High frequency sonography and color-Doppler enhancement with a second generation contrast agent in the preoperative assessment of a melanoma

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Case Type: Clinical Cases
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Patient: 66 years, male

Clinical History:
A man presented with a melanocytic nevus on the back. A sonographic study that was done showed he had a hypoechoic tumor. The tumor measured 3.55 mm in thickness. The color-Doppler showed intratumoral vascularization and after an injection of 2.5 ml of an intravenous contrast agent, it was found to be highly enhanced.

Imaging Findings:
A 66-year-old man presented to his dermatologist with a melanocytic nevus that he had on his back from birth. During the past three months, before going to the dermatologist, it had started to grow without any symptomatology. On physical examination, no adenopathies were found. A sonographic study was done, before its extirpation, to measure the depth and the vascularization of the cutaneous lesion. The sonographic study was performed using an electronic transducer of 15 MHz with a sonoCT® and a Philips HDI 5000 equipment (Royal Philips Electronics Eindhoven, The Netherlands). The tumor was found to be hypoechoic with well-defined lateral and lower margins. The measurement between the lower margins of the hyperechoic line (Interphase gel-epidermis) to the deepest point of the distal margin was 3.55 mm in depth. (Fig. 1). The color-Doppler demonstrated intratumoral vascularization (Fig. 2). After the administration of 2.5 ml of an intravenous second-generation contrast (sonoVue®), the lesion was seen to be highly enhanced (Fig. 3). The spectral analysis of the intratumoral vascularization showed a low resistive index: 0.53, which is characteristic of tumoral neovascularization (Fig. 4) being present. The tumor was surgically removed with a security margin of 2 cm. In the histological analysis, the tumor was found to be 3.05 mm in depth with an increase of its vascular-lymphatic structure using immunohistochemical staining with CD-31. Six months after the surgical removal, a left axillary mass with a maximum diameter of 4 cm was found. In the histological analysis, the surgical piece was reported to be due to lymph recurrence. In the follow-up of the tumor, bilateral pulmonary metastasis was detected in the CT of the thorax enhanced with a contrast (Fig. 5). Three months later, a brain MRI demonstrated the presence of multiple supratentorial metastasis which affected both cerebral hemispheres with edema being associated. At present, the patient is being treated with interferon associated with holocranial...
radiotherapy to control the cerebral metastasis.

**Discussion:**

Treatment for melanomas is based on the age and the general health of the patient, as well as, on the stage of the disease (Breslow index). Surgery is often sufficient to cure people with an early-stage melanoma. In the later stages of the disease, the surgery is generally followed with additional therapy (chemotherapy, radiation therapy or immunotherapy). In approximately 30% of the cases, the histological analysis shows a Breslow index, because of which, a new surgical removal is required. According to the Breslow index, the tumor depth determines the surgical margins, so for an index of 1 mm or less, the security margin would be 1 cm and 2 cm for those with an index between 1.01 mm and 2 mm and 3 cm for those with an index between 2.01 and 4 mm. Some studies have shown the accuracy of high frequency sonography with a mechanic transducer of 20 MHz in dermatology, especially in the melanoma previous evaluation before the surgery. A color-Doppler and sonographic first generation contrast agents can be used for the study of melanoma angiogenesis. We have used an electronic transducer of 15 MHz with sonoCT®, which is capable of obtaining a higher differentiation of the tissue margins and interphases, reaching a high definition of the lateral and lower margins. The surgical planning could be based on the measurement obtained through this technique. We have also used a second generation intravenous contrast (sonoVue®), consisting of microbubbles of sulfur hexafluoride mixed with sodium chloride 0.9%. Using this intravenous contrast, the intratumoral vascularization is highly enhanced. As an intratumoral vascularization is an accurate characteristic of melanoma angiogenesis, and it can be used to determine the high risk of melanoma metastasis development. Our patient had, with this technique, a prominent melanoma vascularization. The clinical evaluation of our patient was wrong, presenting left axillary lymph recurrence at six months of follow-up. He had bilateral pulmonary metastasis in the first year after the surgical removal of the melanoma. In a year and three months, it was found that he had cerebral metastases. In conclusion, the wrong clinical evaluation of our patient can be correlated with the prominent vascularization which was shown on sonography.

**Differential Diagnosis List:** Melanocytic melanoma. A breslow index of 3.05 mm. Sentinel lymph node positive axilar left (HMB-45 positive).

**Final Diagnosis:** Melanocytic melanoma. A breslow index of 3.05 mm. Sentinel lymph node positive axilar left (HMB-45 positive).

**References:**


Srivastava a, Laider P, Davies RP, Horgan K, Hughes LE. The prognostic significance of tumor vascularity in intermediate-thickness (0.7-4.0 mm) skin melanoma: a quantitative histologic study. Am J Pathol 1998;133:419-423. (PMID: [3189515](https://doi.org/10.1016/S0002-9440(10)66037-3))
Description: A transverse gray-scale high frequency sonography scan of the skin showing a hypoechoic tumor with well-defined lower and lateral margins. The tumor measured 3.55 mm in thickness. Origin:
Figure 2

Description: A color-Doppler sonography scan revealing intratumor vessels. Origin:
Description: A color-Doppler sonography scan after injection of 2.5 ml of an intravenous contrast agent showing an enhancement of the intratumor vessels. Origin:
Description: The arterial flow spectrum showing a low resistive index of 0.53. Origin:
Figure 5

Description: A contrast enhanced thoracic CT showing a subpleural metastasis in the right hemithorax which is less than 0.5 cm (indicated by an arrow). Origin: