overtreating patients with no reasonable chance of long term benefit.

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Indium-111 leucocyte scanning—underused?

Indium-111 leucocyte scanning is an accurate method of diagnosing focal sepsis, and is used to localise and measure the activity of disease in some inflammatory conditions. It is, however, less widely used than other nuclear medicine investigations, and some departments do not perform it at all. What is the clinical role of the test, and where should it be available?

Labelling leucocytes means separating them from other blood cells and incubating them with an ^{111}In complex, usually oxine or tropolone. The labelled cells are then reinjected and the patient scanned. Donor cells can be used in neutropenic patients.[1 2] Because patients do not need preparation and contrast media are unnecessary the test is particularly useful postoperatively or in severely ill patients. Some abscesses may be identified 30 minutes after reinjecting labelled cells, although the maximum sensitivity of detection is not reached for 24 hours.[3] Cells are taken up by the reticuloendothelial system in the liver, spleen, and bone marrow, and additional radiopharmaceuticals may be needed to detect sepsis in these organs.[4 5] The fact that the bowel and kidneys do not take up the labelled cells is an important advantage in investigating intra-abdominal disease. All areas of the body can be examined, and often unsuspected extra-abdominal foci of infection are identified.[6] Studies have shown sensitivity and specificity of 84-95% for soft tissue infection[3 6 7]; false positive scans occur particularly with haematomas or coexisting inflammatory disease, and false negatives with chronic sepsis.[8] New insights have also been gained: serial imaging has shown that intra-abdominal abscesses often communicate with the bowel.[9] This was not appreciated previously since the site of the communication is often not apparent even when open surgical drainage is performed.

Ultrasound scanning and computed tomography are also used to localise abdominal sepsis. Few clinical trials have compared these techniques.[7 10] All the techniques have limitations, and sometimes more than one will be needed. When clinical localising signs are present or when results are needed urgently then ultrasound scanning or computed tomography is likely to be the first investigation, the choice depending on the localising site. ^{111}In labelled leucocyte scanning will be needed in some cases, particularly when it is not clear if a fluid collection is purulent or immediately after operation when ultrasound scanning and computed tomography may be technically difficult. Centres without computed tomography will rely heavily on leucocyte scanning as the first investigation. When there are no localising signs leucocyte scanning should be the first investigation[6 9 10]; ultrasound scanning or computed tomography may occasionally be needed as well either because the result of the leucocyte scan is equivocal or to help plan drainage. Abscesses with enteric drainage have fewer localising signs and an appreciably lower detection rate by ultrasound scanning.[9]

Labelled leucocyte scanning is also valuable for identifying acute osteomyelitis unless the infection is in the spine—the reason for the lower sensitivity at this site is unknown.[11 12] The test is less sensitive for chronic bone infection (probably because of its characteristically poor granulocyte infiltration) and is less sensitive but more specific than gallium-67 citrate scanning for identifying infection around prosthetic hips.[13]

Increasing attention has been paid recently to using leucocyte scanning for other inflammatory conditions.[14] In inflammatory bowel disease areas of abnormal bowel can be localised and the response to treatment monitored.[15-17] Counting faecal ^{111}In activity is the most precise method for measuring disease activity, particularly if pure granulocyte preparations are labelled. The results of scanning in acute pancreatitis correlate well with other measures of disease activity and accurately predict outcome.[18] The exact role of the technique in these inflammatory conditions is still being defined but is likely to be for monitoring the progression of the disease and the response to treatment rather than for making a diagnosis.

There are two main reasons why ^{111}In leucocyte scanning is less widely available than other nuclear medicine investigations. Firstly labelling leucocytes with ^{111}In is more complicated and time consuming than preparing other radiopharmaceuticals, taking up to two hours a patient. Skill in labelling cells can, however, be readily acquired by staff trained in preparing radiopharmaceuticals even when only modest facilities are available,[19 20] and newer kit preparations may further simplify the procedure.[21] The £60 cost of the

materials is not prohibitive, but the time needed for cell labelling may restrict the technique's use. The second reason that the technique is not more widely used is that, while gammacameras are now installed in most health districts, some departments do not possess radiopharmacy facilities and have to obtain radiopharmaceuticals daily from larger centres. This means that patients needing ^{111}In labelled leucocyte scanning have to travel to the centre for cell labelling, and many are too ill to be moved.

Several developments could ease these difficulties. A preliminary report suggests that blood may be transferred to and from radiopharmacies without damaging cell function,[22] and methods of in vivo cell labelling are being investigated,[23] as are non-cellular carriers such as prophyrins[24] and sucralfate.[25] More extensive use of donor cells may be possible, and a method of labelling leucocytes with technetium-99m has been described,[26] although others have reported a high false negative rate with the technique.[27]

These new procedures need to be developed and fully evaluated. Until then the ability of ^{111}In labelled leucocyte scanning to localise sepsis and its increasing use in gastroenterological practice should encourage all departments with radiopharmacies to include this investigation among their routine procedures.

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Where should low birthweight babies be born?

Neonatal referral services have contributed greatly to improving survival in low birthweight infants. A logical extension of these services seemed to be in utero or antenatal referral of mothers and fetuses thought to be at risk of neonatal problems to a hospital with intensive care facilities. Unfortunately, however, obstetricians are poor at predicting such a need. As a result some referral centres have become overloaded with patients, many of whom would have been better managed at the referring hospital.

Referral centres have sought to justify in utero transfer, or to stem the increasing tide of patients, by comparing outcome in infants transferred antenatally, in those transferred postnatally, and in those booked into and born at the centre (p 981).[1-3] Such comparisons are bound to be of limited value as these three groups are selected quite differently and comprise infants and fetuses of differing gestations and with differing problems. Attempts to correct for these differences lead to such small subgroups that conclusions cannot be confident. A randomised controlled trial of in utero against postnatal referral would provide an answer, but such a trial would probably be impossible in the current climate of public and professional opinion.

Are we, however, asking the right question? Low birthweight babies arise from geographically defined populations, and any estimate of the effect of referral must include data on those cared for at the original hospital. When such data were examined for a British health region in 1980 for very low birthweight infants the combined survival of those transferred in utero and postnatally and those born in hospitals other than the regional centre did not differ significantly from that of those booked into and born in the regional centre.[4] A cynic could interpret this as evidence that the referral system achieves nothing, but it probably means that because of referral very low birthweight infants booked into district hospitals have a similar chance of survival to those booking into a regional centre.

The important question is not whether in utero or postnatal transfer is better, but rather which is the best balance of the two? Furthermore, how many babies will need transfer? Improvements may come from more precise prediction of neonatal difficulties or preterm labour, but are more likely to arise from more senior doctors deciding when to transfer.

Obstetricians in regional centres often do not like in utero transfer because regional funding might meet the extra costs of looking after the neonate but does not meet those of looking after the mother, who may also be critically ill.

Physiological stability in the first hours of life is critical if