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 SOCIETY OF  
NUCLEAR MEDICINE  
AND MOLECULAR IMAGING

## The Deltoid Tuberosity—A Potential Pitfall (The “delta sign”) in Bone-Scan Interpretation: Concise Communication

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**Evaluation of 100 consecutive technetium methylene diphosphonate bone scintiscans revealed, in seven patients, increased uptake in the upper third of the humeral shaft. Comparison with the radiographs revealed that this corresponded to the presence of a prominent deltoid tuberosity. Though this uptake (the delta sign) is not a common finding, its recognition is important to prevent bone-scan misinterpretations.**

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Total-body bone scanning plays an important role in the early detection of inflammatory and neoplastic diseases. Bone lesions are usually demonstrated as focal areas of increased uptake. The study is extremely sensitive, and a false-negative scan rate of only 1–3% has been reported—i.e., a normal scan picture in the presence of radiographically detectable abnormalities (1). Its specificity, however, is less impressive, as increased tracer uptake does not always occur in pathologic conditions (2).

In a patient referred to our department for a metastatic bone survey, we noted a single localized increased uptake of tracer in the proximal upper third of the humerus, a finding suggestive of a metastatic focus. However, a regional radiograph showed it to correspond to a normal anatomic structure—a prominent deltoid tuberosity (Figs. 1A, B, and C). As this was felt to represent a potential source of bone-scan misinterpretation, a review of 100 consecutive bone scans was undertaken to determine the incidence of this finding.

### MATERIALS AND METHODS

In 100 consecutive bone scans we looked for the

presence of increased uptake in the region of the deltoid tuberosity. The scans of the patients reviewed were referred to our department for the detection of either inflammatory, traumatic, or neoplastic diseases. The studies were performed during May, June, and July of 1978. There were 76 males and 24 females, with ages ranging between 12 and 88 yr (mean 62.9 yr). The scans were performed 2 to 3 hr after the i.v. injection of 15 mCi of Tc-99-labeled methylene diphosphonate. Each patient had a standard whole-body scan (scintillation camera with whole-body imaging table) in addition to high-performance gamma-camera images of areas of interest.

A study was considered abnormal if a localized area of increased uptake were found. If this were identified within the region of the deltoid tuberosity, correlation with regional radiographs of the area was performed.

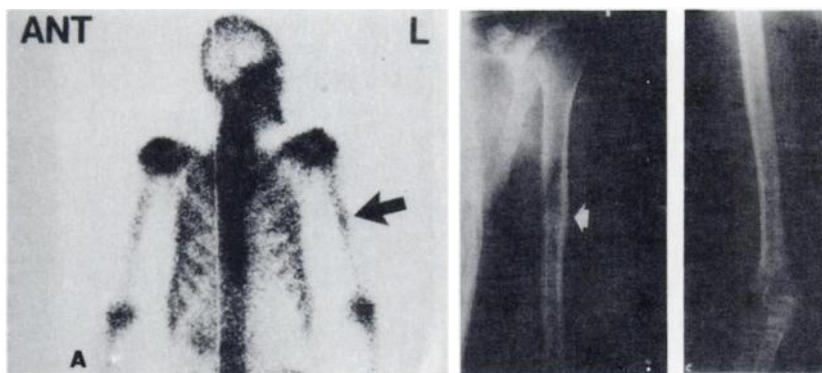
### RESULTS

Of the 100 consecutive bone scans reviewed, seven demonstrated increased uptake in the region of the deltoid tuberosity. Six were male and one was female. Correlative radiographs confirmed the increased uptake to correspond to prominent deltoid tuberosities.

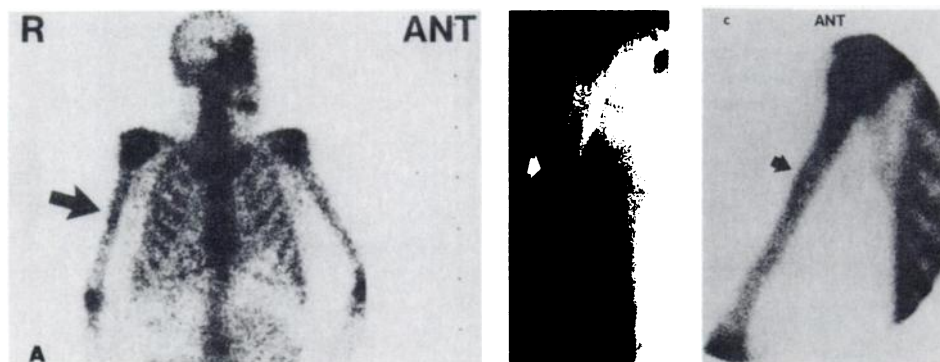
### DISCUSSION

The deltoid tuberosity is a bony prominence on the

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**FIG. 1.** (A) Anterior bone scan demonstrating focal area of increased radionuclide in proximal third of left humerus (arrow). (B) Radiograph of left humerus reveals this area to correspond to prominent deltoid tuberosity. (C) Radiograph of right humerus shows example of a non-thickened cortex at site of insertion of deltoid muscle (arrow).



**FIG. 2.** (A) Anterior bone scan demonstrating focally increased radionuclide within right proximal humerus (arrow). (B) Radiograph of right humerus reveals thickened cortex of prominent deltoid tuberosity. (C) Anterior scintiscan of right humerus (internally rotated) shows increased uptake in region of thickened cortex of deltoid tuberosity.

lateral aspect of the proximal third of the humerus. It represents the site of distal insertion of the deltoid muscle. Sometimes it is very prominent, and radiographically this is accepted as a normal anatomic variant. Its scintigraphic appearance has not been reported, and in our case, might well have resulted in a false-positive scan interpretation had regional radiographs not been obtained. Our retrospective analysis showed it to occur in seven out of 100 scans reviewed. Scintigraphically it appeared either as a well-circumscribed or rectangular area of increased accumulation of radionuclide within the proximal third of the humerus. We think it is now being seen because of the greater affinity of methylene diphosphonate for the cortically thickened site of insertion of the deltoid muscle. Its characteristic location and appearance should suffice to eliminate it as a po-

tential source of bone-scan misinterpretation. If confusion should persist, an anterior scan of the area, with the humerus in internal rotation, will show beyond question that the site of the increased tracer accumulation is within thickened cortex. (Figs. 2A, B, and C).

#### ACKNOWLEDGMENT

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