

Bone Scan Appearance of a Retroperitoneal Cystic Liposarcoma

Pages with reference to book, From 73 To 75

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A variety of primary and secondary soft-tissue neoplasms may accumulate bone-seeking agents. We present a ^{99}Tcm methylene diphosphonate bone scan demonstrating extra-osseous tracer uptake in a retroperitoneal liposarcoma with photon-deficiency in a cystic area of the tumour and displacement of the right kidney across the mid-line to the left.

Case Report

A 57-year-old male Caucasian suffered from increasingly severe Parkinson's disease over the last 14 years. In 1987, he developed a psychotic illness related to Bromocriptine and had a seizure with no recurrence. He was admitted in 1992 for assessment of his Parkinson's disease. On examination, the patient was thin with no palpable nodes, had gross ankle oedema up to his mid-thighs, blood pressure was 120/80 mmHg, chest was clear and cardiovascular system was normal, apart from an ejection systolic murmur. Central nervous system examination revealed no abnormalities (apart from known Parkinson's disease). Abdominal examination revealed a palpable mass in the right hypochondrium, extending down to the iliac crest, which moved partially with respiration. A provisional diagnosis of possible polycystic kidney disease was made. The patient had no symptoms related to the mass but had noticed a vague ache in the right abdomen and lost 9Kg in weight over the last two years. Initial investigations showed hypochromic normocytic anaemia with a Hb of 11.1 g/dl and serum iron at 7 $\mu\text{mol/l}$ (normal range 11-36). The erythrocyte sedimentation rate was 26 mm/h. Serum biochemistry was normal. Alpha-fetoprotein, beta HCG and prostatic specific antigen were normal. ANA was positive but other autoantibodies were negative. Chest X-ray revealed no abnormality. Computed tomography (CT) showed a large soft-tissue mass occupying the right abdomen with some areas of cystic change (Figure 1).

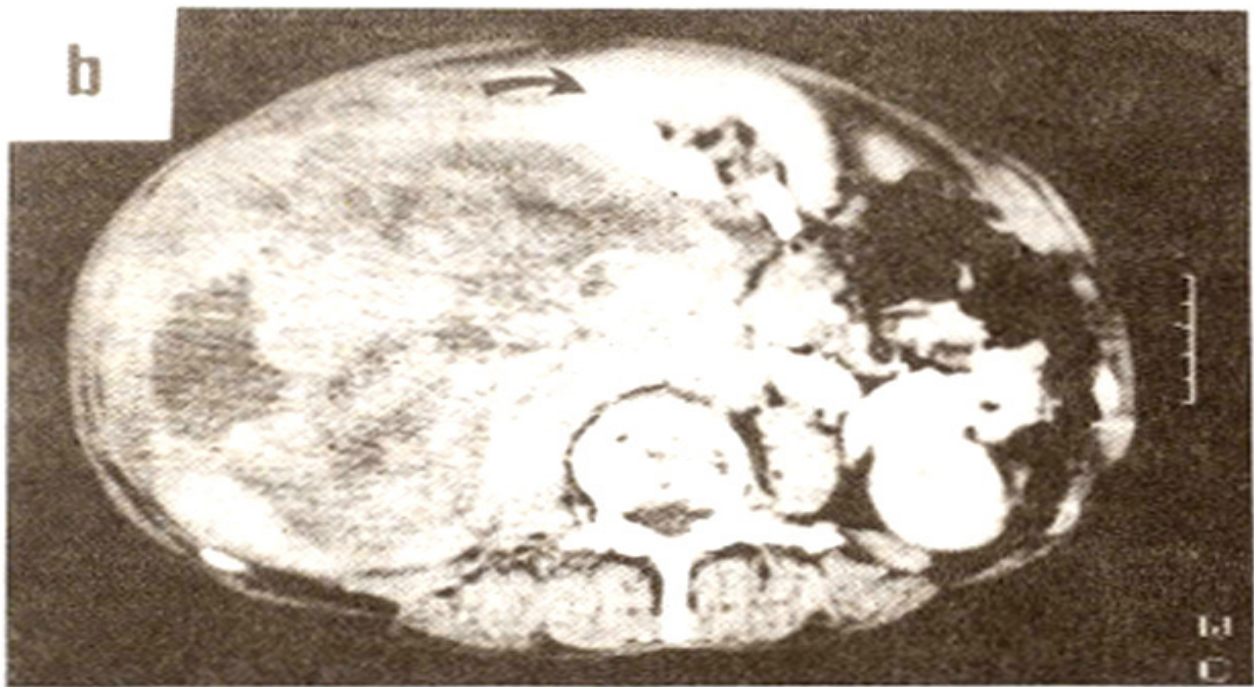
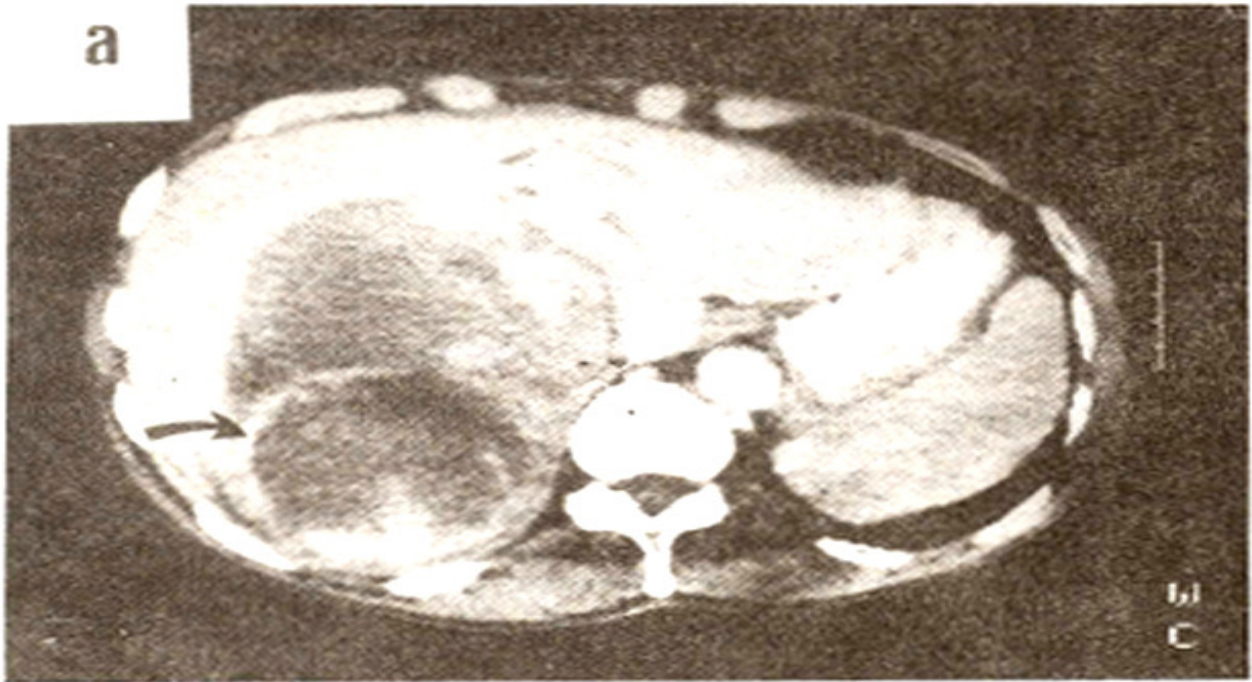


Figure 1. CT scan following intravenous contrast injection showing (A) a large mixed density soft-tissue retroperitoneal mass with reflectivity and an area of cystic change (arrow), (B) the mass is occupying much of the right side of the abdomen and displacing the right kidney (arrow) across the mid-line to the left.

The right kidney had been displaced to the anterior abdominal wall. A bone scan (Figure 2)

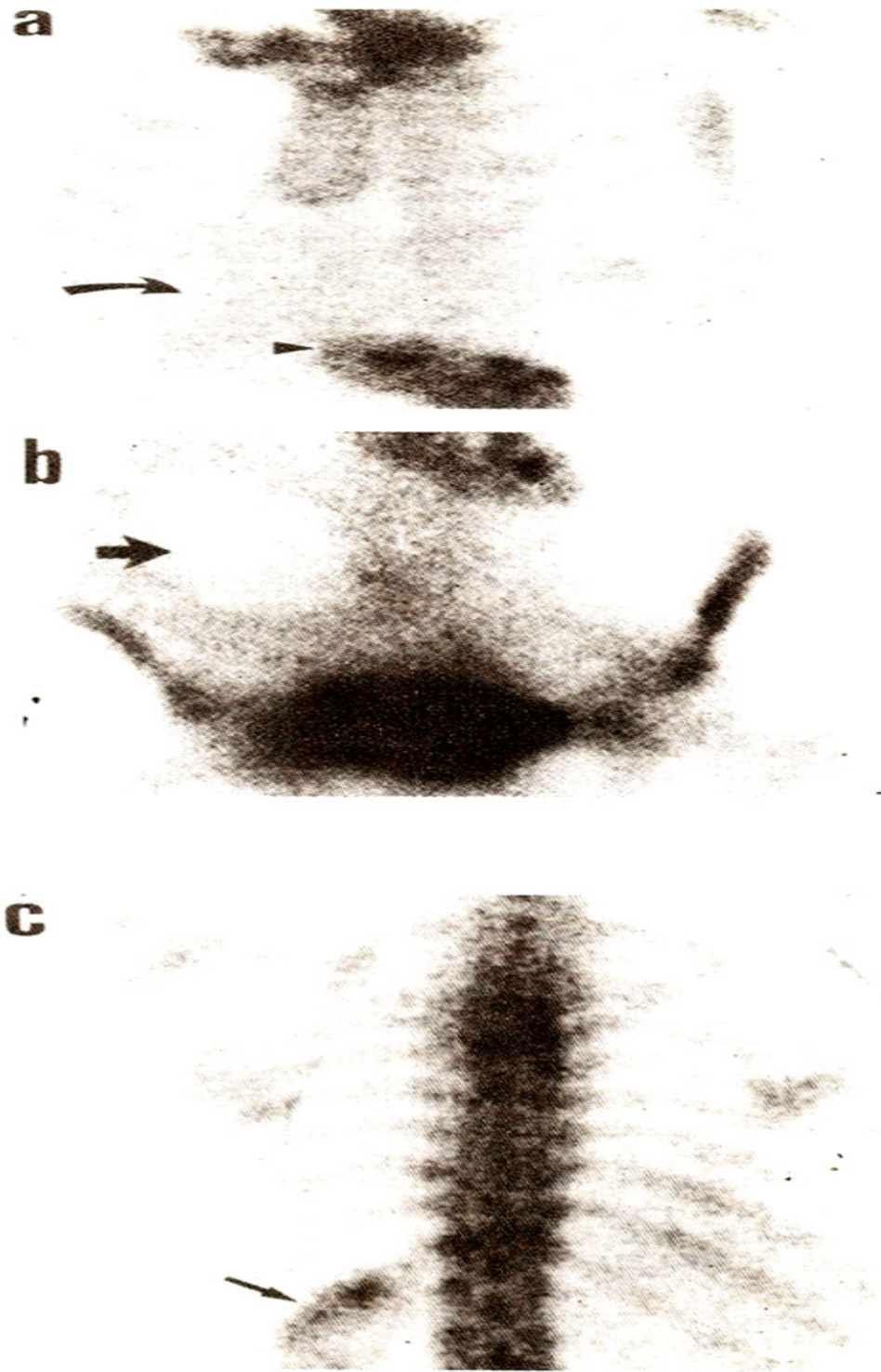


Figure 2. ^{99m}Tc methylene diphosphonate bone scan demonstrating: (A) uptake of the tracer within the mass (arrow) with anterolateral displacement of the right kidney (arrowhead); (B) a photon-deficient area (arrow) corresponding to the cystic/necrotic area seen on the CT; (C) posterior projection showing the left kidney in its normal location (arrow).

was carried out, which showed clear-cut uptake of tracer within the known retroperitoneal mass, a photopenic area corresponding the cystic necrotic region seen on the CT and displacement of the right kidney. There was no evidence of bone metastases. Biopsy of the mass showed a mixoid of loose fibrous stroma containing mainly scattered polymorphic and a few hypochromic variably sized cells with multinucleated cells. Occasional lymphoblast like cells were also identified. The appearance was

in keeping with a low-grade sarcoma or possible liposarcoma. Angiography earned out prior to consideration for surgery, showed compression of the retro-hepatic cava with possible thrombosis. The tumour was relatively avascular with its blood supply arising mainly from the lumbar plexus. On surgery, a massive (7000 gm) retroperitoneal mass with focal areas of haemorrhage and necrosis and a large central cystic space (65 mm in diameter) was excised. The tumour was seen to be displacing the liver, inferior vena cava and the right kidney. Histopathology confirmed a retroperitoneal pleomorphic liposarcoma.

Discussion

Following the introduction of ^{99}Tcm labelled diphosphonates in the early 1970s¹, bone scintigraphy has now become the most frequently performed nuclear medicine test. Due to its excellent in vivo stability and rapid blood clearance with resultant high bone-to-soft tissue ratio, ^{99}Tcm methylene diphosphonate (MDP) has become the current radiopharmaceutical of choice². The excellent clearance of ^{99}Tcm -MDP from normal soft tissues allows detection of abnormal extra-skeletal accumulation in a variety of non-osseous pathological conditions, both benign and malignant³. Accumulation of bone-seeking agents has been demonstrated in several primary and secondary soft-tissue neoplasms⁴. Liposarcomas are primary soft-tissue malignant neoplasms of mesenchymal origin, which develop in tissues where lipoblastic cells are found. Soft-tissue accumulation of ^{99}Tcm -MDP in liposarcomas of the lower extremities has been reported^{5,6}. The basic mechanism (s) underlying the uptake of bone agents by soft-tissue neoplasms is still not clearly understood. The major proposed mechanisms include tumour calcification, regional hypervascularity and enhanced vascular permeability. There is a strong correlation between the calcium content in the soft tissue and ^{99}Tcm -MDP retention. Extra-osseous calcium is found associated with collagen, osteoid matrix and other organic substrates. MDP acts as a ligand adsorbing onto tissue calcium, localising ^{99}Tcm in the mineral phase with no significant organic substrate interaction⁷. Blatt and workers have pointed out that immature collagen can be found in liposarcomas, possibly affecting radiopharmaceutical uptake⁵. Most soft-tissue sarcomas accumulate ^{99}Tcm -MDP due to calcification, hypervascularity or both⁴. According to Chew and Hudson, the mechanism of uptake is not dependent on the calcification in the tumour, but is presumed secondary to angiographic and histologic hypervascularity of liposarcomas⁶. The initial phase of ^{99}Tcm -MDP concentration in normal tissues is directly related to blood flow and vascularity. Although regional perfusion is the primary determinant of abnormal ^{99}Tcm -MDP delivery, increased perfusion alone cannot account for the high uptake of ^{99}Tcm -MDP in soft tissue neoplasms⁸. Other proposed factors causing diffusion of the tracer through the walls of the abnormal capillaries leading to significantly higher tissue concentrations of ^{99}Tcm -MDP include a change in the sympathetic tone that may open local vascularplexuses and an alteration in the normal capillary permeability by vasoactive compounds and neovascularisation⁹. Tumour necrosis¹⁰ and ischaemia¹¹ have also been implicated. Ischaemic damage to cellular membranes results in rapid intracellular influx of calcium, which precipitates within the mitochondria. Denatured proteins act as further substrates for calcium deposition. In the present case, there was no evidence of tumour hypervascularity seen on angiography. The accumulation of ^{99}Tcm -MDP in this case may therefore be related to tumour calcification, immature collagen, altered capillary permeability, or a combination of the above mechanisms.

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