

PLACENTAL SCANNING USING ^{99m}Tc -ALBUMIN AND IONIC ^{113m}In

Jan Urbanek and Miroslav Graf

Charles University, Prague, Czechoslovakia

The diagnostic use of radionuclides in pregnancy is justified by the suitability of the examination. It is believed that the indications for placentography and its results outweigh the potential dangers to both mother and fetus. Localization of the placenta by short-lived nuclides in the third trimester of pregnancy corresponds fully to this point of view.

METHODS

The ^{99m}Tc -pertechnetate was eluted from a ^{99}Mo - ^{99m}Tc generator. Human serum albumin labeled with ^{99m}Tc was prepared by the method described by Stern and modified by Charamza (1). The final product was tested periodically for sterility and pyrogenicity. Three days before the intravenous injection of 400–700 μCi ^{99m}Tc -labeled human serum albumin, Lugol's solution was administered orally in doses recommended as a precaution against accumulation (2) and possible metabolism (3,4) of free ^{99m}Tc by the maternal and fetal thyroid.

Indium-113m was eluted from a ^{113}Sn - ^{113m}In generator. The pH of the eluate was adjusted by 0.5 N NaOH to be close to 4.0 but not to exceed it. At present, raw eluate is being used. The metabolic behavior of ^{113m}In at pH about 4.0 following intravenous injection is known; there is very little transplacental passage (5–7). One thousand microcuries of ^{113m}In was administered intravenously to the mother. Dosimetric control of the administered amount was carried out with the Mediac dose calibrator.

EXAMINATION TECHNIQUE

The Pho/Gamma III scinticamera was used with a collimator chosen to be appropriate for the radionuclide. Point sources of ^{99m}Tc or ^{113m}In were taped over the superior part of the symphysis pubis and the umbilicus. About 4,000 counts were accumulated with the scinticamera. The radionuclide markers were then removed, and additional counts to 70,000 were accumulated with simultaneous registration on the 1,600-channel analyzer. The frontal view was followed by a lateral scintiphoto. In six cases of

difficult interpretation the examination was completed by conventional placentography.

RESULTS

Placentography by both methods was performed in 150 patients.

In the group of 97 women with bleeding, we diagnosed placenta previa 17 times, including placenta previa centralis twice. The rest were placenta previa partialis. In these cases the pregnancy was terminated by Caesarean section and the diagnosis verified. In four cases we were unable to differentiate conclusively between low lying placenta and placenta previa partialis. These women were delivered spontaneously without bleeding, and the placentas were found to be low lying. In 63 cases the interpretation was verified by palpation or during the Caesarean section for another indication (e.g. abruptio placentae). In the remaining 13 cases the location of the placenta was not directly verified, but there was no bleeding at delivery.

In the group with abnormal lie, all 11 women were delivered vaginally, and the diagnosis was verified by palpation.

In 27 patients, placental scanning was done before transabdominal amniocentesis. The outcome was always successful, i.e., the needle did not penetrate the placenta.

The last group includes 15 patients with a history of prior hysterotomy or in whom a uterine anomaly was suspected. The location of the placenta in these cases was verified by Caesarean section or by palpation.

DISCUSSION

Since all the verified scintigraphic diagnoses of placenta previa were correct, the evaluation of the

Received Feb. 8, 1971; revision accepted June 22, 1971.

For reprints contact: Jan Urbanek, Institute of Biophysics and Nuclear Medicine, Charles University, Salmovska 3, Prague 2, Czechoslovakia.

possible pitfalls in radionuclide localization of the placenta is difficult. In our opinion the only indirect criterion of correct diagnosis is a successfully performed transabdominal amniocentesis. From the clinical viewpoint the elimination of placenta previa is a satisfactory result. According to our criteria we have not come to any wrong conclusions. Figure 1 shows a frontal picture of the placenta located in the fundus uteri.

In evaluating the findings we can meet with some difficulties. The relation of the placenta to the internal cervical os is sometimes rather difficult to interpret in low-lying placentas which are located on the

anterior or posterior uterine wall. This is because the part of the placenta inserted in the lower uterine segment is thin and has a limited blood flow. In these cases only the lateral picture permits a correct diagnosis of placenta previa. Figures 2 and 3 show such examinations of placenta previa partialis. Both were verified by Caesarean section.

SUMMARY

Placental scanning using ^{99m}Tc -albumin was performed in 34 patients, as well as with ^{113m}In -transferrin complex in 116 patients. The Anger scintillation camera and 1,600-channel analyzer were used

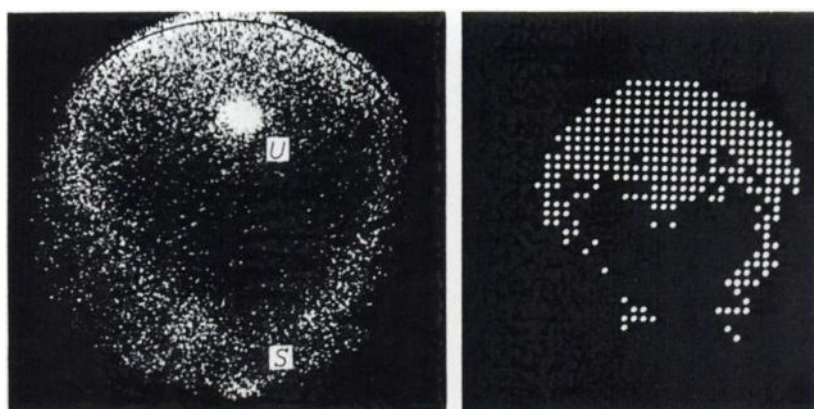


FIG. 1. Placenta in fundus uteri. ^{113m}In -transferrin complex scan. Pregnancy at 30th week. Indications: transabdominal amniocentesis. Umbilicus and pubic symphysis are marked. Frontal view with scintillation camera (left) and 1,600-channel analyzer (right).

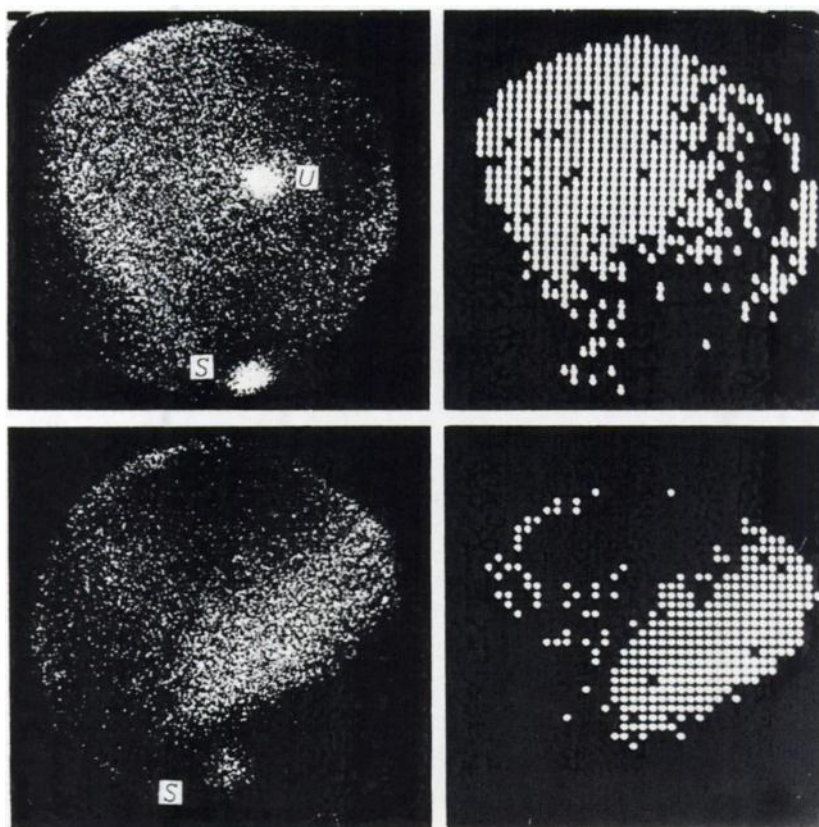


FIG. 2. Placenta previa partialis. ^{113m}In -transferrin complex scan. Pregnancy at 33rd week. Indication: bleeding. Upper frontal view, lower lateral view.

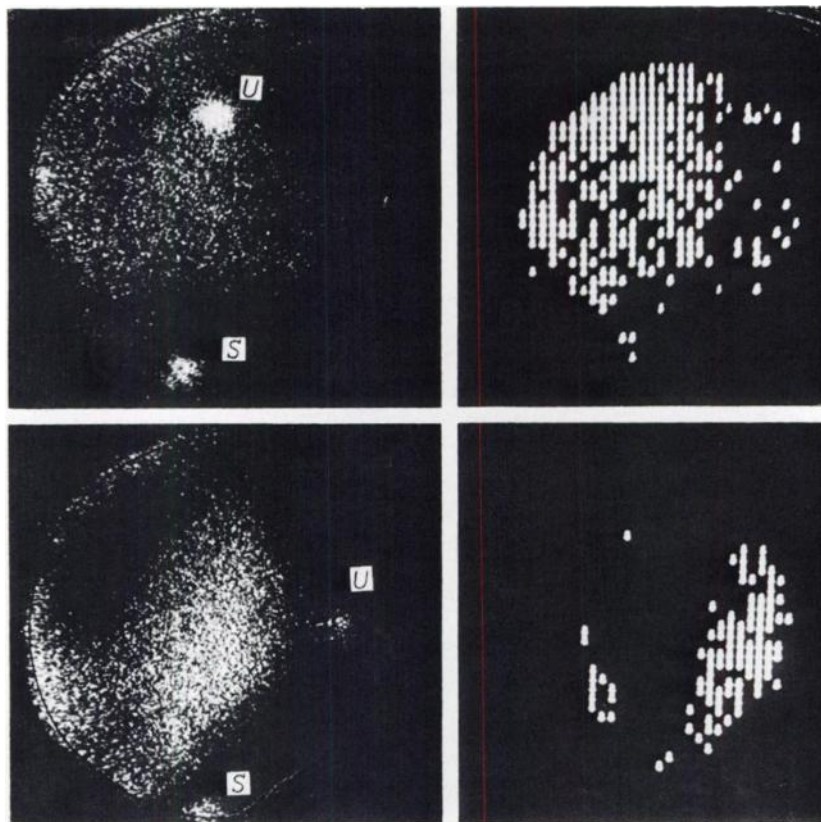


FIG. 3. Placenta previa partialis. ^{113m}In -transferrin complex scan. Pregnancy at 37th week. Indication: bleeding. Upper frontal view, lower lateral view.

for visualization. In six cases examination was completed by conventional placentography. In four cases we were unable to differentiate between low-lying placenta and placenta previa partialis. In 133 of the remaining 146 cases the diagnosis was verified by palpation or Caesarean section and found to be correct.

REFERENCES

1. CHARAMZA O, BUDÍKOVÁ M: Die ^{99m}Tc -Markierung des Serum-Albumins für die Plazenta, Lungen und Leberscintigraphie. *Isotopenpraxis* 4: 322-324, 1968
2. KONTRAS DA, LIVADAS D: The minimum dose of potassium iodide which inhibits the thyroïdal radioiodine uptake. *Nuklearmedizin* 5: 256-261, 1966
3. SOCOLOW EL, INGBAR SH: Metabolism of ^{99m}Tc -pertechnetate by thyroid gland of the rat. *Endocrinology* 80: 337-344, 1967
4. PAPADOPOULOS S, MCFARLANE S, HARDEN RH: A comparison between the handling of iodine and technetium by thyroid gland of the rat. *J Endocr* 38: 381-387, 1967
5. HOSAIN F, MCINTYRE PA, POULOSE K, et al: Binding of trace amounts of ionic Indium-113m to plasma transferrin. *Clin Chim Acta* 24: 69-75, 1969
6. NIEHOFF RD, HENDEE WR, BROWN DW: Placenta scanning with ^{113m}In . *J Nucl Med* 11: 15-18, 1970
7. LEWITUS Z, LUBIN E, RECHNIC J, et al: Scintigraphy of the placenta with ^{113m}In . In *Medical Radioisotope Scintigraphy*, vol 2, Vienna, IAEA, 1969, pp 657-664

SPECIALTY CERTIFYING EXAMINATION IN NUCLEAR MEDICINE

The American Board of Nuclear Medicine, a conjoint board of the American Boards of Internal Medicine, Pathology and Radiology, and also sponsored by the Society of Nuclear Medicine, announces that an examination for certification in the specialty of Nuclear Medicine will be given March 25, 1972.

Application forms and information concerning becoming certified may be obtained from the American Board of Nuclear Medicine, Inc., Suite 2404, 211 East 43rd Street, New York, New York 10017.

The deadline for filing completed application forms is December 15, 1971.