

Reminder of important clinical lesson

Complicated appearance of an abdominal mass in the I-131 MIBG and Tc-99m bone scintigraphy of a patient with neuroblastoma

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Summary

Neuroblastoma is a common childhood neoplasia arising from neurogenic tissues. Main symptoms of this disease are bone pain, fever, weight loss and anaemia. I-131 metaiodobenzylguanidine (MIBG) is a highly sensitive and specific method in the detection of this disease and method of choice in staging, treatment response and recurrence detection as well as prognostification. In determination of the bone metastasis Tc-99m methylenediphosphonate (MDP) bone scintigraphy should be included to staging protocol. Abdominal masses originated from neurogenic tissues (neuroblastoma) can accumulate Tc-99m MDP. We want to present a child with neuroblastoma and abdominal mass displacing the adjacent kidney and accumulating both I-131 MIBG and Tc-99m MDP.

BACKGROUND

The most common cause of abdominal mass in childhood is the neuroblastoma. Neuroblastoma is a tumour arising from neuroectodermal tissues. Since neuroblastoma and metastasis accumulate neurotropic agents metaiodobenzylguanidine (MIBG) as a norepinephrine analogue is the cornerstone of the imaging of the neuroblastoma. However, it has been documented that I-131 MIBG scintigraphy sometimes underestimates the skeletal metastasis and it has been recommended to include Tc-99m bone scintigraphy in the staging of neuroblastoma.¹ Therefore, usually staging with both MIBG and bone scintigraphy is justified in patients with neuroblastoma. MIBG scintigraphy can be performed with I-131, I-123 or I-124 compounds.² However, the most available compound is I-131 and although the radiation exposure is high and image quality is poor compared to other compounds usually I-131 MIBG is acquired. I-131 MIBG scintigraphy has advantages of being a whole body screening modality additionally guiding the treatment by I-131 MIBG.³ Our case has a different I-131 MIBG distribution and bone scintigraphy appearance related to the abdominal mass accumulating both agents and replacing the right kidney.

CASE PRESENTATION

A 15-month-old male patient with a palpable mass in abdomen and history of fever, discomfort, continuous crying and lack of appetite for 3 weeks attended to the hospital. Physical examination of the patient revealed a palpable mass in the abdomen occupying both upper quadrants with palpable lymph nodes in submandibular and submental regions and swelling of right testis. Laboratory analysis showed extremely increased sedimentation (>120 mm/h), white blood cell count (13 600/mm³) and plasma neuron-specific enolase levels (370) and anaemia (6/mm³). CT of the abdomen showed the large

heterogenous intraabdominal mass displacing all the surrounding tissues (liver, spleen and both kidneys).

Bone scintigraphy with Tc-99m MDP showed no bone metastasis; however, there was faint activity accumulation corresponding to the mass and considerable uptake at right inferior part of this accumulation which was a confusing appearance (figure 1A). Additional I-131 MIBG scintigraphy was performed 20 days later. MIBG scintigraphy at 24 h also showed abdominal mass lesion with heterogenous activity accumulation additionally increased uptake at right inferior part of the mass (figure 1B). The additional activity accumulation was corresponding to the stasis in the right kidney in the CT images (figure 1C).

OUTCOME AND FOLLOW-UP

The patient responded to the treatment.

DISCUSSION

The interpretation of nuclear medicine studies with corresponding morphologic methods (CT, MR or direct graphs) is an essential method. The best way of comparing is definitely SPECT/CT; however, if this imaging modality is not available; it is appropriate to compare these modalities side by side (mental fusion). This methodology decreases false-positive results and increases the reliability of our results. Especially I-131 studies which has low resolution needs to be evaluated by guidance of morphological imaging methods. In this case presentation, we wanted to show how the CT images might help in this kind of confusing activity accumulation pattern and interpretation.

MIBG scintigraphy has to be the first line imaging modality in the neuroblastoma for several reasons. It has been demonstrated that MIBG scanning causes upstaging; additionally, it has contribution in the choice of the follow-up method and also implements prognostic information.^{4 5} According to a detailed review about

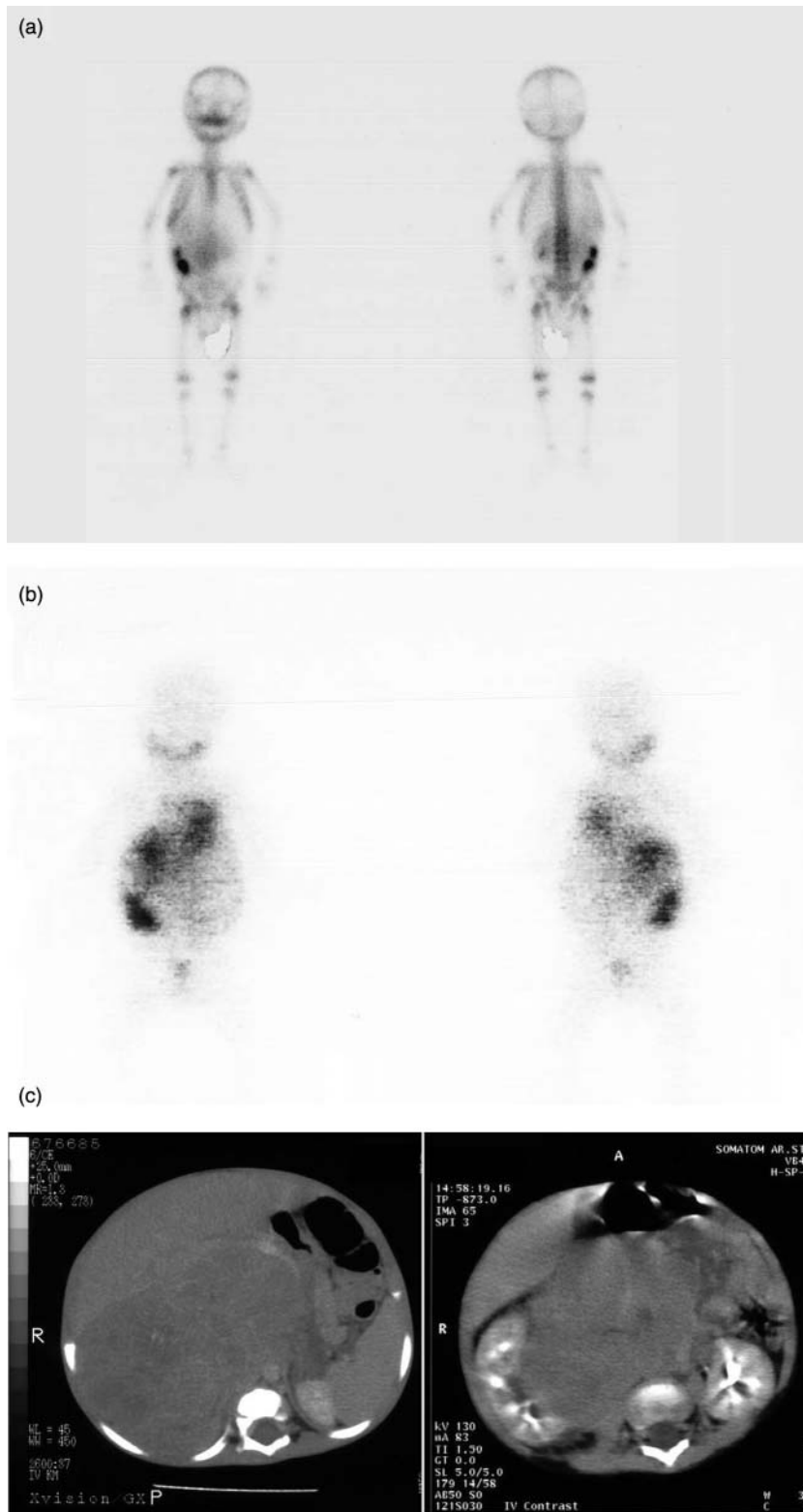


Figure 1 (A) An intra-abdominal mass. A 15-month-old male patient with palpable abdominal mass and in the anteroposterior whole body bone scintigraphy of the patient the mass accumulates Tc-99m methylenediphosphonate. (B) Anteroposterior whole body 24th hour metaiodobenzylguanidine scintigraphy showing the increased activity accumulation in the mass of the same patient. (C) Transaxial CT images corresponding to the mass (left) and kidneys (right) projection, respectively.

neuroblastoma PET imaging has been considered to be an accurate staging method and well correlated with disease activity in the neuroblastoma.⁴ Combination of MIBG

with bone scintigraphy is considered as the best method to detect dissemination of neuroblastoma. According to a study by Shah Syed *et al*⁶ MIBG has been found to be

superior to CT in identification of primary site and soft tissue metastasis but inferior to bone scintigraphy in bone metastasis. Some researchers have found the method reliable in showing bone marrow involvement. Other researchers have showed that MIBG is more specific (100%) than bone scintigraphy (81%) and they have similar sensitivity (87.5%) in detection of bone metastasis.⁷ In conclusion combination of both methods in detection of bone metastasis is required anyway.

It is strictly necessary to interpret I-131 MIBG images with guidance of morphological imaging methods especially in patients with complicated appearance of activity accumulation.

Learning points

- ▶ Neuroblastoma is a common solid tumour of childhood.
- ▶ Bone scintigraphy and metaiodobenzylguanidine (MIBG) are complementary methods in follow-up of the neuroblastoma.
- ▶ However especially I-131 MIBG scintigraphy should be interpreted with correlation of morphological imaging methods.

Competing interests None.

Patient consent Obtained.

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