

## Review article

# Enhanced Accumulation of Bone Seekers at Superior Lateral Orbital Margin: Potential Origin

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## Abstract

Enhanced accumulation of the radiotracer at superior lateral orbital margin is a common finding in bone scintigraphy. Its possible sources are discussed and illustrated with examples from own archive of the authors as well as from the literature. These sources include: Physiologically enhanced bone metabolism at frontozygomatic suture (normal variant), a metastasis at this suture (illustrated with an example of solitary metastasis from prostate cancer), lesions to the zygomatic bone or the greater wing of the sphenoid bone, deepened fossa for lacrimal gland and the gland itself.

**Keywords:** Bone metastasis, bone scintigraphy, frontozygomatic suture, single-photon emission computed tomography/computed tomography, superior lateral orbital margin

## Introduction

Bone scintigraphy with technetium-99m-labeled diphosphonates, as Tc-99m-methylenediphosphonate (Tc-99m-MDP), is among the most common scintigraphic examinations. Screening for bone metastases is a very typical indication for this procedure. Frequently occurring foci of enhanced accumulation of the radiotracer in projection onto the superior lateral orbital margin may cause diagnostic problems. Here, we present a set of cases that are morphologically similar to each other in planar scintigraphy. However, further differentiation with single-photon emission computed tomography/computed tomography (SPECT/CT) reveals diverse locations of the foci. Subsequently we discuss their possible origin.

the zygomatic bone and the zygomatic process of the frontal bone frequently accumulates more radiolabelled diphosphonates than the neighboring bone tissue. Such activity enhancement may be asymmetrical. In most cases, it can be considered the norm variant. This phenomenon has been recently described by Thang *et al.*<sup>[1]</sup> However, an apparent right-to-left asymmetry of tracer accumulation in these regions in planar imaging was considered in our department to be an indication for tomographic imaging (SPECT/CT). Sometimes, it may result in unexpected findings.

## Metastasis at Frontozygomatic Suture

A 52-year-old patient with newly diagnosed prostate cancer was referred to our Department for bone scintigraphy. A whole body scan after intravenous injection of Tc-99m-MDP was performed. A hot spot in projection onto the right superior lateral orbital margin was the only metastase-suspected one. SPECT/CT localized the hot spot in the region of the frontozygomatic suture. Multi-row CT performed later confirmed a sclerotic lesion of the bone in this location; the suture itself could not be delineated. Solitary metastasis from prostate cancer is very rare in this region. The results of planar as well as SPECT/CT-imaging are shown in Figure 1.

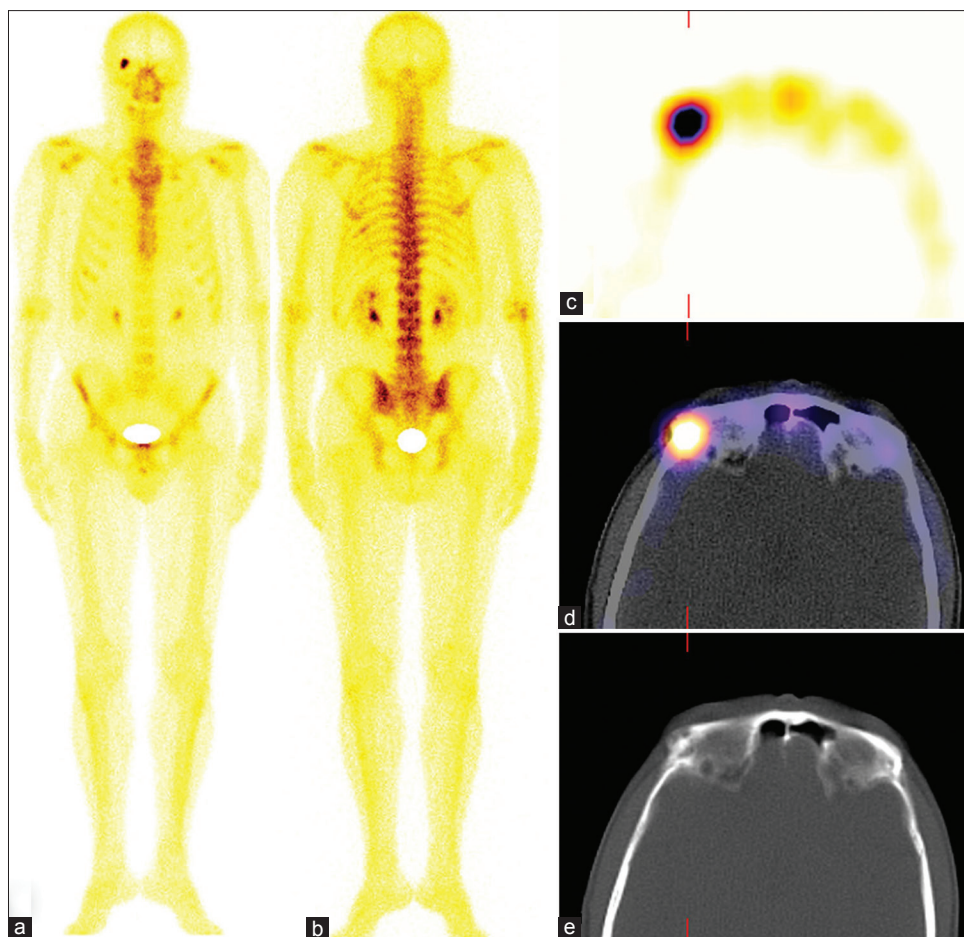
## Enhanced Bone Metabolism at Frontozygomatic Suture

The region of the joint between the frontal process of

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**Figure 1:** Solitary metastasis from newly diagnosed prostate cancer in a 52-year-old patient (a and b) Anterior and posterior view, respectively, of planar scintigraphy, (c-e) single-photon emission computed tomography/computed tomography and fusion SPECT/CT slice, respectively, through the lesion

### Zygomatic Bone

Except for the case above, we have no other warm-spots in our archive which might be attributed to the frontal process of zygomatic bone or the zygomatic bone itself. However, cases of metastatic lesions to the zygomatic bone have been described in the literature.<sup>[2-6]</sup>

### Greater Wing of the Sphenoid Bone

In two patients, a warm focus was located in the greater wing of sphenoid bone. In one of them (a 54-year-old male with carcinoma of the epiglottis), it was accompanied by bone-remodeling in CT [Figure 2], further diagnostics including follow-up confirmed a metastasis. In one case, the apparent asymmetry in the tracer accumulation with no evident radiologic changes was present in a 27-year-old male with sinusitis; no metastatic disease has been detected.

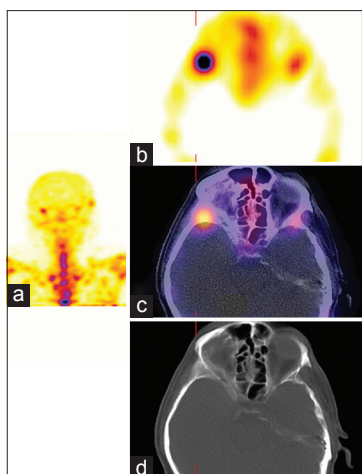
Metastatic lesions to the greater wing of sphenoid bone are described in the literature.<sup>[7-10]</sup>

### Deepened fossa for lacrimal gland

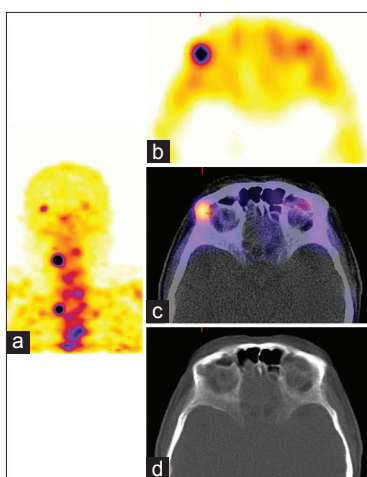
In some pathological states, an enlarging lacrimal gland might impress in the neighboring bone. In our archive, there is one 60-year-old male with such a (benign) condition. SPECT detected enhanced accumulation of the radiotracer, CT confirmed deepened fossa, which was accompanied with a slight bone-remodeling [Figure 3].

### The Lacrimal Gland

As described in the literature,<sup>[11-14]</sup> pathologically changed soft tissues may accumulate bone-seekers. Analogously, it can be expected that the lacrimal gland, especially affected with a malignant or inflammatory disease, could be a source of such an activity enhancement. In addition, lacrimal glands contain sodium-iodide symporter and thus could accumulate pertechnetate, whose traces are present in technetium-labeled radiopharmaceuticals. The later possibility seems especially plausible when the process of labeling has a poor yield. In such cases, however, a very high accumulation of the activity in the stomach, salivary and thyroid glands should be present as well.



**Figure 2:** A 54-year-old male with epiglottitis carcinoma (a) Maximum intensity projection, and (b-d) single-photon emission computed tomography/computed tomography and fusion SPECT/CT slice, respectively, through the lesion in the greater wing of sphenoid bone



**Figure 3:** A 60-year-old male with an enlargement of the lacrimal gland (a) Maximum intensity projection. (b-d) Single-photon emission computed tomography/computed tomography SPECT/CT slice, respectively, through the fossa of the lacrimal gland

Owing to the imaging resolution issues, activity accumulation in a lacrimal gland would be difficult to distinguish from accumulation in the bones of the fossa. This seems to possess a lower significance, however, because of the same potential source of the underlying pathology, that is, the lacrimal gland itself. Pathology of the gland has been described as a source of bone-seeker accumulation in this region.<sup>[15,16]</sup>

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