

Skeletal Changes in Hypoparathyroidism: X-ray to Bone Scintigraphy

Abstract

Parathyroid hormone (PTH) is a key in maintaining calcium homeostasis. Decreased PTH will result in decreased bone remodeling and increased bone density. The major cause is iatrogenic injury to parathyroid gland. X-ray and dual-energy X-ray absorptiometry are used to identify the skeletal changes. Typical skeletal changes are metaphyseal sclerosis in long bones and sclerosis of vertebrae and pelvic bones. ^{99m}Tc methylene diphosphonate scintigraphy is used to identify metabolic bone diseases. There are no typical scan findings in case of hypoparathyroidism. We like to report an interesting image of skeletal scintigraphy in case of hypoparathyroidism.

Keywords: Bone scan, hypoparathyroidism, ^{99m}Tc methylene diphosphonate

Parathyroid hormone (PTH) is a key in maintaining calcium homeostasis. Decreased PTH will result in decreased bone remodeling and increased bone density. Causes include iatrogenic, autoimmune diseases, genetic or infiltrative disorders, and ionizing radiation exposure, with the major cause being accidental removal or injury of parathyroid glands during neck surgeries.^[1]

Skeletal changes are diagnosed using X-ray and dual-energy X-ray absorptiometry. Bone scan is not routinely done to rule out the involvement, but can show findings related to bone metabolism. Radiographic features include generalized or localized osteosclerosis and ossification or calcification of anterior longitudinal ligaments of spine. Occasionally, dense metaphyseal bands and enthesopathy can be seen on radiographs.^[2,3]

We had done dual-phase ^{99m}Tc methylene diphosphonate (MDP) skeletal scintigraphy for a 21-year-old male patient, who was incidentally diagnosed to have hypoparathyroidism (serum PTH – 6 pg/ml; intact PTH – 7.4 pg/ml; serum calcium – 6 mg/dl; and serum inorganic phosphorous – 5.5 mg/dl). The patient had no neck surgeries in the past. He was also a known case of nephrotic syndrome. He was being evaluated for idiopathic hypoparathyroidism or autoimmune

hypoparathyroidism. The patient had no history of trauma to bones. X-ray of the pelvis [Figure 1] showed sclerotic bands in the bilateral acetabulum (right > left) and head and neck of the bilateral femur. X-ray of bilateral knee joints [Figure 2] showed metaphyseal sclerotic band in the distal 3rd of bilateral femur and proximal 3rd of bilateral tibia.

Tissue-phase images [Figure 3] showed abnormally increased tracer distribution in the regions of bilateral costochondral junction, bilateral iliac bone, bilateral sacroiliac joints, bilateral hip joints, and bilateral tibia. Delayed images [Figure 3] showed abnormally increased tracer uptake in the proximal 3rd of bilateral humerus; bilateral sternoclavicular joint; bilateral costochondral junction;



Figure 1: X-ray of the pelvis showing sclerotic bands in the bilateral acetabulum (right > left) and head and neck of bilateral femur

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Figure 2: X-ray of bilateral knee joints showing metaphyseal sclerotic bands in the distal 3rd of bilateral femur and proximal 3rd of bilateral tibia

costovertebral junctions; bilateral sacroiliac joints; bilateral iliac crest; bilateral acetabulum (right >left); head, neck, and distal 3rd of bilateral femur; and proximal 3rd of bilateral tibia. Relatively less uptake is noted in bilateral ribs. Increased tracer uptake is noted along the sclerotic areas. Additional bilateral costochondral and costovertebral junction involvement was noted in bone scan. It can be due to enthesitis, which can rarely happen in chronic hypoparathyroidism or can be due to renal osteodystrophy due to the underlying nephrotic syndrome. Focal increased tracer uptake noted in the right maxillary region was due to sinusitis.

Limited literature is available regarding the bone scan changes in hypoparathyroidism. PTH is responsible for the modulation of osteoprogenitor cells. It reduces the conversion of osteoclasts to osteoblasts. In chronic hypoparathyroidism, there can be net increase in osteoblastic activity, leading to the increased bone mineral density and sclerosis noted in multiple long bones.^[4,5] In some cases, enthesitis of spinal ligaments can happen similar to psoriatic arthritis.^[6] ^{99m}Tc MDP uptake is expected in the sites of increased osteoblastic activity. This explains the uptake pattern noted in our case. Bone scan can be useful to identify the skeletal involvement in cases of hypoparathyroidism.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and

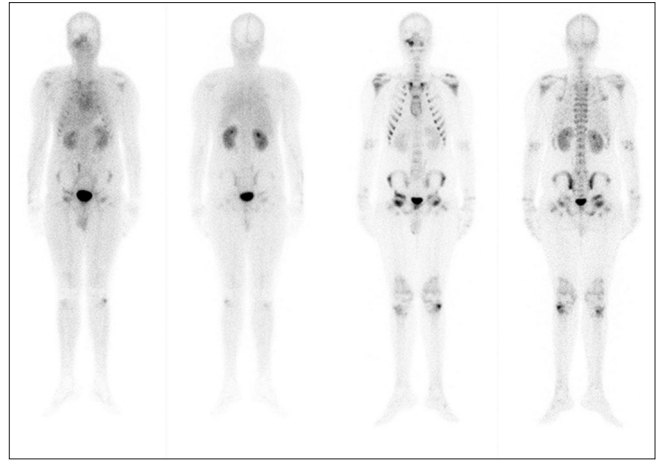


Figure 3: Dual-phase bone scan images showing increased tracer uptake in multiple bones in both phases

other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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