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PET/CT imaging of melanoma lymph node metastases in BALB/c mouse.

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ABSTRACT

Malignant melanoma primarily metastases to the closest lymph node. Therefore the Sentinel node biopsy (SNB) has become an essential element in the tumour node metastasis stating of cutaneous melanoma. The five year prognosis decreases dramatically if lymph node metastases are discovered compared to patients with disease free sentinel nodes: from 90% to 50-60% respectively. Therefore it is important to develop an experimental mouse model of a lymph node metastatic malignant melanoma that could serve as an instrument in the search for better treatments methods. Mouse melanoma cells were injected subcutaneously into the back of a four weeks old male BALB/c mouse. The mice were PET/CT imaged on day 5 and on day 11 after the inoculation of cancer cells. [18F]FDG PET/CT allowed visualisation and semi-quantification of metabolic activity of both the primary tumour and lymph node metastases (LN). Especially the growth of ipsilateral LN was well demonstrated, also by CT based volume. Dedicated small animal PET/CT provides a non-invasive method to study lymph node metastatic melanoma in mice. This technology can be used to test a variety of potent molecules with anti-melanoma effect.

**Keywords**: melanoma, mice, PET/CT, lymph node, metastases.

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INTRODUCTION

Malignant melanoma primarily metastases to the closest lymph node. Therefore the Sentinel node biopsy (SNB) has become an essential element in the tumour node metastasis stating of cutaneous melanoma [1]. The five year prognosis decreases dramatically if lymph node metastases are discovered compared to patients with disease free sentinel nodes: from 90% to 50-60% respectively [2]. Since it has not been able to develop a standardized treatment protocol for metastatic melanoma [3], it is important to develop an experimental mouse model of a lymph node metastatic malignant melanoma that could serve as an instrument in the search for better treatments methods.

Positron emission tomography/computed tomography (PET/CT) with glucose analog 2-[^{18}F]-fluoro-2-deoxy-*D*-glucose ([^{18}F]FDG) has been successfully used since 1991 in the detection of metastasis in the initial stating of malignant melanoma, especially stages III and IV [4-5]. Here we report [^{18}F]FDG PET/CT detection of melanoma metastases in mouse lymph nodes.

MATERIALS AND METHODS

Figure 1. CT based volume
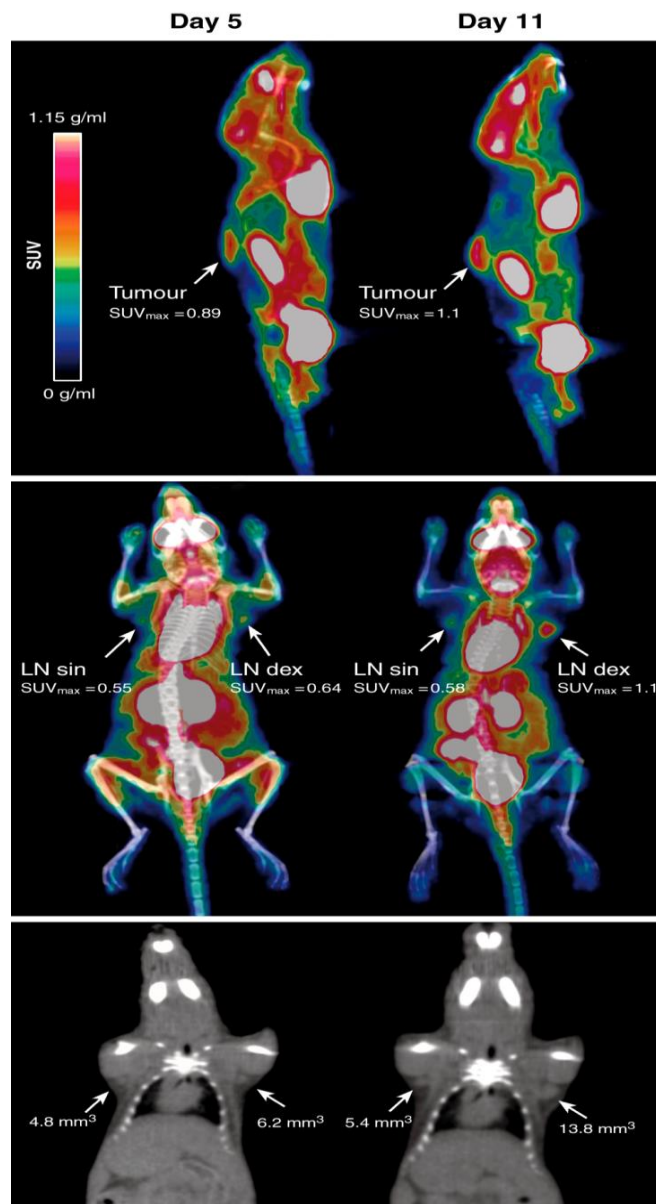
Two million mouse melanoma cells (B16F1; ATCC-LGC Standards, London, UK) were injected subcutaneously into the back of a four weeks old male BALB/c mouse (The Jackson Laboratory, Bar Harbor, ME, USA). The mice were PET/CT imaged on day 5 and on day 11 after the inoculation of cancer cells. Mouse, fasted for 4 hours, was anesthetised with isoflurane and intravenously injected with 5 MBq of [^{18}F]FDG. PET imaging for 20 minutes was performed at 60 minutes post injection using an Inveon Multimodality scanner (Siemens Medical Solutions, Knoxville, TN) and reconstructed with attenuation correction using maximum a posteriori algorithm in conjunction with an ordered-subsets expectation maximisation 3D algorithm. CT was performed for anatomical reference. Reconstructed [^{18}F] FDG PET images were normalized to standardized uptake value (SUV) images by imgsuv 0.1.0 program (Turku PET Centre, Finland, http://www.turkupetcentre.net/software/list.php). Semi-quantitative analysis of [^{18}F]FDG uptake was performed by drawing volume of interest (VOI) in the tumour and lymph nodes (LN) by using IRW software (Siemens). Maximum SUV (SUV$_{max}$) values were used for comparison. Tumours were not accurately visualized by CT, therefore only volumes of LNs were generated by summation of voxels within the tomographic planes.

CONCLUSION

[^{18}F]FDG PET/CT allowed visualisation and semi-quantification of metabolic activity of both the primary tumour and lymph node metastases (LN). Especially the growth of ipsilateral LN was well demonstrated, also by CT based volume (Fig. 1).

Dedicated small animal PET/CT provides a non-invasive method to study lymph node metastatic melanoma in mice . This technology can be used to test a variety of potent molecules with anti-melanoma effect.

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