

Nodular Extramedullary Multiple Myeloma: Hepatic Involvement Presenting as Hypervascular Lesions on CT

Dear Editor,

Multiple myeloma (MM) presenting as nodular liver masses is rare in clinical practice and the literature published thus far has been limited to few reports and case series.¹⁻⁹ In a retrospective review of more than 2000 patients, Talamo et al¹⁰ reported that only 9 cases where there was nodular involvement of the liver by MM, whereas in one autopsy study, nodular liver involvement was present in 13.4% of patients.¹¹ This discrepancy in findings between clinical diagnosis and autopsy findings suggests that nodular involvement of the liver by MM may be under-diagnosed.

Liver involvement by MM is associated with light chain restricted disease.⁵ Histologically, hepatic involvement may manifest in sinusoidal, portal, nodular or mixed patterns.¹² Macroscopically, these can present as either diffusely infiltrative or focally nodular types.

We report a case of a 68-year-old female with biopsy proven non-secretory type multiple myeloma involving the liver and manifesting as arterial enhancing mass lesions on computed tomography, an imaging finding that is not well recognised.

Case Report

Our patient is a 68-year-old female who initially underwent external beam irradiation for solitary plasmacytoma of the sternum, but this had progressed to multi-organ involvement (MM) by the time she was referred to us. Imaging reassessment at our institution with fusion F18-fluorodeoxyglucose positron emission tomography-computed tomography (PET-CT) revealed multiple hypermetabolic osseous and hepatic lesions (Fig. 1a). As the hepatic lesions were not considered to be part of the same pathologic process, multiphasic multidetector row CT scan of the chest, abdomen and pelvis was performed (Lightspeed VCT64-slice scanner, General Electric Medical Solutions; 140 kVp, 570 mA, 0.4 s per rotation, 5.0 mm collimation reconstructed to 2.5 mm section thickness images), using iodinated intravenous contrast (Ioversol, Optiray 300, Mackillrodt Medical; 120 mls injected at 4 ml per second) to characterise the liver lesions. This revealed 3 solid arterial enhancing hepatic lesions (Fig. 1b) that subsequently became isodense to mildly hypodense to the rest of the liver parenchyma on the delayed phase (Fig. 1c). CT-guided biopsy of the largest liver lesion revealed plasma cells with anaplastic features, consistent with multiple

myeloma. Repeat serum testing showed only transient elevation of serum free lambda light chain levels (82.5 mg/L), with an abnormally low kappa:lambda ratio (0.15); these normalised rapidly within 2 months of initiation of combination chemotherapy.

Combination therapy consisting of bortezomib, thalidomide, and dexamethasone was subsequently initiated. Within 2 months, her serum free lambda light chain levels (19.0 mg/L) and kappa:lambda ratio (0.79) had normalised. Initial therapy was switched to a modified regimen consisting of lenalidomide with weekly dexamethasone due to gastrointestinal intolerance.

Over the course of 1 year on therapy, serial CT scans of the abdomen revealed progressive decrease in size and loss of enhancement of the liver lesions, especially in the largest lesion (Fig. 1d). As serum paraproteins remained undetectable on subsequent follow up visits, imaging assessments of the liver lesions were used as a surrogate marker for monitoring treatment response. By 12 months post-treatment, all the liver lesions had regressed completely. The patient continued to show improvement, and ultimately completed an autologous stem cell transplant with good tolerance and response.

Discussion

The imaging findings of the nodular form of liver involvement in MM have not been well-studied, owing to the rarity of the condition. In a review of the literature by Ng et al¹³ in 1999, imaging findings were generally considered non-specific. On ultrasound, the majority findings can be either hypoechoic nodules or hyperechoic nodules with hypoechoic rims. On CT, lesions are reportedly either hypodense or showed variable enhancement. In 2 separate case reports, lesions displayed variable signal intensities on MRI, notably with hyperintensity on T1-weighted imaging.^{3,14}

In the CT study of our patient, the liver lesions showed transient increased enhancement in the arterial phase, becoming isodense and even mildly hypodense on the equilibrium phase. This pattern of enhancement may mimic hepatocellular carcinoma and hypervascular metastasis.¹⁵

As early as the 1970s, active skull lesions have been reported to be hypervascular.¹⁶ Extraosseous MM involvement in the abdomen has also been reported to show increased enhancement on CT.¹⁷ These are postulated to be

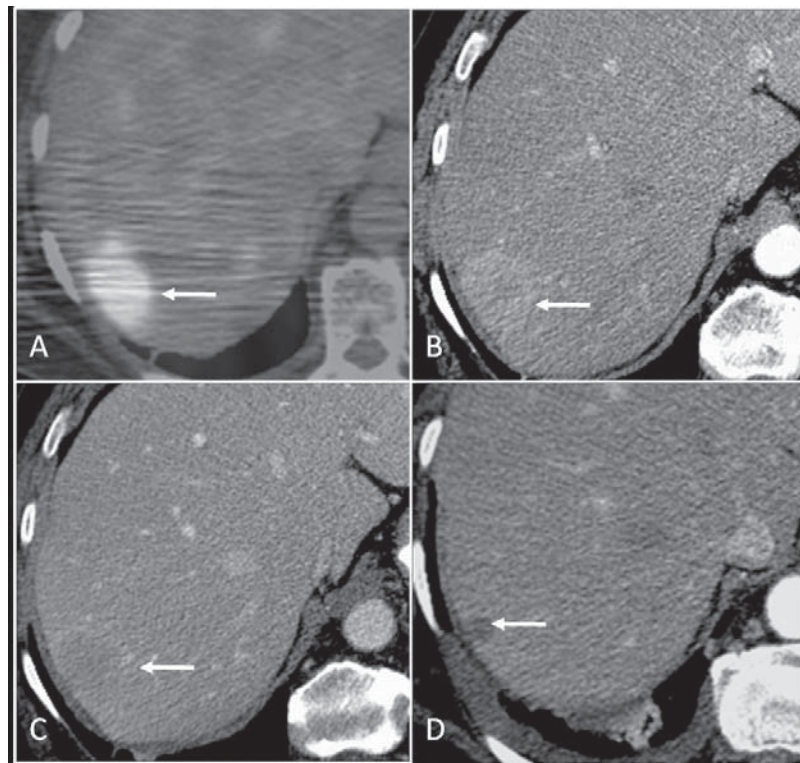


Fig. 1A. Fusion PET/CT image shows hypermetabolic activity within the lesion located in the right lobe of liver, with a maximal SUV of 12.2.

Fig. 1B. Contrast enhanced CT image of the same lesion in the late hepatic arterial phase showing enhancement (arrow), consistent with a hypervascular tumor. Two other similar but smaller lesions were present elsewhere in the liver (not shown).

Fig. 1C. Axial CECT image in the portal venous phase shows the lesion as mildly hypodense to the normal liver parenchyma. A rim of enhancing tissue is seen surrounding it (arrow). This could represent compressed normal hepatic parenchyma rather than part of the tumor. Without pertinent history, differentials may include atypical focal nodular hyperplasia, hepatocellular carcinoma and hypervascular metastases from primaries such as breast, renal cell or medullary thyroid carcinoma.

Fig. 1D. Axial CECT image of the same lesion (arrows) in the right lobe of the liver in the late hepatic arterial phase at 3 months following initiation of combination chemotherapy at our institution. The lesion showed a decrease in size and did not demonstrate any enhancement. The other two lesions (not shown) also showed similar response. By 12 months post-treatment, all the liver lesions had regressed completely.

due to the expression of vascular endothelial growth factors leading to neo-angiogenesis.¹⁸ In one patient, multiple early enhancing plasmacytomas were present in the small bowel and pancreas, prompting the authors to suggest arterial phase imaging for the evaluation of intra-abdominal involvement.¹⁹

A brief review of the various cases of nodular MM liver involvement in the published literature suggests that the “variable” enhancing nature of plasma cell neoplasms in the liver may be due differences in the timing of scan acquisition in various phases of contrast enhancement. The majority of the cases reported so far have been either mildly enhancing or isodense to the liver; we postulate that this is related to the fact that the scans were obtained in the portal venous phase.^{1-6,17}

It is logical to hypothesise that active myelomatous deposits in the liver would behave in the same manner such as in the other intra-abdominal viscera and retroperitoneum;¹⁷ however, because normal liver tissue shows avid and

homogenous enhancement during and following the portal venous phase of enhancement, these lesions may not be apparent without multiphasic CT.

In our patient, progressive decrease in the size and enhancement of the lesions (becoming persistently hypodense on subsequent imaging) correlated well with both haematological and biochemical response to therapy. Intuitively, this would be in keeping with positive treatment response.⁶

In conclusion, myelomatous liver deposits are rare. Transient enhancement in the arterial phase is an imaging finding that is in keeping with the hypervascular nature of active lesions. As our case further illustrates, the setting of non-secretory type multiple myeloma, where the disease may become elusive on serum laboratory tests, CT appearances of the liver lesions may be used as a surrogate marker for monitoring treatment response.

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