

PRELIMINARY REPORT ON PLACENTAL SCANNING BY THE USE OF HUMAN SERUM ALBUMIN LABELLED WITH ^{99m}Tc

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Placental localization by isotopic methods has become an accepted and widely used method in present-day obstetrics. It has a high degree of accuracy while the dose of ionizing radiation received by the mother and the foetus is minimal. Materials in common use have been ^{131}I -labelled human serum albumin, ^{51}Cr -labelled red cells or ^{51}Cr -labelled human serum albumin.

The disadvantage of these materials is that the dose that can be administered without exposing the mother and foetus to unnecessary radiation is so small that it is not possible to obtain a visual record of the placenta by a scanning technique. The localization has to be done either by counting the radiation over several areas on the abdomen and expressing the counts as a percentage of the sternal count, or by the use of a twin channel analyser and producing a graphic record.

By using ^{99m}Tc as the labelling agent, a sufficiently large dose can be given to visualize the placenta by a scanning procedure. The scan outlines the ^{99m}Tc -albumin in the large venous sinusoids of the placenta. The method for labelling albumin was developed by Howard Stern and associates¹ and the use of the material in placental scanning was first reported by McAfee *et al.*² Using ^{99m}Tc , several cases of placental localization by the scanning technique have now been performed at the Medical Physics Department at Addington Hospital.

^{99m}Tc pertechnetate (TCO_4^-) is reduced to ^{99m}Tc pertechnetate (TCO_3^-) by reaction with ascorbic acid, in the presence of ferric chloride. The mixture is reacted with the albumin solution for 3 minutes. Free pertechnetate is removed by the use of a resin column. Through the use of paper chromatography the percentage pre- and post-column albumin-bound ^{99m}Tc can be assessed. According

to published reports 93-98% of the solution should be bound, but the figure obtained by us was 80-90%. Some difficulty was also experienced in removing the free ^{99m}Tc . A residual activity of 5-6% was found, whereas other authors achieved an almost 100% removal. This problem is being investigated. The labelled solution was sterilized by the micropore filtration method.

METHOD

The material used was freshly prepared before each scan. 200 mg. of potassium perchlorate dissolved in water is given orally on the evening before the procedure, in order to block the maternal and foetal thyroid.

One mc. of the ^{99m}Tc -labelled albumin is administered intravenously, and the scanning is started immediately. The apparatus used is a 5 in. Magnascanner with colour printing and photodot recording.

The patient is scanned in the supine position starting over the symphysis pubis, since quantities of free isotope accumulating in the bladder within a short period after injection, may produce a false impression of placenta praevia. The amount of radiation received by the mother and foetus compares favourably with other agents used (Table I).^{2,3}

It is interesting to note that the foetal dose from a single AP radiograph of the abdomen is of the order of 200-300 mrad.^{4,5}

TABLE I. AMOUNT OF RADIATION RECEIVED

	$^{131}\text{I-HSA}$	$^{51}\text{Cr-HSA}$	$^{99m}\text{Tc-HSA}$
Mother			
Whole body	15-17 mrad.	12 mrad.	13 mrad.
Blood	73-87 mrad.		43 mrad.
Foetus			
Whole body	5-6.5 mrad.	8 mrad.	14 mrad.

Case Reports

Case 1. Patient presented at 34 weeks gestation with antepartum haemorrhage. Scanning (Fig. 1) revealed a normal placenta position in the upper pole.

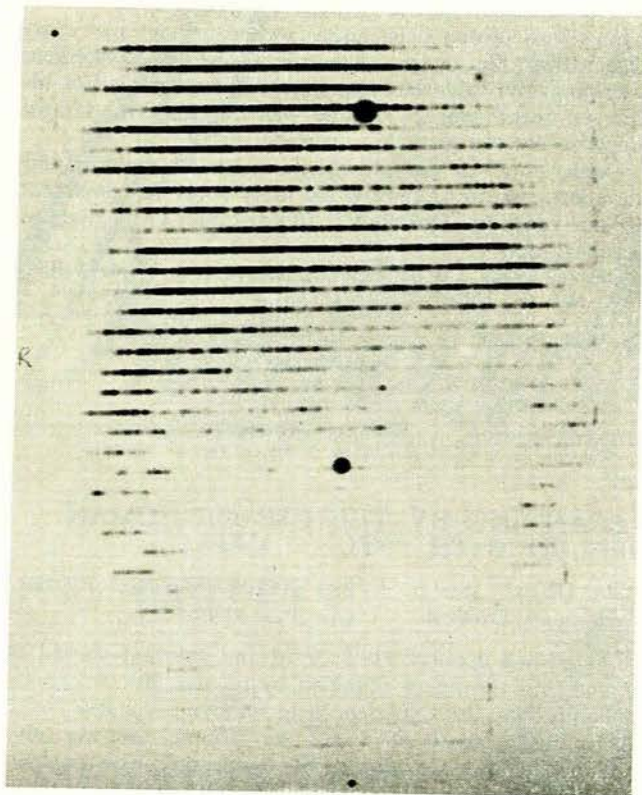


Fig. 1. See text.

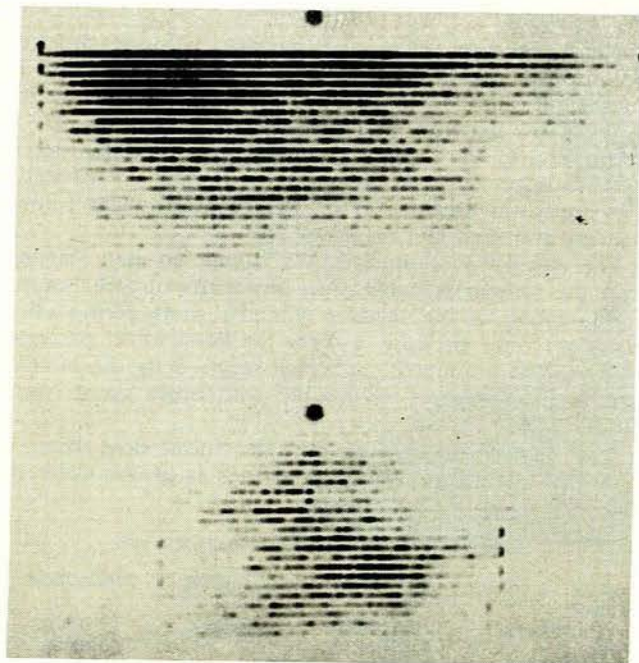


Fig. 2. See text.

Case 2. Patient 38 weeks pregnant presented with a persistent transverse lie. Sixteen months previously she had had a laparotomy with a unilateral salpingo-oophorectomy. Scanning (Fig. 2) showed markedly increased uptake in the lower segment, and to a lesser extent in the upper pole. Placenta praevia was diagnosed.

At caesarean section the placenta was found in the upper pole. At the lower segment, however, the uterine vessels were so dilated that a classical section was found to be necessary. The dilatation was probably caused by the complete removal of the vessels on the one side at the previous operation. The accumulation of isotope in these vessels led to the erroneous diagnosis of placenta praevia.

Case 3. This patient presented with antepartum haemorrhage at 32 weeks gestation. On scanning, a low-lying placenta on the left was demonstrated (Fig. 3). The position was confirmed at caesarean section.

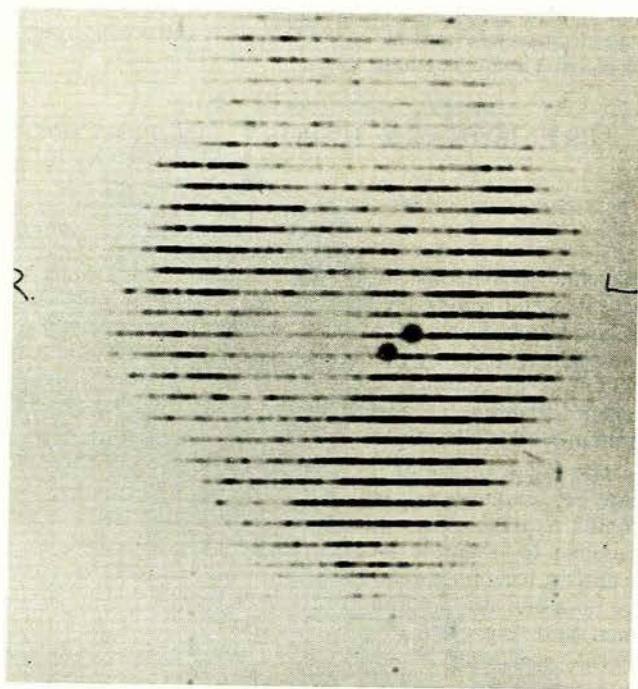


Fig. 3. See text.

SUMMARY

A preliminary report is given of placental scanning with ^{99m}Tc -labelled human serum albumin. The difficulties in labelling and some of the pitfalls in the diagnostic procedure are mentioned.

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