The role of EUS in missed and known linitis plastica

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INTRODUCTION

Linitis plastica is an intramural infiltrating anaplastic adenocarcinoma found in the stomach where it causes thickening and stiffening of the gastric wall. It is an aggressive condition, occurring in 7%–10% of primary gastric cancers.[1] It can be difficult to diagnose endoscopically due to cancer infiltrating the submucosa and muscularis propria, and hence, endoscopic appearance and superficial mucosal biopsies may both be unremarkable for signs of malignancy.[2] EUS has emerged as an important tool for the diagnosis and staging of this disease. We report four cases of linitis plastica diagnosed and/or imaged through EUS.

CASE REPORTS

Case #1

A 37-year-old female presented with vomiting, abdominal pain, early satiety, and weight loss. A recent CT scan had shown moderate ascites, diffuse gastric wall thickening, and nodular thickening of the mesentery, all concerning for malignancy. Diagnostic paracentesis revealed atypical cells and suspicious for cancer. Diagnostic esophagastroduodenoscopy (EGD) and staging EUS were performed together. EGD revealed congested, friable, and nodular mucosa which was biopsied [Figure 1, Case 1]. EUS revealed severe diffuse gastric wall thickening for which fine-needle aspiration (FNA) was performed [Figure 1, Case 1]. Pathology and cytology results were consistent with high-grade adenocarcinoma of gastric origin. The patient was referred to oncology where palliative chemotherapy was started for Stage IV gastric adenocarcinoma. She continues to do well currently.

Case #2

A 79-year-old female with dysphagia was diagnosed with poorly differentiated adenocarcinoma with signet-ring cell features of the gastric cardia through biopsies obtained during the EGD. Subsequent positron-emission tomography scan revealed an area of intense uptake in the gastric antrum and pylorus which had appeared endoscopically normal. Repeat EGD with EUS showed mucosal thickening in the distal gastric body for which biopsies and FNA were performed [Figure 1, Case 2]. Interestingly, the endoscopic biopsies showed only inflammation and atypical cells, while FNA cytology revealed poorly differentiated adenocarcinoma with signet-ring cell features and confirming the diagnosis of linitis plastica. With palliative therapies, the patient went on to survive 6 months from the time of diagnosis.

Case #3

A 60-year-old female presented for the evaluation of nausea, vomiting, early satiety, and unintentional...
weight loss after an outside hospital workup revealed poor peristalsis on an upper GI series and
abnormal antral mucosa on an EGD. Pathology
from outside biopsies only noted parietal gland
hyperplasia and minimal chronic inflammation.
Repeat EGD along with EUS was performed at our
hospital. Endoscopic appearance was remarkable for
diffusely thickened folds in the gastric body and
the antrum with significant lack of distensibility
which was biopsied [Figure 1, Case 3]. EUS showed
diffuse wall thickening in the antrum and prepyloric
stomach, extending through the mucosa into the
submucosa, and muscularis propria for which FNA
was performed [Figure 1, Case 3]. Again, in this
case, the endoscopic biopsies only revealed reactive
gastropathy and infiltrating lymphocytes, while FNA
cytology showed poorly differentiated carcinoma. The
patient went on to have a subtotal gastrectomy with
duodenojejunostomy followed by chemoradiation. With the help of adjuvant
therapy, the patient survived a year from the time of
diagnosis.

**Case #4**
A 54-year-old female with intractable vomiting,
abdominal pain, and weight loss who had been
recently diagnosed with gastric adenocarcinoma at an
outside facility was referred for staging EUS. Repeat
EGD at the time of EUS revealed a malignant
gastric tumor infiltrating the entire stomach with
protrusion into the mid-gastric body which was
biopsied. Pathology was positive for high-grade
signet-ring cell adenocarcinoma [Figure 1, Case 4].
EUS staged the mass at T3NxMx but could not be advanced beyond the gastric body due to the
tumor obstruction [Figure 1, Case 4]. FNA was not performed due to already having a diagnosis. The
patient is being set up for neoadjuvant chemotherapy
and surgical follow-up.

**DISCUSSION**
Linitis plastica is generally a late-presenting malignancy
with poor curative options. The stomach has a rich
lymphatic supply, facilitating the spread of cancer cells,
and poor sensation resulting in few alarm symptoms
early on.\(^1\) EGD with biopsy is a typical starting point
when an upper gastrointestinal malignancy is suspected
but can miss the diagnosis, as revealed in two of our
four cases. Oftentimes it is not until the tumor has
spread significantly, resulting in severe symptoms, that
it is detectable by EGD. By this point, it is rare that
treatment options other than palliative will be offered,
as the overall 5-year survival rate even in resectable
disease ranges from 10% to 30%.\(^1\) EUS is a valuable
tool for both detecting and staging linitis plastica
with accuracy based on multiple studies ranging from
64% to 92% for T staging and from 50% to 90%
for N staging.\(^1\) EUS-FNA can easily be performed
in the same setting at the time of initial EGD, as

| Case 1 | Case 2 | Case 3 | Case 4 |
|--------|--------|--------|--------|
| EGD    | ![Image 1] | ![Image 2] | ![Image 3] |
| EUS Radial | ![Image 4] | ![Image 5] | ![Image 6] |
| EUS Linear | ![Image 7] | ![Image 8] | ![Image 9] |
| Surgical Pathology | ![Image 10] | ![Image 11] | ![Image 12] |
| Cytopathology | ![Image 13] | ![Image 14] | ![Image 15] |

*Figure 1. Endoscopic and endosonographic views, with surgical pathology and cytopathology findings of linitis plastica.*
mucosal biopsies are often negative, thus increasing the diagnostic yield, as our second and third cases illustrate.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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