Clinical Experimental Obst. & Gynecology
Vol. I nn. 2-3-4, October 1974 pp. 111-113

Sereno L., Cugini P., Fallucca P., Cassano C.: *Folia Endocr.* 22, 1, 1969. - 6. Angeli A., Boccuzzi G., Frajria R., Bisbocci D.: *Folia Endocr.* 23, 566, 1970. - 7. Gordon E. S.: *Adv. Metab. Disord.* 4, 229, 1970. - 8. Angeli A., Boccuzzi G., Bisbocci D., Frajria R.: *Minerva Med.* 63, 2079, 1972. - 9. Tsuitsui E. A., Marks P. A., Reich P.: *J. Biol. Chem.* 237, 3009, 1962. - 10. Lopez A. S., Krehl W. A.: *Lancet* 485, 1967. - 11. Schally A. V., Redding T. W., Arimura A.: *Endocrinology* 93, 893, 1973. - 12. Sharma D. C., Dorfman R. I.: « *A generalized outline of the metabolism of steroid hormones* ». Ed. Holden-Day, S. Francisco 1969. - 13. Ceresa F., Angeli A., Gaidano G.: *Rec. Prog. Med.* 49, 507, 1970. - 14. Molino G., Cavanna A., Chiara G., Avagnina P., Giordano O.: *Folia Endocr.* 26, 110, 1973.

Assement of the uteroplacental circulation by electronic development of a scintiphotographic picture

by

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Despite the great number of studies carried out on the subject, assessment of the amount of the uteroplacental hematic flow continues to be very difficult even today. Furthermore, the various methods suggested for this type of research do not always meet the indispensable prerequisites for practical application, e.g. safety for mother and foetus, simplicity of management, the possibility of repetition during the last weeks of pregnancy and consistency of response.

We therefore decided to apply radioisotopic techniques, which are already being commonly used for the exact location of the sites for placental insertion ([4]), by extending the use of short-term half-life radionucleides (^{99m}Tc and ^{113m}In) to the functional study of uteroplacental circulatory dynamics ([5, 6]).

The isotope of choice for this kind of investigation was ^{113m}In. This nucleide has a very short physical half-life (1.7 hours), so that irradiation of the mother and foetus is much reduced; moreover, the ^{113m}In-gelatine compound used in such cases remains in the blood system for a long time (its biological semi-period is three hours), while its very low urinary elimination (approximately 1%) avoids assessment errors in cases of placenta previa which may occur when ^{99m}Tc is used ([1]).

PHOTOGRAPHIC METHOD

The pictures were taken by a Gamma Camera made by Nuclear Enterprises (Scinticamera III) connected to a continuous-image oscilloscope which allowed us to monitor directly and continuously the course of the investigation, and to check on the exact centering of the instrument.

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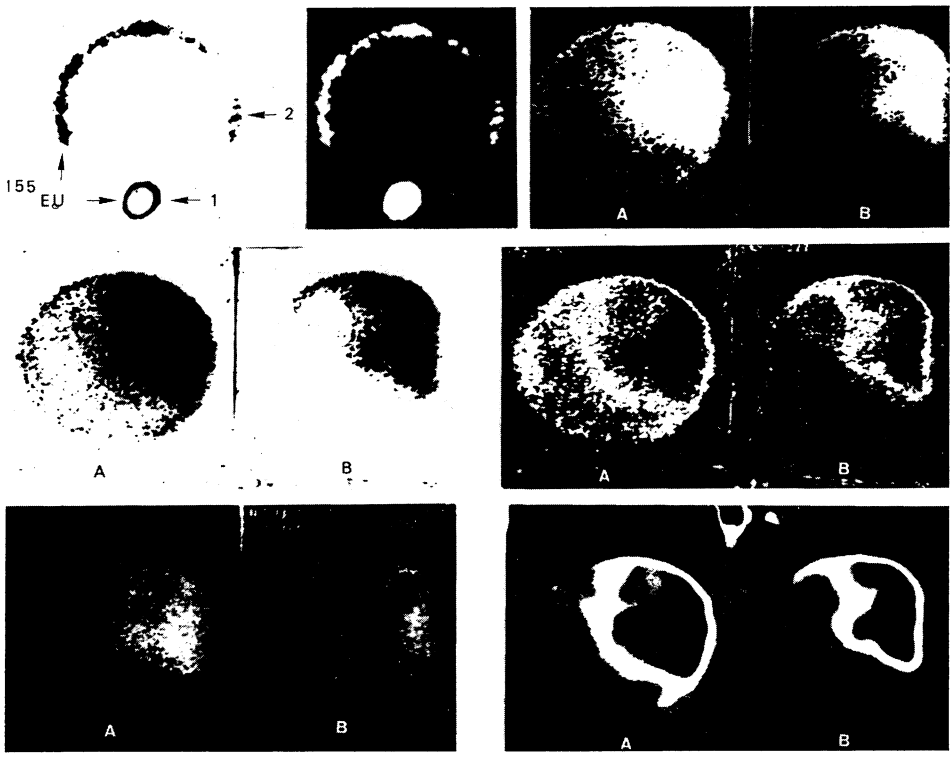

FIG. 1a - Scintiphotographic picture of the images relating to two sources of ^{155} Europio used for the exact delimitation and centering of the pubic symphysis area (1) and of the outline of the uterus (2).

FIG. 1b - This picture corresponds to the preceeding one but has been inverted by electronic development with a negative sign.

FIG. 2a and 2b - Photographic representation of the television pictures obtained without any development: A shows the greater extension of the placental tissue and also the greater isotope concentration, indicated by well pronounced luminosity clear zone on the television screen). The scintiphoto was taken after pharmacological treatment (Orciprenalin).

For comparison purposes, B shows the normal television image of the placenta obtained by scintigraphy under basal conditions. When compared with the preceeding image we see a marked difference in luminosity.

FIG. 3a and 3b - Television development showing only a positive image: A - scintigraphic picture of the placenta after pharmacological treatment with Orciprenalin. B - scintigraphy taken under basal conditions, for comparison.

FIG. 4a and 4b - Electronic development, in negative phase, of the placental picture; same aspect as described for Fig. 3.

FIG. 5a and 5b - Subsequent development of the scintiphotographic picture of the placenta after pharmacological treatment (A) and under basal conditions (B). The two pictures, obtained during passage from the negative phase (Fig. 4), may be used for study of the placental outlines.

FIG. 6a and 6b - Definitive pictures of the two placentas examined for the study and geometric assessment of the surface area of functioning placental tissue; it should be noted that in this final photo the outlines of the placenta are very clear and definite in both cases.

The scintiphotographs were developed by means of a closed-circuit television system consisting of a Philips telecamera connected to a semi-professional 23" monitor.

Thirty-theree patients in the last three months of pregnancy were studied in this manner.

Clinical Experimental Obst. & Gynecology
Vol. I nn. 2-3-4, October 1974 pp. 111-113

The patient was placed in supine position; before taking the picture, the field of observation of the Gamma Camera was precisely delimited by applying two sources of ^{155}Eu on the skin around the outline of the uterus and at the site of the pubic symphysis (fig 1a and 1b).

Each time we injected a standard dose of ^{113m}In-gelatine (1.5mC), after accurately measuring the amount of radiation with suitable equipment; 3, 10, 15 and 20 minutes after the injection we measured the fixation for 60 secs. These values were taken as reference percentages for any possible variations in fixation found in subsequent tests. The number of counts is in direct relation with the amount of uteroplacental flow, since the indio-gelatine compound virtually remains in the circulatory area throughout the test. Consequently, variations in the count should be related to changes in flow in the organs examined, as a result of pathological factors (in pregnancy) or of pharmacological effects (Orciprenalin) ([3]).

Finally, the television development of the scintiphotographic pictures enabled us to assess the surface area of the placental tissue and its possible changes after pharmacological stimulus by carrying out planimetric determinations of the individual images obtained electronically.

CONCLUSIONS

Our observations showed that the test with placental ^{113m}In was very useful for the quantitative assessment of the uteroplacental circulation; it was particularly suited for indicating the amount of placental damage in cases of high-risk pregnancy ([2, 3]), where it provides the obstetrician with valuable comparative data on the course of the disease. In view of its good tolerance, low radiation risk and ease of management, we believe that this is a particularly useful test for the diagnostic determination of high-risk pregnancy.

SUMMARY

The quantitative assessment of utero-placental circulation with ^{113m}In is very useful in high-risk pregnancy. This method have good tolerance, low radiation risk and ease management.

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BIBLIOGRAPHY

1. Varagnolo C., Viozzi A., Marsiletti G. C. and Vangelista R.: *Attual. Ostet. Ginec.* 14, 396, 1968. - 2. Rondinelli M. and Vangelista R.: *Ann. Ostet. Ginec. Med. Perin.* 93, 161, 1972. - 3. Rondinelli M., Vangelista R. and Soccal P.: *Ann. Ostet. Ginec. Med. Perin.* 94, 1973 (in press). - 4. Wagner H. N.: *Principles of nuclear medicine.* Ed. Saunders, Philadelphia, 1968. - 5. Laakso L., Kivikoski A., Mäkelä S., Paasio J. P.: *Acta. Obst. Gynec. Scand.* 49, 355, 1970. - 6. Hünermann B. and Winkler C.: *Nuc-COMPACT*, Siemens, No 3, Sept. 1973.