NUCLEAR MEDICINE AND
THE WOMAN WITH
BREAST CANCER
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What does nuclear medicine offer the woman with breast cancer? The answer depends on answering the question 'what is nuclear medicine?' Nuclear medicine is the technique in which a radioactive isotope is used to follow the process of a disease or its consequences. It differs from ultrasound or mammography in that it is primarily concerned with function not structure. This means that it may be of use on those occasions where traditional imaging techniques are not ideal.

DIAGNOSIS OF BREAST CANCER
Whilst mammography and ultrasound are widely used in the diagnosis of breast cancer, a small proportion of patients will have problems with these techniques due for example, to increased breast density. In these situations a nuclear medicine technique called scintimammography has been used with success. It has been shown that by using this technique which involves the injection of a tiny amount of a radioactive tracer such as Tc-99m MIBI or Tc-99m tetrofosmin, an additional 20% of breast cancers will be found which would have been missed using traditional imaging techniques in those women with dense breasts. This technique is now widely practised throughout the UK and many other European countries.

A new method to help obtain a diagnostic biopsy from a suspected cancer, is the technique of radionuclide lesion localisation (ROLL). In this technique a tiny injection of a radiotracer called Tc-99m MAA is placed at the tumour site using ultrasound. This is then localised during the operation with the surgeon using a probe, which looks a bit like a ball point pen and which can be used to find the lesion and aid removal.

STAGING OF BREAST CANCER
This is the area in which nuclear medicine has been traditionally used in the care of the women with breast cancer; many women will have undergone a bone scan as part of the initial assessment of their breast cancer. This is a simple way in which the bones throughout the body can be checked for any tumour involvement. A second technique is the method of using nuclear medicine techniques to look at the flow of lymph from the breast into the first lymph node (the so-called sentinel node). The woman is studied just before going to the operating theatre. A small injection of a radioactive colloid is given just under the skin over the suspect cancer. Imaging is performed over 30 minutes to 2 hours and as activity accumulates in a lymph node the sentinel lymph node is marked. At operation, the surgeon uses the same probe as used by ROLL to find and remove the lymph node. This technique is useful in women with smaller cancers in whom lymph node involvement is not normally expected. If this technique is used properly, it may be possible to avoid removing further lymph nodes, so reducing the possibility of lymphoedema. There is also a newer technique using a special type of nuclear medicine called positron emission tomography (PET). Whilst it is clear that PET can find areas of tumour metastases not seen by other techniques, what is not clear is how this will help in deciding which is the best treatment for the patient. Also access in the UK is limited to London, Manchester and Aberdeen but, as expected, access to PET is easier in most other European countries.

RESTAGING AND RECURRENCE
Unfortunately sometimes cancer can re-appear after what was thought to be successful treatment. This can occur many years after the initial treatment. If the woman has had a breast conserving operation, less than 5% may suffer some recurrence in that breast. If scintimammography is used in addition to mammography and ultrasound examination, over 90% of these recurrences will be found, compared to 50% if scintimammography is not done. PET is less useful in finding recurrence in the breast but may be
the best way to find if there is any spread beyond the breast. Again, access to its use is limited in the UK.

TREATMENT
Whilst nuclear medicine is normally concerned with diagnosis, it may be possible to change the isotope used to one which can kill tumour cells instead of just looking at the tumour. So far, only one such agent has been developed and that is used not to kill the tumour but to reduce pain in the bones which are resistant to treatment using other techniques. Two such products are in use, called Metastron and Quadramet, both of which seem to help reduce pain in about 30% of patients and markedly reduce pain in a further 30%. Unfortunately both of these treatments are very expensive and this is limiting their use. Many companies are developing techniques which may help attack the tumour itself. Unfortunately, however, the first such product called Octreother proved not to be very effective but this has not stopped alternative products being explored.

CONCLUSION
Over the past 10 years nuclear medicine techniques have been used in everything from diagnosis to treatment in people with breast cancer. Over the next 10 years the main developments will be in PET and in new agents to treat breast cancer. Therefore the nuclear medicine department will become more important in the care of the women with breast cancer.