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Research Article

HYSTEROSALPINGOGRAPHY (HSG) – THE 'LAST MAN STANDING' AMONG THE ERSTWHILE PLETHORA OF CONVENTIONAL RADIOLOGICAL INVESTIGATIONS. 'HOW WE DO IT' AND REVIEW OF LITERATURE

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Abstract :

Context:The advent of cross sectional imaging has relegated the roles of conventional imaging techniques and HSG is almost the 'last man standing' among the erstwhile plethora of conventional radiological investigations.Aims: To understand the present status of HSG in the evaluation of fallopian tubes in infertility.To understand the catheter method of performing HSG. To assess the accuracy, reproducibility and sensitivity of the simple catheter method of performing the procedure.Methods and Material: a random continuous sample of 100 cases appointed for HSG were evaluated. Results:In 93 number of 100 cases the routine catheter method was successful.Number of cases done by the Leech Wilkinson metal cannula method due to inability to cannulate the deep cervix was only 4. Threecases were abandoned as the procedure could not be completed and was repeated under anaethesia.Conclusions:Hysterosalpingography is the gold standard in assessing the patency of the fallopian tubes, which is among the most common causes of female factor infertility, making this technique the most frequent first-choice imaging modality in the assessment of female infertility.Although evaluating feminine infertility is the main indication for this method, it can also be used in other cases, such as congenital or anatomic abnormalities. The described catheter method is the least distressing and most economical.

Key-words:Hysterosalpingography (HSG), Fallopian tubes, Infertility

Key Messages:HSG remains the first line investigation for evaluation of the fallopian tubes patency and the 'last man standing' in the armamentarium of conventional imaging modalities available to the radiologist.

INTRODUCTION

Hysterosalpingography (HSG) remains an important radiologicprocedure in the investigation of infertility and is a commonly performed examination due to recentadvances of reproductive medicine.

Hysterosalpingography (HSG) is the radiographicevaluation of the uterine cavity and fallopian tubesafter the administration of a radio-opaque mediumthrough the cervical canal. A properly performedHSG can detect the contour of the uterine cavity andthe width of the cervical canal. Further contrast mediuminjection will outline the cornua, isthmic andampullary portions of the tubes, and will show thedegree of spillage. If a properly performed HSG does not show uterine cavity abnormality, it is very unlikely thatother modalities would do so [(1)]. Although this procedureis considered diagnostic, there may also be apossible therapeutic benefit from the flushing effect of the contrast injection [(2,3)].

INDICATIONS AND CONTRAINDICATIONS:

HSG is used predominantly in the evaluation of infertility [(4)].Despite the arrival of newer imaging modalities,HSG still remains the best procedure to image thefallopian tubes

[5].Although evaluating feminine infertility,with or without the presence of repeated miscarriages,is the main indication for this method, it can alsobe used in other cases, such as congenital or anatomic abnormalities and abnormal menses. Also, it is sometimesused as a preoperative control for women who areabout to have uterine or tubal surgery [6].Soares and coworkers showed that HSG had asensitivity of 58% and a positive-predictive value of28.6% for polypoid lesions,a sensitivity of 44.4% for uterine malformations,and a sensitivity of 75% for the detection ofintrauterine adhesions[7].

The main contraindication of the examination ispossible pregnancy. This contraindication can beavoided by performing the examination before theovulation phase, between the 7th to 12th day of themenstrual cycle[6].Because of the risk of venous intra-vasation, theexamination should be avoided when there is activeintrapelvic inflammation. Another contraindication isvaginal or uterine bleeding and performing the procedure introduces the risk ofunrestrained bleeding. Finally, the examinationshould not be performed in cases of severe cardiacor renal deficiency, or in cases of recent uterine ortubal surgery[8].

STATITISTICAL ANALYSIS

The number of women available for analysis was 100.

Number of cases done by the routine catheter method: 93 (93 %) (Figure 1)
Number of cases done by the Leech Wilkinson metal cannula method due to inability to cannulate the deep cervix: 4.
Age wise distribution of cases is displayed in Table 1.
No of cases abandoned:Procedure could not be completed and had to be abandoned in three patients. One patient had atretic vagina and hence perspeculum examination was unsuccessful. In the other patient thecervix was not visualized on per speculum examination and were not available to cannulate with the metal cannula. All the cases were repeated under anesthesia.

The no. of cases/overall prevalence of uterine anomalies was 3 per 100. (Uterus bicornisunicollis, Absent Uterus, T shaped uterus)ie 3%

The distribution of tubal spills is described in Table 2.
The no. of cases/overall prevalence of any tubal pathology was 20/100. (Table 3)
The no. of cases/ overall prevalence of bilateral tubal pathology was 6/100
Tubal pathologies subdivision into fimbrial block, isthmic, cornual block, hydrosalpinx

Twelve tubal blocks were at the fimbrial end, nine at the cornua, three at the isthmus and two had hydrosalphinx.

The distribution of compliations during the procedure is described in Table 4. The most common complication was pain during and after procedure which in most cases was self-limiting. One patient had significant persistent post procedure pain which required analgesics for two days. One patient had pelvic abscess on follow up and on probing was found to have skipped the prescribed post procedure antibiotics.

No of cases with intravasation; 3

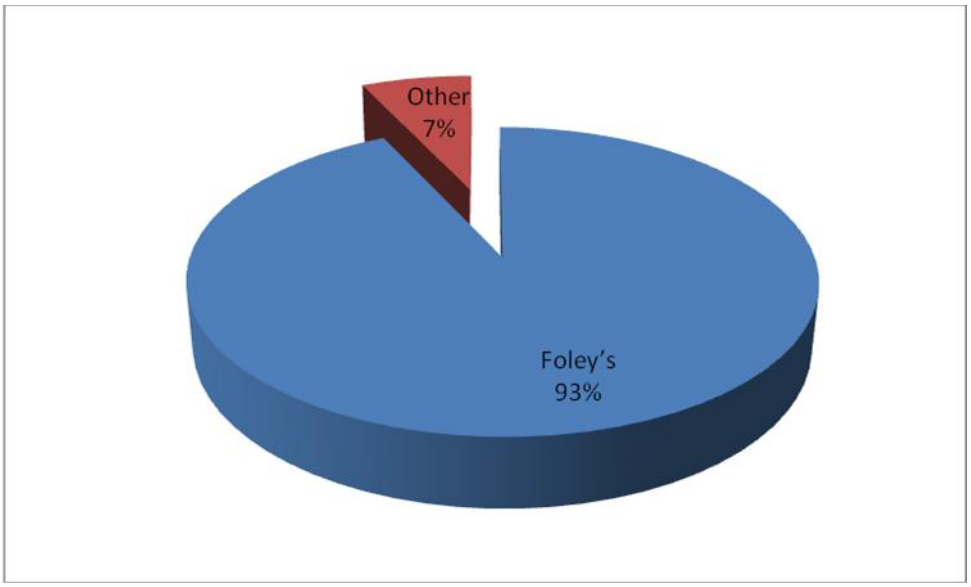

Figure 1: Distribution of cases performed by the catheter method and the metal cannula method

Table 1 : Age wise distribution of cases performed

		Method		
		Foley's	Other	Total
Age	20 - 25	24	1	25
		25.8%	14.3%	25.0%
	26 - 30	42	3	45
		45.2%	42.9%	45.0%
	31 - 35	17	3	20
		18.3%	42.9%	20.0%
	Above 35	10	0	10
		10.8%	.0%	10.0%
Total		93	7	100
		100.0%	100.0%	100.0%

Fishers exact test p=.514, NS

Table 2: Distribution of findings of Tubal spill noted.

		Method		
		Foley's	Other	Total
Spill	Bialteral	78	5	83
		83.9%	71.4%	83.0%
	Left	4	0	4
		4.3%	.0%	4.0%
	No spill	7	2	9
		7.5%	28.6%	9.0%
	Right	4	0	4
		4.3%	.0%	4.0%
Total		93	7	100
		100.0%	100.0%	100.0%

Fishers exact test p=.337, NS

Table 3: Distribution of Fallopian tube pathologies

		Method		
		Foley's	Other	Total
Falopian Tubes	Abnormal	18	2	20
		19.4%	28.6%	20.0%
	Normal	75	5	80
		80.6%	71.4%	80.0%
Total		93	7	100
		100.0%	100.0%	100.0%

X2=.010, p=.922, NS

Table 4: Distribution of cases with complications.

		Method		
		Foley's	Other	Total
Complications	None	90	6	96
		96.8%	85.7%	96.0%
	Present	3	1	4
		3.2%	14.3%	4.0%
Total		93	7	100
		100.0%	100.0%	100.0%

X2=.194, p=.660, NS

DISCUSSION:

Technique

The examination should be scheduled during 7th to 12th days of the menstrual cycle (day 1 being the first day of menstrual bleeding). The patient should be instructed to abstain from sexual intercourse from the time menstrual bleeding ends until the day of the study to avoid a potential pregnancy.Because patients may experience cramping during the examination, women are advised to take a nonsteroidal anti-inflammatory drug 1 hour prior to the procedure. Intramuscular injection of 0.6mg atropine is given to the patient about 30 min prior to procedure and injection Buscopan(10 milligram of hyoscine butylbromide) is administered just prior to the procedure. Having the patient empty her bladder prior to positioning may ease discomfort from the speculum, which should be warmed prior to insertion. As with any pelvic examination, the operator should attempt to drape as much of the patient's lower body as possible, have a female chaperone, and explain to the patient each step of the procedure.

The procedure is performed in a Fluoroscopy unit (Shimadzu FlexavisionHB 630 MA, Japan) under sterile settings with the availability of sterile dressing pack and HSG 'set' (figure 2). The patient is placed supine on the fluoroscopy table in thelithotomy or modified lithotomy position. The perineum is prepared with povidone-iodine solution and draped with sterile towels. A Sim'sspeculum (figure 2 A, C) is inserted into the vagina and the anterior vaginal wall is retracted using a retractor (figure 2 F). The cervix is localized and cleansed with povidone-iodine solution. A uterine sound (figure 2 E) may be used to assess the position of the uterus. The anterior lip of the cervix is grasped gently with a vulsellum (figure 2 B). Distress or pain experienced during this step of the procedure is common. An 8-F foley'scatheter (Bardex Foley natural rubber latex catheter 8 Ch/Fr 2.7mm) is positioned in the cervical canal using a forceps (figure 2 D). The balloon is inflated with 2-4ml of saline to fix catheter. A metallic marker is placed over one side of the pelvis to indicate the right or left side of the patient. A slight traction is applied by a gentle pull of the cervix using vulsellum to create a good orientation of the uterus. Contrast is injected through the catheter. We used nonionic iodinated water soluble contrast medium of room temperature. The maximum amount of contrast injected was not more than 10 ml. This described catheter method is the least distressing and most economical. In case the cervix is deep and cannot be cannulated by the catheter method the metal cannula (Leech Wilkinson) method is used. Cusco's speculum is used to visualize the cervix. (Figure 3 A). The Leech Wilkinson cannula is made of stainless steel with a hollow core and fixed cone at the top (Figure 3 B). The cone is inserted into the cervix and contrast is injected through the hollow cannula after removing the stilette. Only 4 cases out of the 100 cases that were analyzed had to be attempted with the Leech Wilkinson cannula; otherwise the catheter method was sufficient.

A fluoroscopy screening of the pelvis is obtained before contrast material is instilled so that possible intra-pelvic masses or calcifications will not complicate interpretation of the images. Iodinated contrast is then slowly instilled, with fluoroscopic images obtained intermittently to evaluate the uterus and fallopian tubes. The radiographic movie of the entire process of injection of contrast is recorded on the fluoroscopy machine from which representative images are later chosen for printing on film. The first image is recorded during filling of the uterus and is used to evaluate for any filling defect or contour abnormality. Small filling defects are best seen at this stage. The fluoroscopy is continued when the uterus is fully

distended. The shape of the uterus is best evaluated at this stage (Figure 4). The third image is recorded to demonstrate and evaluate the fallopian tubes and demonstrate minimal spill. Further fluoroscopy should exhibit free intra-peritoneal spillage of contrast material. A radiograph is sometimes obtained at the end of the study with the balloon deflated to evaluate the lower uterine segment if the balloon obscured this area after initial placement or migrated into this area during the study. In case there is no opacification of the fallopian tubes (Figure 5), temporary tubal spasm has to be ruled out. Any variations in the uterine anatomy is recorded as shown in figure 6.

As with other radiography procedures, the goal is to obtain an adequate study using as low as reasonably achievable (ALARA) radiation dose. The other areas have to be shielded with lead protection, smallest radiation area has to be used and radiography exposure has to be minimized.

We prescribe oral antibiotic for seven days following the procedure. Tablet composed of Ofloxacin (200 mg) and Ornidazole (500 mg) twice a day for 7 days with Tablet Pantoprazole (40 mg) prior to breakfast is recommended.
Different methods (9,10) have been employed to reduce the incidence of pain (10,11) and vasovagal reaction.

Complications[12. 13]:

Patients usually experience some cramping when the catheter balloon is inflated in the endocervical canal or when the uterus is well distended with contrast material. Cramping is more common in the setting of a tubal obstruction.This cramping is generally minor and transient and is well tolerated by the majority of patients. Other complications are bleeding and infection. Patient should be instructed that she may experience light spotting after the procedure, usually lasting less than 24 hours. Patients are also instructed to watch for the development of fever or foul-smelling vaginal discharge over the 2–4-day period following the procedure. Prophylactic antibiotics are prescribed to prevent development of infection.Allergic reaction to contrast media is very uncommon with the use of the low-osmolar contrast agents. A possible complication due to manipulation of the cervix or inflation of a balloon in the cervical canal is vasovagal reaction. Rare complications are uterine perforation, tubal rupture andvenous or lymphatic intravasation of contrast media (Figure 6).

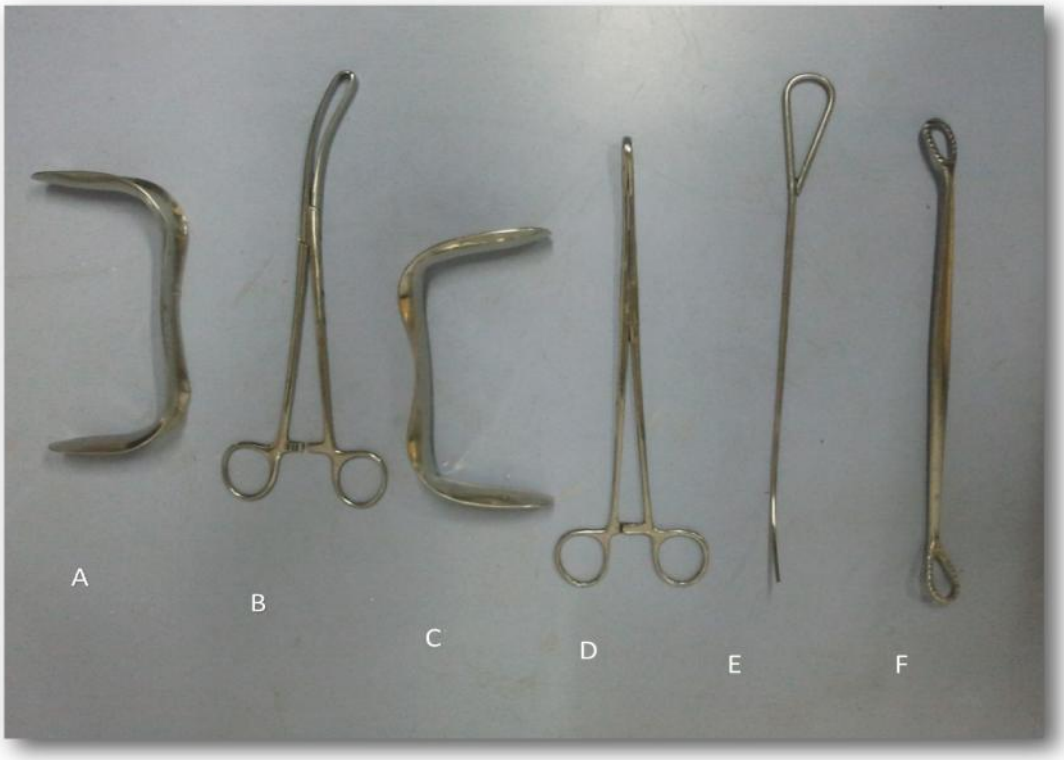

Figure 2: HSG kit comprises of these instruments Speculum (A,C), Vulsellum (B), Forceps (D), Uterine sound (E) and anterior vaginal wall retractor (F)

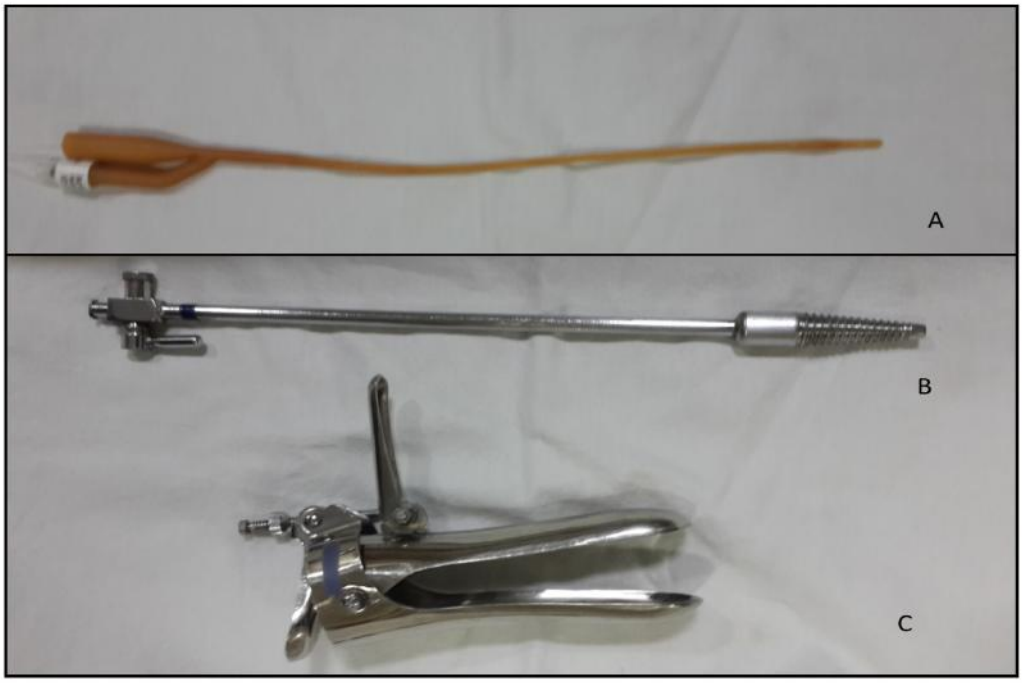

Figure 3: Foleys catheter (A), Leech Wilkinson metal cannula (B), Cusco's speculum (C)

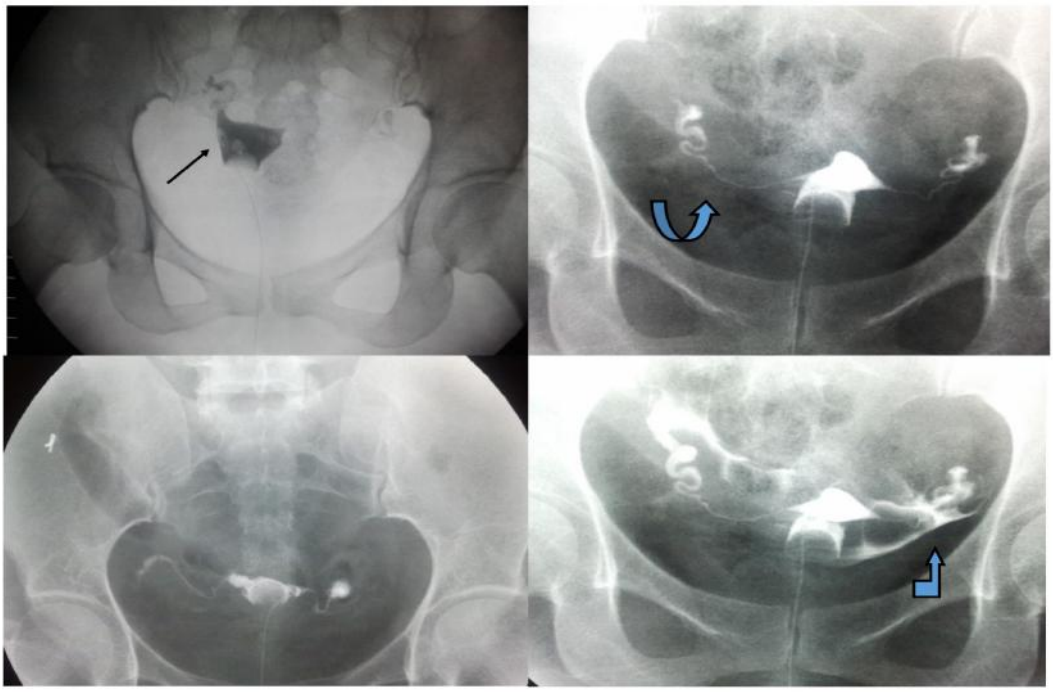

Figure 4: Normal HSG with peritoneal spill of contrast. The uterine contour is well delineated (black arrow)and bilateral fallopian tubes are seen as slender structures (curved arrow) filling with contrast and the distal mildly dilated fimbrial end of the tubes are noted. The peritoneal spill is noted as spill of contrast lining the peritoneal fasciae (bent up arrow).

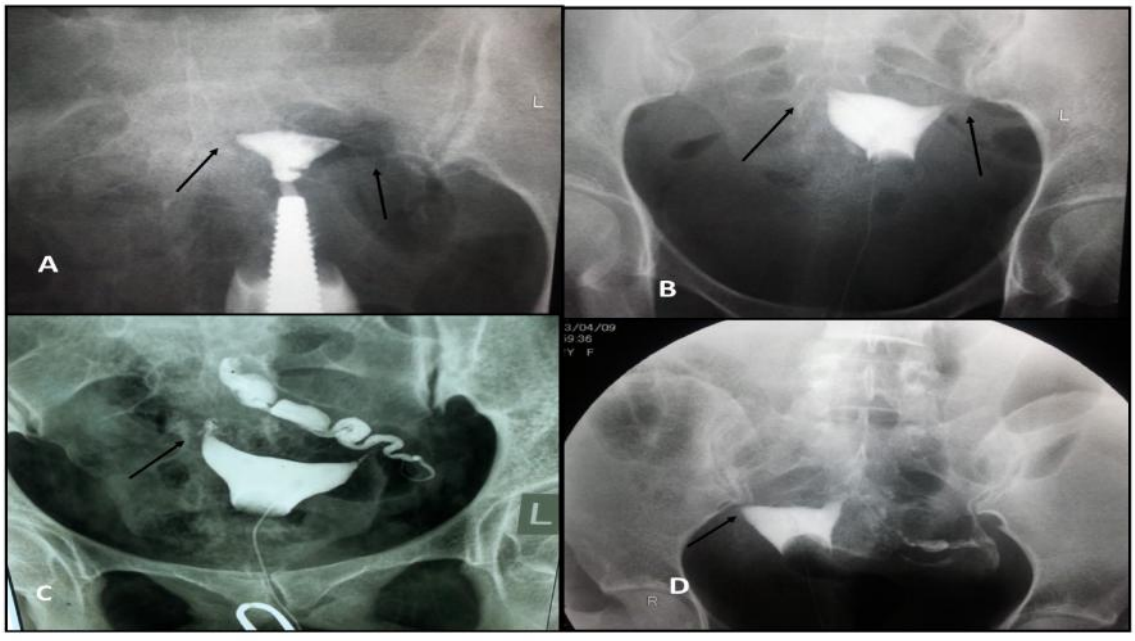

Figure 5: HSGs displaying cornual blocks (black arrows). Leech Wilkinson method (A) and catheter method (B, C, D) showing bilateral cornual blocks (A, B, C) and unilateral right cornual block (D)

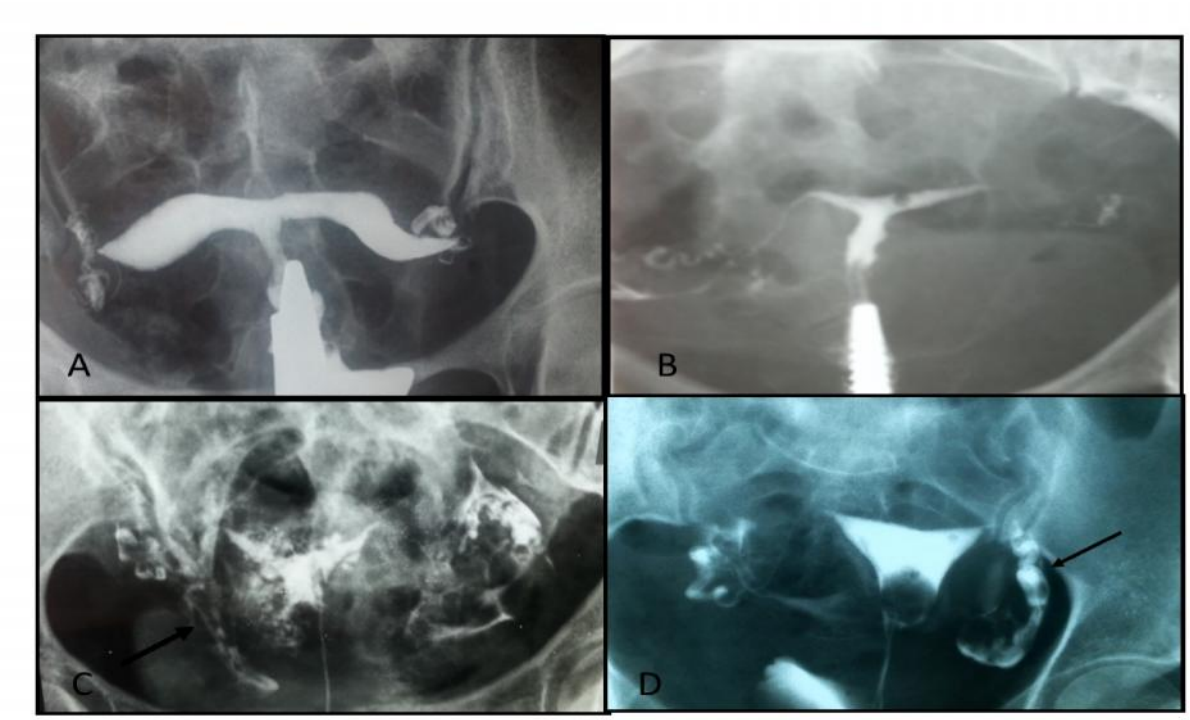

Figure 6: Uterine pathologies. Uterus bicornisunicollis– two distinct uterine horns and a single cervix (A); T shaped uterus (B) due to unknown cause showing a small uterine cavity and irregularities; Venous intravasation as seen by contrast in the pelvic veins (black arrow); Saplingitisishthimcanodosa (D) – seen as rounded filling defects along the fallopian tube mucosal margin (black arrow).

CONCLUSION:

Infertility is a major branch of medicine and gynecology with the increased incidence in subfertility, and the number of women pursuing fertility treatments. Evaluation of the fallopian tubes in the most essential part of infertility evaluation. Tubal block is the most common finding in HSG work up of patients with subfertility and infertility. (14,15)

Hysterosalpingography and laparoscopy combined with chromo-tubation is considered as the gold standard in the evaluation of patency of Fallopian tube (16). The latter is an invasive procedure requiring General anesthesia and hence HSG is used for preliminary evaluation at our institution.

Since the Leech Wilkinson metal cannula is associated with higher incidence of pain, we preferred the catheter method as it adequately demonstrates the fallopian tubes which is the essential prerequisite in the evaluation of infertility.The described catheter method is the least distressing and most economical; accurate and reproducible. The process of recording the radiographic movie of injection of contrast on the fluoroscopy machine from which representative images are later chosen for printing on film is ideal and reduced radiation exposure.

Conventional HSG can be painful due toosmotic irritation of endometrial and peritoneal tissueby iodinated contrast agents. Entrance surface doses and ovarian doses range from2.3 mGy and 0.5 mGy in digital systems to 13.1 mGyand 3.1 mGy in analog systems, respectively (17). Hence sono-hysterosalpingography (18,19) is offered as an alternative in

some centers. In this procedure, Saline is injected through a trans-cervicalcatheter slowly. Trans-vaginal scanning is done to assess the uterine cavity that is distended by saline and also passage of saline (fluid) seen through the tubes. When uterine cavity is filled with saline, any endometrial pathologies can be demonstrated and diagnosed. Spill of saline from fimbrial end is seen as fluid flow surrounding the ovary and its collection in pelvis on B-mode scanning.More recently, three-dimensional extended imaging provides the ability to obtain sequential sections of acquired volume scans in A, B and C planes (19).Maheux – Lacroix S et al (18) performed a systematic review and meta-analysis of studies published in any language before November 2012, and concluded that Sonohysterosalpingography which has the advantage over HSG of obviating ionizing radiation and the risk of iodine allergy and proposed that sono-HSG should replace HSG in the initial workup of subfertile couples.The main disadvantage of HSG in comparison to sonohysterography is exposure to electromagnetic radiation. The limitations of sonohysterosalpingography lies in the logistics of performing the procedure, operator dependency and lack of appropriate recording of the tubal spill as compared to filming in HSG.

Dynamic MR-HSG (16) has been proposed as a “one-stop-shop” for the assessment of the uterus, patency of fallopian tubes, and extra-uterine pelvic structures in a single sitting. 20 ml of gadolinium-polyvidone solution (18.4 mMDotarem 1:20 with polyvidone) is injected intra-cervical through a 5-Charriere balloon catheter while acquiring five consecutive flash-3D T1-weighted MR sequences with fat saturation.The procedure is predominantly well tolerated, but has a high failure rate compared with conventional HSG. The advantage lies in the avoidance of ionizing radiation.

HSG remains the first line investigationfor evaluation of the fallopian tubes patencyand the ‘last man standing’ in the armamentarium of the conventional imaging modalities available to the radiologist (21, 22).
Hysterosalpingography is the gold standard in assessing the patency of the fallopian tubes, which is among the most common causes of female factor infertility, making this technique the most frequent first-choice imaging modality in the assessment of female infertility. In spite of the rapid advances in cross sectional imaging there has been no suitable total replacement for HSG in the present day. Only time will tell how long it will last!

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