

## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 55 year old man has been referred to a surgeon for two issues: he requests colonoscopy, and he has persistent pain in the right upper quadrant. The patient has a history of diverticulitis for which he underwent treatment one year previously. At that time, he had typical symptoms of sigmoid diverticulitis including left lower quadrant pain and altered bowel habits. His diverticulitis resolved with treatment. The patient also has a large scar extending into the right upper quadrant, which he states is from a remote appendectomy, possibly complicated by bowel perforation. The patient's pain appears to occur at the edge of his incision. On physical examination, the patient has no herniation at the incision site but does have mild tenderness to deep palpation in the right upper quadrant.

Which imaging study is most appropriate for this patient?

- (a) plain films of the abdomen
- (b) ultrasound of the abdomen
- (c) computed tomography of the abdomen and pelvis, with, in addition to the standard study, a right-side down decubitus examination performed while the patient performs a Valsalva maneuver
- (d) magnetic resonance imaging of the abdomen and pelvis

## RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

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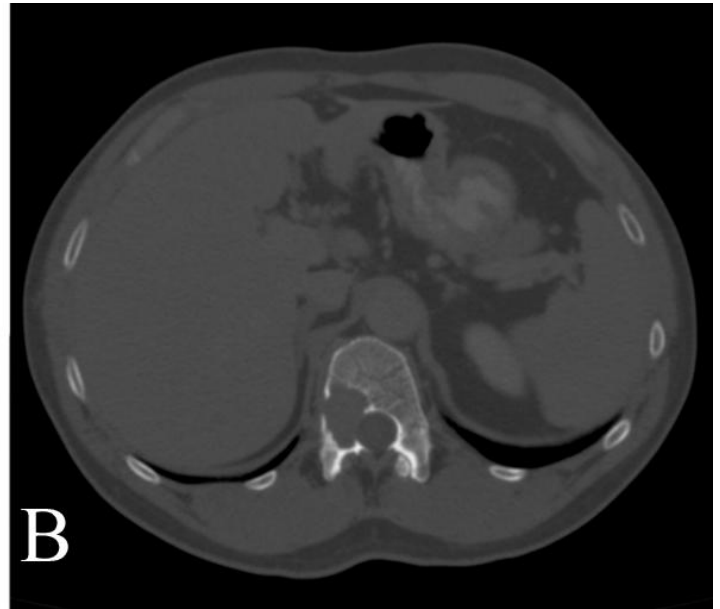
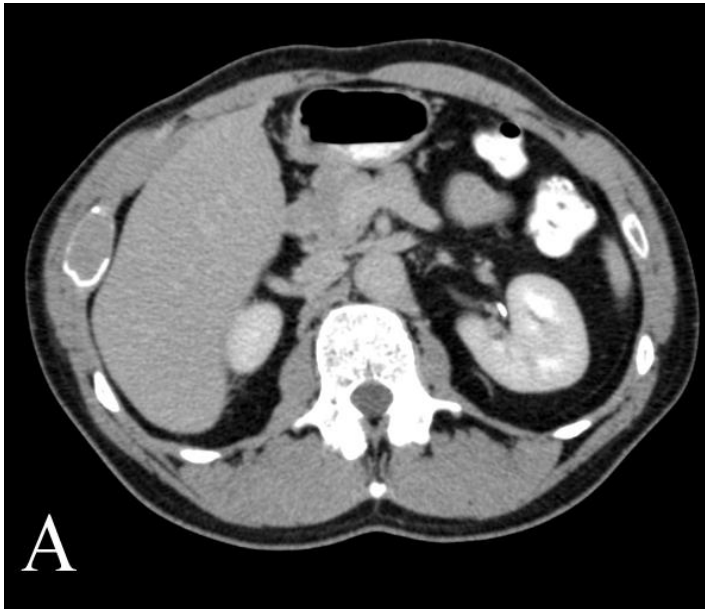
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Answer: (c), computed tomography of the abdomen and pelvis, with, in addition to the standard study, a right-side down decubitus examination performed while the patient performs a Valsalva maneuver is the correct answer. CT examination is the study of choice for "abdomen pain plus" where the "plus" represents inflammation (fever, elevated white count, rebound tenderness, peritoneal signs), suspected obstruction (distension with nausea/vomiting), and such constitutional symptoms as weight loss. CT may also be helpful in such problem cases as this one when pain is suspected to come from an occult hernia. The sensitivity of the CT examination is increased by performing a decubitus examination with the patient performing the Valsalva maneuver.

Plain films of the abdomen are generally of little utility in the evaluation of abdominal pain, with the possible exception of suspected obstruction. Even when obstruction is suspected, a plain film may be false-negative if the distended bowel loops are filled with fluid, and even if the plain film shows abnormal air-distended small bowel loops, a CT is often done to evaluate the location and cause of obstruction. Therefore, (a) is incorrect. Ultrasound of the abdomen is the study of choice for suspected biliary colic, but this patient's pain was not typical for biliary colic, and (b) is incorrect. Magnetic resonance imaging of the abdomen is usually reserved for evaluation of problem patients when ultrasound or CT is nondiagnostic, and (d) is incorrect.

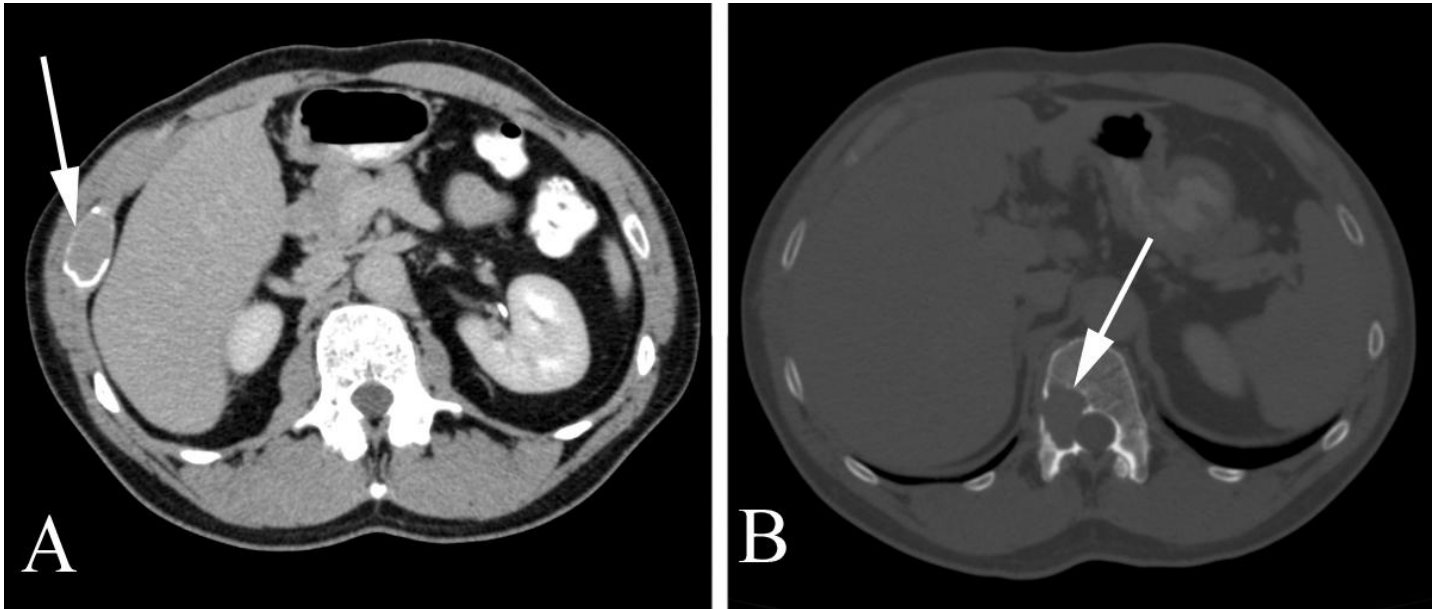
<b>IMAGING STUDY AND QUESTIONS</b>
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Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

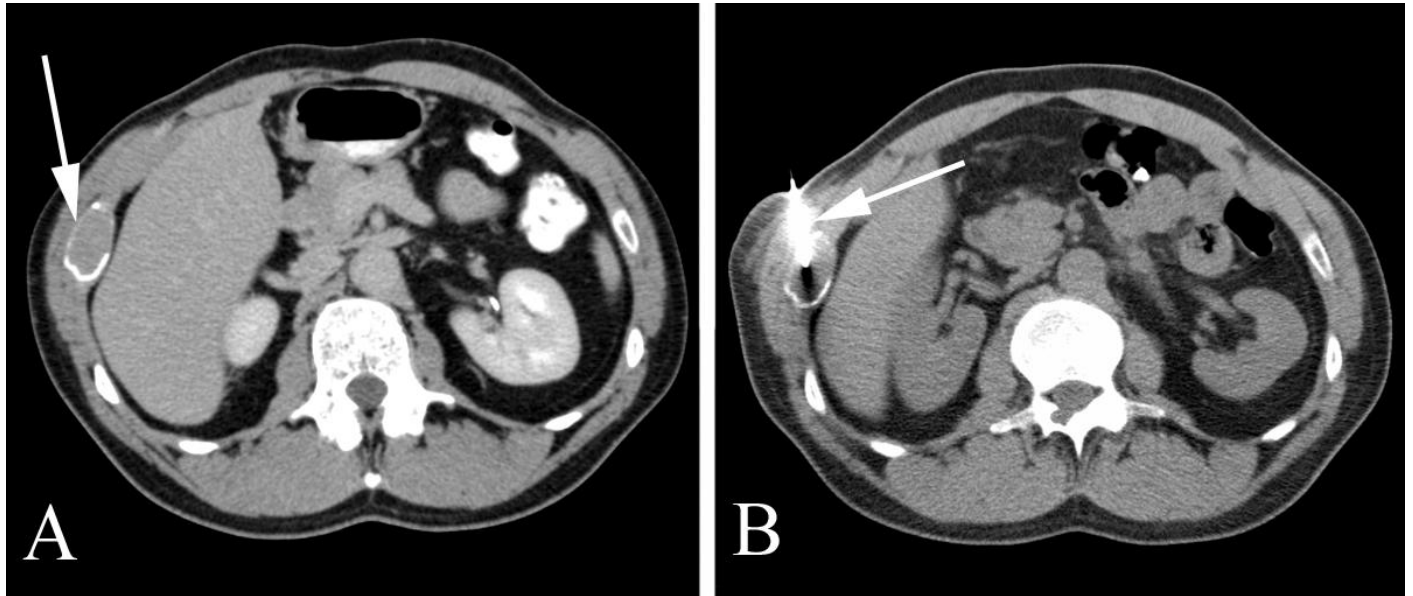
## IMAGING STUDY QUESTIONS AND ANSWERS



### Imaging questions:

- 1) What type of study is shown? An abdominal CT scan performed with oral and intravenous contrast material. The image in A is filmed with the usual “soft tissue” windows, but the image in B is filmed in “bone windows” to allow better visualization of the bones.
- 2) Are there any abnormalities? Yes. In A, there is an expansile lesion of the patient’s right 10<sup>th</sup> rib, with a discontinuous cortex (fracture) (arrow). In B, there is a destructive lesion of the posterior aspect of the T12 vertebral body (arrow) extending into the right pedicle, with associated cortical interruption. There were multiple additional lytic bone lesions including in the pelvis (not shown).
- 3) What is the most likely diagnosis? The imaging features are not histologically specific, but are highly suggestive of metastatic deposit, despite the fact that the patient has no known primary tumor.
- 4) What is the next step in management? Biopsy of any of the accessible bone lesions and referral to oncology.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP



The patient was referred to an oncologist and biopsy of the rib lesion was arranged. As seen in the above image, the rib lesion identified on the original CT scan (A) was biopsied with a cutting needle. In B, the metallic needle creates “streak artifact” (arrow), and the tip of the needle is seen to lie within target lesion in the rib.

The biopsy results revealed a plasmacytoma, and the patient’s multiple other bone lesions were undoubtedly the same process. He had mild anemia (hemoglobin 13.8), normal creatinine, normal calcium, an elevated beta-2 microglobulin (B2M) (3.0 with a normal range of 0.8 – 2.4 mg/L), and a negative c-reactive protein. Electrophoresis was abnormal with an elevated alpha-1 and beta-globulin. Quantitative immunoglobulins demonstrated elevated IgA. A bone marrow biopsy was done which revealed 60% plasma cells (normal < 5%) with lambda light chain restriction. Flow fluorescent in-situ hybridization studies revealed monosomy 13, which is a poor prognostic indicator. The patient met therefore met the usual criteria for the diagnosis of symptomatic multiple myeloma: 1) presence of an M-protein in serum and/or urine; 2) presence of 10% or more clonal bone marrow plasma cells or plasmacytoma; and 3) presence of related organ or tissue impairment that can be attributed to plasma cell proliferative disorder (in this case, lytic bone lesions).

Based on the International Staging System, as the patient had a B2M < 3.5 and an albumin of > 3.5 (his was 3.8), he was Stage 1. He was entered in a clinical trial for chemotherapy (bortezomib and lenalidomide) with a planned autologous stem cell transplant.

## SUMMARY

**Presenting symptom:** Abdominal wall pain at the site of an incision may be caused by a hernia, and while such hernias are typically diagnosed on physical examination, they may occasionally be deep, transient, or otherwise difficult to diagnose. Scarring and adhesions may also cause pain at an incision site. Therefore, it is reasonable to perform CT to exclude treatable causes such as occult hernia in patients such as this one, who present with persistent pain at an incision site. In this case, the patient's symptoms did not have anything to do with his incision, and the location of his pathologically fractured rib near the incision site was serendipitous. Approximately 58% of patients with multiple myeloma will present with bone pain.

**Imaging work-up:** As noted on page 2, CT examination is the study of choice for "abdomen pain plus" where the "plus" represents inflammation (fever, elevated white count, rebound tenderness, peritoneal signs), suspected obstruction (distension with nausea/vomiting), and weight loss. While right upper quadrant pain suspected to be biliary colic should be evaluated with a right upper quadrant ultrasound exam (see Radiology Quiz of the Week #23), this patient's symptoms were not those of biliary colic. The imaging study was designed to optimize sensitivity for occult hernia, with, in addition to the standard sequences, a right (symptomatic) side down, decubitus exam performed during the Valsalva maneuver.

**Establishing the diagnosis:** As noted on page 5, the diagnosis is based on three criteria: 1) an M-spike in serum or urine protein; 2) a bone marrow exam showing > 10% plasma cells; and 3) the presence of end-organ damage. For 3), the mnemonic "CRAB" may help to remember the end-organ damage locations: C = calcium (hypercalcemia); R = renal insufficiency; A = anemia; and B = bony lytic lesions.

**Take-home message:** CT examination may be used to "trouble shoot" problematic cases such as this one where an occult hernia was suspected. In this case, CT examination found an unsuspected tumor.

## FURTHER READING

Penner RM, Majumdar SR. Diagnostic approach to abdominal pain in adults. UpToDate, accessed 7/6/09.

Rajkumar SV. Clinical features, laboratory manifestations, and diagnosis of multiple myeloma. UpToDate, accessed 5/20/11.

Renfrew, DL. "First step" imaging of gastrointestinal symptoms. Chapter 6 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).