10 CLINICAL APPLICATIONS OF 111-In-LABELLED GRANULOCYTES

D.A. GOODWIN, I.R. McDOUGALL, C. CHILES, J.H. PALDI, D. KRIEVES AND M. GAINLEY

10.1 INTRODUCTION

Since its introduction six years ago (1,2), the clinical use of 111-In labelled white cells for the detection and localization of inflammatory disease has greatly increased. In the last three years, reports from several centres have confirmed its diagnostic value (3,4,5,6). The growing interest in imaging of labelled white blood cells is due in part to the increasing availability of 111-In-oxinate and the ease of its use. Some commercial sources now have the capacity to carry out the entire white cell labelling procedure (Pharmatopes, Inc., 2944 Corvin Drive, Santa Clara, CA 95051). Nevertheless, white cell labelling with 111-In-oxinate is a relatively easy technique similar in complexity to the red cell labelling with 51-Cr needed for the determination of mass and halflife which is routinely performed in most Nuclear Medicine laboratories. Normally, autologous white cells are used and it has been shown conclusively that the 111-In labelled white cells retain their viability and chemotactic properties, and concentrate specifically in areas of inflammation and abscess following reinjection (7,8,9).

While 111-In or 67-Ga injected as the citrate or chloride will accumulate in abscesses, probably due to an increased permeability of the capillaries, the concentrations reached are not as high as with 111-In labelled white cells (10) and, more importantly, the uptake is totally non-specific. It has now been well documented in the literature that these 67-Ga and 111-In radiopharmaceuticals concentrate in various normal organs such as the colon as well as in a large variety of tumours (11). Since 111-In white cells do not normally accumulate in the gut, the examination is usually completed in 24 hours, avoiding the two or
three day delay often necessary with 67-Ga-citrate.

This communication reports the results of 111-In white cell imaging in 542 patients referred over the past 5 years for investigation of acute inflammatory disease.

10.2 MATERIALS AND METHODS

The patients were selected from a total of 1138 patients (on whom 1310 scans were performed) because confirmation of the presence or absence of inflammatory disease or abscess was available either from surgery, post mortem, X-ray or the clinical course. The final study group was comprised of 542 patients on whom this follow-up information was available. Repeat white cell scans were performed on approximately 15% of the patients and were usually done to assess the treatment of a patient with a positive scan. These were counted only once, and classified as "true positive".

Autologous leucocytes were labelled with 111-In oxinate using a modification of the method of Thakur (4,6). The patients ranged in age from 1 to 88 years (mean 51), and 138 (25%) were female, the rest male. The main clinical groups investigated were suspected abscess, suspected osteomyelitis, inflammatory gastrointestinal or renal disease, and patients with an elevated white count and fever of unknown origin, especially in para- or quadriplegics in whom localizing symptoms were frequently absent.

Whole body scans were made using a Searle "Pho-Con" tomographic scanner, or an Ohio Nuclear large-field-of-view scintillation camera with a moving table 18-24 hours after the intravenous injection of 0.5-1.0 mCi 111-In labelled white cells. Cell labelling took approximately 2 hours (1 hour of which does not require technician time) and the whole body scans took 50 minutes (anterior and posterior). Spot views were made of suspicious areas seen in the whole body scan as well as of symptomatic areas: these took 5-10 minutes each. The patients spent an average of 1 1/2 to 2 1/2 hours in the Nuclear Medicine Service on the day of the study.