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# Silk suture granuloma with false-positive findings on PET/CT accompanied by peritoneal metastasis after colon cancer surgery



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## ABSTRACT

**INTRODUCTION:** Suture granuloma is a rare benign tumor caused by suture material, which usually appears several months or years after surgery.

**PRESENTATION OF CASE:** A 71-year-old man underwent sigmoidectomy and partial hepatectomy (S6) for sigmoid colon cancer and synchronous liver metastasis at a previous hospital. At 4 postoperative months, surveillance computed tomography (CT) revealed a suspicious tumor at the hepatic resection stump. He was referred to our hospital for further examinations and treatments. Positron emission tomography/CT (PET/CT) revealed abnormal hepatic F-18 fluorodeoxyglucose (FDG) uptake below the diaphragm at the S5/S8 surface. Peritoneal metastasis was suspected and surgery was performed. White nodules were found in the Douglas pouch. A diagnosis of adenocarcinoma was confirmed by frozen section analysis of the nodules. He underwent a partial hepatectomy (S5/S8) and partial resection of the diaphragm. Pathological examination showed that the liver tumor was a foreign body granuloma that included silk suture material.

**DISCUSSION:** Although postoperative PET/CT surveillance is useful following malignant tumor resection, it is important to note that PET/CT false-positive findings are possible. Furthermore, PET/CT cannot detect small peritoneal metastases, necessitating a thorough abdominal examination.

**CONCLUSION:** In cases of malignancy, the possibility of postoperative suture granuloma should be considered. In addition, a thorough surgical examination of the abdomen should be performed in cases of suspected recurrence.

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## 1. Introduction

Suture granuloma is a rare benign tumor caused by suture material, which usually appears several years after surgery. We experienced a case of suture granuloma with false-positive findings on positron emission tomography/computed tomography (PET/CT), which we suspected was peritoneal metastasis. However, a thorough surgical examination and pathological examination revealed a hepatic suture granuloma and the presence of previously undetected peritoneal metastases.

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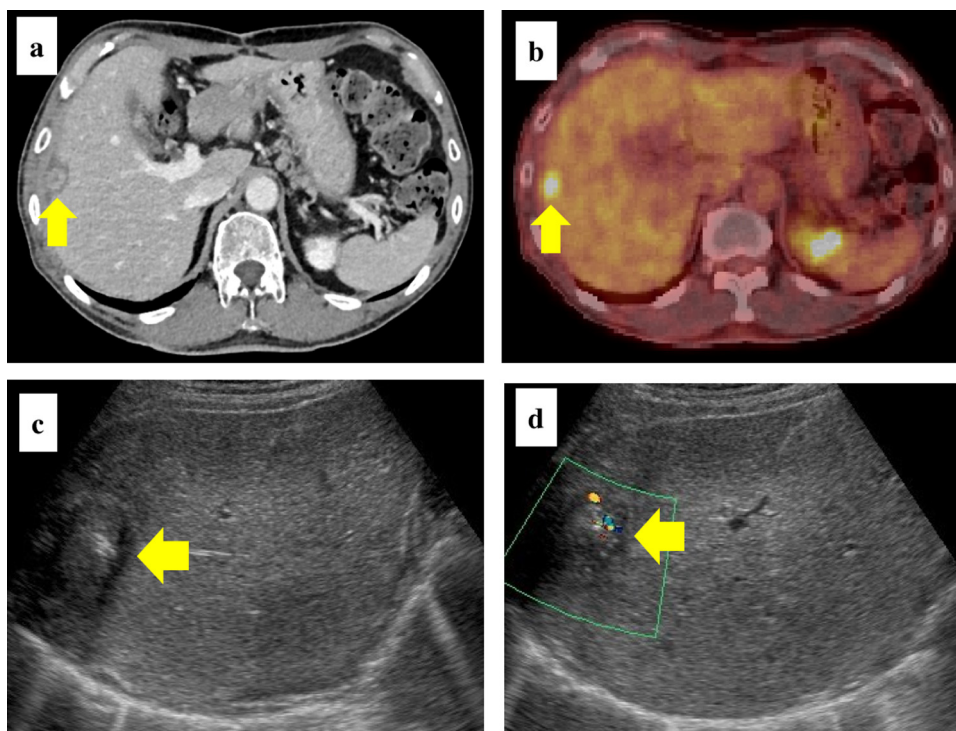
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## 2. Presentation of case

A 71 year-old man underwent sigmoidectomy and partial hepatectomy (S6) for sigmoid colon cancer and synchronous liver metastasis at another hospital. Pathological findings of the resected specimen consisted of well-differentiated adenocarcinoma, pT4a, N1a, M1 a(H1), Stage IV (Union for International Cancer Control). He underwent FOLFOX treatment as an adjuvant chemotherapy, which was discontinued after the first cycle because of general malaise and diarrhea.

At 4 postoperative months, surveillance computed tomography (CT) revealed a suspicious tumor at the hepatic resection stump (Fig. 1a). He was referred to our hospital for further examinations and treatments. Positron emission tomography/CT (PET/CT) revealed abnormal hepatic F-18 fluorodeoxyglucose (FDG) uptake below the diaphragm at the S5/S8 surface (SUVmax = 5.48; Fig. 1b). Sonography revealed a vascular lesion with a halo around a hyper-echoic core (Fig. 1c and d). No other obvious lesions were seen.

Physical examination revealed no significant findings other than the median scar of the previous surgery.



**Fig. 1.** Diagnostic images.

(a) CT showed a hepatic ring-shaped enhanced mass in S5/S8 (arrow). (b) FDG-PET/CT revealed a small focus of increased FDG activity in the liver (arrow). The maximum standardized uptake value (SUVmax) at the focus was 5.48. (c) Sonography revealed a halo around a hyperechoic lesion mimicking a bull's eye sign (arrow). (d) Blood flow was confirmed in the tumor (arrow).

Laboratory tests revealed elevated glycated hemoglobin (12%) and carcinoembryonic antigen (CEA; 8.4 ng/mL), but a normal carbohydrate antigen 19-9 level (21.2 U/mL). Liver function was determined as Child-Pugh grade A (5 points).

He had been taking medication for hypertension and diabetes mellitus, and had a past medical history of cerebral infarction and postoperative chronic subdural hematoma. There was no significant family medical history.

Peritoneal metastatic recurrence to the liver surface was suspected and surgery was performed. He underwent a partial

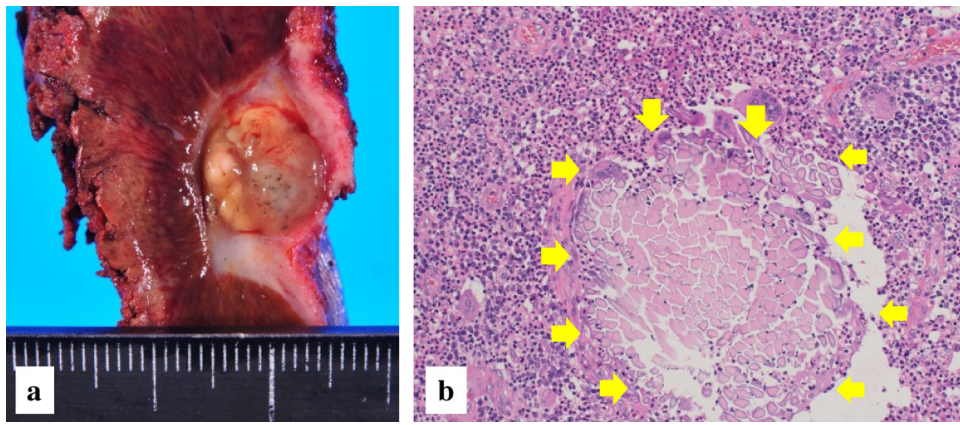
hepatectomy (S5/S8) and partial resection of diaphragm. In addition, white nodules were detected in the Douglas pouch, which were diagnosed intra-operatively as adenocarcinoma by frozen section analysis. A pathological examination after surgery showed that the liver tumor was not malignant and was actually a foreign body granuloma with silk suture inclusions (Fig. 2).

Although he had a postoperative fever because of a prolonged hepatic stump abscess, he was discharged at 18 postoperative days. The patient presently remains disease-free and alive at 2 postoperative years.

**Table 1**  
Case reports of suture granuloma with false positive findings on PET-CT.

Case	Year	Reference	Age	Sex	Primary diagnosis	Interval	SUVmax	Treatment	Causal suture material	Tumor marker
1	2005	Lim	61	F	Sigmoid colon cancer	10 mo	3.9	Laparotomy, complete resection	Silk	Positive
2	2006	Chung	39	F	Thyroid cancer	6 mo	2.9 (SUV mean)	US-guide fine needle aspiration	ND	ND
3	2007	Yuksel	42	M	Pneumothorax	15 y	3.5	Thoracotomy, complete resection	ND	ND
4			47	M	Lung cancer	8 mo	3	Thoracotomy, complete resection	Nonabsorbable suture	ND
5	2012	Kikuchi	64	F	Hypopharyngeal cancer	35 mo	6	Bicisional biopsy	Silk	
6			71	M	Oropharyngeal cancer	38 mo	4.3	Bicisional biopsy	Silk	
7	2013	Takaharia	33	M	Mixed germ-cell tumor	ND	ND	Surgical resection	ND	ND
8	2014	Imperiale	44	F	Ovarian cancer	11 mo	4.2	Laparotomy, biopsy	Nonabsorbable propylene suture	Positive
9	2015	Takeshita	61	F	Uterine myoma	16 y	5.5	Left lymph node dissection	Nonabsorbable suture	Negative
10	2016	Present case	71	M	Sigmoid colon cancer + metastatic liver cancer	4 mo	5.48	Laparotomy, complete resection	Silk	Positive

F, female; M, male; mo, months; y, years; ND, no data available; SUV, standardized uptake value.



**Fig. 2.** Gross tumor and histological findings.

(a and b) The cut surface of the tumor, measuring 15 × 11 × 12 mm, was yellowish-white. (b) A histopathologic examination revealed a suture fragment at the center of the tumor (arrows) and necrotic tissue around it. Numerous atypical multinucleated giant cells surrounded the foreign body with massive polymorphonuclear cell infiltration.

### 3. Discussion

Postoperative suture granuloma has an inflammatory nature that can cause false-positive findings on PET/CT, which can hamper preoperative diagnostic imaging of suture granuloma.

In cases of colorectal cancer with positive postoperative PET/CT findings, the false-positive rate has been reported as 2–11% [1–3]. In addition to the PET/CT finding the elevated CEA levels, indicative of malignancy, led us to the decision for surgical intervention.

Including the present case, there have been 7 reports of 9 cases of suture granuloma with false-positive postoperative PET/CT findings [4–10] (Table 1). As can be seen in Table 1, the interval between surgery and suture granuloma occurrence varied significantly, and suture granuloma can be found several decades after surgery. Therefore, in the present case, the detection at 4 postoperative months could be considered as relatively early. Furthermore, CEA elevation, such as that seen in the present case, is quite rare.

Sonography has been proposed as useful in facilitating a correct preoperative diagnosis [11]. However, in the present case, sonography revealed a halo around a hyperechoic lesion mimicking a “bull’s eye” sign of hepatic metastasis, which would not be typical of suture granuloma.

In the majority of previous reports, patients underwent immediate surgical resection because of an uncertain diagnosis or suspicion of metastasis, although one report commented on the use of ultrasonography-guided fine needle aspiration. Moreover, complete resection is often the preferred option in postoperative malignancy cases because it is the only way to confirm recurrent cancer while preventing tumor exposure. In addition, FDG accumulation may suggest recurrence, especially in postoperative malignancy cases.

Preventing suture granulomas is difficult because they have occurred even when absorbable sutures have been used [12,13]. Silk sutures are known to cause allergic reactions or infections more frequently than absorbable and/or monofilament sutures, and, therefore, appear to be unpopular among surgeons in Western countries. All cases of silk suture granuloma in Table 1 were reported from Asian countries.

The sensitivity of PET/CT for colorectal peritoneal metastasis was reported to be 83–93% [3,14–16]. In patients diagnosed with distant metastasis in other organs, such as the liver, the probability of peritoneal metastasis has been reported to be up to 30% [17]. It should be noted that PET/CT might not detect small peritoneal metastases, whereas surgical abdominal exploration might reveal such findings. Therefore, we should always perform a

thorough exploration of the abdomen and consider the possibility of peritoneal metastasis.

### 4. Conclusion

In postoperative malignancy cases, it can be difficult to distinguish suture granulomas from recurrent tumors. A thorough surgical abdominal examination should be performed because there is a chance of finding small recurrent tumors at distant sites that cannot be detected by PET/CT, as was the case in the present study.

### Conflict of interest

There are no conflicts of interest associated with this manuscript.

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### Ethical approval

According to the rules on medical ethics at our institution there is no need of ethical review for a case report.

### Consent

The patient gave written informed consent for publication of this case and accompanying images. Patient anonymity has been ensured.

### Author contribution

SM conceived of this case presentation and drafted the manuscript. KS, HK, HA, HN, and FY participated in the treatment of this case. All authors read and approved the final manuscript.

### Guarantor

Sohei Matsuura accepts the full responsibility for the article.

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SM conceived of the case presentation and drafted the manuscript. KS, HK, HA, HN, and FY treated the patient. All authors read and approved the final manuscript.

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