

Malignant intraosseous peripheral nerve sheath tumour of the proximal femur: a case report

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ABSTRACT

We report a rare case of an intraosseous malignant peripheral nerve sheath tumour of the femoral head and neck. The tumour presented as a well-defined radiolucent lesion on plain radiography. Computed tomography showed aggressive destruction of the bone with no involvement of the adjacent soft tissues. Magnetic resonance imaging revealed an isointense signal intensity on T1-weighted images, hyperintensity on T2-weighted images, and non-homogeneously increased signal intensity after administration of contrast media. The final diagnosis was based on pathohistologic analyses due to the non-specific nature of the lesion.

Key words: bone neoplasms; magnetic resonance imaging; neurilemmoma; tomography, X-ray computed

INTRODUCTION

Neurilemmomata are relatively rare benign tumours that originate in the Schwann cells of neurilemmal sheaths and comprise around 0.2% of all bone tumours.¹⁻³ Their rarer malignant form—the malignant peripheral nerve sheath tumour (MPNST)—is usually associated with neurofibromatosis.⁴⁻⁶ The intraosseous localisation of MPNST is very rare in the literature: Dahlin and Krishnan¹ reported 10 cases, Wirth and Bray⁷ 31 cases, Bullock et al.⁸ 18 cases, and de la Monte et al.⁹ presented 60 histologically documented cases. To the best of our knowledge, only one case of an intraosseal neurilemmoma of the proximal femur has been published.⁴ The present case is also the first case involving both the proximal femur and the femoral head in a patient with no concomitant neurofibromatosis.



Figure 1 Anteroposterior radiograph of the hip showing an osteolytic lesion with a cortical breach in the superior aspect of the femoral head and neck.

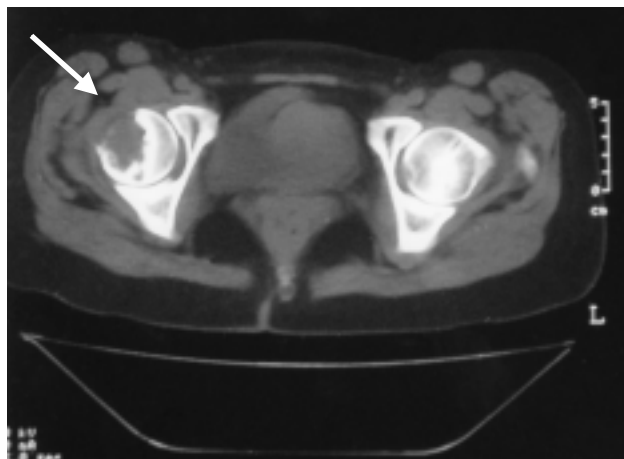


Figure 2 A computed tomographic scan showing a lytic lesion in the anterolateral aspect of the right femoral head with destruction of the cortex (arrow).

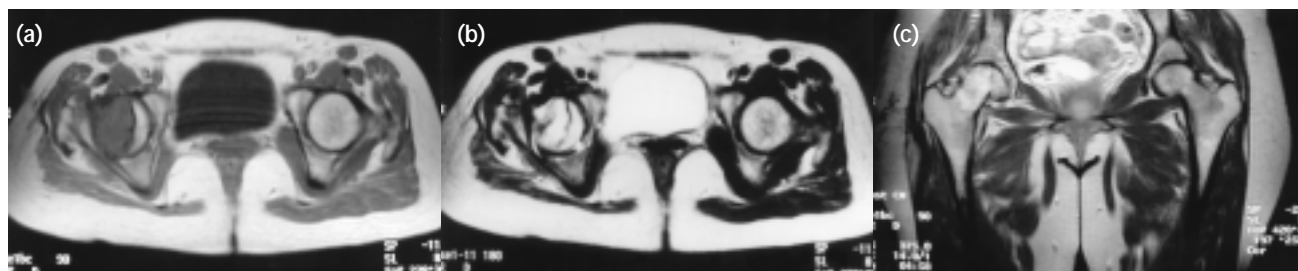


Figure 3 Magnetic resonance imaging showing (a) a mass in the anterolateral portion of the right femoral head with similar signal intensity to the surrounding muscles on axial T1-weighted image. Perforation of the cortex is also evident. (b) The mass has a hyperintense signal on axial T2-weighted image. (c) Coronal T1-weighted image after Gd-DTPA administration shows heterogeneous enhancement of the area affected by the tumour and a loss of cortical definition in the superolateral aspect of the femoral head.

CASE REPORT

In August 2000, a 48-year-old woman presented to the Clinical Centre of Serbia in Serbia and Montenegro with an 18-month history of increasing right groin pain and an antalgic gait. The patient was in good health, without any signs of systemic disease including neurofibromatosis. Plain pelvic and hip radiographs taken upon admission showed an osteolytic lesion involving almost two-thirds of the right femoral neck, with partially sclerotic borders. The lesion extended proximally into the femoral head and distally to the intertrochanteric line (Fig. 1). Computed tomography (CT) confirmed a considerable zone of destruction of the femoral neck and the anterolateral portion of the head (Fig. 2). Magnetic resonance

imaging (MRI) revealed a clearly delineated tumour that was hypointense on T1-weighted images, hyperintense on T2-weighted images, and showed a heterogeneous enhancement after administration of contrast media (Fig. 3). There was no extraosseal spread of the tumour mass; the other pelvic bones had a normal signal intensity and local lymph nodes were not enlarged. Whole-body bone scintigraphy with a 740 MBq dose of Technetium 99 dihydropyrimidine dehydrogenase showed marked accumulation of the radionuclide in the head of the right femur (Fig. 4).

A biopsy was taken through a drill hole for pathohistological analyses. On hematoxylin and eosin staining, the tumour had a nodular appearance typical to MPNST. Two types of tissue were found: Antoni type A-like (fascicular) areas with spindle cells

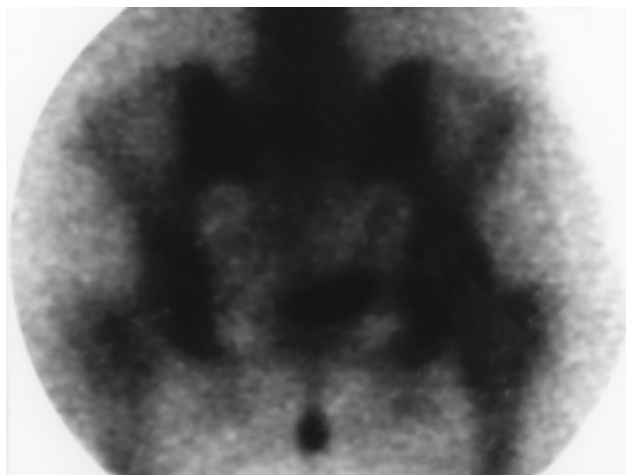


Figure 4 Scintigraphy of the pelvic region showing an accumulation of the radionuclide in the right proximal femur.

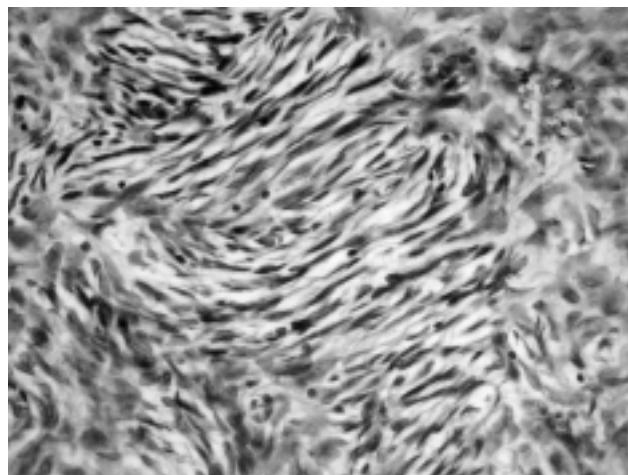


Figure 5 Photomicrograph of the tumour showing a typical nodular appearance of a tumour with Verocay bodies (H&E, x400).

arranged with palisading ovoid basophilic nuclei and an acidophilic cytoplasm, and Antoni type B-like (reticular) areas with myxoid changes. Verocay bodies consisting of acellular eosinophilic processes were arranged in a band-like pattern (Fig. 5). Hypercellularity, slight anisocytosis, and nuclear atypia were also noted. A low mitotic index was observed (1–2 mitoses/10 high-power field), with a few fields of haemorrhage and necrosis. The tumour tissue was stained for reticular fibres and a diagnosis of fibrosarcoma was excluded. Immunohistochemistry found the 2 cellular areas strongly positive for S-100 protein and vimentin (Fig. 6). There was a focal positivity for CD68, and cytokeratin was negative. The stains were positive for neurofilaments and glial fibrillary acidic protein. Tests for HMB-45 were negative. The levels of necrosis, nuclear atypia, and elevated mitotic rate within the lesion led to a diagnosis of a low-grade MPNST.

The patient underwent a radical tumour resection and a cemented bipolar hip hemiarthroplasty (Fig. 7). Pathohistological examination of the resected specimen showed no extraosseous extension, with clear surgical margins. At 4-year follow-up, the patient remained in good health with no evidence of tumour recurrence.

DISCUSSION

The incidence of MPNST is low.^{1–3} The most frequently affected bones are the jaw (nearly 50% of the cases, probably because of the presence of neural tissue in

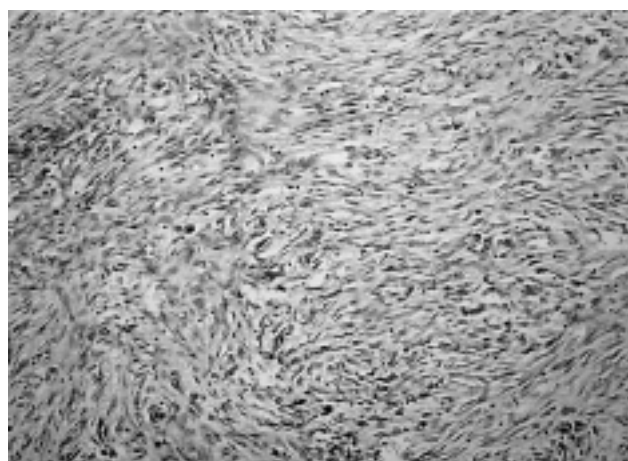


Figure 6 Photomicrograph of the tumour immunohistochemically stained with S-100 showing marked positivity, tumour hypercellularity, and anisonucleosis.

mandible),^{1,8} the skull, and the bones of the upper limb (humerus, ulna, metacarpal, and phalangeal bones). Involvement of the lower extremity is extremely rare,¹ with few reports of MPNST in the distal femur¹ and only one in the proximal femur (trochanteric region).⁴

Neurilemmomata can affect bone by 3 different mechanisms: the tumour tissue can be localised extraosseously, eroding into the bone secondarily; it can develop within a nutrient canal primarily involving the bone secondarily; or it can primarily arise within the central medullary canal.¹⁰

Two different cell patterns can usually be recognised on microscopy: an Antoni type A-like pattern, with spindle cells in a palisade formation, surrounded by an interstitial substance that forms Verocay bodies; and an Antoni type B-like pattern, with irregular cells and a myxoid component.^{3,10-13} Although Antoni type A and B arrangements are commonly described in benign schwannoma,¹⁴ the long duration and slow growth of low-grade MPNSTs can lead to similar histological characteristics. The presence of Verocay bodies is pathognomonic of neurilemmoma.¹⁵ Immunohistochemically the tumour cells show immunoreactivity to the S-100 protein and vimentin, with focal positivity to CD68 and negativity to keratin.^{11,12,16}

Intraosseous neurilemmomata are well-encapsulated tumours usually less than 5 cm in diameter. Tumours larger than 5 cm are known as giant schwannomas and may confer a risk of malignancy. MPNSTs tend to occur in middle age, with a possible higher prevalence in women.⁹ Patients are often diagnosed late, with prediagnostic periods of up to 6 years.^{10,17} The presentation of our 48-year-old female patient was thus not unusual.

MPNST is associated with neurofibromatosis in 2% to 29% of cases,^{4,5} although this association is usually with the soft-tissue MPNST⁶ and not commonly with intraosseous MPNST.⁴ Our patient had no clinical signs of neurofibromatosis.

Radiologically, MPNST is a well-delineated tumour and presents as a lytic lesion with sharp sclerotic or partially sclerotic margins, and occasionally disruption of the osseous cortex.^{10,18,19} Perforation of the thinned cortex with periosteal new bone formation and soft-tissue involvement should not be taken as sure evidence of malignancy.^{10,16} The tumour can be multilocular without central calcification or ossification.⁹ On CT, MPNSTs present as hypodense, non-homogenous masses due to areas of degeneration and areas of varying cellular density.²⁰ MPNSTs have a signal isointense with muscle on T1-weighted MRI images, while the signal is more intense than the subcutaneous cellular tissue on T2-weighted images. Heterogeneous signal intensities have also been reported on T2-weighted images indicating pericellular and myxoid areas.²¹ Hypercellular nodules can be recognised by a strong contrast enhancement compared with the faint enhancement of the loose and less cellular areas. Multinodular enhancement patterns are rarely seen in bone tumours and can also be helpful in the diagnosis of intraosseous MPNSTs.

Differential diagnoses for MPNST are: synovial sarcoma, cellular schwannoma, metastatic malignant melanoma, desmoplastic fibroma, fibrous dysplasia,



Figure 7 Anteroposterior radiograph of the hip following excision of the tumour and implantation of a cemented bipolar hip hemiarthroplasty.

malignant fibrous histiocytoma, non-ossifying fibroma, and well-differentiated fibrosarcoma.^{2,22}

The definitive diagnosis of MPNST is pathohistological. We prefer obtaining specimen for analysis by open biopsy, although needle biopsy is sufficient with a high sensitivity.²³ We are aware of the higher complication rates in open biopsy. Open/surgical biopsy allows us to exclude the possibility of false negative findings and to take sufficient tumour tissue for both standard and specialist histological analyses.

Through immunohistochemical staining, the tumour in this case was found to be strongly positive for S-100 protein, indicating a tumour of neural differentiation. Although S-100 protein can be positive in 10% to 20% of fibrosarcomas, the additional presence of neurofilaments and glial fibrillary acidic protein excluded such a diagnosis.²⁴ Negativity for cytokeratin with an additional absence of a coexpression of vimentin and cytokeratin excluded synovial sarcoma.²⁵

Although CD68 is a marker of histiocytes and is more typical of malignant fibrous histiocytoma, a focal positivity for CD68 has been described in MPNST.^{12,16} Nonetheless, the absence of a storiform arrangement of spindle cells on histology excluded malignant fibrous histiocytoma.²⁶ HMB-45, a marker for melanotic pigment, was also negative, thus excluding malignant melanoma.²⁷ Fibrous dysplasia and non-

ossifying fibroma were excluded by their very different histological appearances from MPNST.

Our patient had a low-grade malignant form of neurilemmoma. The diagnosis was based on the main histological criteria for malignancy: tumour larger than 5 cm, high cellularity, presence of mitosis, necrotic fields, and haemorrhage zones.^{7,11,12} Mitotic index is the most important criterion for tumour grading (1-2 mitosis/10 high-power field point).

The recommended treatment for benign neurilemmomata is phenolisation and bone grafting,^{10,11,28,29} but in a low-grade MPNST such as in our case, with large amounts of bony destruction near the joint, the optimal treatment is wide resection and implantation

of a prosthesis (Fig. 7). The use of bone cement for prosthesis implantation may decrease the incidence of local recurrence through its thermal effects.³⁰

ACKNOWLEDGEMENTS

The authors wish to thank Prof Gernot Jundt from Knochentumor Referenzzentrum, Institute of Pathology, University of Basel in Switzerland and Prof Erwin W Morscher from the Laboratory of Orthopaedic Biomechanics in Basel, Switzerland for reviewing the manuscript and providing useful suggestions.

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