1.5. Standard-of-care CT images were reconstructed in the axial plane  
23 with section thickness from 1.0 to 5 mm.

## 24 2.3. Abdominopelvic CT analysis

25 Two reviewers (JG, abdominal fellow radiologist, and CR, a senior subspecialty trained abdominal radiologist with 25  
26 years of experience) performed a retrospective review of the initial abdominopelvic CT examinations in consensus. CT  
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3 image analysis was performed with blinding to patient outcome, medical records, and subsequent follow-up CT  
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5 examination.  
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8 The abdominopelvic CT images were specifically screened for worrisome features of MP that would raise suspicion of an  
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10 associated malignancy based on prior publications [22–27]: (i), the absence of one or two of the five signs of MP [23]  
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12 (**Figure 1a/b**); (ii), at least one MP soft-tissue nodule with short-axis > 10 mm [22,24] (**Figure 1c/d**); (iii),  
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14 lymphadenopathy in another abdominopelvic region [25]; and (iiii), splenomegaly (defined by the largest anterior-  
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16 posterior measurement on axial images > 12 cm) [26,27].  
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20 The reviewers were given a training session before the CT image review by a senior subspecialty radiologist (BG), with  
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22 30 years of experience in abdominal radiology, to recognize these CT findings. This training concluded with 30 test cases  
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24 that were not included in the final study.  
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#### 27 28 29 30 2.4. Clinical data

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33 Patients' electronic medical records and CT reports were reviewed by JG and IY one month after the CT analysis to avoid  
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35 recall bias, and the following information was recorded: (i), past medical history at the time of the initial CT as well as the  
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37 indication for requesting the CT, in order to classify the patients as “symptomatic” for patients with constitutional  
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39 symptoms such as weight loss, fever, diarrhea, or abdominal pain at the time of the scan, and “incidental” for patients  
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41 without constitutional symptoms at the time of CT examination; (ii), mention of MP in the conclusion of the CT report  
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43 and whether follow-up had been recommended; (iii), performance of [18F] fluorodeoxyglucose positron emission  
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45 tomography/computed tomography (<sup>18</sup>FDG PET/CT), and, if applicable, the conclusion of the report was also reviewed  
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47 and labeled as “positive” or “negative” based on the presence or absence of a significant increase in <sup>18</sup>FDG uptake of the  
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49 MP soft-tissue nodules; and (iiii), clinical and CT follow-up for newly diagnosed malignancies with the following details:  
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51 type (lymphoproliferative disease or solid malignancy), location (possible mesenteric drainage [gastrointestinal and  
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53 biliary/pancreatic malignancies] or distant), stage, and time to diagnosis.  
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#### 60 61 2.5. Reference standard

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3 Among patients with newly diagnosed malignancies, an expert panel of three independent radiologists (BG, JD, and JC)  
4 and one hemato-oncologist (LD) consensually reviewed in detail medical records of all patients, with blinding to any  
5 information related to MP, to adjudicate the probability of an association between MP and the malignancy — “unrelated”  
6 or “possibly related” — as follows. A newly diagnosed solid malignancy was considered “possibly related” to the MP if it  
7 occurred within 12 months after the initial CT and if one of the three following conditions was met: (i), it was a  
8 gastrointestinal or biliary/pancreatic malignancy or (ii), the malignancy was staged as locally advanced or metastatic  
9 regardless of the origin of the primary malignancy or (iii), the  $^{18}\text{F}$ FDG PET/CT results for the MP soft-tissue nodules were  
10 positive at the time of the diagnosis of the malignancy. A newly diagnosed B- or T-cell lymphoid hemopathy was  
11 systematically considered “possibly related” to the MP.  
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## 26 2.6. Statistical analysis

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28 All data were analyzed by using R V.4.2 (<https://www.r-project.org>, the R Foundation for Statistical Computing, Vienna,  
29 Austria). Quantitative variables were expressed as medians and interquartile ranges (IQR; Q1, Q3) and qualitative  
30 variables as raw numbers, proportions and percentages. The prevalence of each CT-based feature was compared between  
31 patients with and those without a possibly related malignancy using chi-square ( $\chi^2$ ) or Fisher exact test, as appropriate.  
32 Sensitivity, specificity, positive and negative predictive values and their exact binomial 95% confidence intervals (CI) and  
33 Youden index [28] were calculated for each CT feature. A decision tree model associating the most predictive features  
34 was designed to achieve the best sensitivity. Two-sided  $P < 0.05$  was considered to indicate statistically significant  
35 difference.  
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## 50 **3. Results**

### 51 3.1. Study population

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53 Between January 2006 and June 2016, 1247 of 179,830 (0.7%) patients who underwent an abdominopelvic CT  
54 examination met our search criteria for MP. After excluding 803 (64%) patients, the final population included 444 patients  
55 with MP and sufficient follow-up (222 patients with a minimum 1-year CT follow-up and 222 with minimum 2-year  
56 clinical follow-up). The patient flowchart is in **Figure 2**.  
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Demographic characteristics are summarized in **Table 1**. The median age was 64 years (IQR: 54, 72), and 172 (39%) were women. Overall, 201 (45%) patients presented symptoms, and for 243 (55%), MP was an incidental finding.

The median follow-up was 36 months (IQR: 22, 60) overall: 22 months (IQR: 14, 42) for the CT follow-up group and 36 months (IQR: 24-72) for the clinical follow-up group. Follow-up was recommended in the initial CT report for 115 (26%) patients. Further follow-up recommendations were included in the follow-up CT report for 11 patients.

### 3.2. Reference standard

In total, 34 of 444 (8%) patients had a concomitant or subsequent diagnosis of a new malignancy (23 [5%] patients in the CT follow-up group, including one patient with two malignancies, and 11 [3%] in the clinical follow-up group) (**Table 1**).

Of the 35 malignancies, five were B-cell lymphoma, seven were solid malignancies with possible mesenteric drainage, and 23 were distant malignancies. The expert panel adjudicated that five of these new malignancies were possibly related to the MP (low-grade B-cell lymphoma with three follicular subtypes and two marginal zone subtypes) (**Table 2**). <sup>18</sup>F<sup>18</sup>FDG PET/CT images were available for four of five of these patients at the time of the diagnosis of the malignancy, and results were considered “positive” for these four cases (two follicular subtypes and two marginal zone subtypes). Among the 30 unrelated malignancies, 25 occurred after 12 months following the initial CT examination, including two with negative <sup>18</sup>F<sup>18</sup>FDG PET/CT results, and five had no regional lymphadenopathy or metastatic disease. A detailed list of the newly diagnosed malignancies is in **Tables 3 and 4**.

No significant associations were found between the context of MP discovery at the initial CT examination (incidental, symptomatic) and the diagnosis of a new possibly related malignancy ( $P = 0.17$ ).

### 3.3. Analysis of CT findings to identify MP worrisome features

CT-based features of MP are summarized in **Table 5**. The findings of “mass effect”, “mesenteric fat stranding” and “mesenteric nodules” were present on all initial CT examinations. A “halo sign” was present for 139/444 (31%) patients with MP and a “hyperattenuating pseudo-capsule” for 267/444 (60%). All five signs of MP were present for 118/444 (27%) patients. The short axis of the largest MP soft-tissue nodules ranged from 3 to 19 mm (median 6 mm; IQR; 5, 8).

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3 *Worrisome features:* On univariable analysis, two MP CT-based features were significantly associated with the newly  
4 diagnosed malignancy as reported in **Table 5**: the presence of at least one MP soft-tissue nodule with a short axis > 10  
5 mm ( $P < 0.0001$ ) and the presence of lymphadenopathy in another abdominopelvic region ( $P < 0.0001$ ). However, we  
6 found no association with the absence of one or two of the five signs of MP ( $P = 0.33$ ) or the presence of splenomegaly ( $P$   
7  $> 0.99$ ) (**Table 5**). At the initial CT, the two significant features had the same sensitivity (80%; 95% CI: 38–94).

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10 Among patients with MP soft-tissue nodules with a short-axis > 10 mm, three had false-positive results (two had a history  
11 of chronic pancreatitis [**Figure 3**] and one had a concomitant diagnosis of a clear cell renal cell carcinoma [Fuhrman 2]  
12 with negative  $^{18}\text{F}$ FDG PET/CT results at the time of the diagnosis). These three patients with false-positive results each had  
13 only one MP nodule with a short axis > 10 mm, unlike the patients with true-positive results who had more than two  
14 nodules > 10 mm.

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16 Among patients with lymphadenopathy in another abdominopelvic region, the only false-positive result was for a patient  
17 with IgG4-related disease with retroperitoneal lymphadenopathies but with negative  $^{18}\text{F}$ FDG PET/CT results for MP  
18 nodules.

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21 *Association of worrisome features:* When at least one of the two worrisome features was present, the sensitivity of the  
22 diagnosis of underlying malignancy was 100% (95% CI: 57–100) and specificity 99% (95% CI: 98–100). The decision  
23 algorithm is presented in **Figure 4**.

#### 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 **4. Discussion**

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47 The clinical significance of MP remains controversial, with a persistent concern about it possibly being an early sign of  
48 malignancy, in particular early-stage lymphoma. This concern leads to substantial heterogeneity in clinical management  
49 [22, 29–31]. The concern is illustrated by in our study, radiologists recommending in their report a follow-up of the MP  
50 by CT for 26% (115/444) of patients. New malignancies related to the MP were identified in only 1% (5/444) of patients,  
51 and all were low-grade B-cell non-Hodgkin lymphomas. We identified two worrisome features of MP that should raise  
52 suspicion of an underlying malignancy: the presence of a soft-tissue nodule with a short axis > 10 mm or  
53 lymphadenopathies in another abdominopelvic region. Associating these worrisome features resulted in high diagnostic  
54 performance, with a sensitivity of 100% and specificity of 99%. Only four patients with false-positive results had  
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3 worrisome features. Of the 435 patients with MP without worrisome features, none had a possibly related new  
4 malignancy. Of note, none of the low-grade lymphomas had all five signs of MP, including the fat halo sign, but the  
5 specificity of this feature was very low (129/439, 29%).  
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10 We conclude that MP without worrisome features is not significantly associated with malignancy and therefore is a benign  
11 condition. These additional imaging features should be considered in the definition criteria provided by Coulier [23].  
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13 Imaging follow-up is not indicated, regardless of the number of MP signs or the clinical presentation. Follow-up imaging  
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15 in all patients with MP would result in a substantial burden on the healthcare system regarding cost and overuse of  
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17 imaging resources. Conversely, in the presence of one or both worrisome features, further work-up should be pursued to  
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19 rule out an underlying malignancy. Furthermore, to distinguish mesenteric malignancies from benign conditions, <sup>18</sup>FDG  
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21 PET/CT should be incorporated into the work-up. Indeed, Nakatani et al. showed a sensitivity of 92% to identify a  
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23 malignancy with the combination of maximum standardized uptake value  $\geq 3.0$  on <sup>18</sup>FDG PET/CT with lymphadenopathy  
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25  $> 10$  mm in the short axis [32]. In our study, <sup>18</sup>FDG PET/CT images were available for four of five patients with low-  
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27 grade lymphoma, and all showed increased metabolism activity in the mesenteric nodules. However, lack of uptake on  
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29 <sup>18</sup>FDG PET/CT should not rule out an indolent lymphoma [33]. When possible, a biopsy of a lymphadenopathy located  
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31 outside the mesenteric region should also be performed. However, if the only worrisome feature is a mesenteric nodule  $>$   
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33  $10$  mm with no hypermetabolism on <sup>18</sup>FDG PET/CT, the benefit/risk ratio of the biopsy should be considered given the  
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35 slow evolution of low-grade lymphomas, with progression-free survival of up to 10 years for the most indolent subtypes  
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37 [34]. This diagnostic approach may be further validated by dedicated prospective studies.  
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44 Although this is the largest published series, our study has several limitations. First, it was inherently limited by its  
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46 retrospective design. We certainly underestimated the prevalence of MP in our database because we identified them from  
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48 CT reports. The prevalence of MP in our study was 0.6%, but it can range from 0.2% for retrospective series using a  
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50 similar retrospective keyword search to 1.7% for studies interpreting consecutive series [22]. Sufficient follow-up was not  
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52 available for almost half of the patients presenting MP, which indicates selection bias. However, patients in whom  
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54 malignancy subsequently developed likely returned for further consultation. Also, the event rate was possibly limited by  
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56 the access to available charts and patients who moved away or were referred outside of our network. Second, we were  
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58 aware that we could not confidently assess the association between MP and newly diagnosed malignancy. Therefore, we  
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60 decided to have a very inclusive definition of related malignancy, especially lymphoproliferative disease. We  
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3 systematically considered it as “possibly related” to the MP in order to test our hypothesis of the benignity of MP. Patients  
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5 with prior malignancy diagnosis and no available CT at the time of this diagnosis were excluded as we considered this to  
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7 represent potential critical flaws. Furthermore, this study did not include a control population because it might have  
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9 introduced a selection bias. The objective was not to determine the rate of secondary development of any malignancy but  
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11 to detect the presence of an underlying related malignancy for which the mesenteric findings would be a manifestation.  
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13 Nevertheless, the incidence of malignancy diagnosed in the first year (8/444, 1.8%) in our population (median age, 64  
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15 years [IQR: 54, 72]) is consistent with the incidence of malignancy for people aged 60–69 years in Canada (2400/100  
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17 000, 2.4%) [35]. Finally, the number of potential worrisome features studied was limited and did not include other  
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19 features such as nodule morphology. However, this choice was based on an exhaustive review of the literature and  
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21 resulted in the design of a diagnostic model built on reproducible and simple-to-apply criteria.  
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26 In conclusion, MP, a relatively rare radiological entity but increasingly diagnosed because of the expanding use of  
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28 abdominal cross-sectional imaging, is a benign condition and should not systematically trigger additional investigations.  
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30 Further workup to rule out an underlying malignancy, mostly low-grade B-cell lymphoid hemopathy, is only necessary in  
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32 the presence of a soft-tissue MP nodule > 10 mm or associated abdominopelvic lymphadenopathy. Avoiding the term of  
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34 mesenteric panniculitis may be warranted when worrisome features are present.  
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#### 44 **Human rights**

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47 The authors declare that the work described has been carried out in accordance with the Declaration of Helsinki of the  
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49 World Medical Association revised in 2013 for experiments involving humans.  
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52 Informed consent and patient details.  
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55 The authors declare that this report does not contain any personal information that could lead to the identification of the  
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57 patients.  
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#### 62 **Funding**

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3 This study was not supported by any funding.  
4  
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8

#### 9 **Author contributions**

10  
11 All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for  
12 Authorship.  
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#### 19 **Disclosure of Competing Interest**

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22 The authors declare that they have no competing of interest.  
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## 33 34 35 36 37 38 39 40 41 **Figures Legends**

### 42 43 44 **Figure 1. CT-based characteristics of mesenteric panniculitis.**

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46 (a) Axial and (b) coronal CT images obtained during the portal venous phase of enhancement show mesenteric  
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48 panniculitis with the typical five signs including mass effect, mesenteric fat stranding (star), mesenteric nodules (dashed  
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50 line), halo sign (arrow) and hyperattenuating pseudo-capsule (arrowhead). (c) Axial and (d) coronal portal venous  
51  
52 contrast-enhanced CT images demonstrate suspected mesenteric panniculitis with mass effect, mesenteric fat stranding,  
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54 supra-centimetric mesenteric nodules (arrow) and hyperattenuating pseudo-capsule. The halo sign was absent.

### 55 56 57 58 59 60 61 **Figure 2. Study flowchart.** (MP: mesenteric panniculitis)

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5 **Figure 3. Reduction in size over 8 years of supra-centimetric nodules of mesenteric panniculitis in a 70-year-old**  
6 **patient with chronic pancreatitis.**  
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10 (a) Initial axial portal venous contrast-enhanced CT image shows supra-centimetric mesenteric nodules (arrow) with mass  
11 effect, mesenteric fat stranding and hyperattenuating pseudo-capsule. The halo sign is absent. (b) Eight years later, axial  
12 portal venous contrast-enhanced CT image shows reduced size of mesenteric nodules (arrow) that are now sub-  
13 centimetric.  
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22 **Figure 4. Decision algorithm associating the number of signs of mesenteric panniculitis, the presence of a**  
23 **mesenteric soft-tissue nodule > 10 mm in short axis and lymphadenopathy in another location to diagnose an**  
24 **underlying malignancy.**  
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29 The five signs of mesenteric panniculitis are a well-defined “mass effect” on neighboring structures due to mesenteric fat  
30 tissue of inhomogeneous higher attenuation than adjacent retroperitoneal or mesocolon fat, containing small soft-tissue  
31 nodules, typically surrounded by a hypoattenuating fatty “halo sign” and a hyper-attenuating pseudo-capsule surrounding  
32 the whole entity.  
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## Highlights

- Mesenteric panniculitis without worrisome features is not significantly associated with malignancy and should be considered a benign condition.
- Mesenteric panniculitis should not systematically trigger additional investigations or specific follow-up.
- Further workup to rule out an underlying malignancy is only necessary when mesenteric panniculitis is associated with worrisome CT features.
- Worrisome CT features included mesenteric panniculitis containing soft-tissue nodule > 10 mm or associated with abdominopelvic lymphadenopathy.

Table 1. Newly diagnosed malignancies in patients with a diagnosis of mesenteric panniculitis

	> 1-year CT follow-up (n = 222)	> 2-year clinical follow-up (n = 222)
<b>Age (years)</b>	65 (55, 73)	64 (53, 71)
<b>Sex</b>		
Female	80 (36)	92 (41)
Male	142 (64)	130 (59)
<b>Follow-up (months)</b>	22 (14, 42]	36 (24, 72)
<b>Lymphoproliferative disease (n = 5)</b>		
Low-grade B-cell follicular lymphoma	3	-
Low-grade B-cell marginal zone lymphoma	2	-
<b>Solid cancer with possible mesenteric drainage (n = 7)</b>		
Pancreatic adenocarcinoma	3	-
Colon adenocarcinoma	2	2
<b>Distant cancer (n = 23)</b>		
Melanoma	1	0
Bladder carcinoma	2	1
Skin basal cell carcinoma	1	0
Breast carcinoma	1	0
ENT carcinoma	0	1
Lung carcinoma	3	0
Prostate carcinoma	3	6
Renal cell carcinoma	1	1
Urothelial carcinoma	1*	0
Hepatocellular carcinoma	1*	0
<b>Delay between diagnosis of MP and malignancy</b>		
Concomitantly (< 3 months)	7*/*	1
3 months to 1 year included	1	0
1 to 2 years included	2	3
> 2 years	14	7

Data are n, n (%) or medians followed by interquartile ranges (Q1, Q3).

\* One patient had two new malignancies. ENT: Ear Nose Throat. MP: Mesenteric panniculitis.

Table 2. Patients with newly diagnosed malignancy possibly related to mesenteric panniculitis

Type of new malignancy	Low-grade B-cell follicular lymphoma	Low-grade B-cell follicular lymphoma	Low-grade B-cell follicular lymphoma	Low-grade B-cell marginal zone lymphoma	Low-grade B-cell marginal zone lymphoma
<b>Demographic characteristics</b>					
Age (year)	73	65	46	75	50
Sex	Male	Female	Female	Male	Female
Indication of initial CT	Symptomatic	Symptomatic	Symptomatic	Incidental	Symptomatic
<b>CT features</b>					
Halo sign	No	No	No	No	No
Hyper-attenuating pseudo capsule	Yes	No	No	Yes	No
All 5 signs present	No	No	No	No	No
> 2 MP soft nodules with short-axis > 10 mm	No	Yes	Yes	Yes	Yes
Short axis (mm)	6	14	19	11	12
Adenomegalies (other location)	Yes	Yes	Yes	No	Yes
Splenomegaly	No	No	No	No	No
<b>Interval between initial CT and malignancy diagnosis (months)</b>					
	37	0	3	8	74
<b>Comments</b>					
	Pathological diagnosis on retroperitoneal lymphadenopathies. Suspected MP was stable between initial CT and malignancy diagnosis.	Pathological diagnosis on bone marrow. Increased uptake on <sup>18</sup> F FDG PET/CT	Pathological diagnosis on mesenteric lymph nodes. Increased uptake on <sup>18</sup> F FDG PET/CT	Pathological diagnosis on bone marrow. Increased uptake on <sup>18</sup> F FDG PET/CT. Transformation in diffuse large B-cell lymphoma 2 years later.	Pathological diagnosis on bone marrow. Slow progression during CT follow-up. Increased uptake on <sup>18</sup> F FDG PET/CT

MP: Mesenteric panniculitis; <sup>18</sup>F FDG PET/CT: [18F] fluorodeoxyglucose positron emission tomography/computed tomography

\* Splenomegaly associated with portal hypertension

Table 3. Unrelated newly diagnosed malignancies in the CT follow-up group

Type of malignancy	Malignancy	Age	Sex	Indication of first CT	Delay with new cancer (months)	Comments
Mesenteric drainage	Colon cancer	72	M	Incidental	41	Occurred after 12 months after initial CT at inclusion
Mesenteric drainage	Colon cancer	67	M	Symptomatic	116	Occurred after 12 months after initial CT at inclusion
Mesenteric drainage	Pancreatic adenocarcinoma	71	M	Incidental	45	Occurred after 12 months after initial CT at inclusion
Mesenteric drainage	Pancreatic adenocarcinoma	54	M	Incidental	65	Occurred after 12 months after initial CT at inclusion
Mesenteric drainage	Pancreatic adenocarcinoma	71	M	Symptomatic	33	Occurred after 12 months after initial CT at inclusion
Distant cancer	Renal cell carcinoma	89	F	Symptomatic	0	Neither regional lymphadenopathy nor metastatic disease.
Distant cancer	Basal cell carcinoma	52	M	Incidental	60	Occurred after 12 months after initial CT at inclusion
Distant cancer	Bladder cancer	89	F	Incidental	1	No regional lymphadenopathy nor metastatic disease (in situ)
Distant cancer	Bladder cancer	59	F	Incidental	43	Occurred after 12 months after initial CT at inclusion
Distant cancer	Breast cancer	81	F	Incidental	52	Occurred after 12 months after initial CT at inclusion
Distant cancer	Lung cancer	62	M	Incidental	72	Occurred after 12 months after initial CT at inclusion
Distant cancer	Lung cancer	80	M	Incidental	39	Occurred after 12 months after initial CT at inclusion
Distant cancer	Lung cancer	64	M	Symptomatic	0	Neither regional lymphadenopathy nor metastatic disease
Distant cancer	Melanoma	72	M	Incidental	19	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	70	M	Incidental	149	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	65	M	Symptomatic	44	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	61	M	Symptomatic	24	Occurred after 12 months after initial CT at inclusion
Distant cancer	Hepatocellular carcinoma	71	M	Symptomatic	0	Neither regional lymphadenopathy nor metastatic disease
Distant cancer	Urothelial carcinoma	71 (Same patient as above)	M	Symptomatic	0	Neither regional lymphadenopathy nor metastatic disease

CT: Computed tomography; F: Female; M: Male

**Table 4. Unrelated newly diagnosed malignancies in the clinical follow-up group**

Type of malignancy	Malignancy	Age	Sex	Indication of first CT	Delay between MP and cancer	Comments
Mesenteric drainage	Colon cancer	53	M	Incidental	68	Occurred after 12 months after initial CT at inclusion
Mesenteric drainage	Colon cancer	60	M	Incidental	66	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	67	M	Incidental	25	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	80	M	Incidental	24	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	64	M	Incidental	24	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	64	M	Symptomatic	24	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	63	M	Symptomatic	38	Occurred after 12 months after initial CT at inclusion
Distant cancer	Prostate cancer	67	M	Symptomatic	27	Occurred after 12 months after initial CT at inclusion
Distant cancer	Bladder cancer	50	M	Incidental	108	Occurred after 12 months after initial CT at inclusion
Distant cancer	ENT carcinoma	60	M	Incidental	48	Occurred after 12 months after initial CT at inclusion
Distant cancer	Renal cell carcinoma	57	F	Incidental	60	Occurred after 12 months after initial CT at inclusion

CT: Computed tomography; F: Female; M: Male; ENT: Ear Nose Throat; MP: Mesenteric panniculitis

**Table 5. Performance of CT signs for identifying worrisome features of mesenteric panniculitis**

Parameter	Sensitivity	Specificity	Youden index	PPV	NPV	P value*
Absence of 1 or 2 of the 5 signs of MP **	5/5 (100) [57–100]	118/439 (27) [23–31]	0.27	5/326 (2) [1–3]	118/118 (100) [97–100]	0.33
At least one MP soft-tissue nodule with a short axis > 10 mm	4/5 (80) [38–99]	436/439 (99) [98–100]	0.79	4/7 (57) [25–84]	436/437 (100) [99–100]	<0.0001
Lymphadenopathy in another abdominal or pelvic area	4/5 (80) [38–99]	438/439 (100) [99–100]	0.80	4/5 (80) [38–99]	438/439 (100) [99–100]	<0.0001
Splenomegaly	0/5 (0) [0–43]	427/444 (96) [94–98]	NA	0/17 (0) [0–18]	427/432 (99) [97–100]	>0.99

Data are proportions, followed by percentages in parentheses and 95% confidence intervals in brackets.

\* Fisher exact test. PPV: positive predictive value; NPV: negative predictive value

\*\* The “halo sign” and the “hyperattenuating pseudo-capsule” were the two signs of MP that were missing among patients



Figure1.png

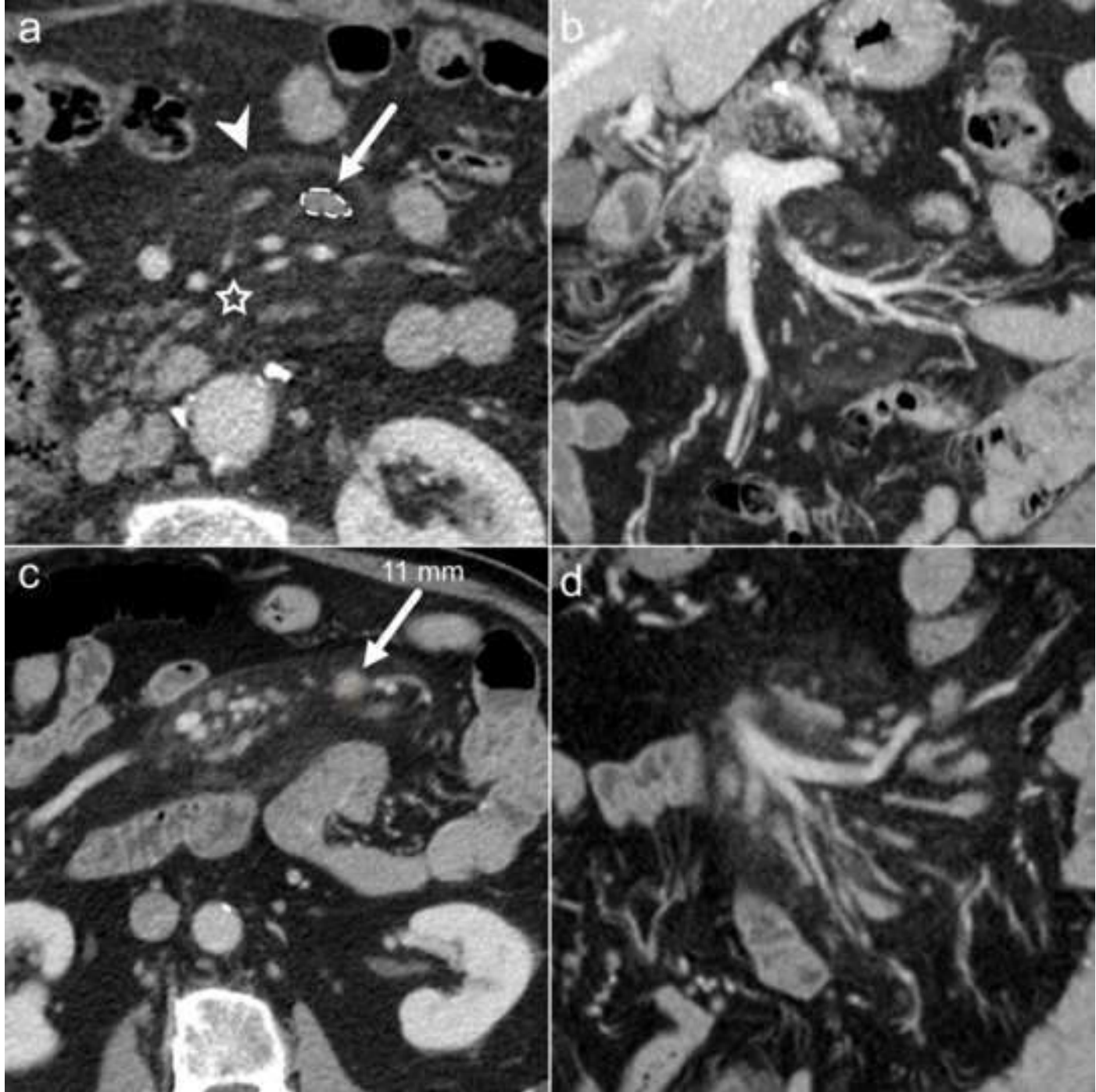


Figure2.png

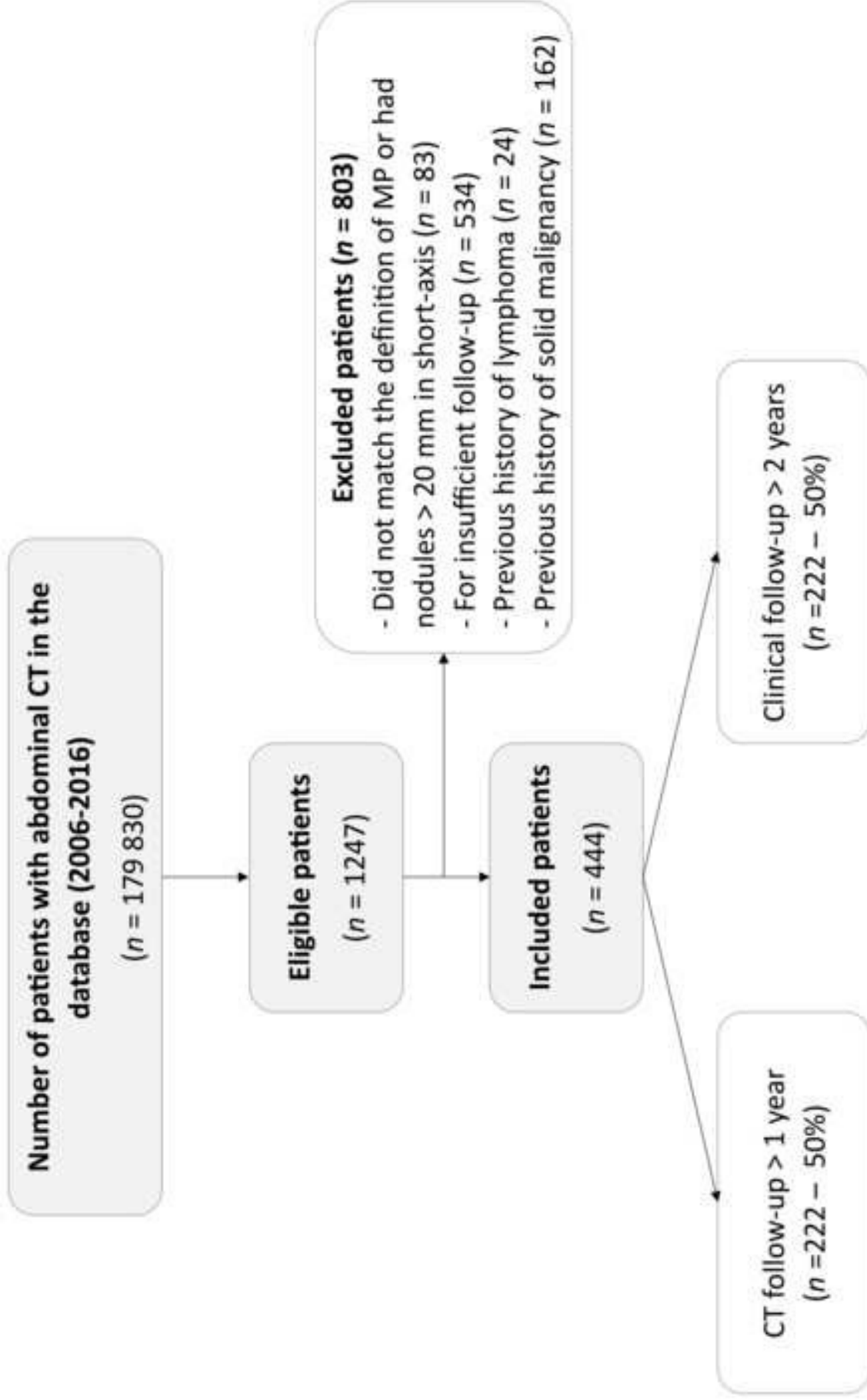


Figure3.png

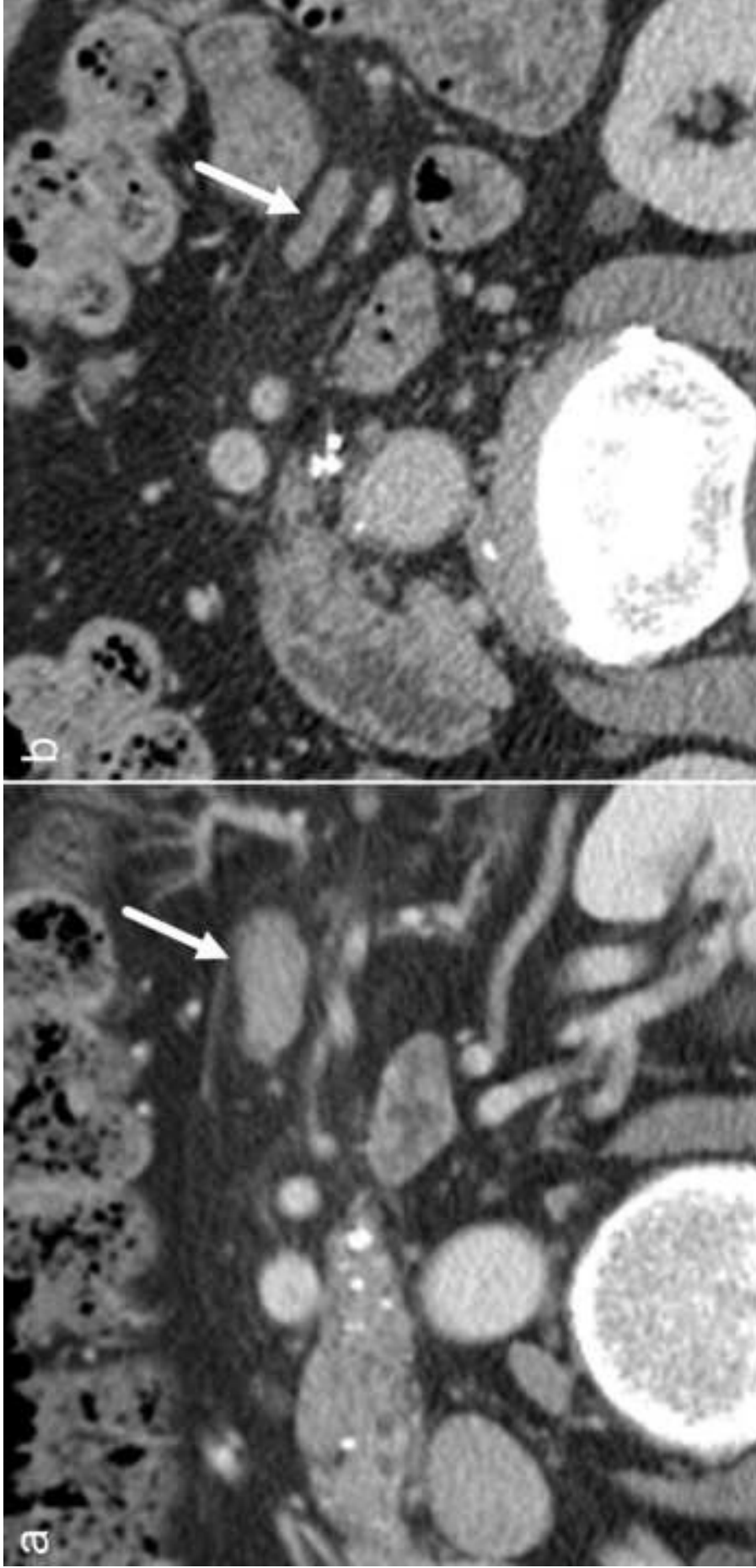
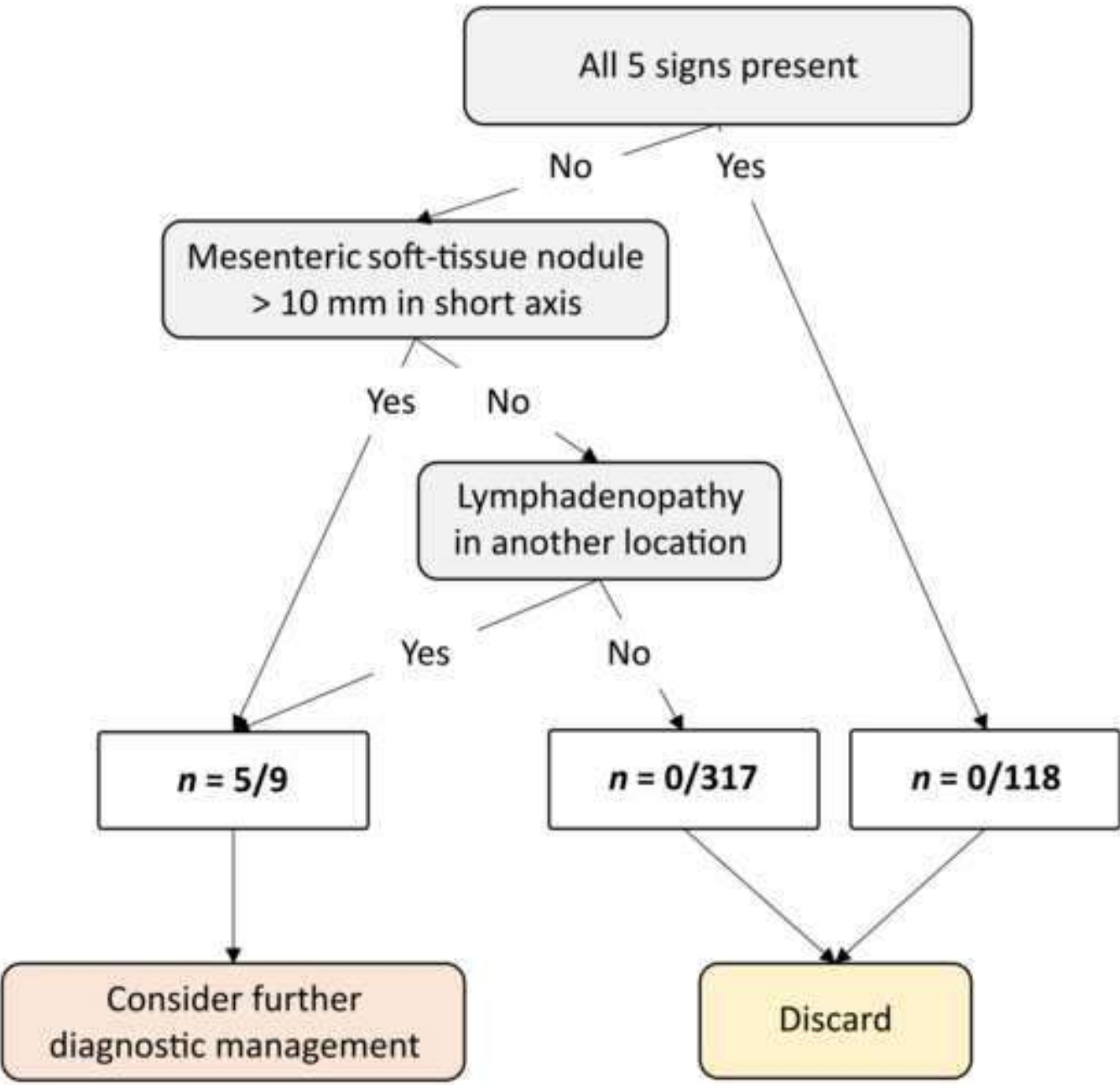


Figure4.png



*Model Performance*  
**Sensitivity 100% (95% CI: 57-100)**  
**Specificity 99% (95% CI: 98-100)**  
**Positive Predictive Value 56% (95% CI: 27-81)**  
**Negative Predictive Value 100% (95% CI: 99-100)**