

## Femoral Neck Fracture with Avascular Necrosis

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## Abstract

Hip fractures are common in the aging population, with complications such as avascular necrosis (AVN). We describe a case of an 85-year-old woman with early AVN as a complication from femoral neck fracture discovered on routine bone densitometry screening (DXA).

## Introduction

Avascular necrosis of the femoral head is a known complication of femoral neck fractures. Various imaging modalities can be used to evaluate AVN, to include magnetic resonance imaging (MRI) and bone scintigraphy.

## Case Report

An 85-year-old female had routine screening bone densitometry (DXA) performed. On DXA images, the femoral neck had a foreshortened appearance (Figure 1), and radiographs were recommended. Hip radiographs performed subsequently showed a displaced subcapital left femoral neck fracture (Figure 2) and chart review revealed the patient had sustained a ground-level fall three weeks prior. Whole body bone scan and MRI of the hip was performed to evaluate for AVN and osseous metastases. The bone scan showed photopenia over the left femoral head on blood pool and delayed images, raising concern for early AVN (Figure 3). Magnetic resonance imaging showed a hypointense femoral head on T1 sequences, confirming the diagnosis of AVN (Figure 4). The patient subsequently underwent hemiarthroplasty of the left hip.

## Discussion

Dual energy X-ray absorptiometry (DXA) is recommended for women age 65 and older to screen for osteopenia and osteoporosis (1). The goal of screening is to identify those at increased risk of insufficiency fracture due to low bone mass. Screening typically evaluates the hip and lumbar spine, and occasionally the forearm. The World Health Organization has devised the Fracture Risk Assessment Tool to estimate the risk of a patient sustaining major osteoporotic fracture or hip fracture, based, in part, on bone mineral density (2).

Hip fractures are problematic, particularly in the elderly, with complications such as AVN of the femoral head. In one study, the incidence of AVN in patients with femoral neck fractures was 14.3% (3). Magnetic resonance imaging is the gold standard for evaluating AVN (4). However, bone scintigraphy is an option. Expected findings on MRI are hypointensity on T1 images, sometimes bordered by a hyperintense line. T2 images may show the “double line sign” consisting of a hyperintense inner line between normal marrow and ischemic marrow. On bone scintigraphy, early AVN shows photopenia on all phases due to absent blood flow. Late AVN will show increased bone tracer activity due to reparative uptake.

## Conclusion

Bone densitometry is a useful screening tool for osteopenia and osteoporosis. The limited images may yield unexpected findings, as demonstrated in this case, during which a displaced femoral neck fracture was discovered. Avascular necrosis is a common

complication of femoral neck fractures and can be evaluated with MRI or bone scintigraphy.

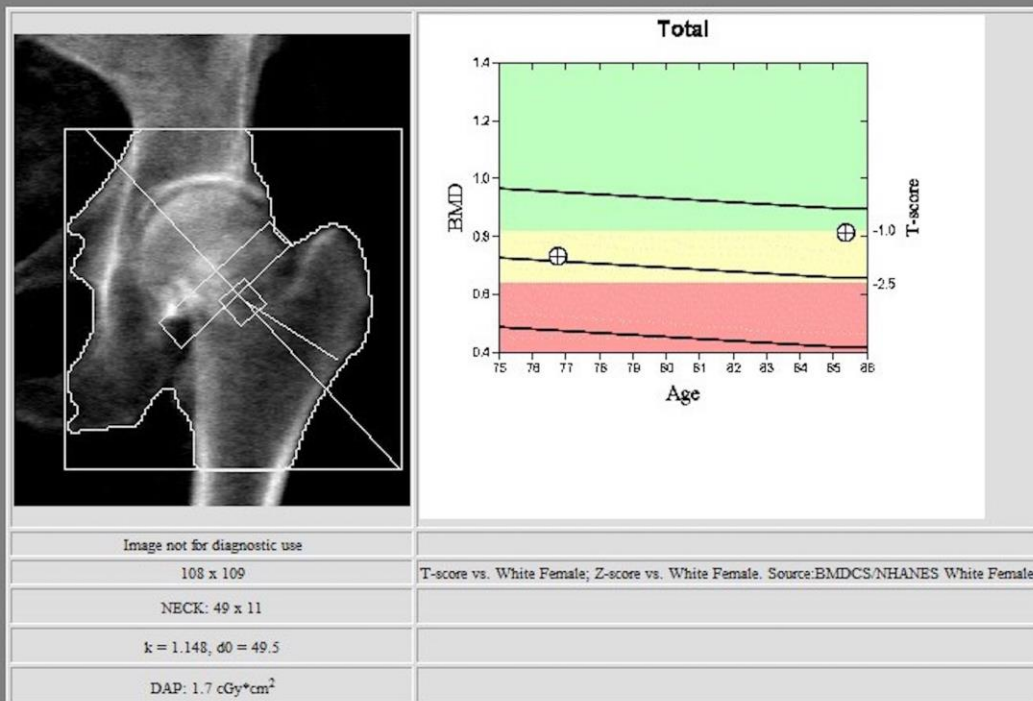
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**Results Summary:**

Region	Area[cm²]	BMC[(g)]	BMD[g/cm²]	T-score	PR (Peak Reference)	Z-score	AM (Age Matched)
Neck	5.21	5.04	0.967	1.1	114	3.6	170
<b>Total</b>	<b>74.19</b>	<b>60.27</b>	<b>0.812</b>	<b>-1.1</b>	<b>86</b>	<b>1.3</b>	<b>124</b>

Total BMD CV 1.0%, ACF = 1.024, BCF = 0.990, TH = 4.891

**Results History:**

Scan Date	Age	BMD	T-score	BMD Change vs Baseline	BMD Change vs Previous
09/22/2021	85	0.812	-1.1	11.2%#	11.2%#
02/15/2013	76	0.731	-1.7		

WHO Classification: Osteopenia

\* Denotes significance at 95% confidence level, LSC is 0.027 g/cm²

# Denotes dissimilar scan types or analysis methods.

FIGURE 1 Dual energy X-ray absorptiometry (DXA) image suggests a foreshortened femoral neck.



FIGURE 2 Anterior-posterior pelvic radiograph shows a displaced subcapital femoral neck fracture.

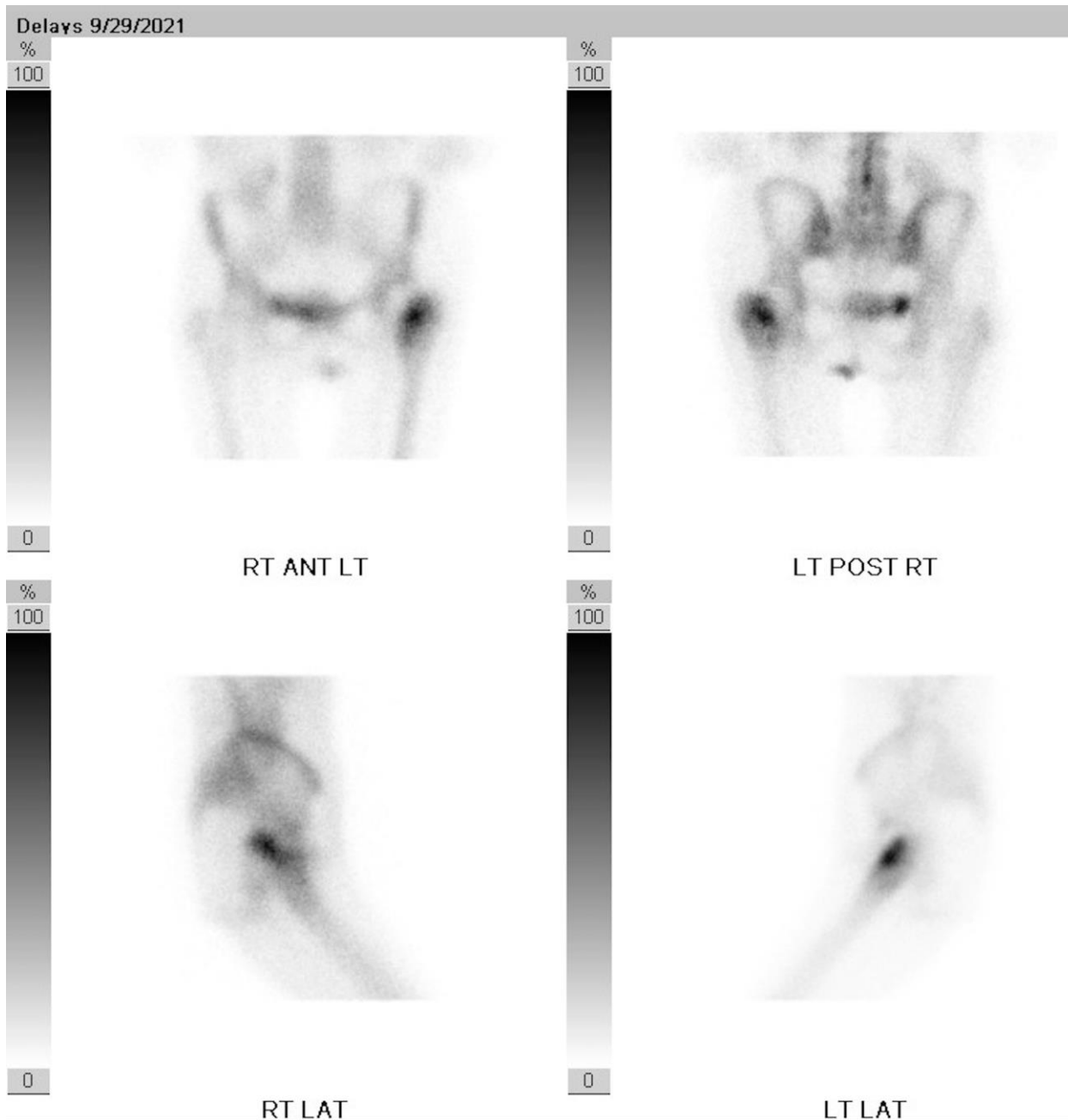


Figure 3 Delayed phase bone scintigraphy images show photopenia over the left femoral head with expected uptake in the femoral neck fracture.



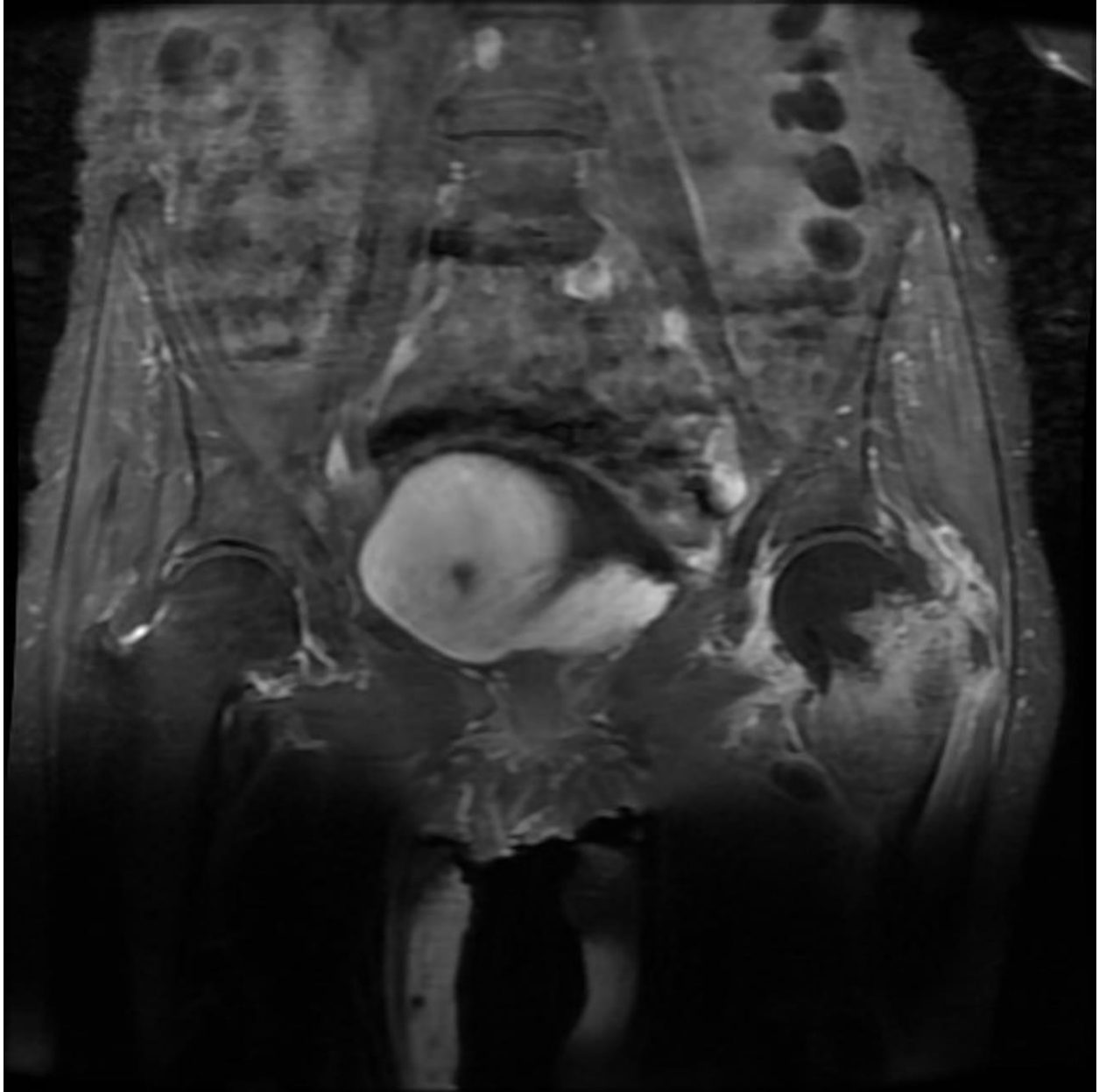


Figure 4 Coronal T1W image through the pelvis shows a hypointense left femoral head.