

## Imaging of Metastatic Melanoma

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### ABSTRACT

*Cutaneous melanoma is a widely metastasising neoplastic disease with an unpredictable pattern of spread. Imaging has an important role to play in the management of this disease, particularly in the delineation of metastases. This article discusses the use of ultrasound, computed tomography, and magnetic resonance imaging for the detection of metastases from melanoma.*

*Key Words: Computed tomography, Magnetic resonance imaging, Melanoma, Metastasis*

Cutaneous melanoma is arguably the most widely metastasising neoplastic disease, with the least predictable pattern of spread. Imaging has an important role in its management, particularly in the delineation of metastases. The imaging features of metastatic cutaneous malignant melanoma are legion. Although rare in the Chinese population, the incidence of melanoma worldwide has increased by an average of 2.5% per year between 1990 and 1995, a rate higher than any other malignancy.<sup>1</sup> The aetiology of this is uncertain but is thought to relate to a combination of increased exposure to ultraviolet radiation and improved detection rates through screening. In the USA, the lifetime risk for developing malignant melanoma has increased from 1 in 1500 in 1930 to 1 in 75 in 2000. The current lifetime risk for developing the disease in Australia is 1 in 25.<sup>2</sup>

Melanoma confined to the epidermis is effectively curable and thin lesions carry a >98% 5-year survival rate. However, patients with primary tumours of >4 mm thickness have a <50% survival rate, while the median survival for disseminated melanoma is just 7 to 8 months.<sup>3</sup>

### Staging of Malignant Melanoma

The use of routine chest X-ray for the screening of early-stage melanoma is controversial. A retrospective review

of the staging chest X-rays of 876 asymptomatic patients with localised cutaneous melanoma found a true positive rate of just 0.1% for pulmonary metastases.

Ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) all have the ability to identify nodal and distant metastases, but there is general agreement that their routine use for asymptomatic patients with melanoma is not indicated. The use of radionuclide studies in the form of sentinel node localisation is, however, quite widely practised and may limit invasive elective regional lymph node dissection to those who are shown to have involved sentinel nodes.

### Imaging of Metastases

#### *Lymph Node Metastasis*

An autopsy series of 216 patients with melanoma revealed the lymph nodes to be the dominant site of metastatic disease with deposits present in almost three-quarters of the patients.<sup>4</sup> Lymph node metastases not accessible to clinical examination or ultrasound evaluation are usually imaged on CT, with reliance being placed on established size criteria for the various nodal groups to define the likelihood of involvement (Figure 1).

#### *The Skin, Subcutaneous Fat, and Muscles*

At autopsy, more than two-thirds of patients dying from malignant melanoma have metastases in the soft tissues.<sup>4</sup> Subcutaneous and soft tissue metastases predominate (Figure 2). The distribution of muscle metastases reflects the distribution of muscle mass with the lower limbs predominating as the site of disease spread.

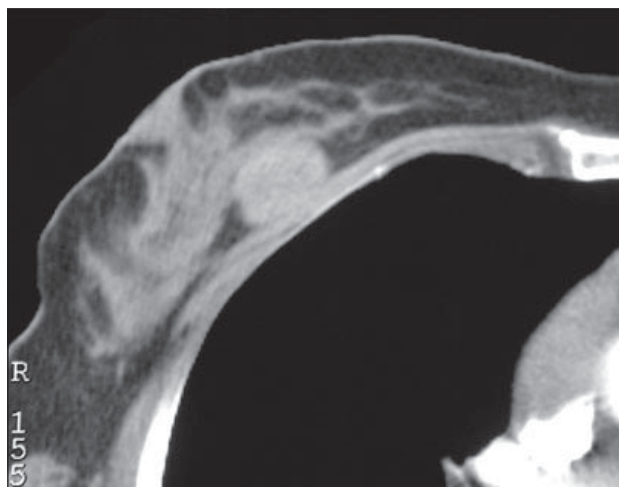
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**Figure 1.** Enhanced axial computed tomography scan showing bulky lymph node metastases extending from the inguinal into the external iliac chain.



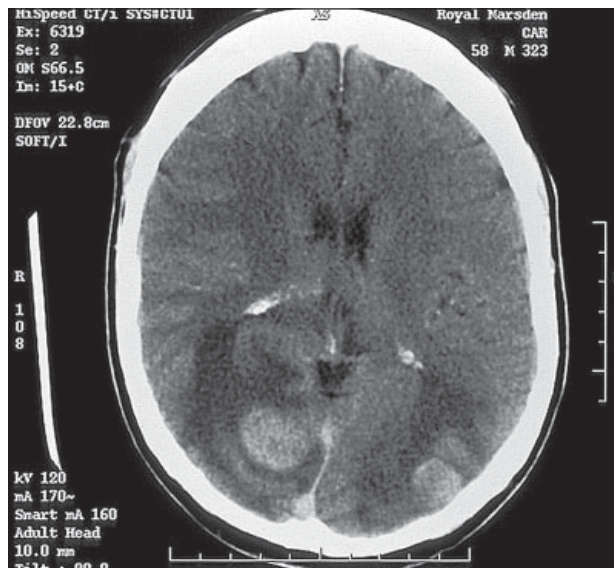
**Figure 2.** Computed tomography section of the thoracic wall showing an ovoid enhancing soft tissue deposit deep to the right breast tissue.

### ***The Lungs***

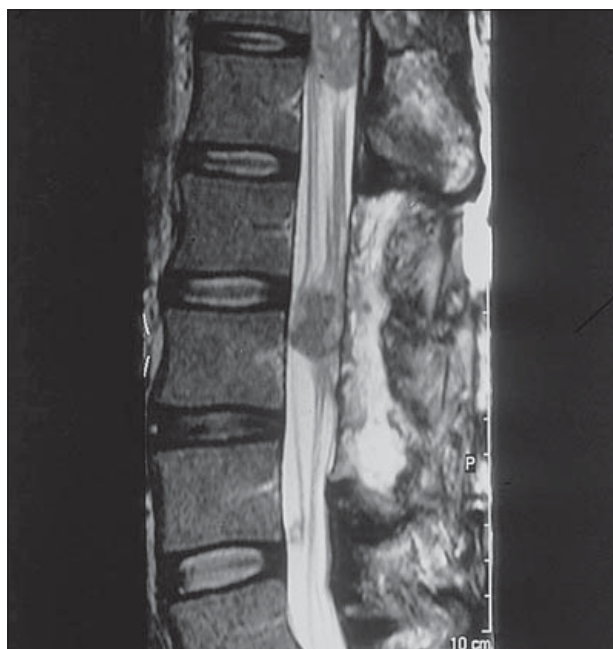
The lungs are the most frequently affected organ at autopsy.<sup>4</sup> Chest X-ray and thoracic CT are the mainstay of imaging for pulmonary metastases. A recent comparative study of positron emission tomography (PET) versus CT and chest X-ray found the latter 2 tests to be superior to PET in the detection of lung metastases.<sup>5</sup> Pulmonary metastases associated with melanoma usually number more than 5.<sup>5</sup>

### ***The Central Nervous System***

Autopsy data show that 49% to 73% of patients with disseminated melanoma have cerebral metastases.<sup>6</sup> Cerebral metastases tend to occur late in the disease and



**Figure 3.** Axial cranial computed tomography scan showing avidly enhancing bilateral occipital metastases.



**Figure 4.** Multiple low-signal leptomeningeal deposits shown on T2-weighted unenhanced sagittal magnetic resonance imaging.

carry the gravest prognosis of all visceral sites, with a median survival of 113.2 days. Cerebral metastases are usually multiple at presentation and average 1 cm to 4 cm in size (Figure 3). Intramedullary or leptomeningeal metastases are not uncommon in metastatic melanoma (Figure 4).

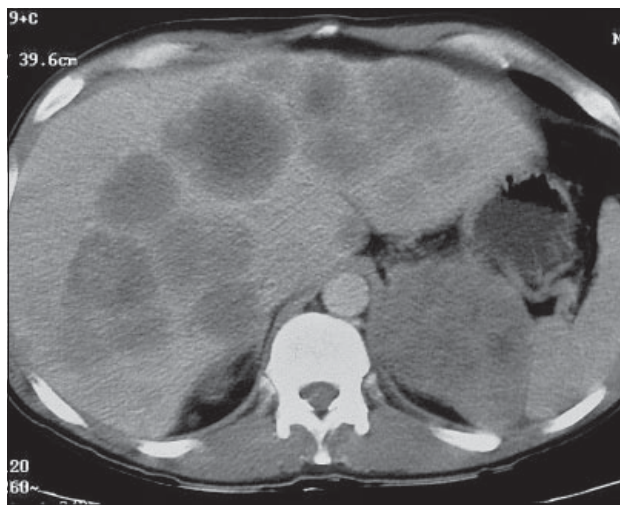
### ***The Liver and Biliary System***

The liver is the third most common site of disease at autopsy, being present in 58% of patients dying from melanoma.<sup>4</sup> The majority of liver metastases from

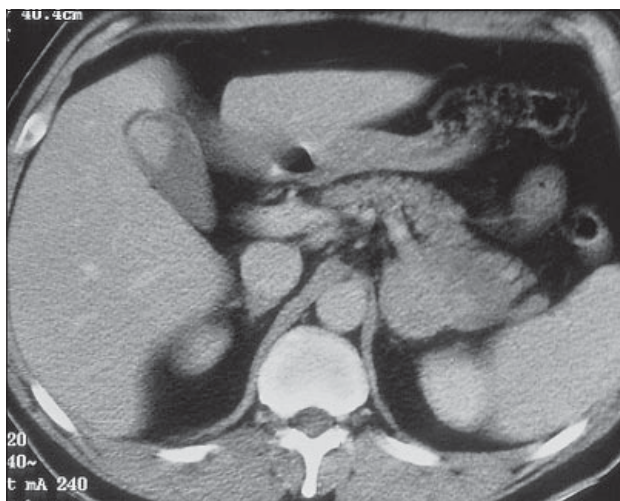
malignant melanoma are of low attenuation on CT when compared with the normal parenchyma (Figure 5). Portal venous phase scanning alone fails to detect 14% of liver deposits. Melanoma accounts for more than half of metastases to the gallbladder,<sup>7</sup> and autopsy data show the incidence of gallbladder metastases from melanoma to be 9% to 20% with a lower frequency for bile duct deposits. They are usually clinically occult (Figure 6).

### The Spleen

The spleen is a rare site for metastatic disease in patients with cancer, with an incidence of 5% at autopsy. However, the 2 tumours most frequently implicated in splenic metastases are ovarian carcinoma and malignant melanoma, with 30% of patients with melanoma having splenic involvement at autopsy (Figure 7).<sup>4</sup>



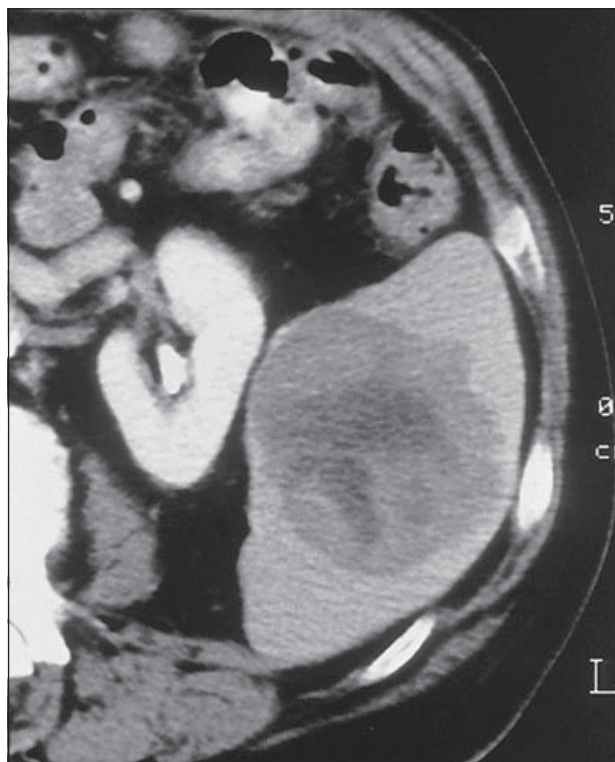
**Figure 5.** Multiple hypodense hepatic deposits on axial enhanced computed tomography.



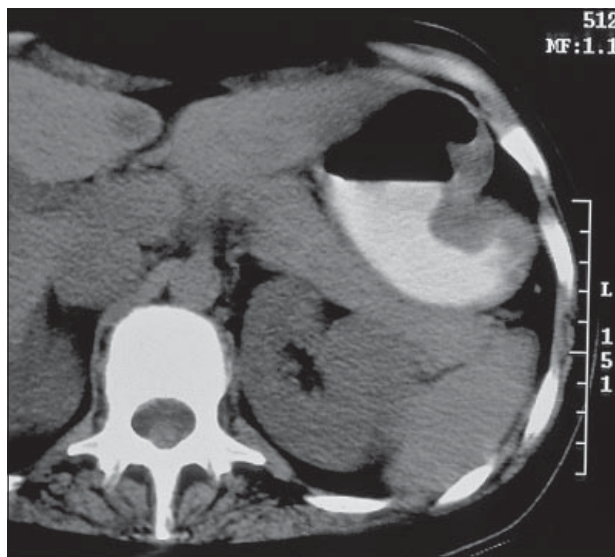
**Figure 6.** Melanoma tumour nodule in the gall bladder. Note also the metastasis in the left adrenal gland.

### Other Sites

Bone metastases are rare until late in the disease and are typically osteolytic. Melanoma is the most common blood-borne metastasis to the gastrointestinal tract and may present anywhere from the mouth to the anus. In the stomach and small bowel, metastases often promote significant haemorrhage (Figure 8). Melanoma may also involve the pancreas, kidneys, uterus, and heart.



**Figure 7.** Large hypodense metastasis in the spleen shown on axial computed tomography.



**Figure 8.** Axial computed tomography section demonstrating melanoma metastasis protruding into the gastric lumen.

## CONCLUSIONS

Cutaneous malignant melanoma has a predilection for young adults. Early-stage disease is curable with surgery. The majority of patients at first metastatic relapse will have disease confined to a single organ. However, it should be remembered that the disease can be widely disseminated, with any number and combination of metastatic sites potentially being involved.

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