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.

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, M1a(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 (SUVRmax = 5.48; Fig. 1b). Sonography revealed a vascular lesion with a halo around a hypo-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.

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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 heptectomy (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.

| 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    | 2012 | Kikuchi   | 64  | F   | Lung cancer         | 8 mo    | 3      | Thoracotomy, complete resection | Nonabsorbable suture | ND |
| 5    | 2015 | Takeshita | 61  | F   | Hypopharyngeal cancer | 35 mo   | 2      | Bicisional biopsy | Silk | ND |
| 6    | 2013 | Takaharia | 33  | M   | Oropharyngeal cancer | 38 mo   | 4.3    | Bicisional biopsy | Silkwax | ND |
| 7    | 2014 | Imperiale | 44  | F   | Mixed germ-cell tumor | 11 mo   | 4.2    | Surgical resection | Nonabsorbable proplene suture | Positive |
| 8    | 2015 | Takeshita | 61  | F   | Uterine myoma       | 16 y    | 5.5    | Left lymph node dissection | Nonabsorbable suture | Negative |
| 9    | 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.
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 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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References

[1] T.J.M. Ruers, B.S. Langenhoff, N. Neeleman, G.J. Jager, S. Strijk, T. Wobbes, et al., Value of positron emission tomography with [18F]-fluorodeoxyglucose in patients with colorectal liver metastases: a prospective study. J. Clin. Oncol. 20 (2002) 388–395.

[2] I. Sobhani, E. Tirtet, R. Lebtahi, T. Aparicio, E. Itti, F. Montravers, et al., Early detection of recurrence by 18FDG-PET in the follow-up of patients with colorectal cancer, Br. J. Cancer 98 (2008) 875–880, http://dx.doi.org/10.1038/sj.bjc.6604263.

[3] R. Audollent, C. Eveno, A. Dohan, L. Sarra, I. Jouvin, P. Soyer, et al., Pitfalls and mimickers on [18F]-FDG-PET/CT in peritoneal carcinomatosis from colorectal cancer: an analysis from 37 patients, J. Visc. Surg. 152 (2015) 285–291, http://dx.doi.org/10.1016/j.jviscsurg.2015.06.003.

[4] J.W.M. Lim, C.L. Tang, G.H.W. Keng, False positive F-18 fluorodeoxyglucose combined PET/CT scans from suture granuloma and chronic inflammation: report of two cases and review of literature. Ann. Acad. Med. Singapore 34 (2005) 457–460.

[5] Y.E. Chung, E.-K. Kim, M.J. Kim, M. Yun, S.W. Hong, Suture granuloma mimicking recurrent thyroid carcinoma on ultrasonography. Yonsei Med. J. 47 (2006) 748–751, http://dx.doi.org/10.3349/ymj.2006.47.5.748.

[6] M. Yüksel, A.G. Akgül, S. Evman, H.F. Batirel, Suture and stapler granulomas: a word of caution, Eur. J. Cardiothorac. Surg. 31 (2007) 563–565, http://dx.doi.org/10.1016/j.ejcts.2006.11.056.

[7] M. Kikuchi, Y. Nakamoto, S. Shinohara, K. Fujiwara, Y. Tona, H. Yamazaki, et al., Suture granuloma showing false-positive finding on PET/CT after head and neck cancer surgery, Auris Nasus Larynx 39 (2012) 94–97, http://dx.doi.org/10.1016/j.anj.anl.2011.04.012.

[8] K. Takahara, H. Kakinoki, S. Ikoma, K. Udo, S. Tobu, Y. Satoh, et al., Suture granuloma showing false-positive findings on FDG-PET, Case Rep. Urol. 2013 (2013) 472642, http://dx.doi.org/10.1155/2013/472642.

[9] L. Imperiale, C. Marchetti, L. Salerno, R. Iadarola, C. Bracchi, L. Vertechy, et al., Nonabsorbable suture granuloma mimicking ovarian cancer recurrence at combined positron emission tomography/computed tomography evaluation: a case report, J. Med. Case Rep. 8 (2014) 202, http://dx.doi.org/10.1186/1752-1947-8-202.

[10] N. Takeshita, T. Tohma, H. Miyachi, K. Suzuki, T. Nishimori, G. Ohira, et al., Suture granuloma with false-Positive findings on FDG-PET/CT recrated via laparoscopic surgery. Int. Surg. 100 (2015) 604–607, http://dx.doi.org/10.3238/arztebl.2011.0802.

[11] T. Rettingbacher, P. Macheiner, A. Hollerweger, N. Gritzmann, C. Weissmann, B. Todoroff, Suture granulomas: sonography enables a correct preoperative diagnosis, Ultrasound Med. Biol. 27 (2001) 343–350.

[12] K. Iwase, J. Higaki, Y. Tanaka, H. Kondoh, M. Yoshihawa, W. Kamiike, Running closure of clean and contaminated abdominal wounds using a synthetic monofilament absorbable looped suture, Surg. Today. 29 (1999) 874–879.

[13] H. Nagar, Stitch granulomas following inguinal herniomy: a 10-year review, J. Pediatr. Surg. 28 (1993) 1505–1507.

[14] T. Tanaka, Y. Kawai, M. Kanai, Y. Taki, Y. Nakamoto, A. Takabayashi, Usefulness of FDG-positron emission tomography in diagnosing peritoneal recurrence of colorectal cancer, Am. J. Surg. 184 (2002) 433–436.

[15] M. Itohashi, Y. Tada, Y. Yamada, K. Takemoto, Y. Yoshimura, M. Kimura, et al., Case of peritoneal dissemination of colon cancer in which PET/CT was useful in determining the indicated surgical procedure. Int. Surg. 94 (2016) 80–83.

[16] N. De Vos, W. Goethals, W. Ceelen, Clinical value of (18)F-FDG-PET/CT in the preoperative staging of peritoneal carcinomatosis from colorectal origin, Acta Chir. Belg. 114 (2014) 370–375.

[17] P. Piso, D. Arnold, Multimodal treatment approaches for peritoneal carcinosis in colorectal cancer, Disch. Arzteblatt Int. 108 (2011) 802–808, http://dx.doi.org/10.3238/arztebl.2011.0802.