Sentinel lymph node (SLN) identification and lymph node mapping is a well-known concept in human oncology. Each area in the body has a dedicated lymphatic drainage pathway, which can be associated with multiple lymph nodes organised in clusters (lymphatic basin). Veterinary clinical experience shows that the draining lymph node will not always be necessary the regional anatomic lymph node. The SLN is defined as the first lymph node to drain a specific body area. Consequently, if an area is affected by a tumour, and since tumour staging implies systematic nodal assessment, the SLN should be the first one to show metastases and therefore should be the lymph node to be assessed in priority. In human oncology, especially breast cancer and cutaneous melanoma, the specific identification and sampling of one lymph node within a lymphatic basin, for staging purpose, prevent potentially unnecessary extensive lymphadenectomy and its associated morbidity. Should the SLN being positive for tumoural spread however, further local radical lymphadenectomy might be recommended although clinical value of radical lymphadenectomy in these indication remains unclear.

Human standard of care for SLN identification is peritumoural injection of radioactive marker and subsequent scintigraphy. SLN identification in surgery is performed with a portable gamma camera in combination with vital dye injection as a direct visual help. Worley et al. reported the application of a similar protocol in a cohort of 19 dogs affected with mast cell tumours (MCT). Technetium was used for the scintigraphy and methylene blue (MB) was used for vital colouration. In this study, 42% of dogs diagnosed with nodal metastases were advised to received adjuvant therapy, which would have otherwise not been advised had SLN mapping not been performed. All but two of the “hot” extirpated lymph nodes had positive uptake of MB. Unfortunately, scintigraphy is not widely accessible in veterinary hospitals. Therefore, efforts were made to look for alternative solutions.

Indirect lymphography (IL) is defined as the deposit of a contrast medium in the periphery of lymphatic vessels in the view of being absorbed and drained by the lymphatic system. Imaging after contrast uptake (radiography, computed tomodensitometry (CT-IL), ultrasonography or MRI, subsequently allows the identification of contrast enhanced lymph nodes and lymphatic vessels. To date only 2 veterinary studies described the use of iodine based imagine studies for SLN identification in veterinary patients.

Lipiodol based SLN mapping. A lipid-based contrast medium: Lipiodol Ultra-Fluid TM (iodised ethyl-esters of the fatty acids of poppy seed oil, Guerbet, Aulnay-sous-bois, France; 480 mg iodine per ml) was used. Injection was performed with a 25G needle into the 4 quadrants encircling the tumour. A slow rate infiltration (2 to 4 ml, over 1 to 5 minutes) was used as described previously. The injection was done in the tissue from which the mass was originating from or directly within the mass if it was not to change further surgical approach (i.e. no modifications of the boundaries or risks of capsule damages): For example, if the mass was cutaneous the injection was intra-dermal, if it was affecting the oral cavity the injection was submucosal. Care was taken not to perform intravenous injection or inject within fluid-filled cavities.

R-IL (two orthogonal views) or CT-IL was performed 24 hours after IO injection. Methylene blue (Proveblue TM (methythionium choride, 5mg/mL, Proverpharm SAS-Cenerexi, Fontenay-sous-bois, France) was injected similarly to IO at the time of surgery, fifteen minutes before first surgical incision. Total volume of MB injected was between 0.5 and 1 ml. In animals weighing less than 10 kg, a diluted solution (1:1, in dextrose 5%) was used.

In a population of 30 dogs with various types of solid tumours, IL allowed successful identification of SLN in 29/30 (96.6%) of the studies. Positive agreement between IL and MB studies was observed in 84.6% of the cases.
In 20/25 (77.9%) of the tumours, the SLN was extirpated through a different surgical site than the primary tumour resection site. In this population, the SLN was positive for metastasis in 7 out of the 25 cases.

**Iohexol and iopamidol and CT for SLN mapping.**

Different contrast media have been used for R-IL or CT-IL: Iohexol and iopamidol has been successfully used in humans and animals but is associated with quick lymphatic uptake and clearance. This might make it more useable in association with CT. Interestingly two human trials reporting IL-CT with iohexol in association with MB study for breast cancer reported 99% identification of SLN when both methods are associated which match results using standard isotopic and colorimetric study. SLN mapping with iopamidol was performed in 17 patients affected with breast cancer. The author reported full agreement between IL-CT and surgical observation and concluded that this SLN mapping protocol has to be considered as a good alternative to scintigraphy.

The basis of the staging process is TNM, and to the best of the authors’ knowledge the most relevant node (N) to identify and analyse is the SLN. Indirect lymphangiography with peritumoural injection of iodised contrast is feasible and allows non-invasive identification of SLN with no significant adverse effects. It would allow decreased surgical footprint, improved tumoural staging and unnecessary lymphadenectomy.

**REFERENCES**


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