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Abstract

- Gastric cancer is the fourth most common type of cancer worldwide and frequently presents at an advanced stage. As such, the presenting symptoms of gastric cancer may be related to sites of metastasis rather than the primary tumor.
- We describe two cases that presented to the same hospital within a six-month period who were found to have pericardial tamponade secondary to gastric adenocarcinoma metastasis.
- The pericardium is a rare site of metastasis for gastric adenocarcinoma and may present atypically.

Introduction

- Gastric adenocarcinoma is one of the most common cancers globally. Common sites of metastases include the liver, peritoneum, lung, and bone and are present in over 40% of newly diagnosed patients [1].
- Gastric signet ring cell adenocarcinoma is an uncommon subset of gastric adenocarcinoma and is usually diagnosed at stage IV due to its late-stage presentation [2,3].
- The most common sites of metastasis for gastric signet ring cell adenocarcinoma are the lungs, breast, and ovaries [3].
- Metastasis to the pericardium is extremely rare for both signet ring and non-signet ring cell gastric adenocarcinoma and has only been discussed in a few case reports [2,3,4].
- Cardiac tamponade as the presenting symptom of gastric adenocarcinoma is an even more uncommon presentation of this disease [2,5].

Case 1

- A 91-year-old South Asian male with a history of hypertension, type 2 diabetes, systolic heart failure with reduced ejection fraction (35-40%), and coronary artery disease presented with progressive dyspnea and weakness.
- Initial chest X-ray (CXR) showed cardiomegaly and small bilateral pleural effusions suggestive of fluid overload.
- CT chest abdomen pelvis showed multiple small high-density structures along the common bile duct, bilateral pleural effusions, and cardiomegaly.
- A bedside echocardiogram revealed a large pericardial effusion with evidence of cardiac tamponade.
- The patient was taken to the cardiac catheterization lab for emergent pericardiocentesis with the formation of a pericardial window.
- Cytology revealed malignant cells with signet ring appearance compatible with metastatic signet ring adenocarcinoma with gastric as the most likely origin. (Figures 1 -4).
- An esophagogastroduodenoscopy was discussed to evaluate the origin of the cancer to decide on a chemotherapy regimen, however, the patient was too unstable to undergo the procedure.
- The patient and family opted for hospice care.

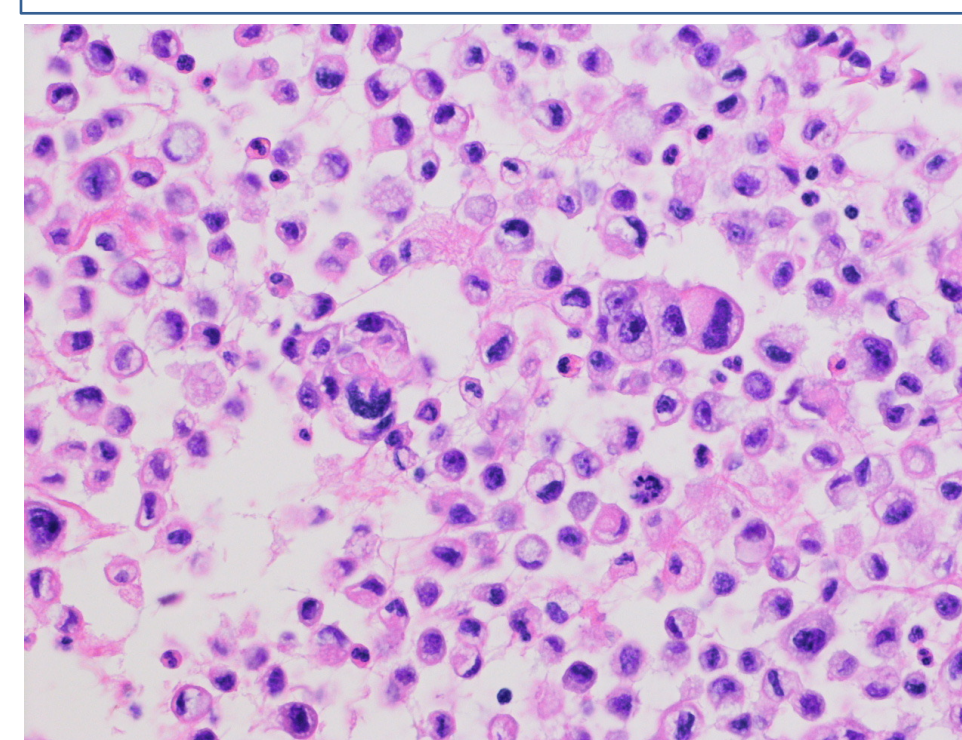


Figure 3: Pericardial fluid, cell block. H&E stain. Metastatic carcinoma cells are present.

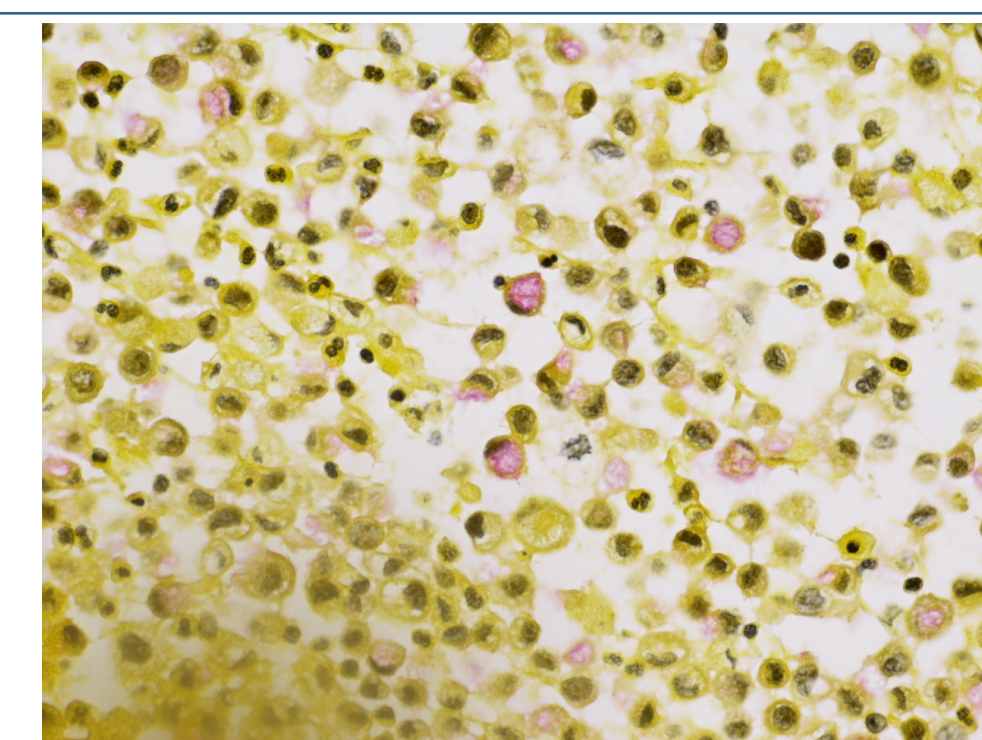


Figure 4: Pericardial fluid, cell block. Mucin stain. Metastatic carcinoma positive for mucin, mesothelial cells negative.

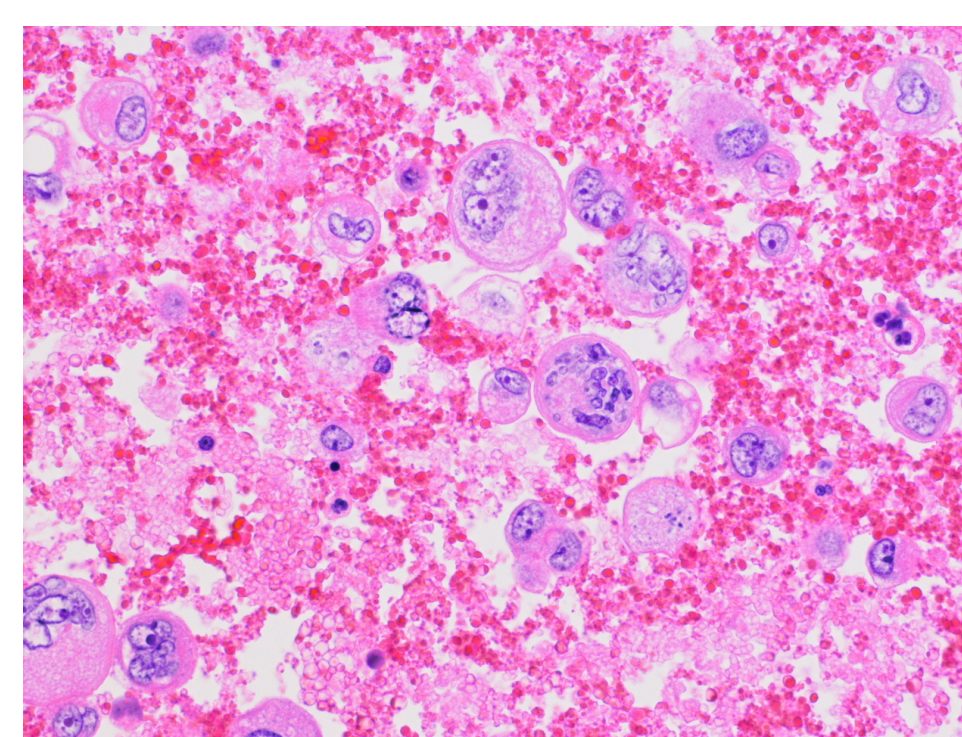


Figure 5: Pericardial fluid, cell block. H&E stain. Metastatic carcinoma cells present.

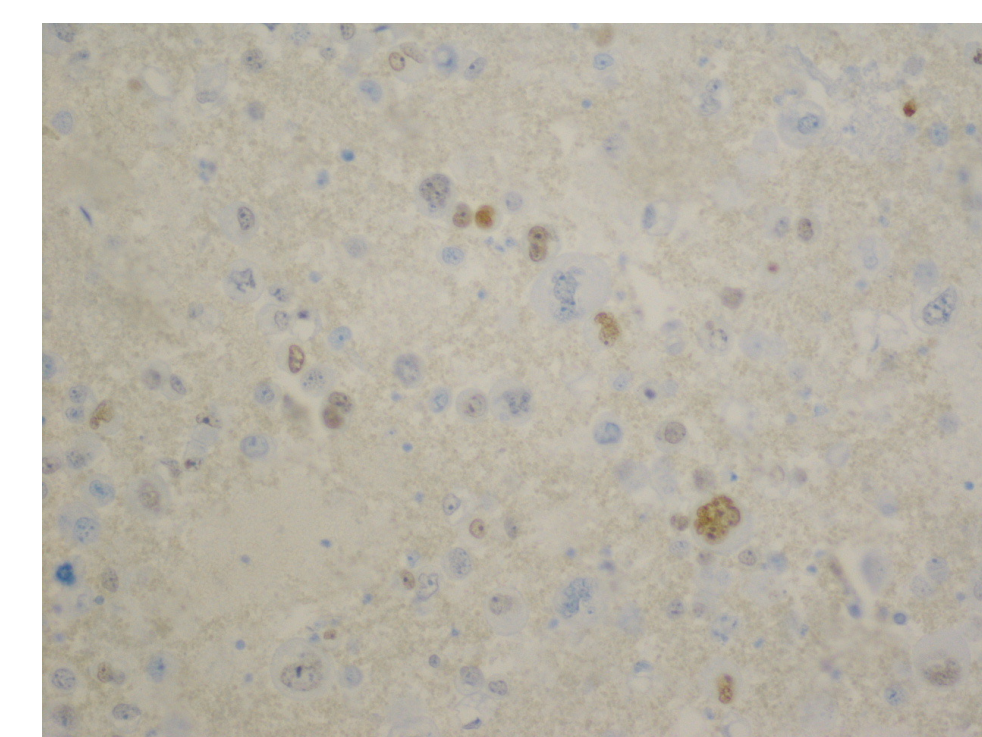


Figure 6: Pericardial fluid, cell block. Immunohistochemical stain for CDX-2. Metastatic carcinoma positive for CDX-2.

Case 2

- A 68-year-old Hispanic female with a past medical history of left-sided breast cancer post lumpectomy and radiation nine years prior to presentation. She presented to the ED for evaluation of a two-day history of epigastric abdominal pain with associated nausea.
- CT of the abdomen and pelvis revealed a large pericardial effusion, numerous liver lesions that appeared to be metastatic in nature, an adrenal mass and enlarged para-aortic lymph nodes.
- An Echo confirmed the presence of a large pericardial effusion with cardiac tamponade. Cardiology was consulted and the patient underwent an urgent pericardiocentesis.
- This fluid was sent for pathology and was determined to be consistent with malignancy (Figures 5 & 6).
- On the day of discharge, the patient underwent an IR-guided liver biopsy of one of her metastatic lesions. Cell testing of this core biopsy was suggestive of metastatic adenocarcinoma (Figures 7 & 8).
- The patient presented back to the emergency room eleven days later for chest pain associated with shortness of breath with activity along with orthopnea.
- CT Chest (Pulmonary Embolism protocol) demonstrated pulmonary emboli in the lobar and segmental branches of the right lower lobe.
- The patient underwent an upper endoscopy to help determine the primary source of malignancy.
- Gastric biopsies showed invasive, moderately to poorly differentiated adenocarcinoma. Immunohistochemical stain for Helicobacter pylori HER-2/neu was negative.

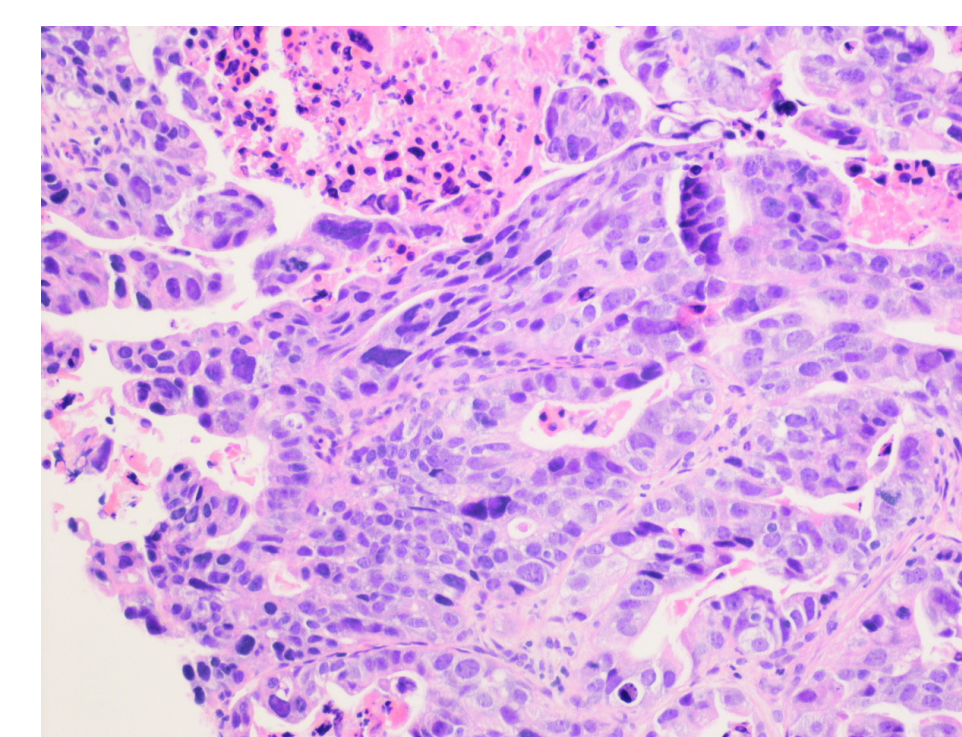


Figure 7: Gastric biopsy. H&E stain. Low power. Gastric adenocarcinoma.

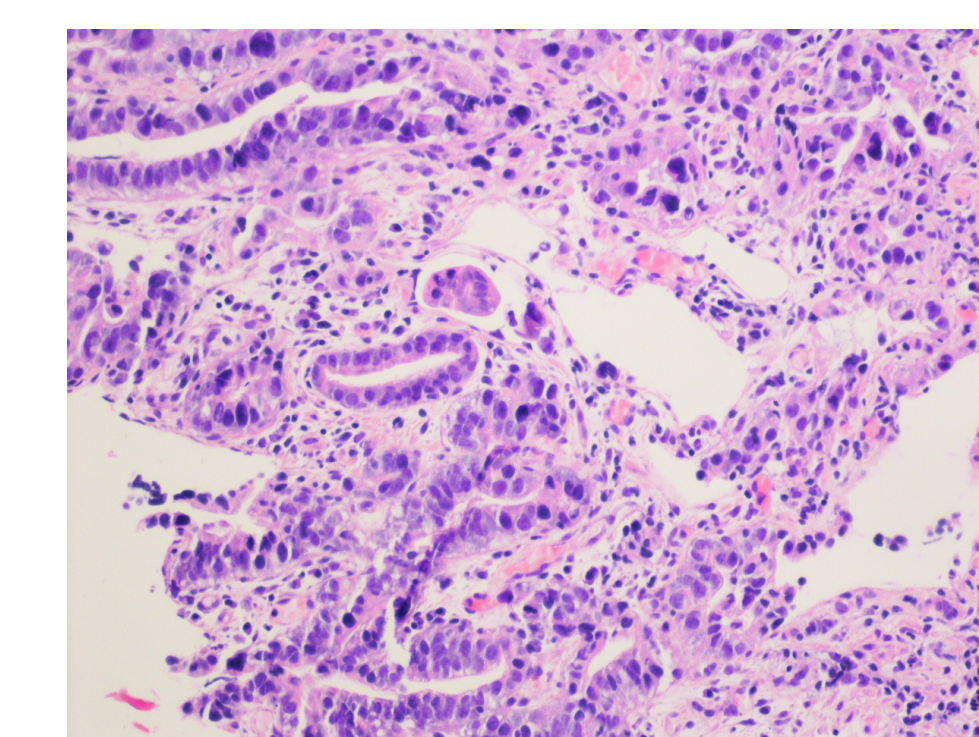


Figure 8: Liver lesion biopsy. H&E stain. Low power. Metastatic gastric carcinoma present.

Discussion

- Gastric cancer is the fourth most common cancer globally. It currently represents 1.4% of all new cancer cases in the US [6].
- Signet ring cell carcinoma is a rare form of cancer that can originate from many different organs. The most common primary site of origin is the stomach comprising 56.8% of signet ring cell carcinoma diagnoses with signet ring cell carcinoma comprising 16.8% of all gastric cancer cases [8].
- It has a poor prognosis and a worse 5-year survival compared to non-signet ring cell gastric cancers with a mean survival 10.2 months as compared to 13.2 for non-signet ring cell gastric cancers [9].
- These cases were unique in that the patients did not present with any gastrointestinal symptoms consistent with gastric cancer.
- Metastases in gastric adenocarcinoma, both signet ring and non-signet ring cell, are common due to the typically advanced stage of presentation [1,10,13,15].
- There is a high rate of peritoneal carcinomatosis with and other common sites of metastasis include the liver, lung, ovaries, and brain [10,13,15,16].
- Metastasis to the pericardium, as seen in both cases, is a very rare site of metastasis with only 4.3-7.7% of cases having pericardial metastasis [17].
- Cardiac tamponade as the presenting symptom of primary gastric adenocarcinoma is only documented in a handful of case reports. Kobayashi et al. reviewed 17 cases being reported in the literature between 1982 and 2005, of which 7 resulted from signet ring cell adenocarcinoma [4].
- While this site of metastasis remains rare, the associated increased morbidity and mortality means it is worth noting and keeping in mind amidst workup and diagnosis of patients with suspected malignant pericardial effusions.

Conclusions

- In conclusion, pericardial effusion with cardiac tamponade is a rare and potentially life-threatening complication of metastatic spread from a primary gastric adenocarcinoma.
- Physicians should have a lower threshold to order an echocardiogram in patients with less traditional symptoms of tamponade including shortness of breath, tachycardia, and tachypnea.
- Additionally, EGD evaluation may be warranted in patients with malignant pericardial effusions of unknown origin, as the pericardium is a rare but well-documented site of metastasis for gastric adenocarcinoma.

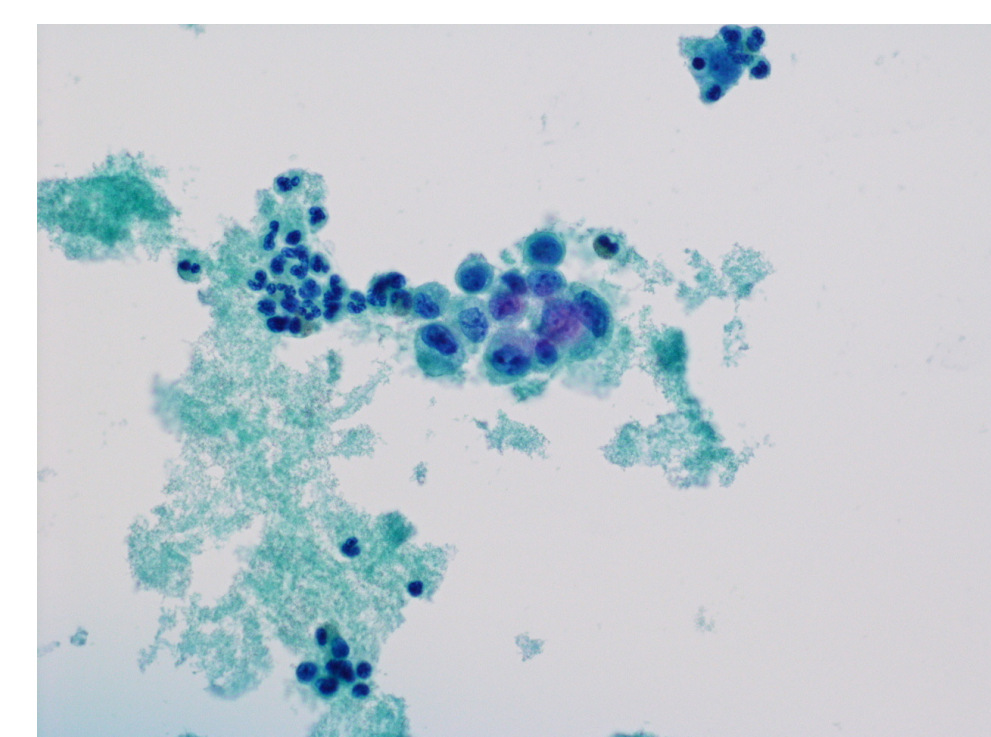


Figure 1: Pericardial fluid cytology, Papanicolaou stain. Malignant epithelial cells, low power.

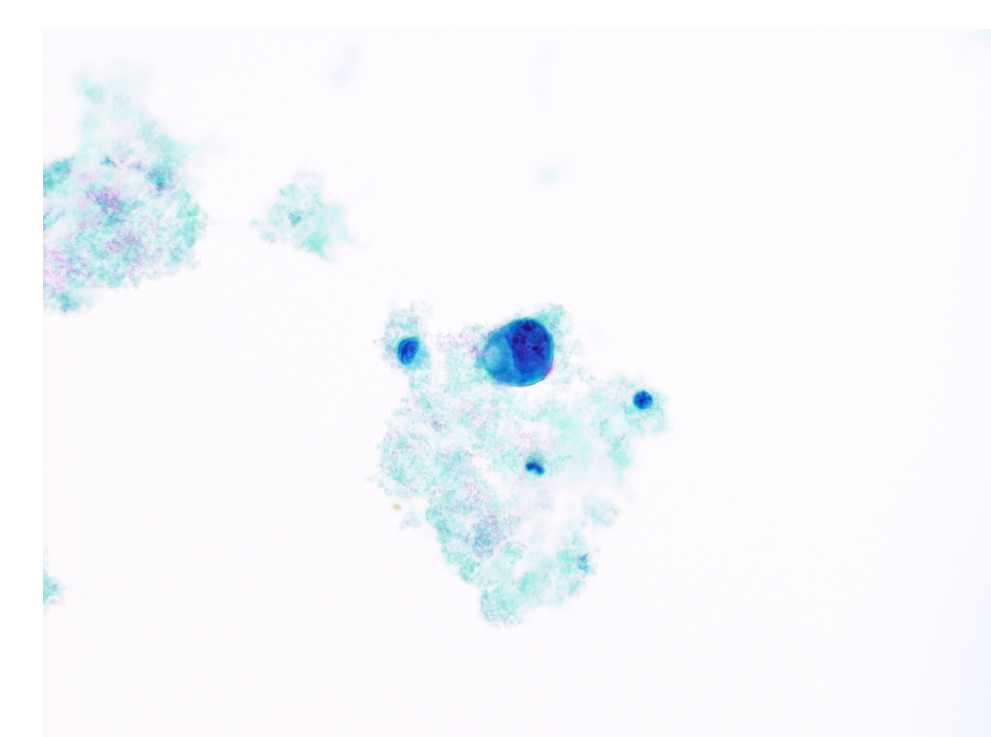


Figure 2: Pericardial fluid cytology, Papanicolaou stain. Malignant epithelial cells, high power.

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References

1. Riihimäki M, Hemminki A, Sundquist K, Sundquist J, Hemminki K. Metastatic spread in patients with gastric cancer. *Oncotarget*. 2016;7(32):52307-52316. doi:10.18632/oncotarget.10740
2. Kaur J, Kaur A, Punia RS, Dsari H. Metastatic signet ring cell adenocarcinoma—an autopsy finding in myocardium: A rare case report. *Asian Journal of Oncology*. 2020;07(03):149–51.
3. Kayaçan O, Karak D, Ayşe Can B, Düzbay Sak S, Beder S. Gastric signet-ring cell adenocarcinoma presenting with left arm deep-vein thrombosis and bilateral chylothorax. *Clinical and Applied Thrombosis/Hemostasis*. 2007;14(4):476–80.
4. Kobayashi M, Okabayashi T, Okamoto K, Namikawa T, Araki K. Clinicopathological study of cardiac tamponade due to pericardial metastasis originating from gastric cancer. *World J Gastroenterol*. 2005;11(44):6899-6904. doi:10.3748/wjg.v11.i44.6899
5. Huang J-Y. Primary gastric signet ring cell carcinoma presenting as cardiac tamponade. *World Journal of Gastrointestinal Oncology*. 2011;3(4):67.
6. National Cancer Institute. SEER Cancer Stat Facts
7. Sitarz R, Skierucha M, Mielko J, Offerhaus GJA, Maciejewski R, Polkowski WP. Gastric cancer: epidemiology, prevention, classification, and treatment. *Cancer Manag Res*. 2018;10:239-248.
8. Benesch MGK, Mathieson A. Epidemiology of Signet Ring Cell adenocarcinomas. *Cancers*. 2020;12(6):1544.
9. Machlowska J, Puculek M, Sitarz M, Terlecki P, Maciejewski R, Sitarz R. State of the art for gastric signet ring cell carcinoma: From classification, prognosis, and genomic characteristics to specified treatments. *Cancer Management and Research*. 2019Mar15;Volume 11:2151–61.
10. Guo S, Shang M-Y, Dong Z, Zhang J, Wang Y, Zheng Z-C, et al. Clinicopathological features and prognostic analysis of Signet Ring Cell gastric carcinoma: A population-based study. *Translational Cancer Research*. 2019;8(5):1918–30.
11. Zhang BL, Xu RL, Zheng X, Qin YW. A case with cardiac tamponade as the first sign of primary gastric signet-ring cell carcinoma treated with combination therapy. *Med Sci Monit*. 2010;16:CS41-44.
12. T. Grandhi, D. Rawlings, C. Morran. Gastropericardial fistula: a case report and review of literature. *Emerg. Med. J.*, 21 (2004), pp. 644-645, [10.1136/emj.2003.007765](https://doi.org/10.1136/emj.2003.007765)
13. Meherashahi S, Mantri N, Sun H, Shaikh D, Patel H. Metastasis from gastric signet ring cell adenocarcinoma presenting as a rectosigmoid stricture: A rare case. *Cureus*. 2020;12(6).
14. Cho WK, Choi DH, Park W, et al. Gastric Complications after Adjuvant Radiotherapy for Breast Cancer. *J Breast Cancer*. 2019;22(3):464-471. Published 2019 Sep 23. doi:10.4048/jbc.2019.22.e42
15. Okutur K, Eren OO, Demir G. Metastasis of gastric signet-ring cell carcinoma to the urinary bladder: A case report and review of the literature. *Case Reports in Oncological Medicine*. 2015;2015:1-6.
16. Pernet S. Signet-ring cell carcinoma of the stomach: Impact on prognosis and specific therapeutic challenge. *World Journal of Gastroenterology*. 2015;21(40):11428.
17. Hashimoto Y, Iwata Y, Sangen R, Usuda D, Kanda T, Sakamoto D, et al. Pericardial biopsy revealed gastric signet-ring cell cancer. *Case Reports in Oncology*. 2015;8(1):174-8.
18. Imazio M, Adler Y. Management of pericardial effusion. *European Heart Journal*. 2012;34(16):1186–97.