



Mesenteric Panniculitis and Systemic Inflammation: A Retrospective Analysis of Inflammatory Indices - a Retrospective Cross-sectional Study

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Abstract

Background: Mesenteric panniculitis (MP) is a nonspecific inflammatory pathological condition affecting the mesenteric adipose tissue. Data regarding systemic inflammatory markers in patients with MP are limited. We aimed that systemic inflammatory blood parameters, including those derived from complete blood count (CBC), would show a significant correlation with computed tomography (CT)-based severity scores in patients with MP.

Methods: This was a retrospective cross-sectional study. Patients aged 18 years and older who underwent abdominal CT scans for any reason and had concurrent comprehensive laboratory tests between January 1, 2015, and January 1, 2020, were included. Demographic data and laboratory findings were reviewed. White blood cell count, hemoglobin, neutrophil count, lymphocyte count, platelet count, platelet-to-lymphocyte ratio (PLR), neutrophil-to-lymphocyte ratio (NLR), systemic inflammatory response index (SIRI), systemic immune-inflammation index (SII), and aggregate index of systemic inflammation (AISII) were evaluated. MP severity was scored between a minimum of 3 and a maximum of 15 points and classified as mild (score 3–5), moderate (score 5–9), and severe (score 10–15).

Results: A total of 80 patients were included in the study. The median total MP score was found to be 6. Among the patients, 36.2% were classified as mild, and 63.8% as moderate-to-severe. When the patients were evaluated based on the severity of MP, there were no statistically significant differences in comorbidities or systemic inflammatory parameters (NLR, PLR, SII, SIRI and AISII) (all values $p>0.05$). Although the density of mesenteric fat was higher compared to visceral adipose tissue, this difference was not statistically significant in relation to systemic inflammatory parameters ($p>0.05$).

Conclusions: In patients with mesenteric panniculitis (MP), in the absence of accompanying acute or chronic infectious or inflammatory pathologies, it does not appear to affect the systemic inflammatory response.

Keywords

Mesenteric panniculitis, Computed tomography, NLR, PLR, SII, AISII, systemic inflammatory response

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Introduction

Mesenteric panniculitis (MP) is a chronic inflammatory disorder affecting the mesenteric adipose tissue, diagnosed based on the observation of mesenteric fat congestion and haziness on abdominal computed tomography (CT). Although the exact etiology remains unclear, it has been associated with prior trauma, concurrent abdominal infections, infestations, and malignancies such as lymphoma and colon carcinoma [1]. MP is a rare condition, with a prevalence ranging from 0.16% to 3.3% [2]. It is more common in men, with a male-to-female ratio of approximately 2:3 [3]. The disease typically occurs in Caucasians and is most

diagnosed in individuals aged between 60 and 70 years [4], although rare cases have been reported in children [5].

While some cases are asymptomatic, approximately 50% of patients present to emergency departments with nonspecific symptoms such as abdominal discomfort (78%), pain, constipation, and diarrhea. Occasionally, it may present as an abdominal mass, leading to bowel obstruction or ischemia, which may require urgent surgery [5]. Diagnosis is achieved by excluding other differential diagnoses such as acute cholecystitis and appendicitis. CT imaging and routine blood tests are typically used in the diagnostic process [6, 7]. MP is primarily

diagnosed through radiological evaluation, with CT and magnetic resonance imaging (MRI) being the most reliable methods for detection.

There are two main forms of MP: the classic form characterized by inflammation, necrosis, and fat degeneration, and the retractile form, where retraction of surrounding structures is observed [1]. The disease generally follows a benign course, and in the absence of other abdominal pathology, treatment is symptomatically managed with medical therapy.

Previous studies have suggested that blood tests in MP patients are generally within normal limits. However, erythrocyte sedimentation rate and C-reactive protein levels may be elevated as a response to the inflammatory process [8-10]. There is limited data regarding other systemic inflammatory markers. We aimed that systemic inflammatory blood parameters, including those derived from complete blood count (CBC), would show a significant correlation with CT-based severity scores in patients with MP.

Materials and Methods

Study design

This retrospective cross-sectional study was conducted at Ankara Atatürk Sanatorium Training and Research Hospital. This 780-bed tertiary care facility is located in a bustling provincial center. Approval for the study was obtained from the local ethics committee with protocol number 2023-KAEK/15-2696. This study was prepared and reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

Study population

Patients aged 18 years and older who underwent abdominal CT for any reason and had simultaneous laboratory tests between January 1, 2015, and January 1, 2020, were included. These patients had presented to the general surgery, emergency medicine, internal medicine, urology, or gastroenterology departments with complaints of abdominal pain or flank pain. Patients with no MP findings on CT scans, patients under 18 years of age, patients with artefacts preventing CT evaluation, patients with chronic inflammatory diseases, pregnant women, and those with missing data were excluded from the study. Patients with chronic inflammatory diseases were excluded to avoid potential confounding effects on systemic inflammatory markers, as these conditions could independently elevate inflammatory indices. Pregnant women were excluded due to physiological

hematological changes during pregnancy, which could alter systemic inflammatory parameters and affect the study outcomes. Only patients in whom laboratory blood tests were performed within three days of CT imaging were included in the study, in order to minimize potential variability in systemic inflammatory markers over time.

Data Collection

Demographic data (age, gender, etc.), comorbidities, history of prior surgeries, and laboratory findings were obtained through retrospective review of patient records. Laboratory parameters evaluated included white blood cell count, hemoglobin, neutrophils, lymphocytes, platelets, platelet-to-lymphocyte ratio (PLR), neutrophil-to-lymphocyte ratio (NLR), systemic inflammatory response index (SIRI), systemic immune-inflammation index (SII), and aggregate index of systemic inflammation (AISII). The inflammatory indices were calculated using the following formulas:

$PLR = \text{Platelet} / \text{Lymphocyte}$

$NLR = \text{Neutrophil} / \text{Lymphocyte}$

$SII = (\text{Platelet} \times \text{Neutrophil}) / \text{Lymphocyte}$

$SIRI = (\text{Neutrophil} \times \text{Monocyte}) / \text{Lymphocyte}$

$AISII = (\text{Neutrophil} \times \text{Platelet} \times \text{Monocyte}) / \text{Lymphocyte}$

Imaging

CT reports containing the terms “mesenteric panniculitis” and “mesenteric lymph node” were reviewed (**Figure-1**). The presence of MP (such as lymph nodes, fat stranding, etc.) and other abdominal pathologies (e.g., malignancies, acute pancreatitis, acute appendicitis) were assessed by a radiologist blinded to the study outcomes.

CT findings were categorized as:

“Mass effect” (compression of adjacent intestines),

“Increased density of mesenteric fat,”

“Presence of lymph nodes,”

“Halo sign” (fat surrounding vascular structures), and

“Pseudocapsule” (dense, capsular appearance surrounding mesenteric fat).

A diagnosis of MP was made if at least three of these features were present. Each feature was scored as absent (0), mild (1), moderate (2), or marked (3), and the total severity score ranged from 3 to 15. MP severity was classified as mild (3–5), moderate (5–9), or severe (10–15).

Statistical Analysis

No a priori power analysis was performed because this study was designed as a retrospective analysis of all eligible cases within the specified time frame, and the sample size was determined by the availability of complete data rather than pre-study calculations. Data collected during the study were analyzed using IBM SPSS 20.0 (Chicago, IL, USA) statistical software.

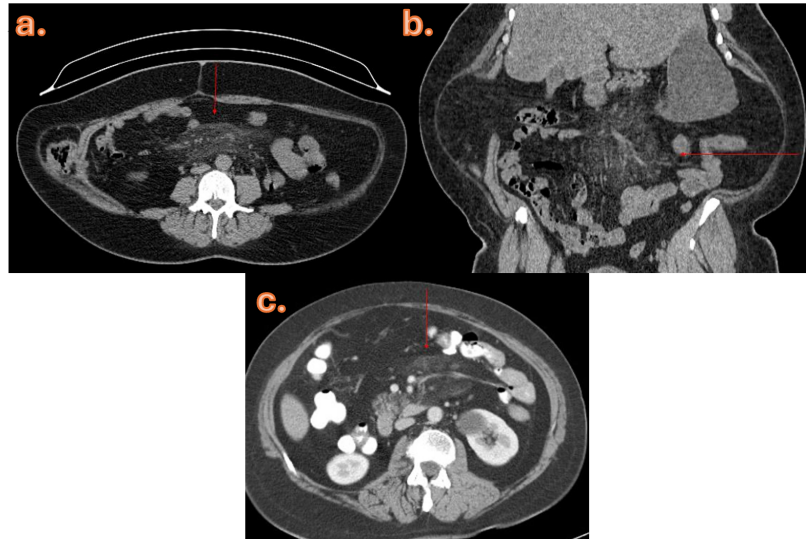


Figure 1: a:-Mesenteric fat stranding with lymph nodes exhibiting a capsular appearance and surrounding halo in a female patient presenting with abdominal pain, observed in the midline. b-c: Abdominal CT images in axial and coronal planes, performed due to a history of nephrolithiasis, demonstrating marked mesenteric fat stranding and mild mass effect on the adjacent bowel loops.

Results

A total of 122 patients were diagnosed with MP using the scoring system during the study period. However, 42 patients were excluded due to missing data, resulting in a final sample size of 80 patients (**Figure 2**).

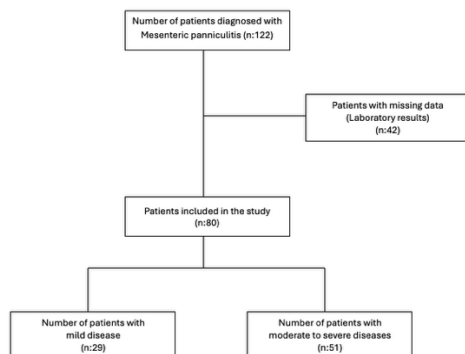


Figure 2: Flowchart showing number of patients of the study

Of these, 50% were female, and the median age was 59 years. The demographic and laboratory data of the patients are presented in **Table 1**.

The CT findings of the patients, along with the panniculitis severity scores, are provided in **Table 2**. The median total MP score was found to be 6. Of the patients, 36.2% were classified as having mild disease, while 63.8% had moderate-to-severe disease.

When the patients were evaluated based on the severity of MP, there were no statistically significant differences

in comorbidities or systemic inflammatory parameters (NLR, PLR, SII, SIRI and AISI) (all values $p > 0.05$). Although the density of mesenteric fat was higher compared to visceral adipose tissue, this difference was not statistically significant in relation to systemic inflammatory parameters ($p > 0.05$) (**Table 3**).

Table 1: Demographics and laboratory data of all patients (n=80)

Gender, n (%)	
Female	50 (50%)
Age, median (IQR 25-75)	
	59 (51-68)
Contrast-Enhanced Computed Tomography, n (%)	
	16 (20%)
Comorbidity, n (%)	
Hypertension	28 (35%)
Diabetes	23 (28.8%)
Coronary artery disease	12 (15%)
Chronic kidney disease	3 (3.8%)
Other	13 (16.3%)
Laboratory, median (IQR 25-75)	
WBC	8.23 (7.02-10.6)
Neutrophil	4.83 (3.91-6.46)
Lymphocyte	2.04 (1.67-2.76)
Hemoglobin	14 (12.8-15.5)
Platelet	252 (207-312)
Systemic inflammatory markers, median (IQR 25-75)	
NLR	2.16 (1.72-3.24)
SIRI	1.15 (0.74-2.02)
PLR	115.4 (92.3-153)
SII	602.2 (421.6-840)
AISI	297.2 (185.2-563.3)

WBC: White blood cell, **NLR:** Neutrophil lymphocyte ratio, **SIRI:** Systemic inflammatory response index, **PLR:** Platelet lymphocyte ratio, **SII:** Systemic immune-inflammation index, **AISI:** Aggregate index of system inflammation

Table 2: Abdominal computed tomography findings of patients

Mass effect, (n) %	
▪ None	12 (15%)
▪ Mild	35 (43.8%)
▪ Moderate	31 (38.8%)
▪ Severe	2 (2.5%)
Fatty tissue contamination, (n) %	
▪ None	3 (3.8%)
▪ Mild	44 (55%)
▪ Moderate	22 (27.5%)
▪ Severe	11 (13.8%)
Number of lymph nodes, (n) %	
▪ 0-9	43 (53.8%)
▪ 10-20	35 (43.8%)
▪ 21 and over	2 (2.5%)
Short dimension of largest lymph node (mm) - median (IQR25%-75%)	4 (4-6)
Pseudo capsule, (n) %	
▪ None	14 (17.5%)
▪ Mild	30 (37.5%)
▪ Moderate	25 (31.3%)
▪ Severe	11 (13.8%)
Fat halo sign, (n) %	
▪ None	23 (28.8%)
▪ Mild	36 (45%)
▪ Moderate	18 (22.5%)
▪ Severe	3 (3.8%)
Total MP score median (IQR25%-75%)	6 (4-8.7)
Total MP score severity, (n) %	
▪ Mild	29 (36.2%)
▪ Moderate	41 (51.3%)
▪ Severe	10 (12.5%)
Transverse dimension of MP area (cm) - median (IQR25%-75%)	7.85 (6.8-9.1)
Anteroposterior dimension of MP area (cm) - median (IQR25%-75%)	3.8 (3.2-4.8)
Upper-lower dimension of MP area (cm) - median (IQR25%-75%)	8.1 (7.1-9.5)
Average fatty tissue density of the MP area (cm) - median (IQR25%-75%)	-87 [(-95.6)- (-76.6)]
Fatty tissue density of MP area (cm) - median (IQR25%-75%)	-19.8 [(-22.8)- (-16)]
Visceral fat tissue mean density - median (IQR25%-75%)	-113.9 [(-117.4)- (-110)]
Visceral fat tissue density - median (IQR25%-75%)	-16.6 [(-19)- (-14.6)]
Additional findings that may cause abdominal pain, (n) %	
▪ Urolithiasis, without obstruction	23 (26.7%)
▪ Urolithiasis, with obstruction	18 (20.9%)
▪ Other abdominal pathologies	15 (17.4%)
▪ Concomitant intra-abdominal malignancy	3 (3.8%)

MP: Mesenteric panniculitis

Discussion

Mesenteric panniculitis is fundamentally a radiologically diagnosed condition. In this study, which investigated the changes in systemic inflammatory markers in patients with MP, we found that despite the underlying inflammation in MP, systemic inflammatory markers did not significantly vary with the severity of the disease. This suggests that in MP, inflammation may remain localized at the mesenteric level, and the absence of associated

abdominal pathology results in no systemic inflammatory response.

MP is a nonspecific inflammatory pathological condition affecting the mesenteric adipose tissue of both the small and large intestines. Histologically, nearly all cases exhibit fat necrosis, chronic inflammation, and fibrosis [10]. Diagnosis is usually confirmed through CT, which reveals pathognomonic features such as pseudo capsules, fat halo sign, and fat stranding [3]. Horton et al. reported that CT findings are specific for diagnosing MP, reflecting a preserved fat ring around the mesenteric vessels and the presence of a tumoral pseudo capsule [11]. In our patients, particularly in those with moderate and severe disease, these findings were prominent. Although histopathology may be considered the gold standard for diagnosis, in most cases, patients are followed without further investigation if the condition does not progress [12, 13]. In our study, MP was diagnosed based on CT findings alone, without pathological confirmation.

In Emory's study, the incidence of MP was higher in men and more frequent in individuals aged 50-60 years [8]. However, some longitudinal studies have shown a higher incidence in women [14]. While our study involved similar age groups, no significant gender differences were found.

The pathogenic mechanism of MP appears to be a nonspecific response to various stimuli. Although numerous causal factors have been identified, the precise etiology remains unknown [1-3]. MP has been associated with a variety of underlying conditions, including rheumatologic diseases, malignancies, pancreatitis, vasculitis, granulomatous diseases, prior abdominal surgeries or trauma, ischemia, and infections [1, 13, 14]. MP may be asymptomatic or present with symptoms such as abdominal pain, constipation, and diarrhea. The majority of our patients presented with abdominal pain, and the primary diagnosis in most cases was urolithiasis. A study analyzing 3,698 consecutive CT scans of patients with MP found that metabolic syndrome, urogenital diseases, and vascular diseases were significantly more common in MP patients compared to those without the disease. In this cohort, urogenital diseases were reported in 37.3% of MP patients and 26.7% of the matched cohort [15]. It has also been suggested that MP may be associated with chronic factors such as urine leakage [3]. In 28% of our patients (n=18), obstruction was observed in the renal collecting system or ureter. However, when comparing systemic inflammatory parameters between patients with and without obstruction, no significant

Table 3: Comparison of patients according to the severity of Mesenteric Panniculitis

	Mild (n=29)	Moderate-severe (n=51)	P value
Age, median (IQR 25-75%)	56 (45.5-679)	60 (54-68)	0.134
Gender, n (%)			
▪ Female	14 (48.3%)	26 (51%)	0.816
Comorbidity, n (%)			
▪ Hypertension	10 (34.5%)	18 (35.3%)	0.942
▪ Diabetes	8 (27.6%)	15 (29.4%)	0.862
▪ Coronary artery disease	4 (13.8%)	8 (15.7%)	0.820
▪ Chronic kidney disease	3 (10.3%)	0 (%)	0.044
Ureteral obstruction, n (%)	6 (20.7%)	12 (23.5%)	0.770
Malignancy, n (%)	0 (0%)	3 (5.9%)	0.550
Number of lymph nodes, n (%)			
▪ 0-9	20 (69%)	23 (45.1%)	0.083
▪ 10-20	9 (31%)	26 (51%)	
▪ 21 and over	0 (0%)	2 (3.9)	
The largest short lymph node size (mm), median (IQR 25-75%)	4 (4-5)	4 (4-6)	0.113
Systemic inflammatory markers, median (IQR 25-75)			
▪ NLR	2.31 (1.66-3.46)	2.1 (1.72-3.24)	0.790
▪ SIRI	1.2 (0.74-2.1)	1.15 (0.74-2.02)	0.951
▪ PLR	115 (100.7-166.6)	118 (90.3-150.5)	0.741
▪ SII	609.4 (356.8-898.2)	595.1 (425.6-832)	0.805
▪ AISI	252.1 (188.8-611.8)	302.4 (185.1-561.3)	0.789

NLR: Neutrophil lymphocyte ratio, **SIRI:** Systemic inflammatory response index, **PLR:** Platelet lymphocyte ratio, **SII:** Systemic immune-inflammation index, **AISI:** aggregate index of systematic inflammation, **MP:** Mesenteric panniculitis

difference was found ($p > 0.05$ for all values). This suggests that inflammation in MP remains localized and does not induce a systemic response.

A study evaluating the relationship between MP and malignancy found that the risk of malignancy in MP patients is five times higher compared to those without mesenteric involvement, and MP is frequently observed in non-Hodgkin lymphoma [10]. In our study, malignancy was present in only three patients, and in these cases, inflammatory markers were generally within normal limits. This could be attributed to the fact that most of these patients were diagnosed with urolithiasis based on CT, and no infectious or inflammatory conditions were present other than panniculitis. Our results align with previous case series in which inflammatory markers remained within normal limits [15]. In a study by Kaya et al. evaluating 22 MP patients, the median C-reactive protein (CRP) level at diagnosis was 26.9 mg/L (range, 0.44–573 mg/L), and the mean white blood cell count was $10.690 \pm 3.504/\text{mL}$ (normal range, 4.500–10,500/mL), with a mild increase in inflammatory markers [9]. Neutrophilia, increased erythrocyte sedimentation rate, and occasionally anemia have been reported in cases of retractile mesenteritis. Retractable mesenteritis has been associated with several malignancies, including lymphoma, lung cancer, renal cell carcinoma, colon cancer, myeloma, gastric carcinoma, chronic lymphocytic leukemia, and Hodgkin's disease [3, 15]. Our findings are consistent with previous literature indicating that systemic inflammatory markers may vary according to the presence of concomitant malignancy in patients with MP. Atacan et al., in a large retrospective study of 716 patients, reported that mean hemoglobin

levels and leukocyte counts were significantly lower in the malignant group compared to the nonmalignant group, while the frequency of anemia and leukopenia was markedly higher in the malignant group. Moreover, mean ESR values and the proportion of patients with elevated ESR were significantly greater among those with malignancy [16]. These results suggest that systemic inflammatory and hematological alterations in MP are more pronounced when associated with malignant conditions. In our cohort, where malignancy was rare, systemic inflammatory parameters remained within normal limits and showed no significant correlation with disease severity, supporting the notion that MP-related inflammation may remain localized in the absence of malignancy or other inflammatory comorbidities. While these findings may be generalizable to similar tertiary care settings, differences in patient demographics and disease spectrum should be considered. Clinically, our results imply that systemic inflammatory markers may have limited diagnostic or prognostic utility for MP severity assessment in patients without underlying malignant or systemic inflammatory disorders. In our study, no correlation between the severity of panniculitis and an increase in systemic inflammatory parameters derived from CBC was observed. MP remains a chronic inflammatory condition of the mesentery with an unknown etiology, and while it is typically diagnosed through radiological methods, it can also be diagnosed in patients with no known pathology causing mesenteric inflammation, as seen in our study. In such cases, no systemic inflammatory response may be observed.

Limitations

This study is a single-center, retrospective analysis. A limitation of our study is that some demographic data (e.g., obesity, smoking) could not be obtained for some patients. In addition, in some cases not accompanied by infection (e.g., urolithiasis), tomography was performed, and the small number of patients with concomitant malignancies prevents us from drawing conclusions in this regard. Furthermore, the lack of a significant association between systemic inflammatory markers and CT severity scores may be partially explained by the limited statistical power and possible selection bias, as a notable proportion of patients underwent CT for non-inflammatory conditions such as urolithiasis. As this study employed a cross-sectional design, causal relationships between CT findings and systemic inflammatory parameters cannot be established. The observed associations should therefore be interpreted as correlational rather than causal. Another limitation is that the diagnosis of MP is based only on CT findings without pathological confirmation.

Conclusion

In conclusion, MP is a rare clinical condition that describes chronic inflammation of the mesentery, which may develop independently or in association with other diseases. MP is typically diagnosed through CT imaging, and its features have been well-defined in recent literature. In the absence of accompanying acute or chronic infectious or inflammatory pathologies, MP does not seem to significantly affect systemic inflammatory response. Further studies with larger sample sizes are needed to clarify the significance of MP and to assess systemic inflammatory responses in these patients.

Author contribution statement

All authors (SUR, İE, GK, CÖ, and YÇ) participated in the planning, writing, editing, and review of this manuscript.

Conflicts of interest and funding

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper. No funding was received for this study.

Ethical approval

This study was approved by Ataturk Sanatorium Training and Research Hospital Ethics Committee (2023-KAEK/15-2696).

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