

# Metabolic skeletal superscan on $^{18}\text{F}$ -FDG PET/CT scan from parathyroid carcinoma

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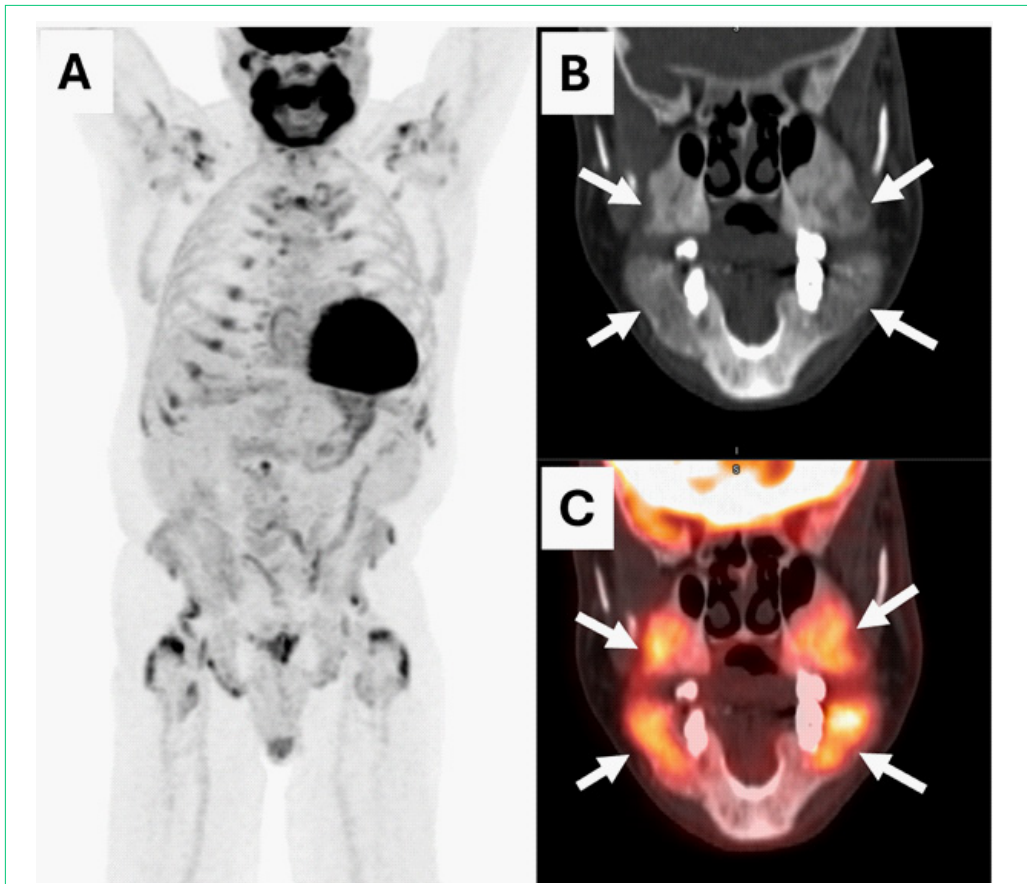
## Description

Metabolic Skeletal Superscan (MSSS) is a well-known finding on  $^{99\text{mTc}}$ -MDP bone scan, characterized by symmetric, uniform increased radiotracer uptake by bones with diminished renal and soft tissue uptake due to elevated osteoblastic activity. Unlike metastatic superscan, metabolic superscan is seen in metabolic bone disease such as primary hyperparathyroidism and renal failure with elevated Parathyroid Hormone (PTH) and low phosphate excretion [1]. Although typical in bone scan, MSSS is scarcely encountered on  $^{18}\text{F}$ -Fluorodeoxyglucose (FDG) Positron Emission Tomography/Computed Tomography (PET/CT). A review of the literature demonstrated only a handful of similar cases on  $^{18}\text{F}$ -FDG PET/CT imaging [2,3]. The mechanism of increased bone FDG uptake in MSSS is likely related to augmented glucose and oxygen use in osteoclasts and osteoblasts, driven by upregulated glycolysis and oxidative phosphorylation.

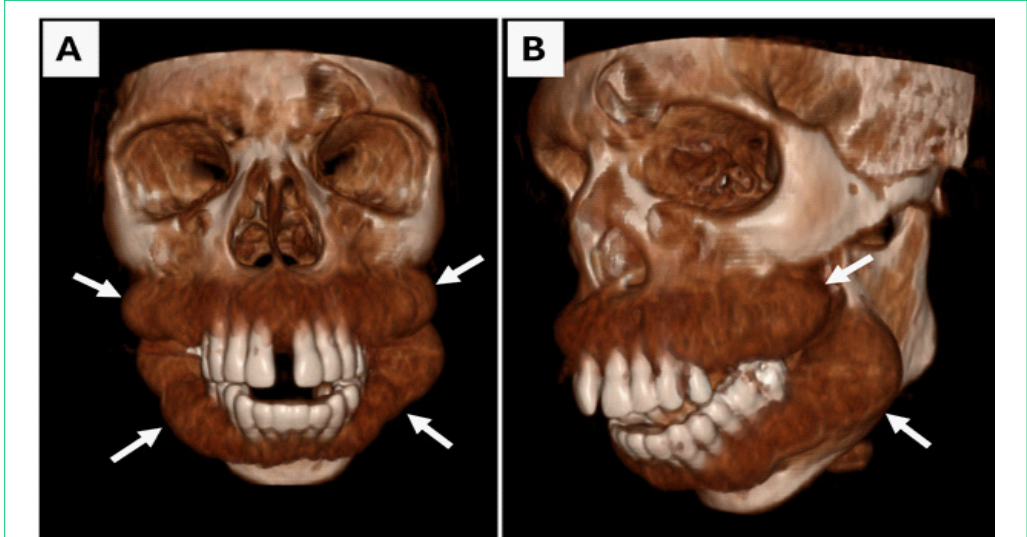
Like bone scan, MSSS on  $^{18}\text{F}$ -FDG PET/CT could often involve craniofacial bones like the mandible and maxilla due to their high baseline metabolic activity and rich vascular supply.

## Clinical image

A 50-year-old male with end-stage renal disease and hyperparathyroidism. Despite treatment with etelcalcetide for six years and hemodialysis, PTH level remained elevated (up to 2090 pg/mL). Sestamibi parathyroid scan revealed possible ectopic parathyroid adenoma in the upper mediastinum and potentially enlarged parathyroid gland in the neck. Further imaging demonstrated upper mediastinal mass which was later biopsy proven parathyroid tissue. He subsequently underwent surgical resection including mediastinal mass excision and radical neck parathyroidectomy. Pathology was consistent with parathyroid carcinoma (6.6 cm) with angioinvasion.



**Figure 1:** MSSS seen on <sup>18</sup>F-FDG PET/CT image in a patient with parathyroid carcinoma. (A) Maximum Intensity Projection (MIP) of 18F-FDG PET imaging showing increased tracer uptake in the skeleton, with minimal uptake in the liver or kidney. (B,C) CT and fused PET/CT showing maxilla and mandible hypertrophy with intense tracer uptake.



**Figure 2:** 3D bone CT cinematic volume renderings in (A) frontal and (B) oblique views show marked maxillary and mandibular new bone formation, characteristic of leontiasis ossea (arrows in A and B).

Post-surgical <sup>18</sup>F-FDG PET/CT demonstrated extensive increased FDG uptake throughout the axial and appendicular skeleton, including FDG-avid heterotopic ossification most pronounced in the maxilla and mandible, leading to a typical “leontiasis ossea” appearance, consistent with metabolic bone disease from long-standing hyperparathyroidism.

**Disclosure of conflict of interest:** None.

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