Pathologic hepatic Tc-99m-MDP uptake in polyostotic fibrous dysplasia

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Fibrous dysplasia of bone is a congenital, sporadic developmental disorder characterized by immature fibrous connective tissue and bone deformities. Hepatic Tc-99m-MDP uptake is a rare, serendipitous finding during bone scanning studies. The present patient was a 25-year-old male who had severe polyostotic fibrous dysplasia. On Tc-99m-MDP (methylene diphosphonate) bone scintigraphy, increased activity accumulations were seen on multiple ribs, vertebrae and base of the cranium. In addition, diffuse increased pathologic uptake of Tc-99m-MDP in the liver was shown. Intravenous pamidronate was administered monthly for two months. In the third week of the last administration Tc-99m-MDP bone scintigraphy was performed again, but despite sustained bone involvement, pathologic hepatic uptake was not seen on the scan. We thought that pathologic hepatic Tc-99m-MDP accumulation, may be related to the formation and aggregation of calcium oxalate and phosphate crystals which improved with pamidronate treatment.

Key words: fibrous dysplasia, hepatic, extra-osseous

INTRODUCTION

Fibrous dysplasia of bone is a congenital, sporadic, developmental condition.1 The pathogenetic abnormality is an expanding fibrous lesion of bone-forming mesenchyma.2 Fibrous dysplasia occurs with somatic activating mutations of the gene encoding the Gsα subunit of the G protein that couples hormone receptors to adenylate cyclase. The disease affects either sex and is generally diagnosed in childhood or adolescence. The clinical picture of fibrous dysplasia can be monostotic or polyostotic. Some patients have characteristic hyperpigmented skin macules called cafe-au lait spots and endocrine hyperfunction (i.e., McCune-Albright Syndrome). The endocrinopathy is usually manifested as pseudoprecocious puberty in girls and less commonly thyrotoxicosis, Cushing syndrome, acromegaly, hyperprolactinemia, or hyperparathyroidism.3 Although serum calcium and phosphate levels are normal, serum alkaline phosphatase activity can be increased. Monostotic disease is more common, but any bone can be affected. The femur, tibia, ribs, and facial bones are most frequently involved. Spontaneous improvement does not occur. Skeletal lesions may progress, and new ones may appear, but in most patients mild disease stays quiescent.4 No established medical treatment exists for the skeletal disease; however promising responses have been reported with intravenous administration of pamidronate.5 Increased uptake of radiopharmaceuticals is usually observed on affected bones scintigraphically but hepatic uptake is an unexpected finding. Here we present a case of fibrous dysplasia with diffuse hepatic uptake detected on bone scan.

CASE REPORT

A twenty-five year old male patient presented with back and chest pain which had worsened over the preceding two years. His physical examination was normal. Chest X-ray and computerized tomography revealed multiple expansile destructive cystic lesions in the ribs and lytic lesions in the fourth, fifth and sixth thoracic vertebrae. A Tc-99m-MDP bone scan showed increased activity accumulation on the left ribs from 1st to 11th; right 4th and 5th ribs, lumbar 3rd and 4th vertebrae and base of the
cranial, and irregular, mildly increased uptake in multiple thoracic vertebrae and sternum. In addition, images demonstrated intense and diffuse hepatic uptake (Fig. 1). Laboratory examinations revealed increased serum alkaline phosphatase activity of 449 U/l (normal 38–155), normal serum calcium concentration of 10.3 mg/dl (normal 8.1–10.4), and inorganic phosphate concentration of 3.1 mg/dl (normal 2.6–4.7). Urinary calcium concentration (250 mg/day) and serum parathyroid hormone level (69.3 pg/ml normal range: 7–72 pg/ml) ruled out either hyperparathyroidism no endocrinologic hyperfunction was revealed. There was no history of repeated iron dextran injection. Serum transaminase values were within the normal limits, and serological tests for viral hepatitis were negative.

An open incisional biopsy of the left fifth rib was performed and the histopathological features were consistent with fibrous dysplasia. To exclude the possibility of amyloidosis—which would explain the abnormal hepatic radiopharmaceutical accumulation—gingival biopsy was performed. However, no amyloid deposition was found.

Intravenous pamidronate (Aredia, Novartis) was administered for severe lytic bone lesions and bone pain. The patient received 90 mg of pamidronate in 500 ml 5% dextrose solution as a 2-h infusion. The infusion was repeated every 4 weeks over a period of 2 months. Neither hypocalcemia or hypophosphatemia nor fever or infusion site reaction was observed during the treatment. However no significant clinical improvement was achieved with regard to pain or the radiographical findings.

On the 3rd week of the last pamidronate therapy, Tc-99m-MDP bone scan was repeated. Despite a lack of any difference on the bone scans, the pathologic hepatic uptake had disappeared (Fig. 1).

DISCUSSION

Fibrous dysplasia, in general, appears as an area of markedly increased uptake on bone scintigraphy. Approximately 15% of cases are polyostotic, leading to multifocal areas of increased uptake. However, diffuse hepatic uptake of Tc-99m-MDP is an unusual, serendipitous finding in nuclear medicine practice, occurring less frequently than focal hepatic abnormalities. Although several possible reasons are suggested, the exact mechanism of non-osseous uptake of Tc-99m-MDP remains speculative.

The extra-osseous uptake of Tc-99m-MDP can suggest the presence of amyloid deposits or the result of an altered serum calcium phosphate balance. The elimination of amyloidosis may provide a possible explanation of the abnormal distribution of these ions in this case. In addition, to our knowledge an association between amyloidosis and fibrous dysplasia has not been reported yet.

Extra-osseous uptake has also been reported in patients with multiple myeloma (MM). It has been concluded that amyloid deposits are the probable reason for such uptake. However, not only is renal failure relatively common in MM, but is also usually associated with hypercalcemia. Disturbances in calcium metabolism can lead to metastatic calcification, which is visualized with Tc-99m-MDP scintigraphy. Similar disturbances leading to radioisotope uptake in the soft tissue can be seen in hyperparathyroidism as well.