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Placental Scanning with Iodine-131[1]

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Point count radioisotopic localization of the placenta is a well established procedure (1-3). Image visualization of the placenta by isotopic scanning could present a better impression of the placental blood pool, would eliminate the need of repositioning the probe several times (9-21 positions), and could possibly be performed in a shorter time.

In order to keep radiation dose to the fetus low, most investigators have used 3-5 μC of ^{131}I for placental study. When this small amount of radioactivity is used with focused scanning collimators, low count rates are obtained. We have used a modified 19 hole collimator and obtained rates of 400-500 counts per minute from 5 μC of iodine-131. This precludes satisfactory scans with the commonly available three-inch commercial scanners.

The problem of sufficient count rate was recently solved by McAfee, *et al* (4) who used technetium-99m labeled to human serum albumin. Scans were performed with an eight inch sodium iodide crystal and a 199 hole collimator. The definition of the placenta was excellent.

Although there are many advantages to the use of technetium as described by McAfee, several limitations are present which restrict its use in small nuclear medicine laboratories. Special facilities for the preparation of technetium-labelled-albumin are necessary. The preparation is time consuming, and requires sterility and pyrogen control if intravenous administration is used. An eight-inch crystal detector adds to the cost of the procedure and is unavailable to most clinical laboratories.

Scanning with a focused collimator results in fine resolution, enabling one to resolve small defects. However, this is not necessary in placental scanning.

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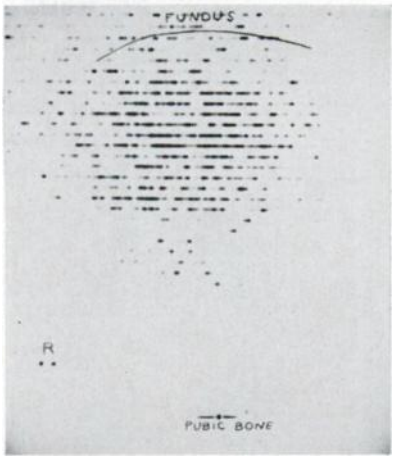

Fig. 1. Placental scan performed with 5 μC ^{131}I (RISA) demonstrates placenta in fundus of uterus.

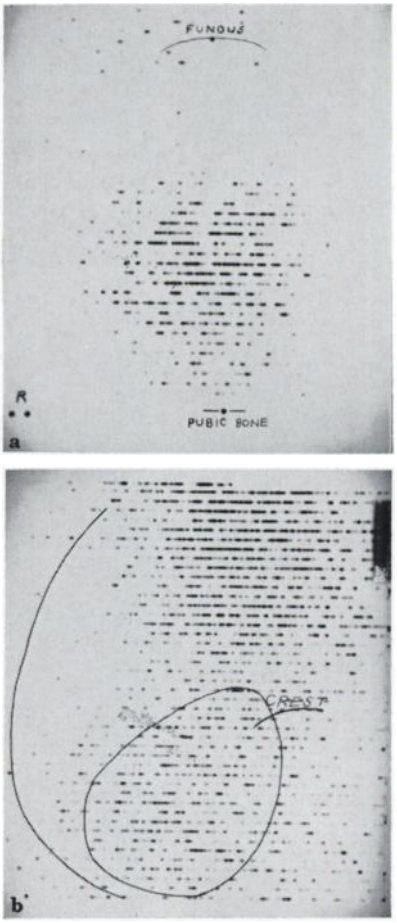

Fig. 2. (A) Placental scan in supine position demonstrates placenta in low lying position. (B) Lateral view shows placenta posteriorly. This is a proven placenta previa.

The purpose of placental localization is a gross determination of the location of the placenta. This can be accomplished with a flat field open collimator traveling relatively fast. In effect, the point count localization method is converted to a probe moved regularly, producing a visual distribution of the radiation rather than a series of numbers. The result is gross visualization of the placental blood pool which affords reasonably easy and accurate interpretation.

A ⅜-inch thick stainless steel open flat field collimator having an internal diameter of 3¼ inches and a length of two inches[1] was adapted to the usual three inch crystal detector. With this collimator count rates of 1500 to 2500 per minute are obtained from 5 μC of iodine-131. Using this equipment and dosage, satisfactory scans were obtained which can readily be interpreted. Although the scans do not show the definition that one would desire, the technique does permit gross visualization of the placenta (Figs. 1,2,3).

Other scanning technical factors used are: scanning speed of 50-60 cm/min, spacing of one centimeter, count per minute range differential of 20-30%, density of 100 microseconds, and window setting of 330-390 keV for iodine-131. The scan can be completed in about 20 minutes.

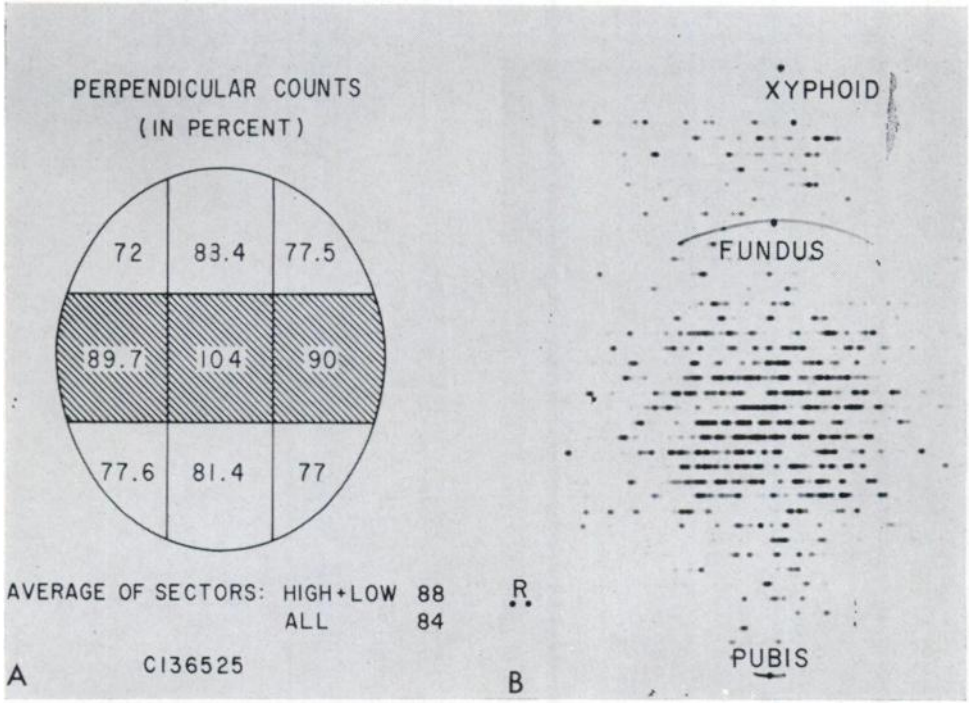

Fig. 3. This patient had a cesarean section because of erythroblastosis. (A) Point count localization indicates the placenta in mid abdomen. (B) Scan depicts placenta mostly in mid abdomen with slight extension into pubic area. This was not considered a placenta previa. At surgery the placenta location agreed with the location on the scan.

[1]Supplied by Picker Nuclear Corporation, White Plains, New York.

Nearly 100 placental scans have been done by the above method. Seventy of the scans were analyzed with respect to point count localization. The results of these studies are to be reported separately in greater detail. However, it may be stated that when the scans were analyzed against the usual point count localization method there was 93.2% good or better correlation.

Both isotopic point count localization and isotopic placental scanning are preferable to x-ray placentography. The placental scan is the more acceptable because of its ease, no calculations, and the presentation of the visual image. With proper collimation the scan can be satisfactorily performed in many departments which have popular, currently available equipment using commercially available iodine isotope preparations.

REFERENCES

1. Browne, J. C. M., and Veall, N.: A Method of Locating the Placenta in the Intact Human Uterus by Means of Radioactive Sodium. *J. Obst. and Gynec. Brit. Emp.* **57**:566-568, 1950.

2. Weinberg, A. Shapiro, G. and Bruhn, D. F.: Isotopic Placentography. An evaluation of its Accuracy and Safety. *Am. J. Obst. and Gynec.* **87**:203-209, 1963.

3. Croll, Millard N., Shuman, Larry H., Stanton, Leonard, and Czarnecki, Casmir: Radioisotope Placentography: A Bedside Procedure. *J. Nuclear Med.*, **4**:417-425, 1963.

4. McAfee, J. G., Stern, A. S., Fueger, G. F., Baggish, M. S., Holgman, G. B. and Zolle, I.: ^{99m}Tc Labeled Serum Albumin for Scintillation Scanning of the Placenta. *J. Nuclear Med.* **5**:936-946, 1964.

CORRECTION NOTICE

Part of Table II* on page 26 of the January, 1966, issue of the Journal should be corrected as indicated:

Mercury–197	X, $K\alpha$	68.2	57.	94.	0.18	
	X, $K\beta$	78.8	18.			
	γ	77.3	20.		0.13	
	γ	191.	<0–1		——	0.31
Mercury–203	γ	279.	81.5		1.16	
	X, $K\alpha$	72.2	9.1	12.7	0.04	
	X, $K\beta$	82.4	3.6			1.20

*Edward M. Smith, C. Craig Harris, Robert H. Rohrer: "Calculation of Local Energy Deposition Due to Electron Capture and Internal Conversion."