Melanoma surgery and the impact of sentinel node biopsy

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Chapter 9

Lymphatic drainage of melanomas located on the manubrium sterni to cervical lymph nodes: a case series assessed by SPECT/CT

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ABSTRACT

The lymphatic drainage of cutaneous melanomas located on the upper trunk is often complex and sometimes follows an unexpected pattern. Occasionally, even direct drainage to cervical lymph nodes is seen. In this case series, three patients with lymphatic drainage to the neck derived from melanomas located over the manubrium sterni are described. There appears to be a restricted area that involves the manubrium sterni from which lymphatic drainage to different cervical node basins appears more frequent. SPECT/CT was helpful in visualizing these patterns and for the localization of the sentinel nodes.
INTRODUCTION

The technique of lymphatic mapping in melanoma patients has evolved into a routine procedure in the past decade. Since the successive introduction of lymphoscintigraphy, sentinel lymph node biopsy and single photon emission computed tomography camera with integrated CT scanner (SPECT/CT), the knowledge of lymphatic pathways has increased.[1-4] Although certain drainage patterns have been established, pathways of melanomas located on the upper trunk are often ambiguous. Melanomas in the infraclavicular region, on the midline of the trunk or near Sappey’s line sometimes drain to multiple, unlikely or contralateral lymph node basins.[5,6] InfrACLavicular melanomas seem to have a preferential drainage to the axilla, while supraclavicular melanomas have a preferential drainage to the head and neck region.[7,8] Direct lymphatic drainage from lesions on the upper trunk to cervical lymph nodes is sometimes seen.[5,6,9]

In this case series we describe three patients with direct drainage from melanomas located over the manubrium sterni to a cervical lymph node. These unexpected lymphatic drainage patterns are illustrated using SPECT/CT images for each patient.

Patient 1

A 68-year old female with a superficial spreading melanoma located on the manubrium sterni, with a Breslow thickness of 1.0 mm was referred for re-excision and sentinel node biopsy after diagnostic excision elsewhere. Pre-operative lymphoscintigraphy showed drainage to both sides of the neck and to the left axilla. SPECT/CT visualized sentinel nodes in level I of the left axilla, level IV and Vb of the left side of the neck and in level IV of the right side of the neck (Figure 1). During the operation all sentinel nodes were pursued and harvested from these locations. None of the dissected nodes contained metastases and no recurrences developed in the 40 months thereafter.
Figure 1. Case No. 1: Planar images (A) show drainage to one sentinel node in the right neck, two sentinel nodes in the left neck and one sentinel node in the left axilla. These nodes are anatomically displayed on fused 3D volume SPECT/CT (B). Fused SPECT/CT (C and E) shows the precise locations of these sentinel nodes, corresponding with single lymph nodes on CT (D and F), in level IV on the right side of the neck and in level IV and Vb on the left side.

Patient 2
A 50-year old female with a lentigo maligna melanoma on the midline over the manubrium sterni with a Breslow thickness of 1.0 mm was referred for excision and sentinel node biopsy after diagnostic punch biopsy elsewhere. Pre-operative lymphoscintigraphy and SPECT/CT visualized sentinel nodes in level III of the left side of the neck and one possible sentinel node underneath the injection site in level Vb of the right side of the neck (Figure 2). One tumor-negative sentinel node was removed from level III on the left side of the neck. After excision of the primary tumor no residual activity beneath the injection site was found. During a follow up period of 22 months no relapses occurred.
Figure 2. Case No. 2: Planar images after 10 minutes (A) visualize a sentinel node in the left side of the neck. This node is anatomically displayed in 3D SPECT-CT (B) together with a possible additional sentinel node in level Vb of the right side of the neck underneath the injection site. On transversal SPECT/CT (C) and CT (D) the sentinel node in level III on the left side of the neck is shown.

Patient 3
A 56-year old male had undergone a diagnostic excision of a nodular melanoma with a Breslow thickness of 1.1 mm in the midline over the manubrium sterni. Pre-operative lymphoscintigraphy and SPECT/CT depicted three sentinel nodes in the right axilla and one sentinel node in level Vb of the right side of the neck (Figure 3). Only two sentinel nodes were harvested from the right axilla. Most likely the third sentinel node that was visualized pre-operatively was activity in the lymphatic duct. Although one sentinel node was visualized supraclavicular, no activity and thus no sentinel node was detected in level Vb after extensive exploration. One sentinel node harvested from the axilla contained melanoma metastases. The completion axillary node dissection revealed no additional metastases and the patient remained free of disease in the subsequent seven months.
Figure 3. Case No. 3: Planar images ten minutes after administration of the radiopharmaceutical (A) depict two sentinel nodes in the right axilla of which the most caudal appears elongated. A sentinel node is also visualized in level Vb in the right neck. 3D SPECT/CT (B) confirms the location of two sentinel nodes in the right axilla in level I with activity in the afferent lymph vessel. Another hot spot is localized in level III of the right axilla and a hot spot is seen supraclavicularly in level Vb in the right neck. The supraclavicular sentinel node is displayed on transversal SPECT/CT (C) and CT (D) slices.

DISCUSSION

Melanomas located over the manubrium sterni have the potential to follow an unusual direct lymphatic drainage pattern to cervical lymph nodes. In the present case series, three such patients are described. Pre-operative imaging visualized lymphatic drainage to level Vb, level IV and level III.

Uren et al. also mentioned lymphatic drainage to the neck originating from primary melanomas on the anterior upper trunk.[6] They already noticed that trunk melanomas with direct drainage to cervical lymph nodes are usually located in a more or less restricted area
Melanomas located on the manubrium sterni around the manubrium. In 2009, Reynolds et al. described lymphatic drainage patterns of 5239 melanoma patients based on lymphoscintigrams.[5,7] From their maps we identified thirteen patients with a melanoma located in this area demonstrating lymphatic drainage to 18 sentinel nodes located in level I (n=1), level II (n=2), level III (n=4), level IV (n=2), level Vb (n=6) and the axilla (n=2). In one patient an interval lymph node was visualized.

SPECT/CT was helpful in visualizing the lymphatic drainage patterns in these three patients. Using this technique, the sentinel node is depicted in his anatomic habitat and which makes it easier to describe the precise location of the node in the neck. A previous study performed at our institute demonstrated that the routine use of SPECT/CT in addition to conventional lymphoscintigraphy can show additional sentinel nodes that are not visualized when using conventional lymphoscintigraphy only.[10] The aforementioned studies, including ours, suggest that one should be prepared to see direct lymphatic drainage from a melanoma located over the manubrium sterni to the neck. It may well be that early lymphangiogenesis and embryogenesis of superficial lymphatic vessels draining the skin of the manubrium sterni might play a role.

In two of these three patients not all visualized sentinel nodes were harvested during exploration. The possible present sentinel node underneath the injection site in patient 2 was not found and the pre-operatively visualized sentinel node supraclavicular in patient 3 was not harvested after wide exploration. At our institute Vermeeren et al investigated the use of a portable gamma camera for intra-operative sentinel node visualization in the head and neck region.[11] This device is able to detect residual radioactivity by visualization of the tracer signal on screen intra-operatively. Vermeeren et al concluded that intra-operative identification of sentinel nodes in the head and neck region with this portable gamma camera is feasible and might lead to detection of more sentinel nodes. In the future this device might support the surgeon to find additional sentinel nodes or sentinel nodes visualized pre-operatively but not detected with the hand held gamma probe only.

**CONCLUSION**

Three patients are described with a primary melanoma over the manubrium sterni with direct cervical lymph node drainage visualized by pre-operative imaging. SPECT/CT is a helpful imaging tool to reveal this pattern and can show the precise location of the sentinel node.
REFERENCES