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Fallopian tube patency using color Doppler

G.N. Allahbadia

Department of Obstetrics and Gynaecology, Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Bombay — 400 022 (India)

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Abstract

OBJECTIVE: To evaluate a new test for tubal patency using color Doppler ultrasonography in infertile women. METHOD: Between October 1991 and March 1992 results of our new technique were compared with those of hysterosalpingography (HSG) and laparoscopy in 27 cases. The new technique of evaluating tubal patency using color Doppler has been described in detail. RESULT: There was 92.59% agreement, i.e. patency or occlusion of the fallopian tubes when the results of our test were compared with those of hysterosalpingography and laparoscopic chromopertubation. The HSG and laparoscopy findings were in 100% agreement. CONCLUSION: Color Doppler ultrasonography is now a very important investigation in the assessment of fallopian tube patency and compares favorably with the existing 'gold standards' namely HSG and laparoscopic chromopertubation.

Keywords: Fallopian tube; Color Doppler; Infertility.

Introduction

Hysterosalpingography (HSG), using radio-opaque dye for X-ray studies to assess tubal and uterine anatomy has been the standard form of investigation for several decades. The disadvantage of this type of investigation is that ionising radiation has inherent risks to the oocyte, which may result in congenital malformations, if conception were to take place in the investigatory cycle. Laparoscopy, to investigate tubal status, has been used as the gold standard in the last two decades, but this does require a general anesthetic and carries the risk of surgical complications, such as bowel or vascular injury. Ultrasound does not require general anesthetic or carry risks outlined above. The inherent visual appeal of color Doppler flow imaging accounts in some measure for the ready acceptance of this technique by both technologists and physicians alike. Not only has color Doppler ultrasound expanded the role of sonography, but, in a number of instances, it is now being used as a definitive diagnostic test without requirement for co-relative angiography. Herewith a new tubal patency test using color Doppler ultrasonography and normal saline is presented. Previous attempts with the use of sterile dextran, hyskon and antibiotic solutions failed to allow direct visualisation of the tubes and the flow of contrast medium [8,9]. Tubal patency was deduced indirectly from the presence of increasing fluid in the pouch of Douglas, without differentiation of the sides. The aim of this prospective study was to demonstrate the diagnostic efficacy of color coded duplex sonography in assessing fallopi-

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an tube patency as compared with HSG and laparoscopic chromopertubation.

Materials and methods

Twenty-seven infertile patients were chosen from our Gynaecology Out Patient Department (OPD). The present study began in October 1991 and the data presented is an analysis up to March 1992. For this series of 27 infertile patients, a diagnostic laparoscopy, hysterosalpingography and our test was done. This group includes 20 cases of primary infertility and 7 cases of secondary infertility. A detailed history was recorded including the nature and duration of infertility. After performing other routine investigations for infertility, the patency of fallopian tubes was checked using color Doppler ultrasonography in the preovulatory phase of the menstrual cycle. Hysterosalpingography was carried out the next day using meglumine iothalamate 60% (Conray 280, Rhone Poulenac, Bombay, India), a watersoluble dye. A diagnostic laparoscopy along with curettage was performed in the late secretory phase soon after the HSG under general anesthesia. A comparison of accuracy with the three methods of evaluating tubal patency was done after analyzing the collected data.

Procedure

Color Doppler ultrasonography was used to evaluate fallopian tube patency. We used the Vingmed Diasonics 700 color Doppler ultrasonography machine (Vingmed, Salt Lake City, Utah, USA) which has realtime/2D sector and linear imaging modes along with M mode and documentation by multiformat camera and videocassette recorder. The 2.5 MHz abdominal transducer was also used for our procedure. The patient was atropinized and the procedure explained to her. After a pelvic examination, the patient was brought to the edge of the table, the anterior lip of the cervix was held with a volsellum and a Leech Wilkinson's canula was screwed onto the cervical canal. The nondistended fallopian tube is difficult to depict on sonography, probably because of its small intraluminal size and serpiginous course. The uterus is used as a landmark for depiction of other adnexal structures. After a routine pelvic scan, we concentrated on an area between the uterus and left ovary. About 20 ml of normal saline was pushed through the canula. Direction and flow into and out of the fallopian tubes was observed with color Doppler flow ultrasonography. When no fluid was seen to enter the peritoneal cavity, tubal occlusion was diagnosed. Each tube can be assessed separately and the free spill from each tube is depicted with a characteristic phasic indeterminate color assignment. The patients were allowed to rest for a short period of time and were then sent home on a 7-day course of ampicillin (Campicilin, Cadilla Laboratories, Ahmedabad, India) and metronidazole (Flagyl, Rhone Poulenac, Bombay, India).

Observations and results

Table 1 elucidates clearly the accuracy with the three different tubal patency tests. When the results of our test were compared with those of HSG and laparoscopic chromopertubation there was 92.59% agreement, i.e. patency or occlusion of the fallopian tubes. There was 25.92% agreement between color

Table 1. Accuracy of tubal patency comparing three different investigative modalities.

Method	Total cases	Bilateral patency	Bilateral block	Left block	Right block
Color flow	27	18	5	2	2
HSG	27	20	5	1	1
Laparoscopy	27	20	5	1	1

Doppler and the other two modalities if only tubal occlusion (both ipsilaterally and contralaterally) was studied. With respect to ipsilateral and contralateral patency there was agreement in 66.67% cases. The HSG and laparoscopy findings were in 100% agreement. Two cases which showed left and right sided tubal blocks respectively with color imaging showed bilateral patency subsequently with both HSG and chromopertubation. Laparoscopy confirmed all findings with the other two techniques and in addition picked up peritubal adhesions and endometriosis in two cases, respectively where free spill was reported with all the three methods.

Discussion

Endosonography as a tool for checking the patency of fallopian tubes was an expected development in the giant strides of progress the field of gynecology was taking. 'The Sion Test' used transvaginal sonography to evaluate tubal patency [1]. But one question that was not answered by this test was the status of the fallopian tubes; the mobility and the 'milieu exterior'. 'The Sion Procedure' [2] effectively solved all the unanswered questions about 'The Sion Test' by sonographic delineation of the tubes facilitated by intraperitoneal fluid in the cul-de-sac. Next came transvaginal hysterosalpingo-contrast sonography for the assessment of tubal patency with gray scale imaging and additional use of pulsed wave Doppler [4]. Presented in this paper is a new technique to assess fallopian tube patency. When this technique was compared with the more traditional techniques of assessing tubal patency, it was found to correlate well with the diagnosis of tubal occlusion. Tubal factors account for approximately 25% of the causes of infertility among 3 million couples in the United States [3,6]. The most frequently used procedures to evaluate tubal patency currently are HSG and chromopertubation. These procedures require the use of radio-opaque dye, radiation, general anesthesia and an operation. Ultrasonographic color Doppler flow does not require any of these risks. Therefore the accuracy of ultrasonographic color Doppler flow used to perform hysterosalpingography was studied. The procedure is performed in an office setting, which makes it more convenient for both the patient and the physician. Tiny ovarian cysts, small intramural and submucous fibroids and any other pelvic pathology is easily picked up on a pelvic scan but with color Doppler we can go much further and pick up even 'arteriovenous' malformations. The entire procedure can be recorded on a video-cassette and preserved by the patient as permanent documentation of her tubal status. To get the real impact of the color spill, it would be mandatory to watch a video recording of the procedure. Difficulty in making a diagnosis of tubal occlusion arises in those patients with dilated hydrosalpinges because flow through the dilated fallopian tube may simulate spillage on the Doppler ultrasonography screen [7]. In addition, tubal architecture is not demonstrated with Doppler flow hysterosalpingography as it is with X-ray hysterosalpingography. However, a recent study has shown this information is not useful in preoperative salpingoplasty procedures [5].

Previous experience with transvaginal sonosalpingography for tubal diagnosis in comparison with conventional procedures for checking tubal patency, e.g. HSG and laparoscopic chromopertubation, has shown that the sonographic diagnosis of patent tubes is reliable [1,2]. According to other authors the assessment of patent tubes in hysterosalpingo-contrast sonography using gray scale imaging alone is regarded reliable in 60 to 70% of cases [4]. Diagnosing is difficult if only short partial segments of the tube or only the intramural part can be visualized, e.g. because of cranial dislocation of the tube when the depth of penetration of the ultrasound may not be enough because of the frequency of the transducer employed. Moreover, the sonographic diagnosis of unilateral or bilateral tubal occlusion begs the question of whether

negative flow or nondemonstration of a long tubal section might be of technical origin, e.g. the positioning of the transducer. Tubal occlusion secondary to tubal spasm cannot be ruled out either. The diagnosis of tubal occlusion is therefore made as an exclusion diagnosis based on the fact of nonvisualization of the tubal flow in gray scale imaging. The use of color Doppler ultrasound offers advantages here because it permits a more sensitive detection of the intratubal flow of saline even in borderline sized areas of interest. Although the improvements achieved by color Doppler are promising, further clinical studies are required to confirm the diagnostic advantage, particularly in the case of tubal pathology. In conclusion, the color Doppler tubal patency test should be suitable as an outpatient procedure for early tubal screening in the diagnosis of infertility. In the case of sonographically normal findings, i.e. free tubal patency, the patient could be spared more invasive diagnostic techniques such as HSG or chromolaparoscopy and time would be gained for further steps in sterility diagnosis and therapy. In the event of pathological findings at color Doppler ultrasonography, more invasive diagnostic methods could be instituted early on.

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Address for reprints:

G.N. Allahbadia
262, My-Nest
Wadala, Bombay-400031
India