

# Predicting Pathologic Bone Lesions Using Scout Computed Tomography (CT) Imaging

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## Introduction

- Early detection and management of pathologic bone lesions can improve quality of life and functional outcomes
- CT imaging is used for both the initial work up and surveillance of visceral disease and can be valuable for the evaluation of osseous structures
- Scout CT view displays a larger anatomic field not included on tomographic images
- Review of the scout CT view may add diagnostic information without adding any additional radiation to the patient or time to clinical evaluation

## Purpose

- The purpose of this study is to evaluate the benefit of reviewing scout CT images, obtained for routine oncologic surveillance, for the early identification of pathologic bony lesions

## Methods

- Retrospective review of patients who underwent surgical treatment for pathologic lesions or fractures of the humerus or femur from 2009-2019
- Radiographic records were reviewed to identify patients with available scout views prior to official diagnosis of the bony lesion
- CT scout images were reviewed to identify any pathologic lesions, and radiographic reports were reviewed to identify if the lesions were noted by the radiologist during initial scan interpretation
- Exclusion criteria included: lack of available CT scout imaging prior to initial diagnosis of the lesion, scout images that did not include an adequate view of the humerus and/or femur, CT images without a dictation by a radiologist at the time of the study

## Results

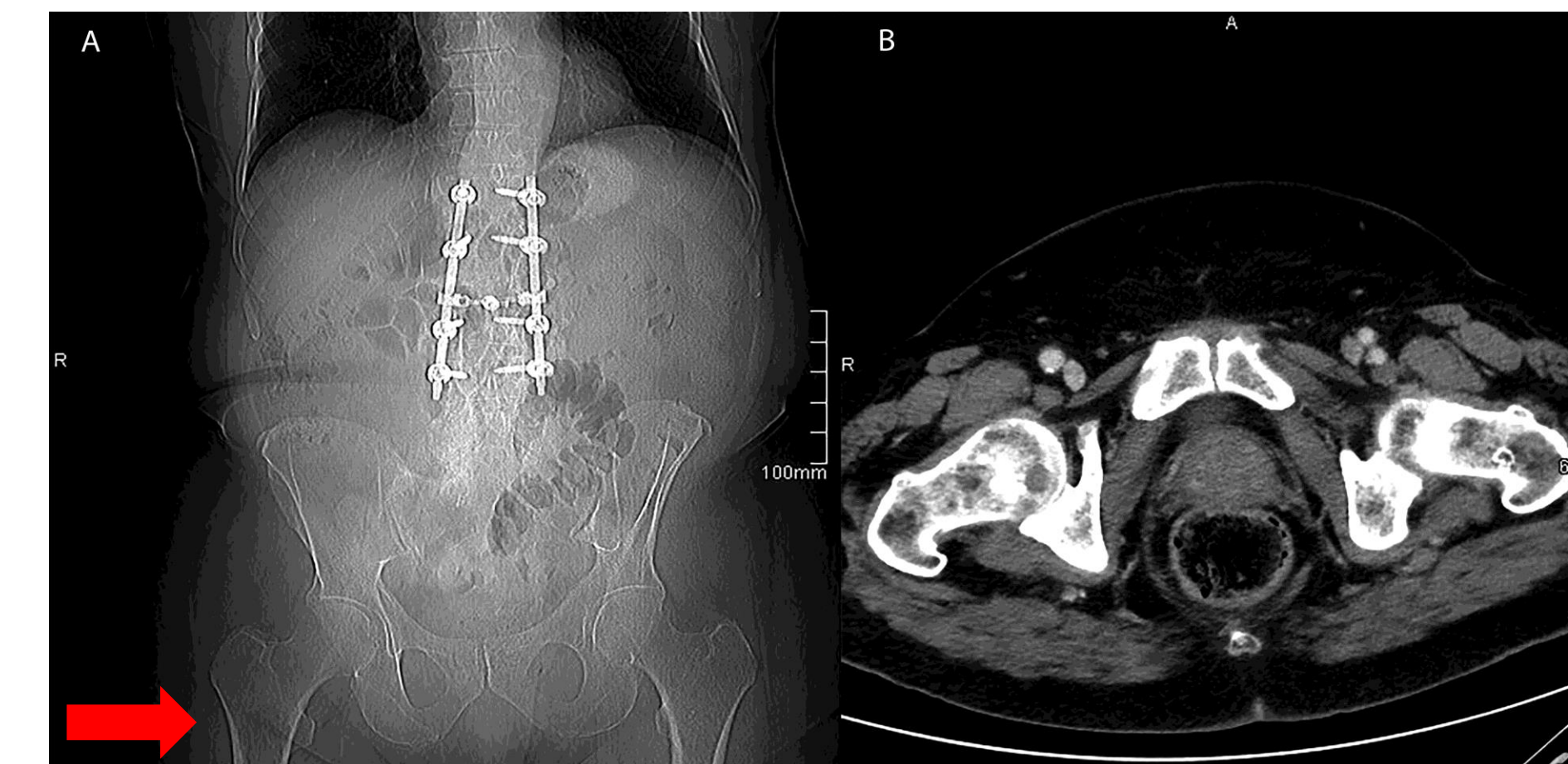
### Demographics:

- Average age: 61 years
- Gender: 66.7% Female
- Ethnicity: 92.3% Caucasian
- Cancer type: 41% Breast; 17.9 % Lung
- Site of lesion: 87.2% Femur, 12.8% Humerus

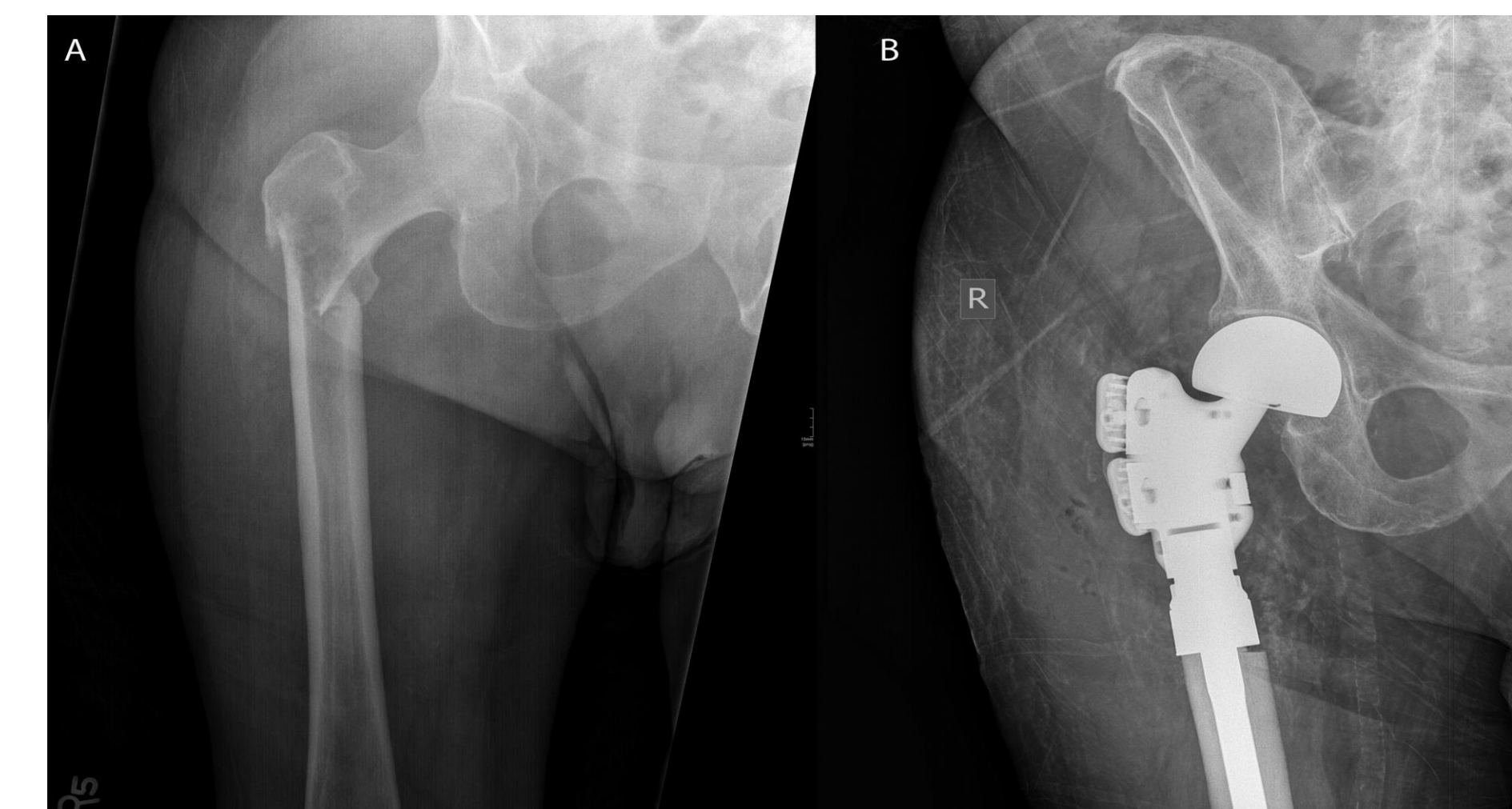
Population	Authors (n)	Radiology (n)
<b>Patients with available scout CT images</b>	39	39
<b>Number of patients with lesions identified on scout CT</b>	25 (64.1%)	9 (23.1%)
<b>Femur</b>	21	7
<b>Humerus</b>	4	2
<b>Total number of lesions identified on scout CT</b>	29	10
<b>Femur</b>	23	9
<b>Humerus</b>	6	1

- 19/29 (65.5%) of lesions identified by the study authors on scout CT were missed in the initial radiographic interpretation
- Average time between observation by authors and official diagnosis of 202 days
- 1 missed lesion was considered a complete pathologic fracture at the time of scout CT
- 18 missed lesions were considered impending pathologic fractures, defined as:
  - Size greater than one-third the diameter of the bone, location in the proximal femur or humerus, poor remaining bone stock, and specific tumor subtypes
- Of the 18 impending fractures, 3 patients (16.7%) went on to complete fracture prior to referral to orthopedics
- Average between missed lesions on scout CT and presentation with fracture of 68 days

## Patient Example



A) Scout CT film showing a pathologic lesion with impending fracture in the right subtrochanteric femur that was not documented in the initial radiographic report (red arrow). (B) Axial CT view in which the lesion is not well visualized



(A) Twelve days after routine surveillance CT, the pathologic lesion went on to a complete pathologic subtrochanteric femur fracture. (B) They subsequently underwent proximal femoral replacement

## Discussion

- Patients with missed lesions were significantly younger than patients with lesions identified by radiology (55 years vs. 65 years; p=0.006) which could represent a lesser degree of suspicion for identification of metastatic lesions in younger patients
- The majority of lesions identified were in the proximal femur (87.2%)
- All lesions identified on scout CT were either impending or complete pathologic fractures, suggesting that scout CT only allows for significant lesions to be seen

## Discussion, cont.

- A significant number of patients with clinically relevant bony pathology could have received an earlier diagnosis and treatment with prophylactic surgery or radiation therapy through careful review of scout CT imaging
- Earlier identification of these lesions with timely stabilization could have prevented complete pathologic fractures
- Existing studies have shown a propensity for unidentified clinical findings on CT imaging when compared to scout CT views, but none are specific to pathologic bone lesions of the appendicular skeleton
- Prophylactic fixation of impending pathologic fractures also has economic benefits compared to acute fracture treatment

## Limitations

- Selection bias
- No standardization at our institution for reviewing scout CT imaging
- CT scans in this patient population were obtained for evaluation of visceral disease and osseous structures may not have been a primary focus
- Lack of pain score analysis in determination of impending pathologic fractures

## Conclusions

- This study advocates for the careful review of all scout CT imaging as an essential part of the work up for metastatic disease and encourages all practitioners to utilize this screening tool for the identification of pathologic bony lesions which may help expedite early treatment to reduce patient morbidity