

## Discrepant uptake between $^{111}\text{In}$ -pentetreotide and $^{99\text{m}}\text{Tc}$ -MDP in bone metastases of small-cell lung cancer

**To the Editor:** In HJNM several papers have referred to somatostatin receptor scintigraphy (SRS) as a functional imaging modality with high sensitivity for lung cancer [1, 2]. We describe two cases, specifically of small-cell lung cancer (SCLC) referred to us for staging, in which the radionuclide distribution on indium-111 [DTPA-d-phe<sup>1</sup>]-octreotide ( $^{111}\text{In}$ -pentetreotide) SRS was compared to technetium-99m methylene diphosphonate ( $^{99\text{m}}\text{Tc}$ -MDP) bone scintigraphy findings.

In a 63 years old man, SRS with  $^{111}\text{In}$ -pentetreotide showed the primary lesion in the right lung as well as diminished and unevenly distributed liver uptake. There was diffusely increased tracer uptake throughout the skeleton (Fig. 1 A- C). A  $^{99\text{m}}\text{Tc}$ -MDP bone scan showed increased tracer uptake in the right parietal bone, the right femur, the left 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> ribs and the right 4<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> ribs posteriorly (Fig. 1 D, E). An age- and sex-matched normal  $^{99\text{m}}\text{Tc}$ -MDP scan is shown for comparison (Fig. 1 F, G). The findings of SRS and  $^{99\text{m}}\text{Tc}$ -MDP scan suggested widespread metastases.

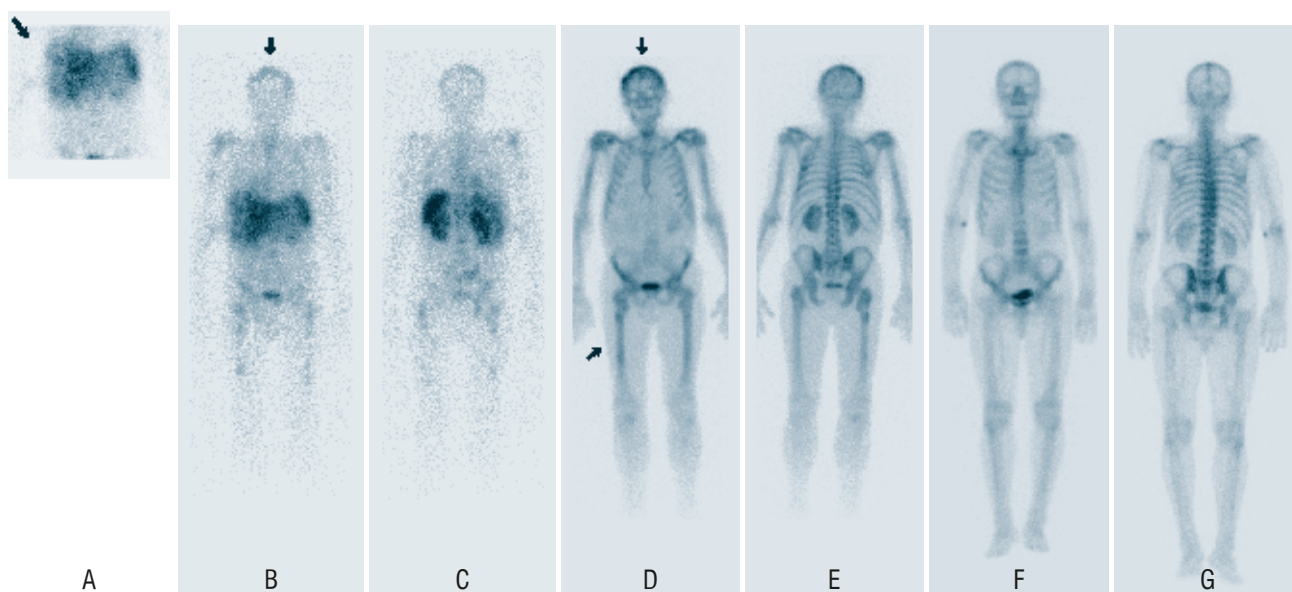
In another case,  $^{111}\text{In}$ -pentetreotide scintigraphy in a 75 years old man with SCLC, showed unevenly distributed uptake in the liver (Fig. 2 A, B). Further imaging with  $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy showed skeletal lesions (Fig. 2 C, D). After 4 months another  $^{99\text{m}}\text{Tc}$ -MDP bone scan indicated more osseous lesions, a finding consistent with extensive metastatic bone disease (Fig. 2 E, F).

Despite chemotherapy, both patients deceased within 12 months.

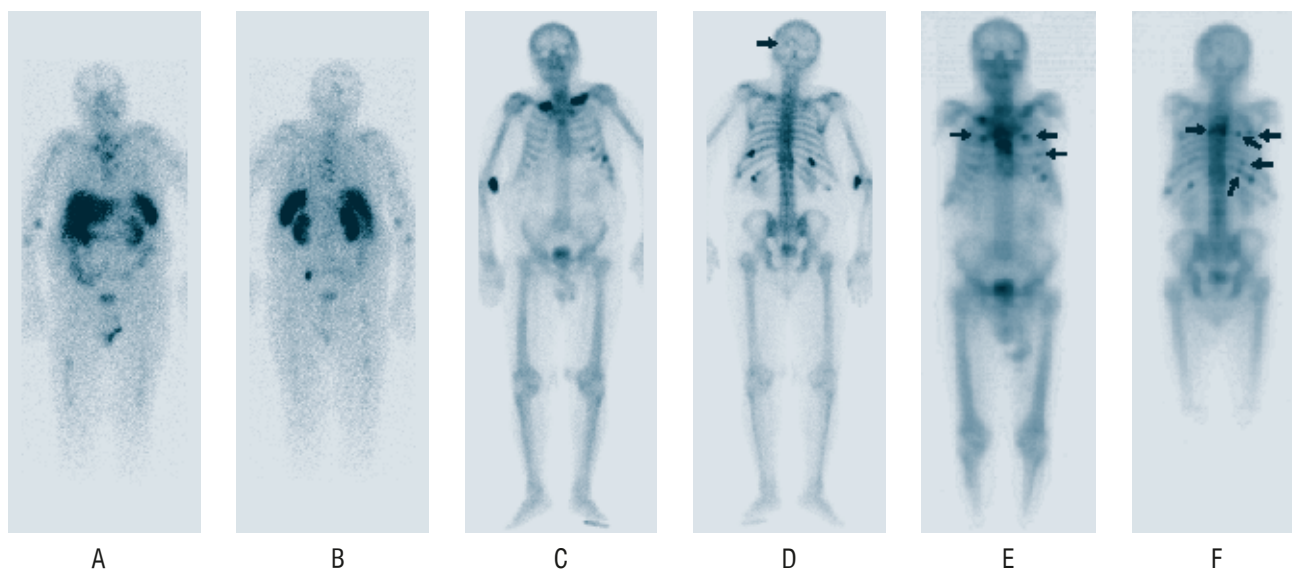
Somatostatin receptors are expressed by neuroendocrine cancer cells, enabling the *in vivo* localization of the primary tumor as well as of metastatic foci by SRS [3]. Also SRS may show inflammatory and granulomatous diseases [4, 5]. Normal biodistribution of  $^{111}\text{In}$ -pentetreotide includes tracer uptake in thyroid, liver, spleen, kidneys, pituitary gland, urinary bladder and the bowel. In  $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy, the localization of the radiotracer depends on osteoblastic activity. *In vitro* tests showed that somatostatin receptors were expressed in 50%-75% of SCLC cases [6].

Somatostatin receptor scintigraphy with  $^{111}\text{In}$ -pentetreotide has high sensitivity for detecting the primary tumor in SCLC, but low sensitivity for the detection of regional metastases and, even lower sensitivity for distant metastases [7-10]. That is presumably due, to the loss of somatostatin receptors with high affinity for somatostatin or to the presence of somatostatin receptor subtypes with low affinity for somatostatin [7].

Although SRS with  $^{111}\text{In}$ -pentetreotide and  $^{99\text{m}}\text{Tc}$ -depreotide has been reported to be useful for staging SCLC and non-small cell lung cancer respectively, to the best of our knowledge, skeletal and/or liver metastases detected by SRS have been rarely described [7-13]. Regarding our present cases it should be noted that pathologic verification of the metastatic lesions that were observed is lacking. Bone scintigraphy is a more sensitive modality to detect bone abnormalities in patients with SCLC compared to SRS, possibly due to low expression of somatostatin receptors.



**Figure 1.**  $^{111}\text{In}$ -pentetreotide liver lesions of uneven distribution uptake in a patient with SCLC are seen pointing to metastatic disease; (A: anterior view): Diffusely increased tracer uptake is noted in the entire axial, proximal appendicular skeleton and in the skull (B, C: anterior and posterior views).  $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy depicts minimal bone lesions in the ribs, right femur and skull (arrows) (D, E: anterior and posterior views). A normal  $^{99\text{m}}\text{Tc}$ -MDP scan of an age- and sex-matched subject is shown for comparison (F, G: anterior and posterior views).



**Figure 2.**  $^{111}\text{In}$ -pentetreotide scintigraphy in a patient with SCLC. Note that visualization of lesions in the lower thoracic ribs is hampered because of high physiological uptake in the liver, spleen and the kidneys (A, B: anterior and posterior views).  $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy shows a lytic lesion in the posterior skull (arrow) and intense uptake in both clavicles, the thoracic spine and in the inferior ribs bilaterally (C, D: anterior and posterior views). A  $^{99\text{m}}\text{Tc}$ -MDP bone scan performed after 4 months (E, F: anterior and posterior views) showed progression of bone metastases in the ribs, sternum, thoracic vertebra and right scapula (arrows). The patient was a retired teacher and did not engage in strenuous exercise and had no history of trauma (thus the sternoclavicular lesions were attributed to metastatic disease). The increased activity in the area of the right basilic vein is due to residual radiopharmaceutical concentration in the venous catheter. The lesion in posterior skull is not visible in the follow-up study due to previous irradiation of the head.

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