Journal of Medical Radiation Sciences

Open Access

EDITORIAL

# Rolling out radioguided occult lesion localisation for breast tumours

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*J Med Radiat Sci* **62** (2015) 1–2

doi: 10.1002/jmrs.94

There is a disconnection between the high-resolution displays in the medical imaging department and what the clinician can detect at the bedside. One example is the flood of impalpable tumours which can account for more than half of those detected by breast cancer screening programs: how to guide the surgeon to where the lesion is? One solution is the subject of the article by Landman et al.[1] in this issue of the journal.

There is more than one solution for guiding surgical excision of impalpable breast lesions. Intra-operative ultrasound would appear to be a ready fix – the surgeon merely brings the imaging suite into the operating suite. However, this necessitates extra planning and cost because it commits extra personnel and equipment. A more convenient solution is to inject a marker within or in the vicinity of the lesion. One kind of marker is a coloured dye such as methylene blue or carbon particles in suspension. Its disadvantages are that the surgeon still starts the dissection unsighted and there is a limited time before the dye disperses in the case of methylene blue. Another kind of marker is a needle wire. These wires have a distal anchor which is positioned within or near to the lesion of interest. The method provides easier localisation, decreases the operative time and enables excision of a small volume of tissue. It does have difficulties such as migration, kinking and fracture of the wire post insertion. Also up to 20–50% of wired guided excisions in published series are incomplete by virtue of contaminated margins. Nevertheless, this has become the preferred option in most centres and regarded as the gold standard procedure. A third alternative marker is a radioactive source. This arose from the experience breast surgeons gained in utilising radiocolloid lymphoscintigraphy and the intra-operative gamma probe to localise the sentinel lymph nodes. With his proficiency in the use of the gamma probe to localise nodes, one surgeon issued a challenge to his nuclear physician colleague to make the impalpable breast lesions a similar target. Thus, the technique of radiocolloid localisation was born.[2]

Radioguided occult lesion localisation (ROLL) is a simple but effective method of guiding the excision of clinically occult breast lesions with a minimum of adjacent normal tissue. Either mammography or ultrasound is used to guide injection of a small volume of radiolabelled colloid into the centre of the lesion. In the operating theatre, this focus of radioactivity is detected by a handheld pencil gamma probe which converts the intensity of the gamma emission to a sound and visual scale. The surgeon can use this to guide the skin incision at a point directly over and closest to the lesion. As the dissection proceeds, the probe can be used as often as desired by the operator for guidance towards the lesion and to centre it within the excised specimen. Finally, the probe can confirm complete excision by detecting low residual radioactivity in the cavity. The gamma radiation dose to the patient and the operators is very low and well within safe nuclear regulatory limits. This method has been rolled out in many centres using wire localisation as a control.

In most studies to date, ROLL compares favourably against wire localisation. The interventional radiologists have reported that ROLL is easier than inserting a needle wire. The surgeons have reported that it is easier to use the gamma probe to guide the dissection and centralise the lesion: resulting in shorter operating times, smaller excision volumes, higher rates of tumour-free margins and lower rates of re-operation. The patients have reported less discomfort with ROLL than wire localisation, and a better cosmetic result. A systematic review[3] that summarised 27 studies and a meta-analysis[4] that accepted only four of these studies, set out with the main objective of testing the rate of contaminated or inadequate margins when biopsy was guided by ROLL versus wire localisation. Both concluded that ROLL did result in lower positive margin rates and fewer repeat

operations. The other favourable outcomes listed earlier were reported by some but not all the studies. However, a multicentre randomised controlled trial published after these reviews found that both techniques had no significant difference in positive margin rates, and that ROLL resulted in a higher excision volume.[5] Given the small number of well-designed trials and the conflicting results, it may not be possible to state that ROLL can replace wire localisation as the gold standard. For now it falls on individual centres to assess whether to introduce ROLL and to do so ideally in an audited comparison to their current method of localisation, as Landman et al.[1] have done. I draw attention to the exemplary care they took in establishing procedural protocols to ensure accuracy of lesion localisation, including a backup plan in the event of failure of the new technique.

One advantage of ROLL that is not shared by wire localisation is the potential to localise the sentinel nodes (SN) from one radiotracer injection. The acronym SNOLL was conferred on SN and occult lesion localisation in the one operative session. The original protocol, as used by Landman et al.,[1] was to give separate injections of two different radiocolloids. $^{99m}$Technetium labelled macro-aggregates of human serum albumin (MAA), with large particles that should undergo minimal lymphatic transit, was given by intra-lesional injection. A second radiocolloid with optimal particle size for lymphoscintigraphy – such as $^{99m}$Technetium labelled nanocolloid, sulphur colloid or antimony sulphide colloid – was injected separately either in the peri-areolar breast or in the sub-dermis radially superficial to the lesion. It was not long before a number of centres published their experience of only administering intra-lesional or peri-lesional injections of the smaller radiocolloid for the dual purposes of SNOLL. This modified SNOLL method works because the majority (94–99%) of the injected radiocolloid does not undergo significant lymphatic transit or diffusion: enough remains for subsequent intra-operative probe localisation of the injected site. The minority fraction of radiocolloid migrates through the lymphatic vessels towards the regional lymph node basin – which is the scintigraphic method of tracing the first lymph node in the node basin which will be affected by tumoural metastasis, i.e. the SN. It is gratifying that SN mapping is feasible from the injections given for radiocolloid localisation of the breast tumour alone. This is because many practitioners, including me, believe that accurate breast SN lymphoscintigraphy should begin with intra-lesional or peri-lesional radiotracer injections. We doubt that the sub-dermis or areola will always share the same lymphatic drainage of a primary tumour which is some distance away. This is supported by newer insights into breast lymphatic anatomy, the fact that peri-areolar injected studies map significantly fewer extra-axillary SN, and most compellingly that the axillary SN mapped from peri-areolar injections are often different to those mapped from peri-lesional injections in the same individual.[6]

In conclusion, ROLL is a simple and effective solution for guiding the excision of impalpable breast lesions. It builds on the experience that surgeons already have with lymphoscintigraphic and gamma probe localisation of SN. Therefore, the radiotracers and equipment are already present in the same centres that provide a breast cancer service. Landman et al.[1] provide guidance on how to introduce this new procedure methodically and safely.

## Conflict of Interest

The author declares no conflict of interest.

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