Localizing the Sentinel Node in Cutaneous Melanoma: 
Gamma Probe Detection Versus Blue Dye

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Background: Sentinel node (SN) biopsy can be used to select patients with melanoma for therapeutic lymphadenectomy. We investigated the value of two methods to locate the SN: patent blue dye (PBD) and gamma probe detection of $^{99m}$Tc-nanocolloid.

Methods: One hundred ten patients with cutaneous melanoma were studied. Lymphoscintigraphy with $^{99m}$Tc-nanocolloid was performed to determine the position of the SN. Before operation, PBD was injected at the same site as the radiopharmaceutical. When a blue node was identified intraoperatively, its radioactivity level was measured with the probe. In the absence of blue coloration, the probe was used to trace the SN.

Results: Scintigrams visualized a total of 219 SNs in 141 basins. Eight SNs were not explored. One SN was not found. The remaining 210 and 27 additional intraoperatively identified SNs were excised. From the total of 237 removed SNs, 200 (84%) were found using PBD only. All 37 nodes that were not found with the PBD were localized with the probe so that the probe combined with PBD identified 99.5% of all SNs. In 23 patients the SN contained tumor. In three patients the SN was false-negative for metastasis.

Conclusion: The gamma probe together with PBD can identify more SNs (99.5%) than lymphatic mapping with PBD alone (84%).

Key Words: Melanoma—Sentinel node—Gamma detection probe—Patent blue dye.
ported by the lymphatic system and lodges in the SN, which can thus be visualized using a gamma camera. Intraoperatively, a gamma detection probe can be used to trace the lymph node. A second method is injecting patent blue dye (PBD) intradermally at the same site. Blue staining of lymphatic vessels enables recognition of the SN. The present study reports our experience with both these methods to localize SNs.

PATIENTS AND METHODS

Patients with clinically localized melanoma and a Breslow thickness of \( \geq 1 \) mm were entered. Excision had to have been performed \(<3\) months previously, preferably with a small (2 mm) margin. Informed consent was obtained from all patients, and the protocol of investigation was approved by the Ethics Committee of The Netherlands Cancer Institute.

Between December 1993 and October 1995, 110 patients were studied. The group consisted of 55 men and 55 women with a mean age of 47 years (range 16–77). The mean Breslow thickness in this group of patients was 2.7 mm (range 1.0–9.6, median 2.1). Ulceration was present in 31 cases.

The day before operation, all patients underwent lymphoscintigraphy to locate the SN. A dose of 60 MBq \(^{99m}\)Tc-nanocolloid (Solco Nuclear, Birsfelden, Switzerland) in a volume ranging from 0.2 to 0.5 ml was injected using a 27-gauge needle at 2 to 4 points intradermally around the biopsy wound or the melanoma when still present. Immediately afterward, dynamic images were obtained to visualize the lymphatic drainage. Dynamic acquisition continued for a minimum of 20 to a maximum of 45 min. Routine anterior and lateral static images of 5 min, using a dual-head gamma camera (ADAC Vertex, Milpitas, CA) were obtained (Fig. 1). These images were complemented with oblique views whenever there was a possibility that the site of injection obscured the SN. The position of the SN was then marked on the skin for the surgeon. A sufficient amount of radioactivity in the SN for detection with the gamma probe remained the following day.

On the following day, 0.5–1.0 ml PBD was injected intradermally at approximately the same points as the colloid, around the biopsy wound. Subsequently, the location of the SN was determined through the intact skin using the gamma probe (Neoprobe 1000, Columbus, OH) to help the surgeon choose a convenient site for the incision. A small incision was then made, and the subcutaneous tissue was explored in search of a blue-stained lymphatic channel. The channel was carefully dissected down to the blue-stained SN (Fig. 2). When no blue-stained node or vessel could be found, the node was traced with the probe in the wound. The excised SN was submitted for pathologic examination, consisting of paraffin hematoxylin-eosin sections and immunohistochemical staining with S-100 protein and HMB-45 antigen, preceded by frozen section microscopy in 46 patients. Only when micrometastases were present was a formal regional lymph node dissection performed.

The average follow-up for this group of patients was 13 months (range 3–25).

RESULTS

Lymphoscintigraphy showed drainage to 141 basins in the 110 patients. Drainage to one basin was observed in the majority of patients (\( n = 82 \)). Twenty-