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Axillary Lymph Node Groups – The Center in Lymphatic Drainage from the Truncal Skin in Man

Clinical significance for management of malignant melanoma[1]

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Summary

In order to identify regional lymph node drainage groups of primary malignant melanomas resp. suspicious pigmented tumors on truncal skin, lymphoscintigraphy using ^{99m}Tc-Sb_2S_3 colloid was performed in 50 patients of either sex prior to operative treatment. The lymphatic drainage pattern proved to be practically unpredictable by conventional anatomic guidelines based on the thesis of "lymphatic watersheds".

In 96 per cent of the patients examined radiocolloid uptake was to be found in one or both of the axillary lymph node groups, either solely or combined with inguinal, supraclavicular, posterior cervical or parasternal node-bearing areas.

In conclusion, axillary lymph node drainage groups are the center in lymphatic drainage from the truncal skin in man.

Introduction

During recent years, more and more investigators could demonstrate that prophylactic dissection of regional lymph node group(s) of cutaneous malignant melanoma increases survival in patients with histologically classified "high risk" melanoma (1–5). Taking the line of regional lymphadenectomy being effective, the question arises, which are the regional lymph nodes to drain the primary lesion.

Lymphoscintigraphy proved to be an appropriate approach to identify regional lymph node drainage group(s) (6–10). Cutaneous malignant melanomas on head and neck as well as on distal segments of the limbs almost always followed anatomical expectations (10). Melanomas on the trunk, however, were found to have an ambiguous lymphatic drainage pattern (6–10). Especially those truncal melanomas located inside "lymphatic watersheds" are expected to have a pluripotent direction of lymph flow. "Lymphatic watersheds" are zones of anatomic variation about 2.5 cm to either side of the ventral and dorsal midline as well as the Sappey's line of the trunk (2, 11, 12).

It was the aim of this study to reveal, if lymphatic drainage from a given malignant melanoma resp. suspicious lesion on truncal skin is purely fortuitous or, if there are distinct regional lymph node groups being favoured above others. In order to avoid manipulation of lymph flow and to guarantee exact identification of lymphatic drainage pattern, we decided to perform lymphoscintigraphy prior to operative treatment.

Material and Methods

Lymphoscintigraphy was performed preoperatively in 50 patients with various types of cutaneous malignant melanoma (the vast majority being superficial spreading melanomas) resp. suspicious pigmented tumors on the trunk, seven of the latter being histologically classified as benign pigmented nevi. The topographical position of malign and benign skin lesions was exactly determined, especially concerning location inside or outside "lymphatic

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watersheds". The study population consisted of 35 males aged 26–72 (mean 51) and 15 females aged 27–67 (mean 53). Written informed consent was achieved from each patient.

Colloidal ^{99m}Tc-labeled antimony sulphide (^{99m}Tc-Sb_2S_3) was used as radiotracer and prepared according to manufacturer's instructions (TechneScan®, Byk-Mallinckrodt, Petten, Holland). A total of 1.5 – 2.0 mCi ^{99m}Tc-Sb_2S_3 colloid was injected both intradermally and subcutaneously at a distance of 0.5–1.0 cm around the skin lesion (4–8 intradermal resp. subcutaneous deposits, less than 0.1 ml of activity volume per deposit).

The radiocolloid is transported from the injection sites via afferent lymphatics to draining lymph nodes, where it is phagocytozed predominantly by macrophages lining the marginal and medullary sinuses (9, 13).

4–6 hours following injection, imaging was accomplished with a large-field gamma camera with an all purpose 140 KeV parallel-hole collimator. Views of every regional lymph node group were obtained.

Results

Radiocolloid uptake could be revealed in the following regional lymph node groups: axillary, inguinal, posterior cervical, supraclavicular, and parasternal. In 48 out of the 50 patients (96 per cent) investigated, radiocolloid was to be found in axillary lymph node groups, either solely or in combination with other drainage groups (Figs. 1–4). One patient with melanoma positioned over the fourth lumbar vertebra demonstrated lymph flow only to left groin, and another patient with benign nevus near anus had a lymphatic drainage to both groins. In three patients with regional lymphatic drainage to axillary node groups, scattered subcostal in-transit lymph nodes were to be detected.

Locations of the skin lesions on the trunk (inside and outside "lymphatic watersheds") with their corresponding lymphatic drainage pattern are depicted in Figs. 2–4. Men outnumbering women in the present study, figures with male sex symbols were chosen. No difference in lymphatic drainage pattern was to be observed between males and females. Nor was there any obvious drainage difference between primary malignant melanomas and benign pigmented nevi, nor any difference dependent on the patients' age.

Fig. 5 illustrates the number of regional lymph node groups with lymphatic drainage from a given skin lesion located inside or outside "lymphatic watersheds". In 27 (54 per cent) of the patients examined, only one regional lymph node group was to be revealed, 11 patients thereof having a primary lesion situated inside "lymphatic watersheds" (Fig. 1 and 5). On the other hand, in 36 per cent of the skin lesions being positioned outside "lymphatic

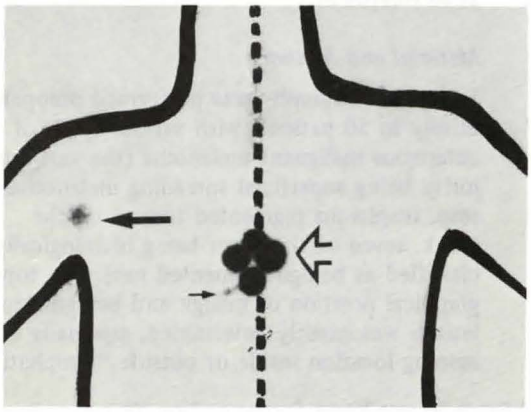

Fig. 1 Lymphoscintigram in posterior view 5 hours after injection.
Cutaneous malignant melanoma on back (injection site ⇐) inside "lymphatic watershed" around dorsal midline. Radiocolloid uptake is to be seen in left axillary lymph node group (←). Moreover, a small subcostal in-transit lymph node is visualized (→)

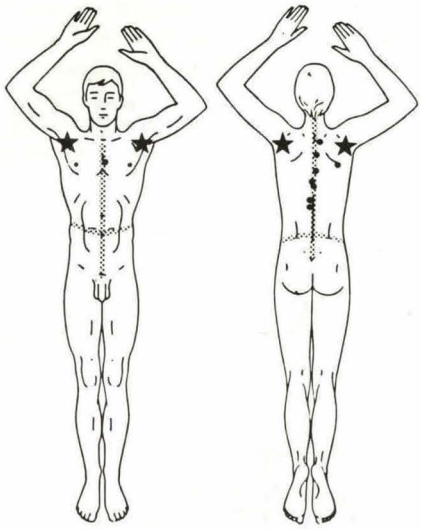

Fig. 2a Locations of truncal skin lesions (●) with lymphatic drainage to both axillary lymph node groups (★)
"lymphatic watersheds"

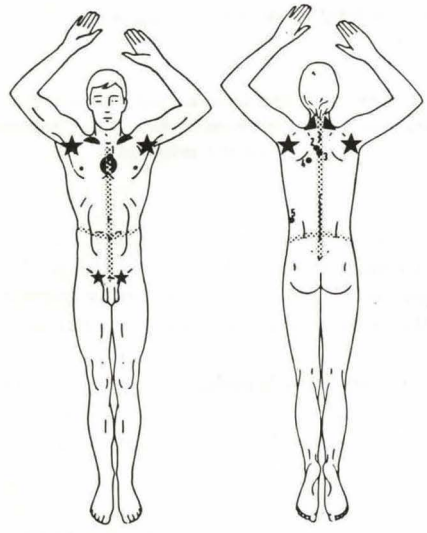

Fig. 2b Locations of truncal skin lesions (●) with lymphatic drainage to both axillary lymph node groups (★) in combination with inguinal (★), supraclavicular (◢ ◣), posterior cervical (◢ ◣), and parasternal (◖ ◗) node-bearing areas:

1 both axillary, parasternal
2 both axillary, left posterior cervical, left supraclavicular
3 both axillary, both posterior cervical
4 both axillary, right posterior cervical
5 both axillary, left inguinal

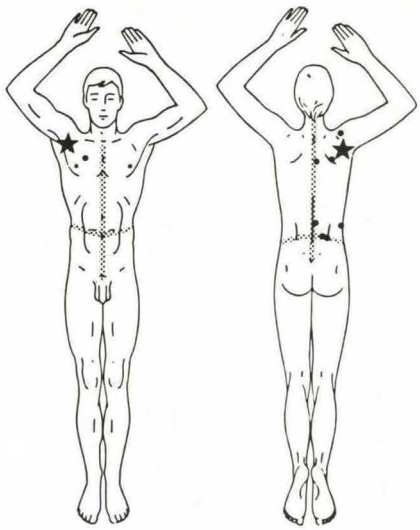

Fig. 3a Locations of truncal skin lesions (●) with lymphatic drainage only to right axillary lymph node group (★))

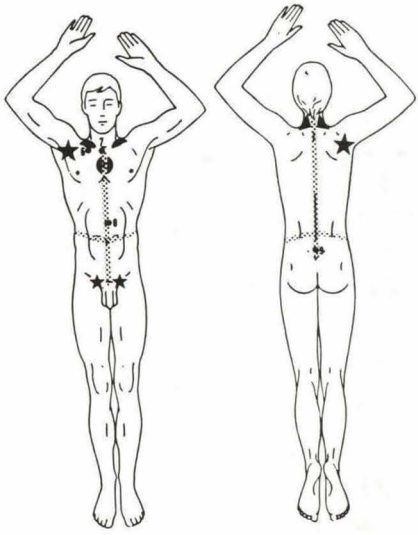

Fig. 3b Locations of truncal skin lesions with lymphatic drainage to right axillary lymph node group in combination with other node-bearing areas (concerning symbols see legend of Fig. 2b):

6 right axillary, right supraclavicular
7 right axillary, right supraclavicular
8 right axillary, both inguinal, parasternal
9 right axillary, both inguinal

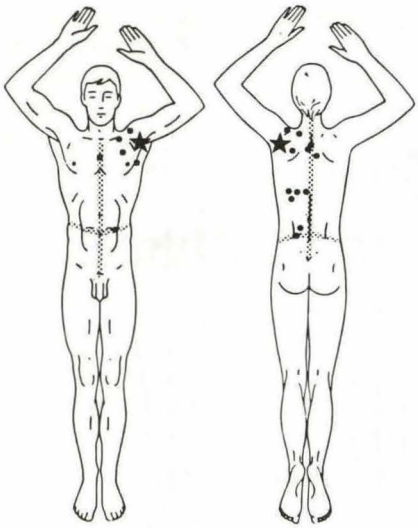

Fig. 4a Locations of truncal skin lesions (•) with lymphatic drainage only to left axillary lymph node group (*)

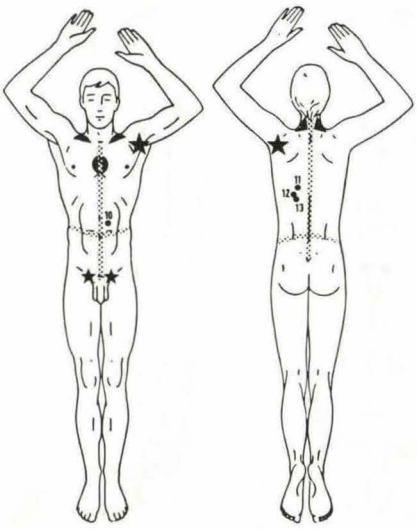

Fig. 4b Locations of truncal skin lesions with lymphatic drainage to left axillary lymph node group in combination with other node-bearing areas (concerning symbols see legend of Fig. 2b):
10 left axillary, both inguinal
11 left axillary, left posterior cervical
12 left axillary, right posterior cervical
13 left axillary, left posterior cervical

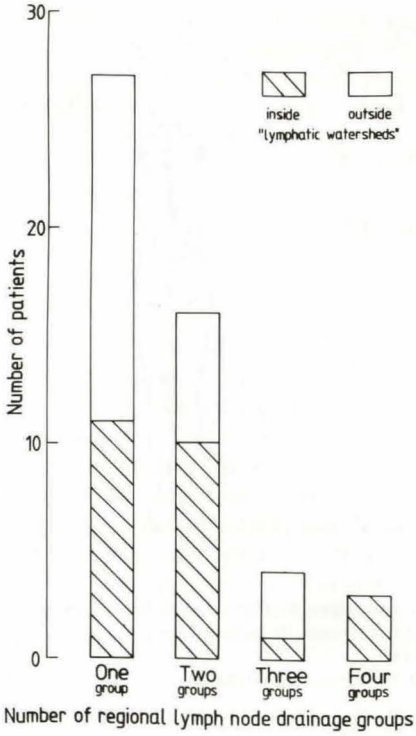

Fig. 5 Incidence of one or more regional lymph node drainage groups of truncal skin lesions located inside and outside "lymphatic watersheds"

watersheds", two resp. three regional lymph node drainage groups could be identified. Surprisingly, in 18 per cent of the study population, the lymph flow had crossed either one or two "lymphatic watersheds". In all of the three patients with lymphatic drainage to four regional lymph node groups, the skin lesion was located inside "lymphatic watersheds".

Discussion

Conventional anatomic guidelines for predicting the direction of lymph flow from the truncal skin are based on the thesis of "lymphatic watersheds" (2, 11, 12):

Lymph flow from a district inside "watershed areas" is expected to have a polyvalent direction, i.e. lymphatic drainage to more than one node-bearing area. Lymph vessels outside

"watersheds" surrounding ventral and dorsal midline of the trunk are said to drain to the ipsilateral lymph node groups. Below the "watershed" around Sappey's horizontal line, lymph vessels are reported to drain to the groins and above to the axillae.

The present lymphoscintigraphic data, however, clearly document that not only malignant melanomas resp. benign pigmented nevi situated inside, but also outside "lymphatic watersheds" of the truncal skin do have an ambiguous lymphatic drainage which is practically unpredictable by conventional anatomic guidelines in individual patients. Therefore, the anatomical thesis of "lymphatic watersheds" of the truncal skin should be revised.

Nevertheless, lymphatic drainage from the truncal skin is not purely fortuitous. In 96 per cent of our patients with skin lesions in various topographical positions on the trunk, axillary lymph node groups were found to be involved in lymphatic drainage. Even in skin lesions located below Sappey's horizontal "watershed", radiocolloid uptake could be revealed in one or both of the axillary node groups. Hence, we are forced to conclude that the axillary lymph node groups play the leading role in lymphatic drainage from the truncal skin in man.

Proper timing of the lymphoscintigraphic study proved to be of utmost importance (10). Since wide excision of the primary lesion leads to considerable manipulation of lymphatic drainage due to interruption of lymph vessels and opening of collaterals, lymphoscintigraphy should be performed after clinical suspicion resp. diagnosis of malignant melanoma or, at the latest, after simple excisional biopsy. It must be stressed, however, that lymphoscintigraphic data do not indicate nodal metastatic disease per se, but those drainage groups implying greatest risk for harboring occult metastases are clearly identified. Based on the lymphoscintigraphic data, elective regional lymph node dissection(s) can readily be performed.

Again, the axillary lymph node groups as the "center in lymphatic drainage from the truncal skin" should attract our greatest attention in case of primary malignant melanoma or other cutaneous tumors of the trunk independent of their topographical position.

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