Unexpected Cancer and the EGS Surgeon

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The discovery of a malignancy during the course of the workup or treatment of an EGS condition is common. There are varying presentations and implications. Priorities to be addressed include treatment of the acute EGS condition, following oncologic surgical principles if possible, and providing patients and their families the support needed.

Disease demographics and Clinical Presentations

- Malignancies in the EGS population are common.[1]
    - It is estimated that 8.9% of EGS patients admitted in the United States have concurrent diagnoses of malignancies.
    - The three most common EGS conditions associated with a concurrent malignant diagnosis include (1) gastrointestinal bleeding, (2) intestinal obstruction, and (3) peritonitis. However incidental discovery of malignancies is similarly common.[2]
- Gastrointestinal bleeding in EGS patients with cancer can be due to:
    - Bleeding from the tumor itself.
    - Mallory-Weiss tears due to chemotherapy-associated retching.
    - Radiation- and chemotherapy-induced inflammation and erosions.
    - In the case of proximal GI lesions (e.g. pancreatic), portal hypertension-induced variceal bleeding
- Intestinal obstruction can occur in multiple settings.
    - Large bowel obstruction is the initial presentation of colorectal cancer in 7-29% of cases[3].
    - Small bowel obstruction (SBO) from primary or metastatic lesions may be the cause of obstruction in the patient presenting with an SBO in the setting of a "virgin" abdomen.
- Peritonitis due to perforation, can similarly occur in different scenarios from a variety of malignancies.
- Patients undergoing active chemotherapeutic treatments, who are also neutropenic, present other challenges:
    - Typhlitis, or neutropenia enterocolitis, is a potentially lethal condition that can present with severe abdominal pain in patients undergoing chemotherapy.
    - Management relies upon IV antibiotics and bowel rest, unless signs of perforation or bleeding are present. Patients who are initiated on antibiotics should be closely followed by the surgeon for failure of antibiotic therapy, such as perforation or worsening signs of sepsis.
        - Broad-spectrum antibiotic coverage is preferred, with adequate local coverage aimed at gram-positive, gram-negative and anaerobic organisms.
    - Acute appendicitis may have more serious consequences in the neutropenic patients. Surgical resection is indicated and preferable to non-operative management. There are no data yet to support an antibiotic-only strategy for this special population.
- The incidental discovery of malignancy during work-up and treatment for EGS pathology is also common.
    - CT of the abdomen and pelvic may contain incidental, clinically significant finings in 5-16% of asymptomatic patients.[4]

- Appendiceal tumors, including mucoceles and carcinoids, may be discovered during the course of workup or treatment for presumed appendicitis.

Evaluation, Diagnostics, and Imaging

- Timely care for an acute surgical condition (particularly if life-threatening) should not be delayed for an oncologic workup if a malignancy is suspected.
- If an intra-abdominal surgery is being considered and the patient is at risk for peritoneal carcinomatosis, a CT scan should be performed. Pre-operative identification of carcinomatosis may impact decision-making for the surgeon, patient and family.
  - Findings on CT that can indicate carcinomatosis include ascites, nodular invasion or masses of the omentum, invasion of the mesentery, tumor implants on the peritoneal surfaces.[8]
- An incidental finding of a malignancy not related to, or involved with, a primary EGS pathology may be discovered (e.g. renal cell cancer). Full disclosure of the findings to the patient is critical, with suggested plans for follow-up.
  - Mature EGS services must have protocols in place for the management of incidentally discovered malignancies. These should include timing of consultation for other specialities, as well as ensuring proper outpatient follow-up is arranged.
  - When determining when and what to biopsy, priority in the management of the acute process remains paramount. If a suspicious finding is noted incidentally, assessing the risk of a biopsy in the current clinical situation is warranted. Bleeding and added time on the OR should be weighed against the possible need for an additional procedure for diagnostic or therapeutic purposes
    - Liver Lesions – if the lesion is near the periphery an excision can be considered, core biopsies can be used for larger lesions.
    - Carcinomatosis – excision of peritoneal or omental implants can easily be done and sent to pathology
    - Mass – careful consideration should be undertaken as a complete resection may not be possible
  - Participation in Tumor Board – if available – should occur as soon as possible to facilitate timely multi-disciplinary treatment

Malignant Bowel Obstruction

- The role of the surgeon in most cases of malignant obstruction remains controversial—there are few validated outcome measures regularly employed across all studies and no standards for management.[5]
- When considering operative intervention for malignant bowel obstructions, the decision to perform resection may be influenced by advanced age, the presence of carcinomatosis, multiple points of occlusion, severe malnutrition, refractory ascites, symptomatic extra-abdominal disease, renal/hepatic insufficiency, previous abdominal radiotherapy, and the absence of the active oncologic treatments. In such cases, palliative options may be preferable.[6]
  - Surgeons may be consulted for palliative venting gastrostomies, in cases of a frozen abdomen and intractable vomiting not amenable to medical therapy. In these cases a percutaneous option may be preferable.

    - Consideration should be given to whether there is ascites, whether the tube would pass through the mass, or whether there is widespread carcinomatosis. Each of these situations increases the possibility of complication and would change the risk/benefit ratio.
- Stenting is a valuable adjunct to unresectable disease. Tumors of the proximal GI tract and descending colon are most amenable to this therapy.[7]
    - For obstructing, resectable left-sided colon cancers, stenting may allow for pre-operative preparation.
- Massive lower GI bleeding, while an uncommon complication of colon cancer, may benefit from selective embolization while resuscitation efforts are undertaken.[2]
- When considering operating on an EGS condition remote from a patient's malignancy, consideration should be given to factors which might impact the patient's ability to heal including neutropenia, need for ongoing chemotherapy, and poor nutrition.

Operative techniques and intraoperative considerations

- When malignancy is incidentally discovered during an emergency general surgery procedure, resection should comply with oncologic principles
    - Ensure margins are of adequate distance from the malignancy. One centimeter is adequate for most cancers
    - Wider margins are ideal if anatomy allows (five centimeters)
    - Take vasculature and related lymph nodes at the origin of the pedicle
    - Specifics will vary somewhat depending on the primary
- Though oncologic resection is ideal, a more limited resection should be pursued if the patient is hemodynamically unstable and unable to tolerate a more extensive procedure or if anatomy will not allow
- Some malignancies should be treated with temporization, especially if it is unresectable or in a region that is less familiar to the surgeon. Extensive curative resections may be best served by a secondary procedure after specialist consultation and staging.

Ovarian/GYN Malignancies[8]

- Bowel obstruction is the most common complication of advanced pelvic cancers, affecting 5.5-51% of patients with Stage III and IV disease. The onset can be prolonged as the symptoms worsen with advancing disease.
- Medical management with fluids, electrolyte replacement, steroids and anti-cholinergics can alleviate mild symptoms.
- Endoscopic management may be indicated with stents for obstruction, or palliative percutaneous endoscopic gastrostomy tube placement for relief of obstructive symptoms.
- Surgical management in appropriate candidates can be considered, but operative mortality (up to 40%) and complication rates (up to 90%) are high. Complications include recurrent obstructions, pain, infections and fistulae.

Perforations secondary to Lymphoma

- Approximately 9-34% of lymphomas of the small bowel perforate, either as a presenting symptom or as a result of chemotherapy. The most common type of lymphoma presenting with perforation is B-cell lymphoma.[9]

- If lymphoma is suspected (e.g. bowel obstruction associated with a mass; spontaneous bowel perforation), fresh tissue must be sent to pathology.
- Anastomose at healthy unaffected tissue

Appendiceal Cancer

- Appendiceal neoplasms are rare, and are found in <1% of appendectomies. However, given the frequency of operations for this disease, it is likely to be encountered by the emergency general surgeon in their career. If presenting as acute appendicitis, perforation can occur in over 50% of patients.[10]
- Appendiceal neoplasms include neuroendocrine tumors (carcinoids), mucoceles, and adenocarcinoma:
    - *Appendiceal mucoceles* include a spectrum of disease including simple cysts, mucinous cystadenomas, mucinous cystadenocarcinomas, and pseudomyxoma peritonei
    - When discovered during the course of an operation, care should be taken not to rupture the tumor, as this is associated with pseudomyxoma peritonei and a worse prognosis. Traditional approach has been the open approach, with wide resection of the appendiceal mesentery, although mounting evidence indicates that laparocopic resection is a safe option.[11]
    - In patients with a cystadenocarcinoma without mesenteric involvement, local spread to an adjacent organ, or peritoneal involvement, appendectomy is adequate.
    - All mucoceles >2cm require resection, given the high risk they may be a mucinous neoplasm.[12]
    - New data suggests that a right hemicolectomy may not be required in all cases of appendiceal mucoceles, as the risk of nodal metastasis is low and there may not be a survival benefit for node positive disease.[13] However, a right hemicolectomy would be required for complete cytoreduction tumor clearance, if indicated.[14]

    - *Appendiceal carcinoid tumors* overall have a favorable prognosis.
    - A decision for appendectomy only vs. right hemicolectomy depends largely on tumor size and evidence of metastasis, but is still an area of debate.
        - Tumors less than 1 cm can often be managed by simple appendectomy (unless there are signs that the tumor is aggressive such as mesoappendiceal invasion, angioinvasion, or lymph node spread)[15]
        - Tumors 1-1.9 cm in size can be selectively managed with appendectomy alone, unless there are worrisome signs such as mesoappendiceal invasion, positive margins, angioinvasion, high-grade morphology, or mixed histology.[16]
        - Tumors > 2cm are recognized as being more aggressive. Right hemicolectomy in the young, healthy adult is indicated in most cases.

    - *Appendiceal adenocarcinoma* is managed with an oncologic right hemicolectomy.

Gallbladder Cancer[17]

- Gallbladder cancer is most often discovered as a consequence of cholecystectomy after treatment of symptomatic cholelithiasis.
    - Approximately 1% of cholecystectomies may result in the discovery of gallbladder cancer, with an average age of presentation at 60 years. The prognosis overall is poor, with metastatic disease in 1/3 of patients at diagnosis.
- Perforation is associated with high risk of local recurrence or peritoneal carcinomatosis. This is true for perforation at presentation or intraoperatively. Risk of intraoperative perforation is increased with increased grade of the tumor and surrounding inflammation. The type of surgery, laparoscopic versus open, has no influence on outcomes. Access to definitive treatment in higher staged tumor is associated with improved outcomes.
- If a mass is unexpectedly encountered during laparoscopic cholecystectomy, management may include local en bloc resection to normal liver with potential formal hepatectomy, as indicated, in a staged fashion versus intraoperative consultation with a surgical oncologist.
    - A pancreaticoduodenectomy, if needed for unexpected cancer, should be referred to a hepatobiliary surgeon or surgical oncologist.

Incidental thyroid nodules [18]

- One of the most common incidental finding on imaging that includes the neck, seen in up to 25% of chest CT scans.
- The majority are benign and small as malignancy rates for incidental thyroid modules range from 0% to 11% if detected on CT or MRI.
- The American Thyroid Association recommends that ultrasound be used to evaluate all thyroid nodules seen on CT, MRI or FBG-PET scans if
    - Nodules are deemed to by high risk (suspicious lymph nodes, local invasion, PET avid nodule)
    - Nodule >/= 1 cm in patient age < 35 years
    - Nodules >/= 1.5 cm in patients age >/= 35 years
- Use of ACR TI-RADS classification, a standardized scoring system to determine need for biopsy for suspicious lesions (TR 3-TR 5) [19]

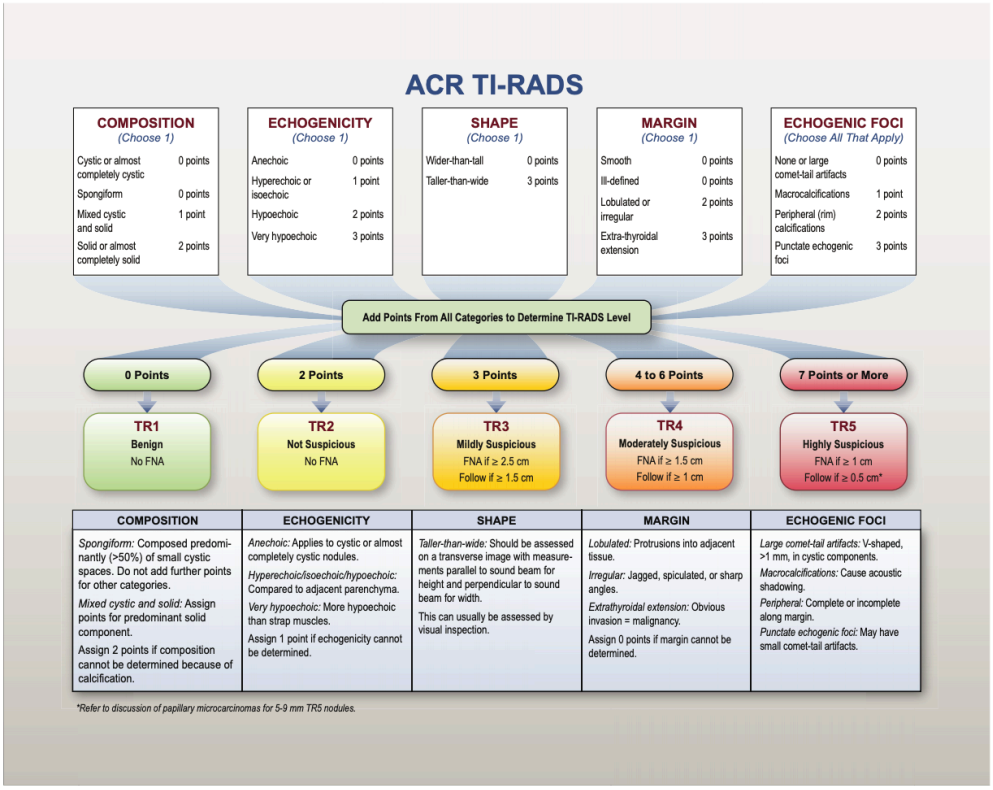

Fig 1. Chart showing five categories on the basis of the ACR Thyroid Imaging, Reporting and Data System (TI-RADS) lexicon, TR levels, and criteria for fine-needle aspiration or follow-up ultrasound. Explanatory notes appear at the bottom.

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