



## Imaging Findings of Granulomatous Peritonitis in a Female Patient Presenting with Erythema Nodosum- A Case Report

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### Abstract

Granulomatous peritonitis may occur as a consequence of a disseminated infection, as a reaction to foreign materials or rupture of an intraabdominal mass or hollow viscus, or as a very rare postoperative complication. Cases of non-infectious granulomatous peritonitis are usually related to tissue reaction to talc or cornstarch in surgical gloves. The imaging findings of this condition are usually suggestive of malignancy and can lead to misdiagnosis. We report a case of aseptic granulomatous peritonitis in a 44-year-old woman with a history of multiple abdominal surgeries, presenting with erythema nodosum. Abdominal masses were also found on imaging. The patient responded well to conservative management, and no relapse was reported in the follow-up. Erythema nodosum in this patient is considered to be a manifestation of granulomatous peritonitis that developed two months after laparotomy, and the authors weren't able to find an earlier case report of such a clinical case. The goal of this paper is to introduce a possibly new presentation of granulomatous peritonitis. Also, the authors wanted to give a presentation of imaging appearance of this condition, otherwise rarely described in literature. This paper reminds us of importance of being aware of rare complications following abdominal surgery, as well as of conditions that can mimic intraabdominal malignancy. The proper management can be conservative and more invasive procedures can be avoided.

**Keywords:** Granulomatous peritonitis; Disseminated infection; Erythema nodosum; Intraabdominal malignancy

### Introduction

Granulomatous peritonitis may occur as a consequence of disseminated infection, as a reaction to foreign materials or rupture of an intraabdominal mass or hollow viscus. It has also been described as a rare postoperative complication with wide spectrum of clinical presentations that range from life-threatening ascites to non-specific abdominal pain accompanied by low-grade fever [1-3]. Cases of non-infectious granulomatous peritonitis have been reported, usually due to tissue reaction to talc or cornstarch in surgical gloves, even when laparoscopic approach is used [1,2]. It has also been reported that imaging findings of this condition are usually suggestive of malignancy [2,3], which, accompanied with non-specific symptoms, may lead to misdiagnosis. Pathohistological or cytological analysis that shows a granulomatous reaction can help rule out other causes of peritoneal involvement.

Erythema nodosum is an inflammatory condition resulting in tender red nodules usually seen on both shins. Underlying pathology is inflammation of subcutaneous fat tissue. It is reported as a common manifestation in inflammatory bowel diseases, such as ulcerous colitis or Chron's disease [4]. However, we haven't yet found a report of granulomatous peritonitis presenting with erythema nodosum. In this report, we present a case of a female patient with concomitant occurrence of postoperative granulomatous peritonitis and erythema nodosum.

### Case Report

A 44-year-old woman presented with fever, morning stiffness in multiple joints, bilateral lower leg edema and pain in both knees and ankle joints, accompanied with painful, erythematous nodules on both legs. The patient had history of multiple abdominal surgeries due to volvulus and postoperative complications. She also had a history of a severe stenosis at the colorectal anastomosis site, and tissue reaction to surgical material was suspected as the cause of this condition. The last surgery performed was a laparotomy two months before the admission,

due to the development of an intraabdominal abscess after colorectal reanastomosis. No intraabdominal nodules were observed and the patient didn't have any history of rheumatic diseases. She didn't take any drugs other than trespium chloride for abdominal colics.

Physical examination revealed fever (38°C axillary), signs of cachexia, one enlarged lymph node in the right axillary region and swollen knees. Multiple painful erythematous nodules on lower legs and swelling of both ankle joints were also observed. No deformity of joints or other signs of rheumatic disease were found. Laboratory tests revealed normocytic anemia and elevated inflammatory parameters. Red blood cells were  $3,93 \times 10^{12}/L$  and hemoglobin levels were 110 g/L. White Blood Cells (WBCs) were  $13,9 \times 10^9/L$ , with increase in neutrophils number (78,9%), C-reactive protein levels were 69,3 mg/L, and antistreptolysin O titre was also slightly elevated (215 IU/ml). Further investigation was performed, which revealed normal titre of antinuclear antibodies and C3 and C4 complement components. Further raise of C-reactive protein levels was noted. Ultrasound examination of ankles and soft tissues of feet revealed subcutaneous edema of both ankles and feet. Effusion in both talocrural joints and in first metatarsophalangeal joints bilaterally was also found. Hypoechoic halo sign of peritendinous tissue of extensor and flexor muscle tendons in both ankles was also noted.

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Firstly, fever and patient's history raised suspicion of an intraabdominal abscess and Multislice Computed Tomography (MSCT) of abdomen in venous phase was also performed. However, no formation of an abscess was detected. Instead, large solid nodular perihepatic masses were revealed. The first one was located around the right hepatic lobe (Figure 1) and the second one anteriorly to hepatic segment 4 of the left lobe, measuring  $9 \times 3 \times 7,5$  cm and  $3 \times 1,5 \times 6,5$  cm, respectively. Triangular hypoperfusive lesion of hepatic segment 2 was also noticed, as well as a hypovascular lesion in segment 5. Due to these findings, a Magnetic Resonance Imaging (MRI) of the abdomen was recommended. The contrast-enhanced MRI in the arterial phase showed that those perihepatic masses were well vascularized by wide, hyperemic right intercostal arteries, by the phrenic artery and by hyperemic blood vessels originating from the right abdominal wall (Figures 2 and 3). The hypoperfusive lesion in hepatic segment 2 was not visualized by MRI. In hepatic segment 5, an ill-circumscribed hypovascular lesion was confirmed, morphologically suggestive of metastases (Figure 4). These findings were indicative for possible malignant tumor and cytological analysis was recommended.

Fine needle aspiration and cytological analysis, however, didn't show any signs of malignancy. Tissue particles were obtained, composed of fibrocytes and fibroblasts, with some basophils, particles of endothelium, some lymphocytes, granulocytes, monocytes and phagocytes, a few multinuclear histiocytes and plasma cells. The cytological diagnosis was primarily granulation tissue, less possible a mesenchymal tumor.

After reviewing clinical and laboratory findings, a granulomatous peritonitis was suspected, presenting with abdominal masses and erythema nodosum. An abdominal surgeon and a rheumatologist were consulted and conservative approach was chosen. Oral glucocorticoids were administered and patient responded well to the therapy. The follow-up physical examinations were performed three, eleven and sixteen months after the admission. Two follow-up MRIs were performed, seven and fourteen months after admission to our hospital, the last one showing full regression of previously noted abdominal masses and hepatic lesions. The only residual finding on the MRI scan was a strong enhancement of hepatic fibrous capsule in the arterial

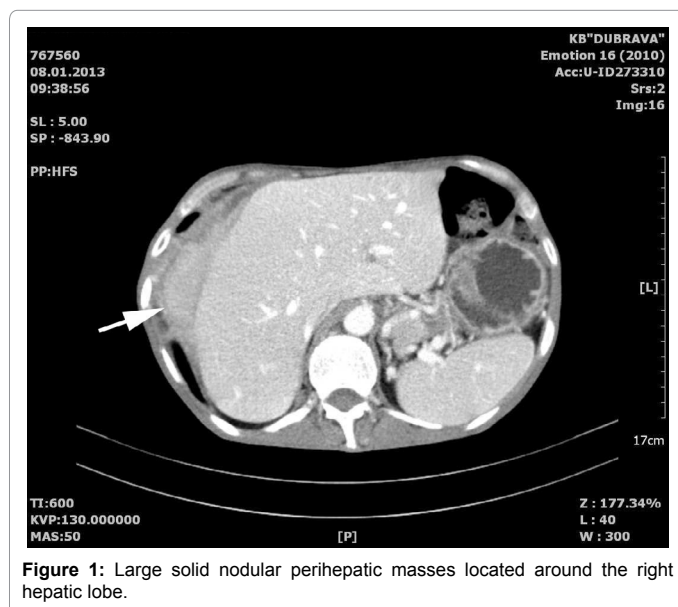


Figure 1: Large solid nodular perihepatic masses located around the right hepatic lobe.



Figure 2: Contrast-enhanced MRI in the arterial phase showing that those perihepatic masses were well vascularized by wide, hyperemic right intercostal arteries, by the phrenic artery and by hyperemic blood vessels originating from the right abdominal wall.

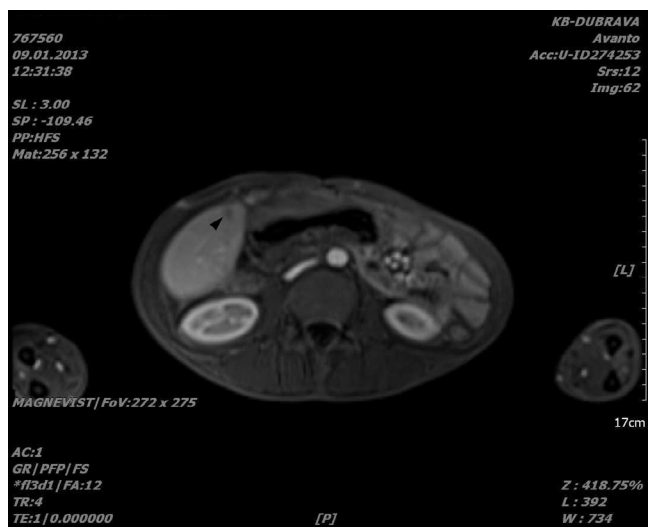


Figure 3: Hyperemic blood vessels originating from the right abdominal wall.

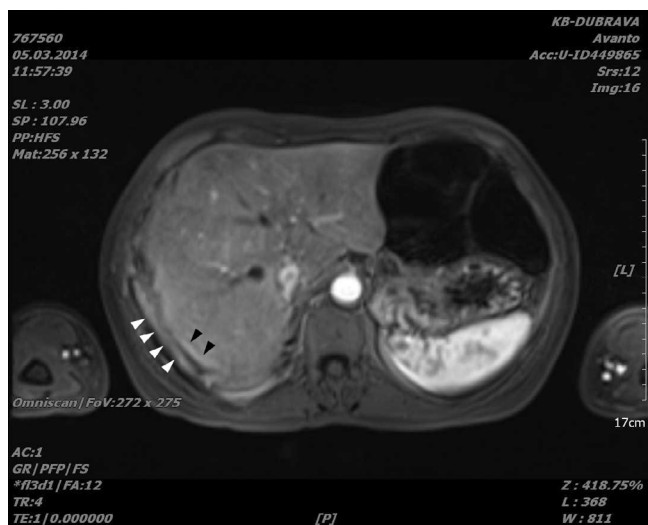
phase (Figures 5 and 6). Patient didn't report any symptoms similar to those at the time of admission.

## Discussion

Erythema nodosum in this patient is considered to be a manifestation of peritonitis that developed two months after laparotomy. She had no prior history of rheumatic or inflammatory bowel diseases, but had a history of tissue reaction to surgical stapling material as well as multiple abdominal surgeries. During the hospitalization, other inflammatory and non-inflammatory causes of both erythema nodosum and granulomatous peritonitis were excluded. Clinical features as well as the timeline of the patient's condition were similar to those described in other reports on granulomatous peritonitis [1,2,5,6]. Reported intraoperative findings in granulomatous peritonitis are grey-white nodules varying in diameter, located on peritoneum



**Figure 4:** An ill-circumscribed hypovascular lesion was confirmed, morphologically suggestive of metastases.



**Figure 5:** The only residual finding on the MRI scan was a strong enhancement of hepatic fibrous capsule in the arterial phase.

including the mesenteric and bowel surfaces, associated with thick omental adhesions [6]. Fluid in the peritoneal cavity along with diffuse and nodular thickening of the peritoneum and omentum are also reported [1]. Reports on imaging of this condition are relatively scarce and usually are observed in animal models [7]. Some of the available reports on imaging of granulomatous peritonitis in human patients noted abundant ascites and diffuse thickening of the omentum [1]. In tuberculosis-related granulomatous peritonitis, ascites and soft-tissue masses or nodules located on the peritoneal surfaces or infiltrating the omentum and mesenteries are usually found on CT and can sometimes be suggestive of peritoneal carcinomatosis [3,8-10]. In our patient, perihepatic masses and intrahepatic lesions were found, suggestive of possible malignancy – a finding common in cases of granulomatous peritonitis reported so far.

Regarding the hypovascular lesion in hepatic segment 5 visualized

on CT and confirmed by MRI, the authors believe that this lesion was an inflammatory pseudotumor (IPT) of the liver. IPTs are rare benign lesions that can occur at all ages and are more common in young men. Histologically, they consist of inflammatory cells, and fibrous tissue [11,12]. The true cause of IPTs is not yet known, but they are associated with trauma and surgical inflammation and immune-autoimmune conditions [12]. The hypoperfusive hepatic lesion described in our patient had similar presentation on imaging methods as those described in literature [11,12], it can be related to an inflammatory intraabdominal process and it responded to antiinflammatory therapy.

Erythema nodosum can appear secondary to a systemic process: it is one of the most frequent extra-intestinal manifestations of inflammatory bowel diseases and is known to occur secondary to a granulomatous inflammation such as granulomatous mastitis [4,13-15]. Consequently, we find it very likely that an immunological mechanism exists that may trigger erythema nodosum as a secondary reaction to the granulomatous peritonitis. Of note is that we have found no reports on erythema nodosum as a manifestation of granulomatous peritonitis yet. Thus, we believe this is the first report on such a clinical case.

Most common postoperative complications of open abdominal surgery are wound infection, temporary or prolonged disruption of peristalsis, early and late bowel obstruction and anastomotic leakage or breakdown, resulting in septic peritonitis [16-18]. Granulomatous peritonitis is considered to be a rare postoperative complication. The specific incidence of this condition is still unknown because it is believed that some of the milder cases can go unnoticed [1]. Exact pathophysiology is also not yet fully explained, but the mechanisms proposed are related to hypersensitivity reactions [1,3,19]. The major cause of peritoneal reaction leading to granulomatous inflammation is the presence of a foreign body, such as talc or cornstarch from powder in surgical gloves. Granules of talc or starch can later be identified in granulomatous tissue by patohistological analysis [2,3]. Spillage of bile acids or abdominal cysts is also reported to cause granulomatous inflammatory response of peritoneum [5,20]. In our patient, however, no obvious bile leakage was detected and there were no intraoperative findings of abdominal cysts. The surgeon used gloves containing talc powder and an open abdominal surgery was performed, these



**Figure 6:** The only residual finding on the MRI scan was a strong enhancement of hepatic fibrous capsule in the arterial phase.

being two factors presenting potential mechanism of accidental intraperitoneal introduction of talc. Even so, only a cytological analysis of the intraabdominal masses was performed and no talc granules were verified by this method.

Other potential causes of peritoneal hypersensitivity and granulomatous reaction are reported in literature, such as chemical agents used for peritoneal lavage during abdominal surgery, iodinated contrast media and cotton lint from surgical drapes [1,6]. Whether the clinical course of postoperative granulomatous peritonitis is similar to those of other immune-mediated inflammatory peritoneal disorders is not clear, and proper therapy for this condition is still discussed, including the use of infliximab [1,21]. In our patient erythema nodosum was also observed and our team decided to administer oral corticosteroid therapy which resulted in regressive dynamic of both abdominal and skin lesions. No signs or symptoms of long-term sequelae of granulomatous peritonitis, such as peritoneal adhesions, bowel obstruction or fistulae have been observed in the follow-up.

## Conclusion

Granulomatous peritonitis is a rare complication of abdominal surgery and very few clinical reports discuss imaging appearance of this condition. The authors haven't found a report of granulomatous peritonitis presenting with erythema nodosum like the one presented in this paper. It is important to be aware of rare complications following abdominal surgery, as well as of conditions that can mimic an intraabdominal malignancy so the right treatment options may be chosen. It is also of note that the imaging methods and minimally invasive fine needle aspiration and cytological analysis in correlation with patient's history and clinical findings are important tools in the diagnostic process. The granulomatous peritonitis can have more than one appearance on imaging, but with better understanding of these presentations, more invasive procedures can be avoided. Although it is not clear if the clinical course of postoperative granulomatous peritonitis is similar to those of other immune-mediated inflammatory peritoneal disorders, in this particular case oral corticosteroids have effectively induced regression of both skin and intraabdominal lesions.

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