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Mesenteric panniculitis: Prevalence, imaging findings, relation with malignancy, comparison with control group and six-year follow-up

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ABSTRACT

Objective: To investigate the prevalence of mesenteric panniculitis (MP), imaging findings, its relationship with malignancy, development of malignancy in follow-up and make a comparison with the control group.

Patients and Methods: A total of 3196 multidetector computed tomography (CT) scans were evaluated retrospectively in terms of MP. CT findings of MP, accompanying benign and malignant pathologies were examined. Two consecutive patients who matched by age, gender, and abdominal diameter were included in the control group. A comparison was made between the MP and control groups concerning malignancy and new malignancy development during a six-year follow-up.

Results: One hundred and sixty-three MP cases and 326 control cases were included to the study. The most common CT findings of MP were increased density of mesenteric fat, pseudomass appearance, and lymph nodes within the pseudomass. 59.5% (n: 97) of the MP group and 58.3% (n: 190) of the control group were associated with malignancy (p: 0.77). The most common malignancies were colorectal cancer (n: 21, 12.2%) in the MP group, and lung cancer (n: 40, 12.2%) in the control group. During follow-up, new malignancies were detected 9.2% (n: 11) in the MP group and 6.3% (n: 8) in the control group (p: 0.37). Lung cancer (n: 3, 27.3%) in the MP group and colorectal cancer (n: 2, 25%) in the control group were the most frequently seen cancer type (p: 0.09).

Conclusion: Mesenteric panniculitis prevalence is 5.1%. When the MP group was compared with the control group, there was no significant accompanying malignancy and no significant new cancer development was observed.

Keywords: Abdomen, Body CT, Follow-up, Mesenteric panniculitis, Oncologic imaging

1. INTRODUCTION

Mesenteric panniculitis (MP) is an idiopathic chronic nonspecific inflammation of intestinal mesenteric fatty tissue [1, 2]. It is frequently detected incidentally on multidedector computed tomography (CT) examinations [3]. Prevalence is between 0.16% and 7.83% [1-5]. It is frequently seen in the middle and late adulthood and is more frequent in males [4].

As a result of the increased number of abdominal CT scans, specific CT findings of MP were identified and diagnostic frequency was increased [2, 6]. Some studies have shown an association between MP and malignancy, and the incidence of accompanying malignancy has been reported as 17-69.4% [4, 7-12]. It has also been suggested that MP may occur due to or in association with abdominal trauma, autoimmune diseases, mesenteric ischemic disease, granulomatous diseases, infectious and inflammatory diseases, paraneoplastic conditions, and recent surgical procedures [1, 4, 6, 8, 13]. Although, the probabilty of malignancy development in MP cases was reported in the follow up, this relationship is still being questioned [2, 4, 7, 8, 10, 14]. MP is often asymptomatic, usually a benign and self-limited condition. In the literature, the number of MP studies that include follow-up and control groups are very limited [1-3]. In this study, we retrospectively reviewed the multidetector CTs to determine the MP prevalence, imaging findings, comparing the relationship between MP and malignancy with the non-MP control group, and examine the development of new malignancies in the up to 6 years follow-up.

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2. PATIENTS and METHODS

Patients

Our study was approved by the Ethics Committee of Trakya University Hospital (approval number and date: 12/01, 02/07/2018). Multidector CT scans of 3196 patients between January and July of 2012 over 18 years of age, were retrospectively evaluated (MG). The CT findings of MP which are (a) a high attenuation of fat in the mesentery of the small intestine; (b) a pseudomass appearance that slightly displaces but does not invade the neighbouring structures; (c) a pseudocapsule in the form of a dense line that separates the high attenuated mesenteric fat and normal mesentery; (d) short axis <10mm lymph nodes in the pseudomass, and (e) hypodense halos around the vessels and lymph nodes were examined [5]. MP was diagnosed in the presence of at least 3 of 5 CT findings (Fig. 1). Subsequently, cases were reevaluated in terms of MP criteria and exclusion criteria (MG and EY, 13 years of abdominal imaging experience). Mesenteric infiltration (cirrhosis, pancreatitis), mesenteric fibrosis and retention, neoplasia including mesenteric tissue, mesenteric edema, massive ascites, hemorrhage (due to trauma or surgery which occurred during the <6 month period) and mesenteric ischemia were exclusion criteria. After every patient who were included in the MP group, 2 consecutive patients of appropriate gender, age (± 2 years), abdominal diameters measured at umbilical level (± 2cm) and with no MP findings were included in the control group.

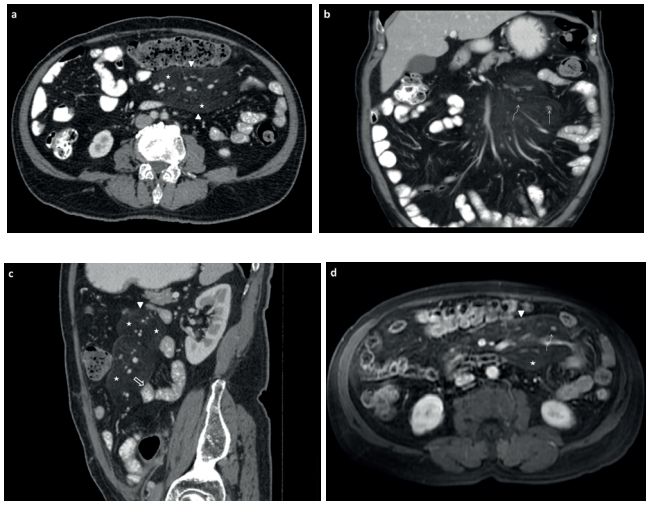

Figure 1. *A 71-year old male patient with prostate and colon cancer. a-c. Typical CT findings of mesenteric panniculitis on axial (a), coronal (b), and sagital (c) views. A pseudomass appearance that slightly displaces but does not invade the neighbouring structures (thick arrow); a pseudocapsule (arrowhead) in the form of a dense line that separates the high attenuated mesenteric fat (asterisk) and normal mesentery; short axis <10mm lymph nodes (thin arrow) in the pseudomass, and hypodense halo (curved arrow) around the vessels and lymph nodes. d. Contrast-enhanced axial MR imaging apearance of mesenteric panniculitis.*

Imaging protocol

Computed tomography studies were performed with a 64-slice scanner (Aquillon, 64-detector, Toshiba Medical Systems, Tokyo, Japan). 300 mg I/mL iohexol (Omnipaque 300; GE Healthcare, Cork, Ireland) were used based on arterial and portal venous phase. Oral contrast solutions 30 ml/1500 ml megluminamidotrizoat (Urovist Angiografin, Schering, Germany) were used 1 hour before the CT scan. The CT parameters were as follows: gantry rotation time, 0.5 s; section collimation, 0.5 mm; helical pitch 53; 125 mAs; and 120 kVp. Images were evaluated at the Picture Archiving Communication Systems (PACS) workstation (Sectra PACS IDS7 17.3, Linköping, Sweden).

Measurements

Patients were evaluated for age, sex, history of abdominal surgery, diabetes mellitus, hypertension. MP prevalence was assessed. CT criteria of MP were compared between patients with and without malignancy in the MP group.

Follow-up

We evaluated the changes in density, size and extent of mesentery (stable, increase, decrease) in MP findings on follow-up CTs in up to 6 years. Imaging findings and medical records were evaluated during the follow-up period. MP group and control group were compared in terms of development of new malignancy and metastasis. In patients with MP who had magnetic resonance (MR) imaging, MR imaging findings of MP were evaluated. Mortality in the MP group and in the control group were compared in the follow-up period.

Statistical analysis

All analyses were performed using the statistical software package SPSS 16.0 for Windows (SPSS Inc. Chicago, IL). The variables were examined using analytic (Kolmogorov–Smirnov or Shapiro–Wilk's test) and visual (histogram) methods by defining whether they are normally distributed. Categorical variables were expressed as percentages and continuous variables were expressed as mean±standard deviation. In intergroup comparisons of continuous variables, the Mann-Whitney U test was used, and for categorical variables chi-square test was used. $p<0.05$ was accepted as the level of significance. An overall 5% type I error level was used to infer statistical significance.

3. RESULTS

Three thousand one hundred and ninety-six consecutive CTs were examined. At the initial assessment, 190 MP patients were detected by a single radiologist (MG). 163 patients (5.1%) were identified and twenty-seven patients were excluded from the study (MG, EY) as a result of the re-evaluation, considering CT criteria and exclusion criteria. Patients with 3 MP findings (n: 6, 3.7%), 4 findings (n: 42, 25.8%) and 5 findings (n: 115, 70.5%) on CT scans were included in the MP group.

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High attenuation of fat in the mesentery root of the small intestine, pseudomass appearance and lymph nodes with <10 mm short axis in pseudomass, were seen in all patients. Pseudocapsule was found in 156 patients (95.7%) and fat halo sign in 116 patients (71.2%).

Male gender was greater in the MP group (90M, 73F), the mean age was 62 ± 11 (range 27-91). Three hundred and twenty-six patients were in the control group (180M, 146F) and the mean age was 60 ± 9 years.

Most of the CTs were performed for a known malignancy, suspicion of malignancy and follow-up (MP group: 115, [70.5%]; control group 190 [58.3%], p: 0.06). Other indications were abdominal pain (MP group: 25, [15.3%]; control group 72, [22%], p: 0.47), others (renal stone, infection, ischemia, etc.) (MP group: 23, [14.1%]; control group 64, [19.6%], p: 0.65).

Malignancy and MP

In the MP group, 97 (59.5%) of 163 patients already had known malignancies. The most common malignancy associated with MP was colorectal cancer (n: 21, 21.4%). Breast (n: 13, 13.2%) and lung (n: 13, 13.2%) cancers were the other most common types of cancer. There were two malignancies in 4 patients. 23 (14.1%) patients with malignancy had viseral metastasis. There was no statistically significant difference in malignancy between the MP group (59.5%) and the control group (58.3%) (p: 0.77) (Table I).

There were no differences in terms of CT criteria between patients with malignancy and those without malignancy in the MP group. In all patients, high attenuation of fat in the mesentery root of the small intestine, pseudomass appearance and lymph nodes were seen with and without malignancy. Pseudocapsule was seen in 92 of patients with malignancy (93.9%) and 64 of patients without malignancy (98.5%) (p: 0.15). Fat halo sign was seen in 71 of patients with malignancy (72.4%) and 45 of patients without malignancy (69,2%) (p: 0.65).

Relationship between MP and other diseases

There was no significant difference between the MP and the control group in terms of comorbidity of the patients. Hypertension (MP group: n: 24, [14.7%]; control group: n: 52, [15.9%], p: 0.66), and diabetes (MP group: n: 12, [7.4%]; control group: n: 27, [8.3%], p: 0.72) were the the most frequently seen comorbidities.

6-year follow-up

In the MP group, 139 patients (85.3%) had clinical and CT follow-up (median 21 months, min-max: 2-72 months). New malignancies were diagnosed in 11 patients (7.9%). The most common malignancies were lung cancer (n: 3) and melanoma (n: 2). New metastases were seen in 25 patients (15.33%). The most common metastases were liver (n: 10) and lung (n: 6). There was no statistically significant difference between the MP group and the control group during follow-up (p: 0.37).

Table I. *Malignancy prevalence of the MP group and the control group*

	MP Group (n:163)	Control Group (n:326)	P value
Type of malignancy, n (%)	97 (59.5%)	190 (58.3%)	0.77
Colorectal	21 (21.4%)	36 (18.9%)	0.45
Breast	13 (13.2%)	25 (13.1%)	0.77
Lung	13 (13.2%)	40 (21%)	0.07
Gynecological	12 (?%)	10 (5.3%)	0.08
Bladder	7 (7.1%)	21 (11%)	0.35
Prostate	7 (7.1%)	3 (1.6%)	0.02
Sarcoma	6 (6.1%)	7 (3.7%)	0.73
Oeso-gastric	5 (5.1%)	9 (4.7%)	0.34
Renal cell cancer	4 (4.1%)	12 (6.3%)	0.65
Lymphoma/Leukemia	4 (4.1%)	4 (2.1%)	0.61
Larynx	3 (3.1%)	6 (3.1 %)	0,96
Seminoma	2 (2.1 %)	3 (1.6%)	0.49
Pancreas	1 (1%)	1 (0.5%)	0.16
Thyroid	1 (1%)	6 (3.1%)	0.26
Nasopharenx	1 (1%)	0 (0%)	0.25
Melanoma	1 (1%)	2 (1%)	0.33
Hepatobiliary	0 (0%)	5 (2.6%)	0.07
Metastasis, n (%)	23 (14.1%)	54 (16.6%)	0.47
Bone	8 (4.9%)	16 (4.9%)	0.17
Lymph node	7 (4.3%)	12 (3.6%)	0.28
Liver	5 (3.1%)	18 (5.5%)	0.26
Lung	2 (1.2%)	18 (5.5%)	0.06
Intraabdominal implant	1 (0.6%)	0 (0%)	0.87
Surrenal	1 (0.6%)	3 (0.9%)	0.82
Brain	1 (0.6%)	1 (0.3%)	0.76

MP: Mesenteric panniculitis

In the control group, 276 patients (84.7%) had follow-up (median 17 months, min-max: 1-72 months). New malignancies were detected in 8 patients (2.9%). These were the colorectal (n: 2), thyroid, larynx, breast, lung, gynecologic, and esophago-gastric cancer (n: 1, each). In 42 patients (15.2%), new metastasis were diagnosed. The most common metastases were in the lung (n:22), the bone (n:12), and the liver (n:10). There was no statistically significant difference between the MP group and the control group during follow-up (p: 0.08) (Table II).

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Table II. *Follow-up findings of the MP group and control group*

	MP Group (n:139)	Control Group (n:276)	P value
Type of malignancy, n (%)	11 (7.9%)	8 (2.9%)	0.37
Lung cancer	3 (2.1%)	1 (0.3%)	0.25
Melanoma	2 (1.4%)	0 (0%)	0.65
Colorectal cancer	1 (0.7%)	2 (0.7%)	0.68
Oeso-gastric	1 (0.7%)	1 (0.3%)	0.56
Gynecological	1 (0.7%)	1 (0.3%)	0.56
Prostate	1 (0.7%)	0 (0%)	0.46
Hepatobiliary	1 (0.7%)	0 (0%)	0.44
Lymphoma	1 (0.7%)	0 (0%)	0.42
Breast	0 (0%)	1 (0.3%)	0.77
Thyroid	0 (0%)	1 (0.3%)	0.72
Larynx	0 (0%)	1 (0.3%)	0.68
Metastasis, n (%)	25 (17.9%)	42 (15.2%)	0.08
Lung	10 (6.1%)	22 (7.9%)	0.16
Liver	6 (3.7%)	10 (3.6%)	0.07
Bone	4 (2.4%)	12 (4.3%)	0.63
Lymph node	4 (2.4%)	8 (2.8%)	0.45
Intrabdominal implant	4 (2.4%)	0 (0%)	0.06
Surrenal	2 (1.2%)	4 (1.4%)	0.37

MP: Mesenteric panniculitis

In the MP group 112 patients (68.7%) had follow-up with control CT. MP findings were stable in 75 patients (67%). There was an increase in 18 patients (16%) and a decrease in 19 patients (17%) in MP findings (Fig. 2,3). During the follow-up period, 32 patients (19.6%) in the MP group and 99 patients (30.4%) in the control group (p: 0.01) died. Twenty-five patients who died in the MP group had follow-up CT scans and the MP findings in 12 patients were stable (48%), decreased in 10 patients (40%) and increased in 3 patients (12%). The rate of decrease in MP findings was found to be higher in the patients who died than in the whole MP group (40% versus 17%). MR imaging was taken in 34 (30.9%) of the follow-up cases and MP findings could be seen in 31 (91%) on the MR. Four patients with newly developed malignancies in the MP group had MR imaging. 2 of them (endometrium, hepatocellular carcinoma, 50%) were detected by MR imaging. Other patients with malignancies were rectum and lung, and MRs were performed after surgery.

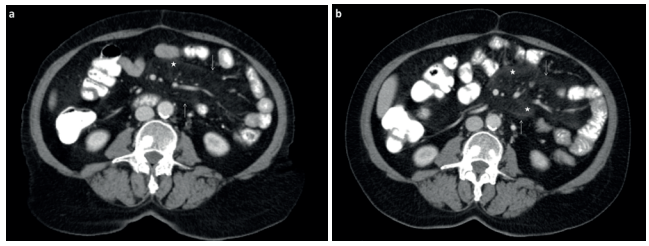

Figure 2. *A 67-year old female patient with breast cancer. Baseline CT (a) and follow-up CT (b) scans demonstrate increased MP findings. Density of mesenteric fat (asterisk) and size of MP increased. Borders of pseudocapsule are more prominent (arrows) when compared with previous CT scan.*

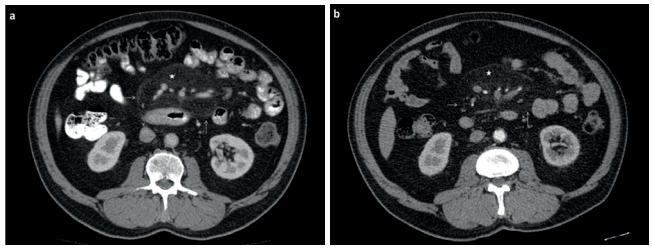

Figure 3. *A 59-year old male patient with lung cancer. Baseline CT (a) and follow-up CT (b) scans demonstrate decreased MP findings. Density of mesenteric fat (asterisk) slightly decreased. Also lateral border of pseudocapsule can not be differentiated clearly (arrow) when comparing with baseline CT scan.*

4. DISCUSSION

As far as we know, our study has the largest number of MP patients, control group, and the longest follow-up period.

In our study, MP prevalence was found as 5.1%. MP was found to be more prevelant in males (90M, 73F) and the mean age was 62 ± 11 (range 27-91). The prevalence of multidetector MP is variable depending on the CT technology, diagnostic criteria, and the method of collecting the patients, ranging from 0.16% to 7.83% [1-5, 8]. Previous studies have found low prevalence such as 0.16% and 0.58%. This result is most probably because of the study methods which is 'keyword search' in terms of patient search [1,8]. Because of the increase of the number of abdominal CT imaging, multidetector CT technical progression, as well as the fact that typical findings of MP have been determined, MP prevalence is increasing as in our study. However, we think that 7.83% of the prevalence in the previous study was due to the small number of the study group [5]. It was found more frequently in middle-aged adult men, although a previous study showed that MP is slightly more common in women [2,4,5].

In our study, a high attenuation of the fat in the mesenteric root, a short axis of <10mm lymph nodes and pseudomass appearance were seen in all patients. There was an increase in MP findings in 18 patients (16.36%) and a decrease in 19 patients (17.27%) with the absence of significant changes in vast majority in MP findings (n: 75, 68.18%). In previous studies, no change

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was observed in the imaging findings of 80.9% of the cases of MP during follow-up [2,4,5,15]. The MP diagnosis was made according to characteristic CT findings [5]. Diseases that can increase the density of the mesenteric fatty tissue can be excluded to enable the diagnosis of MP [2]. Increase of fat density in the mesentery and at least 2 of the other MP criteria are enough for diagnosis. But all CT criteria of MP shoud be carefully evaluated. With these findings, MP may be distinguished from lymphoma, carcinoid tumors, carcinomatosis, primary mesenteric mesothelioma, and mesenteric edema [16,17]. In differential diagnosis, the infiltration of the tumor into the mesenteric fatty tissue is an important exclusion criteria and its presence cannot be diagnosed as MP. The most common CT findings of MP were reported in lymph nodes and in the increased density of the mesenteric fat [3]. Pseudomass appearance, hypodense halo and pseudocapsule appearance are other common findings respectively [2-4].

In our study MP-malignancy association was seen in 97 patients (59.5%). As the mean age of our patients (62 ± 11) was high, comparison was made with the control group that included patients without MP. The frequency of malignancy in the control group was 58.3% and there was no significant difference between groups (p: 0.77). When MP findings are detected, possible accompanying malignancy should be searched for. In the literature, association of malignancy with MP has been reported between 17.6% and 69.3% [1,7]. Excessive prevalence in previous studies may be due to patient selection bias, often involving malignancy and elderly patient populations.

In our study, the most common malignancies associated with MP were colorectal, lung and breast cancer. In the MP group, prostate cancer was significantly higher than in the control group (p: 0.02). Malignancies associated with MP have been shown in literature as colorectal, prostate, lymphoma, melanoma and lung cancer [1-3,5]. In the literature, data about this issue is limited. Further studies are needed to clarify the accompanying malignancy finding and whether it is a coincidental or significant finding.

In our study, there was also no statistically significant difference in new malignancy development compared with the control group (p: 0.37). 11 of 139 patients in the MP group (7.9%) and 8 of 276 patients in the control group (2.9%) were diagnosed with new cancers in the follow up. It has been stated that it is important to follow up the patients with MP for potential development of malignancy. The rate of new malignancy development in previous studies is 4.58-11% [8,9]. In a 5-year follow-up study, new cancer development was found to be statistically significantly higher than the control group [2]. There are also studies showing that there is no significant difference in malignancy development which includes follow-up and control groups [1,3]. However, further prospective studies with larger population are needed.

In our study, 34 patients (30.9%) had MR imaging in the MP group. MP findings were seen in 31 (91.17%) patients, most prominently on fat-suppressed contrast enhanced late phase images. Follow up CT scan has a potential risk of malignity development because of the radiation dose [2]. MP findings can also be detected on MR examination [18,19]. Follow up MR imaging may be considered as an alternative method in MP patients regarding malignancy development. If the breath-holding is not possible, movement artefacts may obscure MP findings.

In our study, there were more deaths in the control group than in the MP group (p: 0.01). In addition, when we analyzed the patients with decreased MP findings, the patients who died had a higher percentage than the entire group (40% versus 17%). These findings may suggest that the presence of MP may lead to a better prognosis in malignant patients and a decrease in MP findings may lead to worse prognosis. We think that these findings should be evaluated in studies with larger patient groups. MP is usually a self-limiting disease with a good prognosis. On the other hand in MP patients with known malignancy, while malignancy is treated, MP is ignored. If malignancy is not accompanied, MP will be ignored again [15]. There was no significant difference about decreased MP findings between patients with malignancy and wihout malignancy [15]. In a recent study, 2 cases with decreased MP findings died in 2 years [3].

Limitations

One of the limitations of our study is retrospective design. Another limitation is that there is no histopathologic verification to confirm MP. However, we think that biopsy is not necessary because of the incidental, self-limiting structure and clear CT findings [2,4,16]. Moreover some of the detected MP patients had no follow-up CT and the mean follow-up time was relatively short. However, we compared the MP group and the control group. As can be understood from the control group, most of our patients are oncology patients. Another limitation was the lack of intra-interobserver variability comparison.

Conclusion

The frequency of MP in our study was 5.1% and the most common accompanying malignancies were colorectal, breast and lung carcinoma. CT findings of MP are usually stable. There was no significant difference regarding accompanying malignancy, development of new malignancy and metastasis between the MP group and the control group. We believe that our findings should be verified with extensive prospective studies including long-term follow up.

Compliance with Ethical Standards

Ethical approval: Our study was approved by the Ethics Committee of Trakya University Hospital (approval number and date: 12/01, 02/07/2018).

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Conflict of interest: The authors declare that they have no conflict of interest.

Authors contributions: EY: re-evaluated the MP cases, write the manuscript, performed the statistical analysis and prepared the

tables and figures, MG: examined the CT studies of the patients. Both authors approved the final manuscript.

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