RADIONUCLIDE HYSTEROSALPINGOGRAPHY: DOES IT HAVE A ROLE IN THE MANAGEMENT OF FEMALE INFERTILITY ?

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SUMMARY

The diagnostic usefulness of the radionuclide hysterosalpingography (RN-HSG) .was evaluated after a year of its use in 39 female patients who underwent basic diagnostic tests (endometrial biopsy, post coital test) for infertility.

The results of the radionuclide evaluation were compared with classic hysterosalpingography (37/39 patients) and laparoscopy (32/39 patients). In 32 patients all three procedures were performed. When using the basic diagnostic tests and classic hysterosalpingography, 12 patients, or using the laparoscopy, 16 patients were entirely normal. Of these 8/12 (66%) and 12/16 (75%) were obstructed at RN-HSG. When using both techniques (classic hysterosalpingography and laparoscopy) 10 patients were normal. Of these 6/10 (60%) were obstructed at RN-HSG.

According to these results (66%, 75% and 60%), it was possible to identify the reason for the infertility and to decide on the therapy of these 6 patients with an unknown reason of infertility. In this kind of patients it was suggested that infertility was due to an impaired tubal transportation capacity.

Key Words: Radionuclide hysterosalpingography, Female infertility

INTRODUCTION

Newly developed methods in the recent years such as in vitro fertilization and egg transfer (IVF-ET), gamete intrafallopian transfer (GIFT) and zygote intrafallopian transfer (ZIFT) have opened new approaches to the treatment of infertility. Today, by the investigative techniques applied to fallopian tubes, it has been established that a tubal factor accounts for 25-50 % of infertile females (1,2). Approximately 50 % of tubes of infertile women were found to be completely normal both by salpingoscopy, falloscopy and classic hysterosalpingography (HSG). Although 25 % of infertility cases were normal by findings of laparoscopy, the endosalpinx has been found to be abnormal in these cases (1,2).

In 1981, Iturralde and Venter (3) first demonstrated how 99mTc-labelled albumin spheres were transported from the vagina to the ovaries. This method was called radionuclide hysterosalpingography (RN-HSG) and started a new diagnostic method. Since then RN-HSG has been studied in some centers (4-12). It was accepted as a simple and noninvasive method for evaluation of the active transportation capacity of fallopian tubes. However, the radiation dose to the ovaries was discussed as an important point (8,10,12,13).

The aim of this study was to evaluate the value of the RN-HSG in infertile women.

MATERIALS AND METHOD

Thirty-nine patients included in this study were investigated by basic diagnostic methods (endometrial biopsy, post coital test) classic HSG, laparoscopy and RN-HSG for infertility.

The ages ranged from 23 to 37 years. All procedures were performed in the late follicular phase.

For the radionuclide examination, macroaggregated albumin (MAA) labelled with 1 mCi of 99mTc was suspended in 1 ml of normal saline. Each patient was placed in the lithotomy position. After a speculum had been placed into the vagina, the injection was performed very slowly. The activity was administered into the posterior fornix of the vagina and external os of the cervical canal with a 2 ml plastic syringe. After the speculum had been removed the patients walked to the Department of Nuclear Medicine. Images were obtained with a gamma camera (Siemens Orbiter) 60 and 180 minutes after the application of the activity.

Anterior images of the pelvic region were obtained with a low energy all purpose collimator. 300.000 counts for each image were accumulated. Also data were stored in a computer.

Classic HSG was performed using the conventional method with contrast material under fluoroscopic control.

At laparoscopy, methylene blue dye was given from the transcervical canal. Tubal anatomy and passage of methylene blue from uterus to peritoneum was observed directly.

The scintigraphic patterns for interpretation of the images were as follows:
1- A normal scintigraphy was represented by activity visible in the area of the adnexa including outlining of ovary within 1 hour of radiopharmaceutical administration and/or continuity of activity from the region of the uterine cornua to the ipsilateral fallopian tubes (Fig. 1).
2- Absence of this continuity and failure of activity to appear around the ovary on images obtained for periods longer than 1 hour were considered to be evidence of obstruction (Figs. 2 and 3).

RESULTS

The right and left fallopian tubes were evaluated independently. A comparison of results between classic HSG and RN-HSG was made for 37 patients (74 tubes) (Table I and Table II). In the classic HSG, there were 39 patent tubes and 35 obstructed tubes. Of the 39 patent tubes, 14 were found to be patent in the RN-HSG. Of the 35 obstructed tubes, 28 were found to be obstructed in the RN-HSG. The findings of classic HSG were congruent with those of RN-HSG in 57% of the cases.

A comparison of results between laparoscopy and RN-HSG was made for 32 patients (64 tubes) (Table I and Table III). Of 64 fallopian tubes 37 were patent at laparoscopy of which only 10 were patent at RN-HSG. Laparoscopic findings were congruent with those of RN-HSG in 47% of the cases.

In 10 patients, the reason for infertility was not found from the basic diagnostic methods, classic HSG and laparoscopy. In other words, they were classified as normal cases. But 60 % of these patients was found as obstructed by RN-HSG. So it is possible to explain the reason for the infertility in this group by this finding.

In three normal patients, regions of interest were obtained over the vagina, uterus and each ovary, and the fallopian tube. Computer analysis of this data demonstrated that between 10 and 14 % of the total activity was present on each ovary at 60 and 180 minutes images. The radiation dose to the ovaries was estimated using S values (14). The total absorbed dose to each ovary was estimated to be 3.6 rad per mCi of 99mTc-MAA.

DISCUSSION

The reason for infertility in 25-50 % of infertile females is a tubal factor. Table IV shows the procedures which are used to assess disease of the fallopian tubes.

Classic HSG is a standard radiologic procedure that is used as a routine method for diagnosis of female infertility in most departments. It provides good anatomical resolution to evaluate the uterus and tubes and detects mechanical tubal obstruction and peritubal adhesions following the introduction of contrast material under positive pressure. But, there are some disadvantages. These are, patient discomfort, hypersensitivity to iodinated contrast media, tubal spasm, febrile reaction, rarely anaphylaxis and embolization.

Laparoscopy and laparotomy are surgical procedures. Both of them are performed under general anesthesia. Salpingoscopy is performed both at laparoscopy and laparotomy. It provides a direct observation of tubal epithelium. However, it is an invasive technique.

Some of the tests in table IV have been abondoned, and some of them have been used occasionally. In the past, there was no method for the evaluation of the active transportation capacity of the fallopian tube. Since the initial report by Iturralde and Venter (3), a few other investigators have reported results using RN-HSG in patients with infertility (Table V) (4-12). Some authors have pointed out about the radiation dose to the ovaries by RN-HSG (Table VI). They reported between 0.21 and 5 rad/mCi.

However, the active transportation capacity of the fallopian tubes has great importance. Because, microsurgery and new fertilization procedures have achieved wide attention. Lack of active transportation capacity of the fallopian tube would direct the patient to IVF-ET and exclude the possibility of GIFT (9). This situation exposes the importance of RN-HSG.

In our study, RN-HSG was very helpful in patients found to be normal according to basic diagnostic procedures, classic HSG and laparoscopy. In this group, the active transportation capacity of the fallopian tubes have been destroyed. For this reason, while 22 patients were candidate for tuboplasty, new therapeutic methods for 10 patients were planned.

Recently, Yang et al (12), described a new method with 99mTc pertechnetate. In contrast to the previous studies, Yang et al used free 99mTc pertechnetate. They used 0.5 mCi of 99mTc pertechnetate with direct intra-uterine injection. When using 99mTc pertechnetate in this study, imaging should begin immediately after injection. They reported that about 13 % of the injected activity reached the ovary. The dose to the ovaries was 0.21 rad/mCi. 99mTc pertechnetate has very short effective half time, since 99mTc can diffuse into blood capillaries and be

removed from the entire region. In contrast to this, MAA is removed by physical decay only, as MAA cannot penetrate into the blood capillary due to its large size of particle.

Mc Queen et al (15) have presented an interesting study. In this study, it was suggested that impared migration of particles in fallopian tubes occured in patients with endometriosis. They found that this abnormality did not correlate with the severity of endometriosis, nor with the presence of pelvic adhesions.

As a result, RN-HSG may be accepted as a routine diagnostic procedure in infertile females. RN-HSG is not an alternative procedure to classic HSG and laparoscopy. They are complementary techniques. It must be used in patients with an unknown reason for infertility, after tubal microsurgery and especially in patients who will undergo IVF-ET. RN-HSG is readily accepted by all patients. It does not need special equipment and it is easy to perform in all nuclear medicine laboratories. There is no doubt of its value in evaluating tubal patency. But there is still some suspicion about radiation dose. Further studies and some modifications will be necessary to reduce the radiation dose. We conclude that RN-HSG is a simple, noninvasive technique. It should be accepted as an important technique to diagnose and select therapy for infertility due to a tubal factor.

Table I- Radiographic, laparoscophic and scintigraphic data.

Patient number	classic HSG		laparoscopy		RN - HSG	
	r tube	l tube	r tube	l tube	r tube	l tube
1	1	1	1	1	1	1
2	1	1	1	1	0	1
3	0	0	0	0	0	0
4	0	0	0	0	0	1
5	0	0	0	0	0	0
6	0	1	0	0	0	0
7	0	0	0	0	0	0
8	1	0	1	1	0	0
9	1	1	1	1	0	0
10	0	0	0	0	0	0
11	1	1	1	1	1	1
12	0	0	0	0	0	1
13	0	1	0	1	0	0
14	1	1	1	1	1	1
15	0	0	1	1	0	0
16	0	0	1	1	0	0
17	1	1	0	0	1	0
18	1	0	1	1	0	0
19	1	0	not seen		0	0
20	0	1	not performed		1	1
21	1	1	1	1	0	0
22	1	1	1	1	1	0
23	0	0	0	0	1	1
24	1	0	1	1	0	0
25	0	0	not performed		0	1
26	1	1	1	1	0	0
27	1	0	1	not seen	0	0
28	0	0	0	0	1	0
29	0	0	1	1	0	0
30	0	0	1	0	0	0
31	1	1	1	1	0	0
32	1	1	0	0	0	0
33	1	0	0	0	1	0
34	1	1	1	1	1	1
35	not performed		1	1	0	0
36	not performed		1	0	0	0
37	1	1	not performed		0	1
38	1	1	not performed		0	0
39	1	1	not performed		0	0

r : right
l : left
1 : tube patent
0 : tube obstructed

Table II- Correlation for 37 patients (74 tubes) with RN - HSG and classic HSG.

		Classic HSG	
		Tube Patent	Tube Obstructed
RNHSG	Tube patent	14	7
	Tube obstructed	25	28
		39	35

Table III- Correlation for 32 patients (64 tubes) with RN - HSG and laparoscopy

		Laparoscopy	
		Tube Patent	Tube Obstructed
RNHSG	Tube Patent	10	7
	Tube Obstructed	27	20
		37	27

Table IV- Diagnostic procedures for assessment of fallopian tubes.

Classic hysterosalpingography
Pneumohysterosalpingography
Tubal insuflation
Laparoscopy
Culdoscopy
Methylene blue test
Salpingoscopy
Ecohydrotubation
Selective salpingography
Falloscopy
Radionuclide hysterosalpingography

Table V- Investigated patient number with three methods.

References	RN - HSG	C - HSG	Laparoscopy or Surgery
Iturralde et al 1981	29	29	29
Mc Calley et al 1985	26	3	19
Stone et al 1985	34	–	34
Mc Queen et al 1988	80	–	80
Antuaco et al 1989	13	13	–
Van der Weiden et al 1989	25	25	–
Brundin et al 1989	19	19	–
Kennedy et al 1989	16	–	19
Mojiminiji et al 1991	16	–	16
Yang et al 1992	29	28	–
Present study	39	37	32

Table VI- Administered doses and radiation doses to ovaries

References	Dose	Radiation dose
Iturralde et al 1981 (M)	2-3 mCi	?
Mc Calley et al 1985 (M)	1 mCi	1.8 rad/mCi
Stone et al 1985 (M)	1 mCi	3.6 rad/mCi
VanderWeiden et al 1989 (M)	1 mCi	2.8 rad/mCi
Kennedy et al 1989 (M)	3-5 MBq	?
Brundin et al 1989 (M)	1 mCi	?
Antuaco et al 1989 (M)	1 mCi	2.3 rad/mCi
Stabin et al 1989 (M)	1 mCi	5 rad/mCi
Mojiminiji et al 1991 (M)	3-5 MBq	?
Yang et al 1992 (P)	0.5 mCi	0.21 rad/mCi
Present study (M)	1 mCi	3.6 rad/mCi

(M) : Microspheres

(P) : Pertechnetate

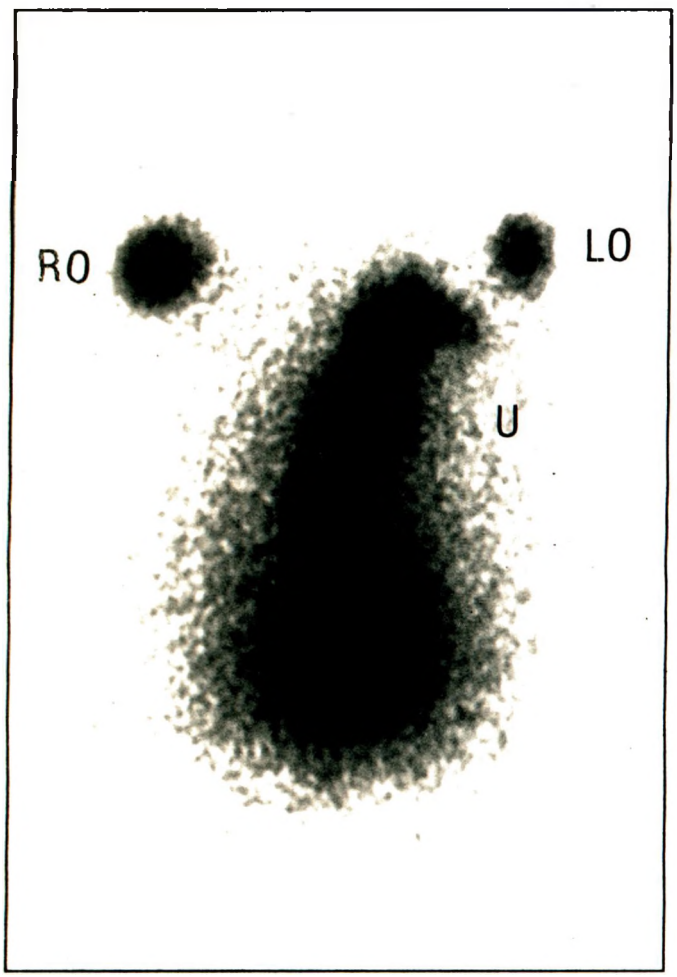

Fig 1.: Normal radionuclide hysterosalpingography. U : Uterus, RO: Right ovary, LO: Left ovary

Fig 2.: Radionuclide hysterosalpingography showing patent tube on right but obstruction on left

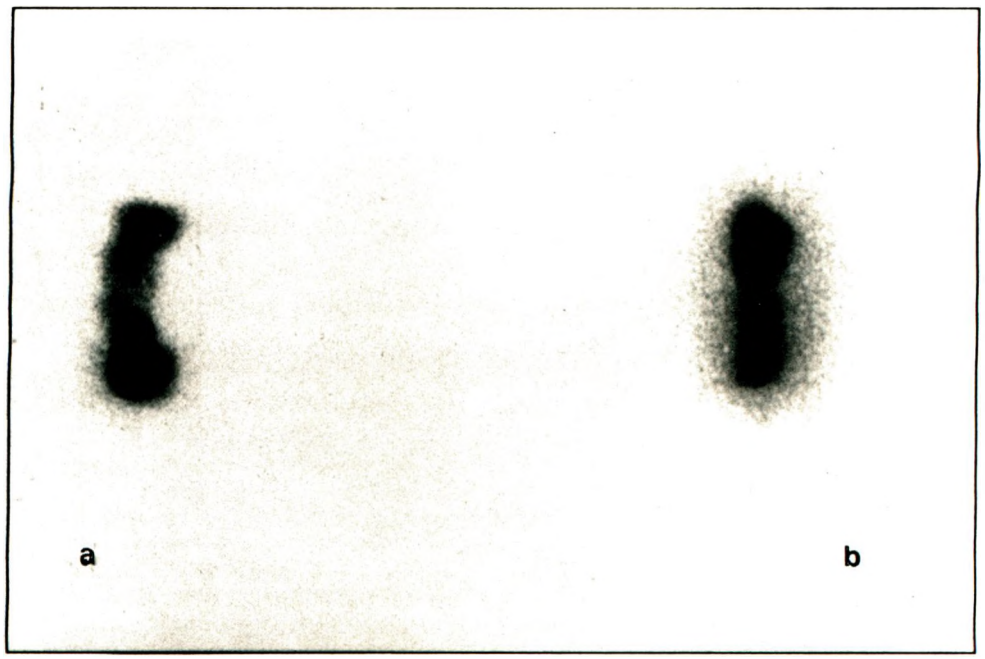

Fig 3.: Radionuclide hysterosalpingography showing bilateral fallopian tube obstruction in two patients (a and b)

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