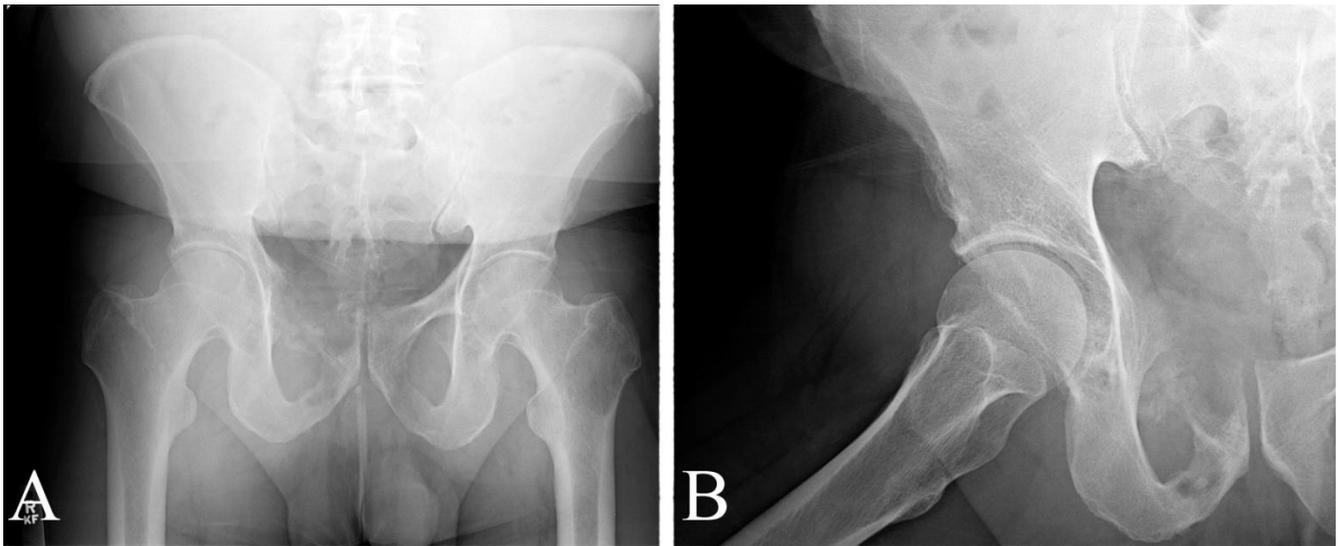


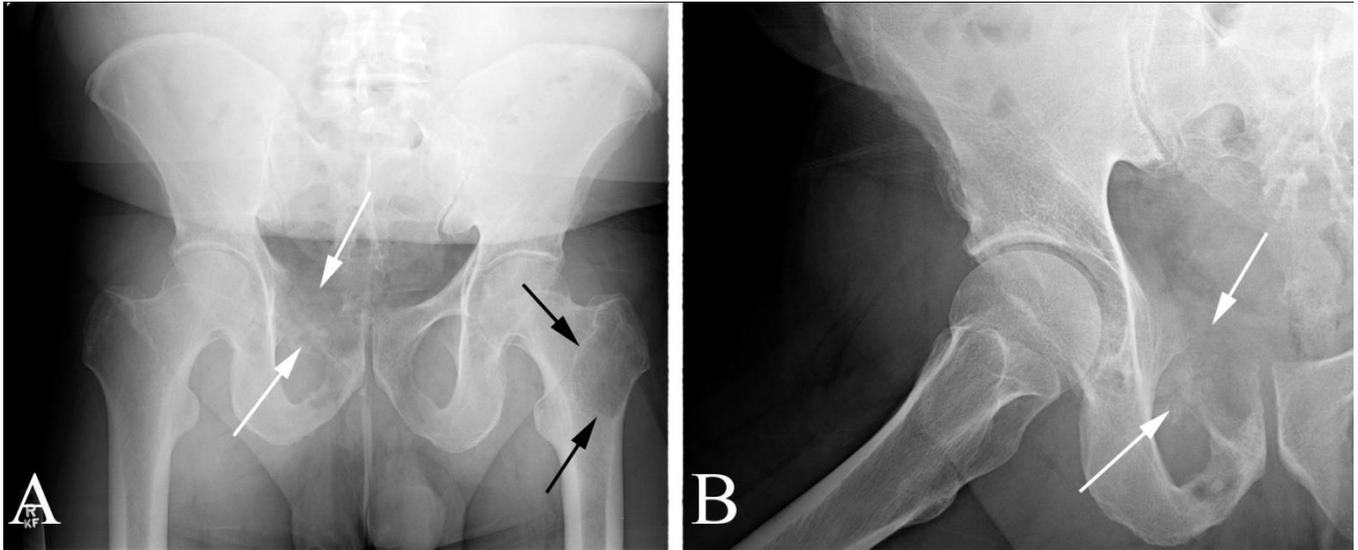
## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 59 year old man presents to clinic with a history of pain of six weeks' duration in the right groin. The patient states that the pain originally seemed to be in the left hip, but is now more pronounced in the right groin. He has never had any similar pain in the past, and he denies any injury or history of arthritis in other joints. The patient denies fever, chills, nausea, night sweats, or lower extremity numbness or tingling. He has had no overlying skin changes. His vital signs are unremarkable. Physical examination reveals point tenderness over the right pubic tubercle and painful motion with internal and external rotation of both hips. A straight leg raising test does not provoke any hip or back pain. No hernia is identified on physical examination. The patient had a plain film examination of the pelvis and right hip:



Which of the following imaging studies would be *least* helpful in further evaluation of this patient?

- (a) magnetic resonance (MR) imaging of the right hip
- (b) nuclear medicine positron emission tomography (PET) scan of the whole body
- (c) computed tomography (CT) of the chest, abdomen, and pelvis
- (d) nuclear medicine bone scan of the whole body

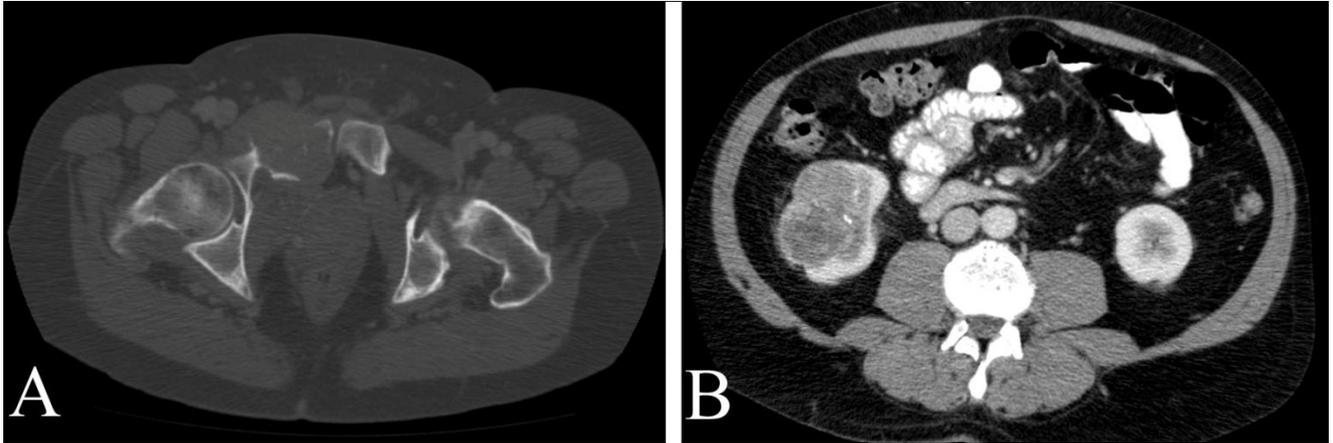
**RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION**

The plain film demonstrates an obvious expansile, lytic, destructive lesion of the right superior pubic ramus (white arrows in A and B). There is also a destructive lesion of the left proximal femur (black arrows in A).

While the plain film findings are not histologically specific, the overwhelming likelihood is that the abnormalities seen on the plain film represent diffuse metastatic disease. Problems to be solved in these cases include finding the tumor origin, evaluating the extent of the lesion, and obtaining tissue to document the tumor type. A PET scan of the whole body, CT of the chest, abdomen, and pelvis, and a bone scan would all help to evaluate the extent of the lesion, and the CT (and to a lesser extent the other studies) may offer some insight into the tumor origin. MR of the right hip, however, would likely be of little benefit. For one thing, the right pelvis lesion would likely be at the margin of a dedicated hip MR (a bony pelvis study would be more appropriate to study both the right symphysis lesion and the left proximal femur lesion). For another, it is already obvious that there are gross abnormalities of the bones causing the patient's symptoms. Therefore, MR imaging of the right hip would be *least* helpful in further evaluation of the patient, and (a) is the correct answer. Note that under some current insurance plans, the PET study may not be covered prior to documentation of the type of primary tumor (except in the case of pulmonary nodules).

## IMAGING STUDY AND QUESTIONS

An imaging study was performed:



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 ANSWER



### Imaging questions:

- 1) What type of study is shown? A computed tomography (CT) study of the abdomen and pelvis (chest CT was performed at the same time). A. Axial CT of the pelvis filmed at “bone window” settings. B. Axial CT of the abdomen at the level of the kidneys.
- 2) Are there any abnormalities? Yes. A. This study redemonstrates the patient’s known, destructive right superior pubic ramus lesion with an associated soft tissue mass (arrows). B. This study shows a right renal mass (arrows).
- 3) What is the most likely diagnosis? Renal cell carcinoma, with metastatic disease. Also possible, but less likely, is metastatic disease to both the bone *and* the kidney from another source.
- 4) What is the next step in management? Referral to an oncologist. Consider biopsy of one of the patient’s bone lesions versus nephrectomy based on the likelihood that this is the primary tumor and nephrectomy will a) obtain diagnostic tissue; b) prevent complications of the renal tumor such as discomfort from tumor bulk and anemia from ongoing hematuria; and c) possibly help in management of metastatic disease (since some evidence suggests that removal of a primary renal tumor results in better outcomes for those with metastatic disease).

<b>PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP</b>
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The patient was referred to oncology. He underwent percutaneous CT directed biopsy of the right superior pubic ramus lesion, and the biopsy results were compatible with a metastatic deposit from a renal cell carcinoma. He subsequently underwent right nephrectomy, with a diagnosis of renal cell carcinoma (clear cell variant), Fuhrman grade 3. The patient was subsequently treated with sunitinib, a receptor tyrosine kinase (RTK) inhibitor. Sunitinib acts on vascular endothelial growth factor receptors (VEGFRs), inhibiting tumor angiogenesis and tumor cell proliferation. Seven months later, zoledronic acid was added to enhance disease response. Approximately six months after this, the patient developed new bony metastatic deposits and sunitinib was stopped and Pazopanib was started. Axitinib was later added to the chemotherapeutic regime. The patient remains alive and active, and is being treated as an outpatient with oral medications, more than two years after his diagnosis of metastatic renal carcinoma.

## SUMMARY

**Presenting symptoms:** The patient presented with non-traumatic hip pain. There is a long list of possible causes of such pain, including osteoarthritis, avascular necrosis, bursitis, infection, rheumatoid arthritis, villonodular synovitis, stress fracture, hernia, tendinitis, labral tear, femoroacetabular impingement, bone marrow edema syndrome, crystal arthropathy, and tumor.

**Imaging work-up:** The initial imaging examination in patients with nontraumatic hip pain is typically a plain film study including an anteroposterior (AP) and “frog lateral” study. An alternative to the “frog lateral” study is a “shoot through” lateral. Additional imaging is usually done only after the hip plain film, and is predicated on the history, physical examination, laboratory results, and the results of the plain film.

**Establishing the diagnosis:** As noted above, problems to be solved in patients with what seems to be obvious metastatic tumor include finding the tumor origin, evaluating the extent of the lesion, and obtaining tissue to document the tumor type. Imaging can be helpful in all three of these tasks. A CT of the chest, abdomen, and pelvis may strongly suggest (through the size and location of the lesions) a thyroid, chest, renal, or bowel primary lesion. CT, bone scans, and PET scans can document the location and number of metastatic deposits. Imaging (fluoroscopy, ultrasound, or CT) may be used to target a location for biopsy. In almost every case, a diagnostic biopsy is highly desired to optimally care for the patient. Some biopsies may be nondiagnostic even though they target obvious tumors, because of necrosis of the biopsied tissue. In many cases, current pathology techniques allow determination of the primary tumor type from biopsy of a metastatic deposit.

**Take-home message:** The initial study of choice for virtually all patients with nontraumatic hip pain is a plain film examination. Additional studies are based on the history and physical examination, laboratory results, and the results of the plain films study.

Note the similarity of this case to that presented in RQW091 Chronic Shoulder Pain, RQW093 Chronic Elbow Pain, RQW095 Chronic Wrist Pain, and RQW097 Chronic Hand Pain. In most cases, chronic joint pain is first evaluated with a plain film.

### FURTHER READING

Anderson BC. Evaluation of the adult patient with hip pain. UpToDate.com, accessed 5/11/12.

Jude CM, Modaresi S. Radiologic evaluation of the painful hip in adults. UpToDate.com, accessed 5/11/12.

Renfrew DL. Single joint pain. Chapter 14 in *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).