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RESEARCH ARTICLE

FEMALE INFERTILITY: ULTRASOUND AND HYSTEROSALPOINGOGRAPHY

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ABSTRACT

The causes of female infertility are multifactorial and necessitate comprehensive evaluation including physical examination, hormonal testing, and imaging. Given the associated psychological and financial stress that imaging can cause, infertility patients benefit from a structured and streamlined evaluation. The goal of such a work up is to evaluate the uterus, endometrium, and fallopian tubes for anomalies or abnormalities potentially preventing normal conception.

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INTRODUCTION

Infertility is defined as the inability for a couple to conceive a pregnancy following 1 year of unprotected vaginal intercourse (McLaren, 2012).W.H.O. defined infertility as: failure to conceive over 12 months of exposure to a good practical guide. Physiological sterility is present before puberty and after menopause. A, physiological sterility is present during pregnancy because eovulation is inhibited as soon as conception occurs. The infertility of lactation period should be regarded as relative. Only60% of lactating women have amenorrhea (John Howkins, 1971).

Pathology of Infertility: A variety of factors may affect normal fertility including patient age, anatomy, ovulatory status, and sperm quality. Potential causes of infertility can be divided into male and female causes and include endocrine, anatomic, genetic, and behavioral conditions (Sadow, 2014). As a result, the evaluation of the infertile couple is multifactorial, necessitating physical examination, hormonal testing, and imaging.

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Causes of Infertility as Related to Female

- Developmental Uterine absence, hypoplosia, uterine anomalies, and gonadal dysgenesis.
- Endocrine: Pituitary failure, thyroid disturbance, adrenal hyperplasia, ovarian failure and disease (Jones, 1995).
- Genital Causes: Pelvic infection and tubal obstruction (Stanley, 1981).
- These are major factors in parts of Africa.
- Endometriosis which is relatively common in higher social classes in developed countries, myomata, polyps, cervicitis and vaginitis.
- General Cause As in dietary disturbance, severe anemia and anxiety fear.

Evaluation of the Infertile Patient

This includes

- Hysterosalpingography,
- Pelvic Sonograplhy,
- Multiple Laboratory and Endocrine Test.
- Laproscopy.
- M. R. I (Jones, 1995; John, 1970).

Fertilization: Fertilization of the ovum normally takes place in the ampullary portion of the Fallopian tube between few minutes to 3 hours after, coitus (John, 1970) .The transit of the spermatozoa results partly from their own motility and partly from uterine and tubal peristalsis (Stanley, 1981).Under the influence of the ovarian hormones, the endometrium undergoes cyclical changes. If fertilization occurs, the greatly thickenedendometrium becomes the decidua of pregnancy (John Howkins, 1971; Stanley, 1981).

Hysterosalpingography: HSG is the gold-standard imaging modality in the diagnosis of occlusion within the fallopian tube (Table 1). The obstruction results in lack of intra-peritoneal free spillage of contrast (Eng *et al*., 2007). When the obstruction is identified within the proximal cornual portion of the Fallopian tube, differentiation from spasm must be considered with delayed imaging or administration of a spasmolytic agent such as scopolamine or glucagon to determine whether the obstruction is permanent or temporary (Simpson, 2006; Krysiewicz, 1992; Schankath *et al*., 2012). In addition it may be helpful to place the patient prone and re-inject contrast material into the uterus (Thurmond, 2003).

Indication

- **Infertility:** to demonstrate normal patency of the Fallopian tubes and their communication with peritoneal cavity.
- Recurrent abortions to demonstrate congenital abnormalities of the uterine cavity or incompetence of internal os of the uterus (Horwitz, 1979).
- To monitor the effect of tubal surgery (Zanetti, 2013).

Contra Indication

- Active pelvic sepsis, the examination may result in a spread of infection.
- Severe renal or cardiac disease.
- Sensitivity to contrast media.
- Recent dilatation and curettage.
- Pregnancy.
- The week prior to and week following menstruation (Sutton, 197; Stephen -Chapman , 1986) .

Patient after menstruation but generally not less than seven days (Horwitz, 1979).

Uterine malformation: Classification of uterine malformation based on the embryonic development of uterus Figure (1)

Malformation due to Arrested Development of the Mullerian Ducts: They occur during the first phase of embryonic development, i.e. the phase of cranio caudal growth of Mullerians ducts . They may be either symmetrical bilateral (uterine aplasia), or a symmetrical unilateral (uterus unicornis unicollis) Figure (2), These malformations very rare (Zanetti, 1978; Sutton, 1987).

Malformation due to the Failure of Fusion of the Mullerian Ducts: Malformation according to whether failure of fusion is total or partial;

- Uterus didelphys resulting from total failure of fusion of the two ducts. The uterus and vagina are duplex and one side is usually better developed than the other (John Howkins, 1971).
- Uterus bicornis bicolis resulting from partial fusion of Mullerian ducts, the two coruna of the uterus remain separate and two complex cervices project into the vagina. Occasionally only a partial vaginal septum is present.
- Uterus bicornis unicollis characterized by the presence of one vagina, one cervix, two quite distinct uterine horns Figure (3). Uterus arcuatus: the least marked degree of failure of fusion Figure: (4) (John Howkins, 1971; Sutton, 1987). The complex of complete Mullerian duplication only 92 cases have been reported. Renal agenesis was shown on the side of the imperforated Vagina (James Johnson, 1986).

Malformation from incomplete resorption of the sagital septum

- Uterus septus, although the two Mullerian ducts fused, a median septus passes from fundus of the uterus through the cervix and may extend into the vagina.
- Uterus subseptus, this septum is restricted to the body of the uterus: Figure (5) (James Johnson, 1986).

Congenital Developmental Defect of Uterine Cavity

- Uterine hypoplasia.
- Infantile uterus with disproportion between the body and the cervix.
- Uterus with gaping cervix and isthmus.
- Pencil uterus
- Star shaped uterus (Schankath *et al*., 2012).

Zanetti- E. *et al*; had done a series of 13470 HSG investigations that demonstrated congenital abnormalities of uterus in 1160 cases, (8.6%). The types of malformations and percentage are shown in table (McLaren, 2012).The findings stresses the great value of HSG in the study of congenital malformation , its diagnostic value coupled with the possibility in some cases of successful surgical resection are point together with considerable simplification of the method have made forever increasing use of this type of investigation. Reuter- KI. *et al*; concluded that the H. S. G. has been the primary diagnostic modality for Mullerian defect, on basis of 63 patients HSG, when supplemented with gynecologic evaluation the diagnostic accuracy 62.5% . and when protocol including U.S with HSG the diagnostic accuracy improved to 90% (17) .Types and percentage of congenital uterine malformation in 1160 cases out of 13470 HSG in investigations as demonstrated by Zanetti, E. *et al*.,)

Ultrasound for the Assessment of Uterine Anatomy and Detection of Congenital anomalies: The sonographic diagnosis of uterine malformation depends on the ability to define abnormalities of the external contour of the uterus (Seibel, 1981).Uterine hypoplasia and/or agenesis, US demonstrates a fibrous remnant/connective tissue and vessels in the expected region of the uterus in the setting of agenesis and small hypoplastic uterine soft-tissue remnant in the setting of hypoplasia Mayer-Rokitansky-Kuster-Hauser syndrome is the most common variant in this class of anomalies (Troiano, 2004).

Table 1.

Types of ut. Malformation	No. of Cases	%of all malformation
uterus arcuate	400	34.5%
uterine hypoplasia	386	33.3%
uterus bicornisuncollis	160	13.8%
uterus unicornisunicollis	158	13.6%
uterus septus or subseptus	22	1.9%
uterus didelphys	18	1.5%
uterus bicornisbicollis	16	1.4%

Table 2.

Total No. of Patients	Types of Congenital Uterine Anomaly	No. of patients diagnosed by HSG and Iaprocopy	No. of patients diagnosed by U.s
39	Didelphic	2	1
	Bicomnuate	11	11
	Complete Septate	4	4
	Partial Septate	22	22

Table 3. Accuracy of Tubal Findings on HSG

Authors	% of peritubal adhesion	% of tubal obstrucation	% of hydrosalpinx	Total No. of patient
Freakly-W.J, et al.		22%	22%	860
Horwitz-R.C et al	65%	27%	39%	98
Fayez-J.A	8.8%	Similar accuracy to laproscopy		420
Karasick	75% diagnosis confirm by laproscopy			100
Marcinkowskin-Z Bulatowic-Z.M	9.0% on Rt. Side 12.9 on Lt.bside	13.0% Rt. oviduct 12.9% Lt. oviduct		191
Thomala-J.		30.7%		283

Table 4. Different Sonographic Patterns of endometriosis

Authors	No. of Patients	Cystic Lesion	Mixed Lesion	Solid mass	Polycystic Lesion
James-W; et al	25 patient (31 lesions)	17 54.8%	5 16.4%	4.12.9%	4 12.9%
Beverly-G; et al	13 patient	8 61.5%	3 23%	2 15.4%	

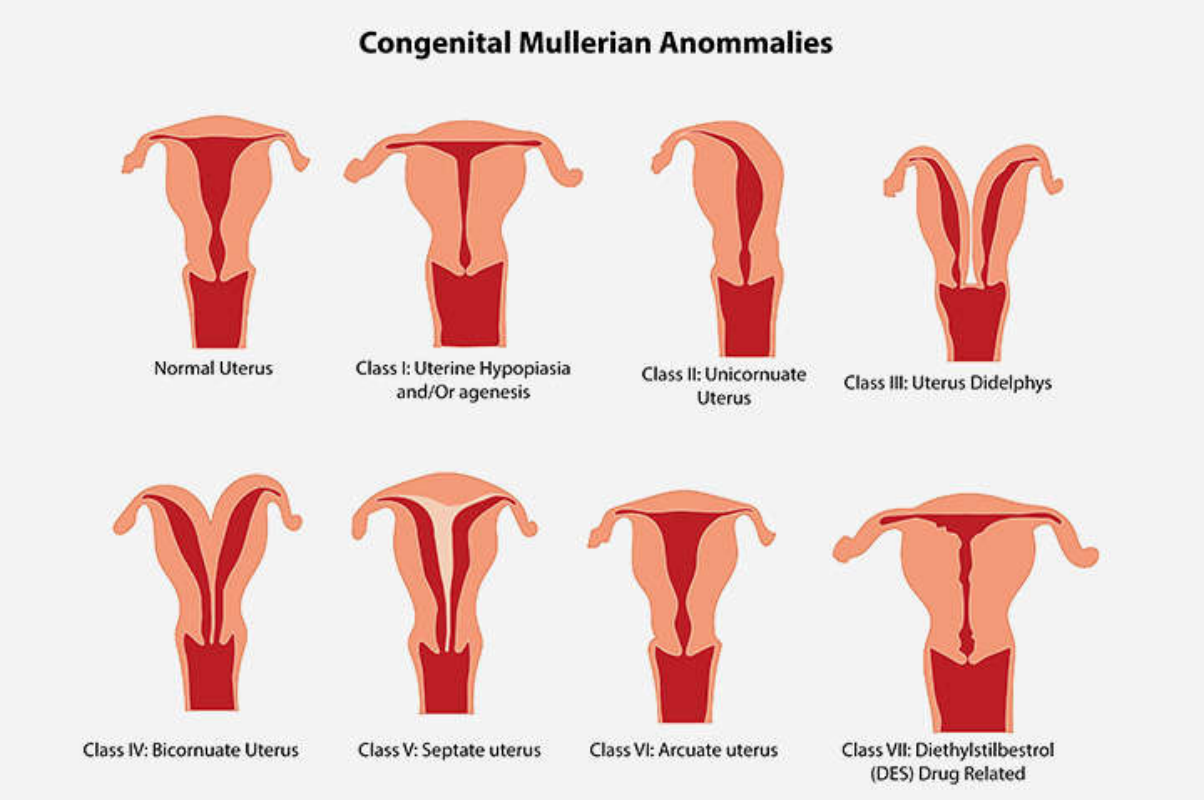

Figure 1. Congenital Mullerian Anomalies

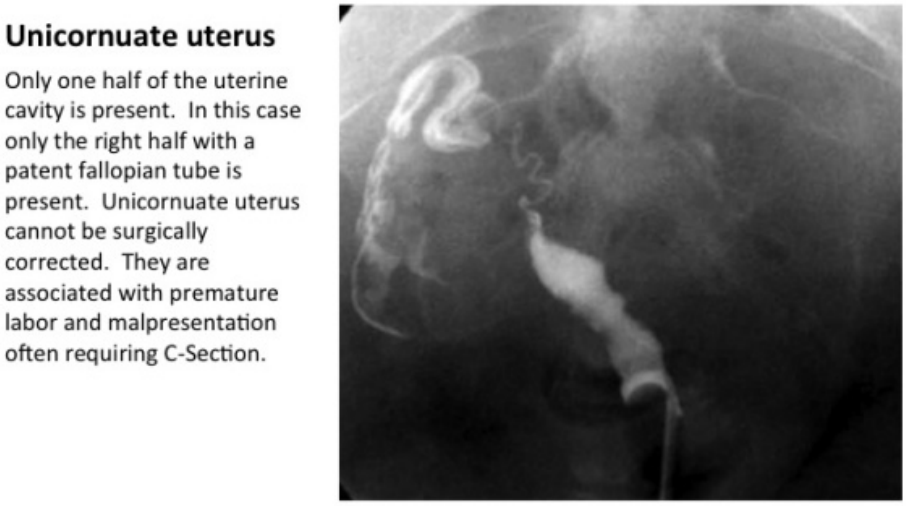

Figure 2. Unicornuate uterus

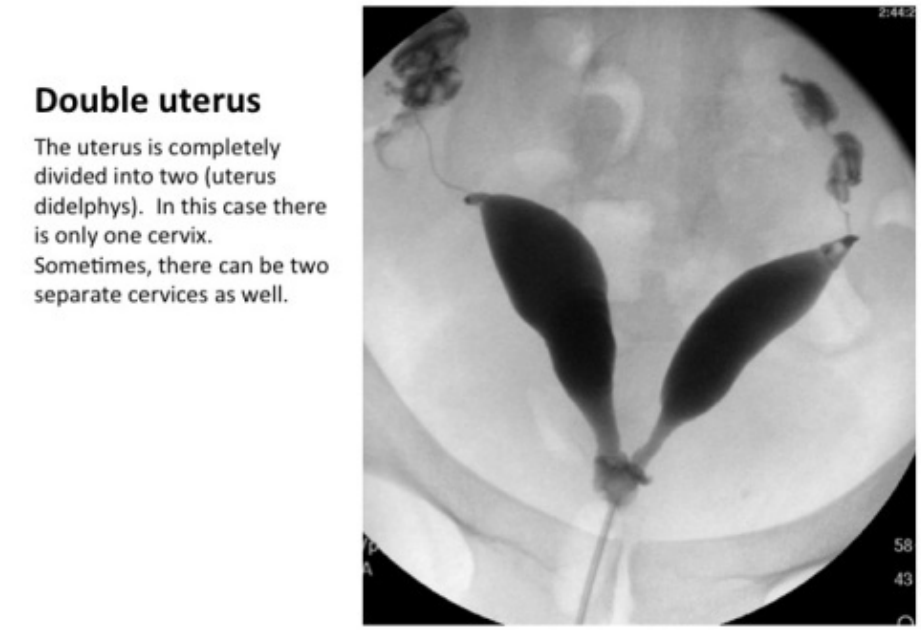

Figure 3. Bicornis bicolis uterus

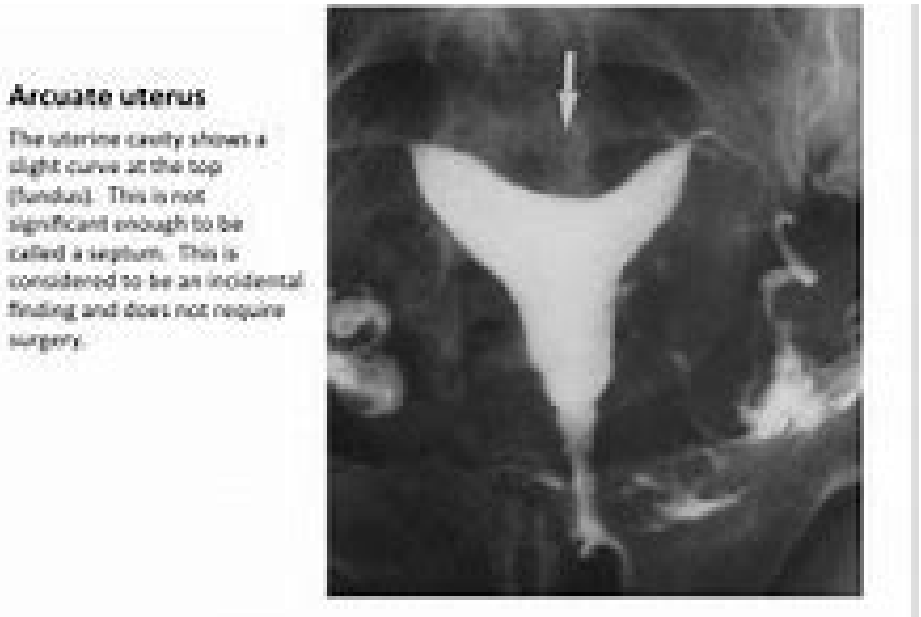

Figure 4. Uterus arcuatus

Figure 5. Uterus subseptus

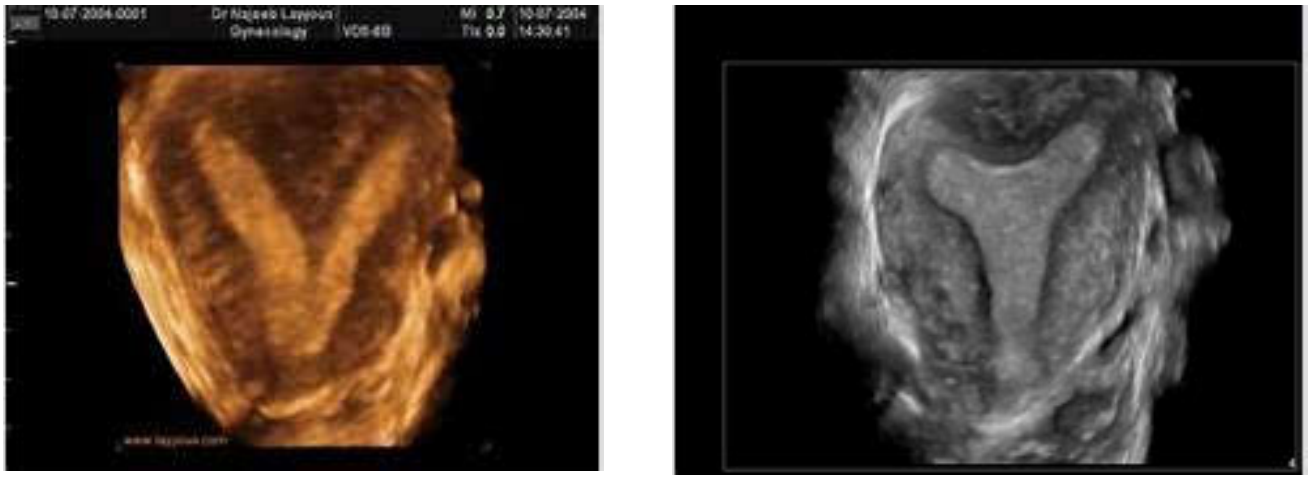

Figure 6. Three dimensional us of congenital uterine anomalies

The most frequent anomaly by U. S in Bicornuate uterus, US demonstrates a fundal uterine cleft larger than 1cm separating divergent uterine horns. It will also show fusiform symmetric size and appearance of the endometrial canals, with possible visualization of a communication between the inferior segments of the uterine horns (Kaproth-Joslin *et al*., 2013).

Didelphys uterus, US demonstrates 2 symmetric, widely spaced uterine horns each with its own cervix. Both HSG and MRI will show a similar picture. Failure to identify and canulate both cervices during HSG may lead to false diagnosis of unicornuate uterus. There is an association of urinary tract anomalies with this condition which is present in 23% of

women with didelphys uterus (Taylor, 2008). Unicornuate uterus, US demonstrate a fusiform "banana-shaped" endometrial canal, which is laterally deviated with a single fallopian tube. If this is detected, it is better to do MRI to evaluate for a rudimentary horn which is often resected to avoid an increased risk of endometriosis and/or ectopic pregnancy (Khati, 2012). It is important to note that this condition is often associated with urinary tract anomalies with renal agenesis contralateral to the dominant uterine horn most commonly seen (Kaproth-Joslin *et al*., 2013; Troiano, 2004). Fedele- L. Candiani, *et al* evaluatethe ability of U.S to demonstrate the peritoneal profile of the malformed uteri-correctly by the comparing the result of U.S with the result of hystrosalpingograplhic and subsequent laproscopy the results are listed in table (John Howkins, 1971). The sensitivity of U.S to detecting the presence perimetrial fundal notch was 92.3% and its specificity is 100% (Fedele, 1988)

Three Dimensional U.S for the Assessment of Uterine Anatomy and Detection of Congenital Anomalies: On three dimensional U.S the most useful plane was a transverse section through the hall length of the uterus from the fundus to the cervix. Comparison between HSG and three dimension US agreed with HSG in all cases of arcuate uterus and in the majority of congenital anomalies. The ability to visualize both uterine cavity and myometrium on three dimensional scan facilitated the diagnosis of uterine anomalies and enable easy differentiation between subseptate and bicornuate uteri, figure (6) (Chawla, 2009). Demonstrates the ability of U.S to Demonstrate Malformed uteri, US visualization was adequate in 35 cases out of 39 as reported with HSG and laproscopic findings

Tubal pathology: HSG for many years has been an invaluable procedure for theassessment of tubal patency and tubal and intrauterine pathology recently, the use of laproscopy for direct tubal visualization in theinvestigation of infertility has tended to replace HSG in many centers (Stanley, 1981).

Hydrosalpinx: It is the dilatation of the proximal tube as a result of blockage of ampullary portion of the fallopian tube taking on a classic sausage-shaped appearance (Kaproth-Joslin, 2013). The condition is often bilateral and is caused by scarring or adhesions of the distal tube from PID, adhesions from previous pelvic surgery or trauma, endometriosis and tubal neoplasm (Kim, 2009; Chawla, 2009). A previous infection results in a blockage of the tubes with dilatation of the ampullary position and obliteration of normal internal mucosal architecture. There was free communication of the dilated area with the is thmic portion of Fallopian tube, the terminal ridges of adherent and ballooned fimbria were sometimes visible. Fluid -contrast levels werefrequently seen in the hydrosalpinx on the erect 20 minutes radiograph. HSG demonstrates a dilated proximal tube: Figure (7) with absence of free intra-peritoneal spillage of contrast. There is need for post procedural antibiotic prophylaxis (doxycycline) to prevent infection from stasis of contrast material within the obstructed tube 56. Ultrasound Figure (8) and MRI may show a fluid-filled tubular structure. The imaging characteristics of the fluid vary depending on whether the fluid is simple, hemorrhagic, protein or pus filled (Kim *et al*., 2009; Chawla, 2009). Kasby-C. B., *et al*; their study was carried out on 230 HSG with infertility, repeated abortion, post surgery group. 18 and 30% of women refereed with primary and secondary infertility had unilateral or bilateral tubal obstruction. One half of these were accompanied by hydrosalpinges (Kasby, 1989). Limited intra-peritoneal spill of contrast material occasionally occurred on pressure which cause separation of adherent fimbriae and usually spill tend to remain indiscrete localy and not spread freely in thegeneral peritoneal cavity (Horwitz, 1974; Sutton, 1987) .

Peri-tubal Adhesion: Multiple convolutions of the isthmus and ampulla of the Fallopian tube, with reduced mobility which could be assessed on manipulating under fluoroscopy. Karascik- S. *et al*; mention other radiological signs of peri-tubal adhesion involving:

- Location of spillage of contrast medium into peritoneal cavity.
- Ampullary dilatation.
- Peri-tubal hallo effect (double contour) appearance
- Vertical Fallopian tube (Karasick, 1989).

Cornual Spasm: SadekFoda, mention's a useful adjunct to the diagnosis of cornual spasm in the I.V Hexoprenaline 10 mg and subsequent visualization of the Fallopian tubes, if this fails to demonstrate the Fallopian tubes in apparent bilateral cornual spasm, and contrast is noted in the peritoneal cavity on the 20 minute radiograph which is indirect evidence of spasm in at least one tube (SadekFoda, ?). Alanc-Winfield, *et al*; study the effect of I.V injection of 1 mg glucagon in 24 patients: 21 had unilateral and 3 had bilateral corneal occlusion as demonstrated on HSG this yielded 7.7°% of 310 patient undergone HSG Glucagon was administrated to these 24 patients with reversal of occlusion in 9 of these 27 tubes (33% response rate) and lowering the incidence of cornual occlusion to 5.8% of the 310 patients. Radiographic appearance of cornual spasm characterized by breast like cornual contour, either unilateral or bilateral (Horwitz, 1979) .

Cornual Occlusion: Characterized by appointed or irregular cornual margin, and failure to visualize the tubes after administration of Hexaprenalin or glucagon (Sadek Foda, ?; Alanc, 1982).

Partial Distal Occlusion of Fallopian Tubes without Hydrosalpinx: Some dilatation of ampulla, retention of contrast in the ampulla at 20 minute and late spill of contrast were indicative of artial occlusion of Fallopian tubes (Horwitz, 1979).

Role of HSG in the Diagnosis of Tubal Pathology: Horwitz-RC, Shaf-MI, *et al*; They have reviewed the place of HSG , radiological appearance and accuracy of reporting with direct relevance to infertility. As a result to their findings the HSG has a definite part to play as a preliminary procedure in every case and in many may bethe only investigation of tubal patency required prior to surgery or conservative management.

Moghissi -K.S, *et al*: concluded according to their studies that the peri-tubal adhesion was the pathologic process most commonly missed by HSG (Moghissi, 1975). Kasby *et al* found that the greatest diagnostic weakness of HSG was in defining peri-tubal disease. It could sometimes be inferred by delayed or localized spill, lack of tubal mobility and abnormal tubal contour. It must be recognized that technical problems such as a poor cervical seal during dye insufflation at laproscopy may give misleading results of tubal patency. An unwise preliminary dilatation and curettage may contribute to apparent tubal obstruction with menstrual.

Figure 7. Bilateral tubal block and hydrosalpinx

Figure 8. Fallopian tube obstruction

Both of the above causes were felt to contribute to the disparity between laproscopic and HSG finding. The 68% concordance rate for tubal patency in higher than some published comparative studies (Coltart &El-Minawi *et al*.), but below the 76% achieved by debris Keirse *et al* (1989).

Fayaz *et al*. found after a comparison of HSG and laproscopy that the accuracy in the diagnosis of tubal patency or tubal blockage was quite similar for both procedures laproscopy revealed peri-tubal adhesion in 29.8% of 240 infertile patients, whereas HSG made anaccurate diagnosis in 8.8 % It is concluded that the HSG is as accurate as laproscopy in the diagnosis of tubal patency or blockage (Fayez, 1987). Karasick. Their findings suggest HSG can be the diagnostic procedure of choice in the initial assessment of infertility due to peri-tubal adhesion (Tinas- Richmn, 1984). Wart *et al*. Concluded that, although HSG is of limited use for detecting tubal patency because of its low sensitivity, its high specificity makes it a useful test for ruling intubal obstruction.

They also suggest that HSG is not reliable for the evaluation of peri-tubal adhesion. The result of correlation between HSG and laproscopy of tubal pathology are summarized in table [(3).]

Ultrasound of Fallopian Tubes: It has been often been stated that an U.S visible tube is an abnormal tube because the narrow (5-8 m) diameter undulating contour and delicate fimbria of the normal un-dilated tube make it difficult to resolve without contrasting fluid inside (Sandral Hagon, 1989). The tubes lie above the utero-ovarian ligaments, the round ligament and tubo-ovarian vessels must be distinguished from all three (James Johnson, 19896).

Fallopian Tubal Patency Assessed by U.S Following Fluid Injection: Sonosalpingograph technique was developed in which sterile fluid injected trans-cervically can be identified in the cul-de sac indicating patency of at least one Fallopian tube. In addition masses in the pelvis were visualized using U.S Tinas Richman n , *et al*; found the ability of U.S to detect

patency of at least one tube by demonstrating free-fluid in the cul-de sac was evaluated in 35 patients, US demonstrate bilateral occlusion with sensitivity of 100% and showed tubal patency with specificity of 96% This result eliminated unnecessary exposure of the female pelvis to ionizing radiation and avoid the use iodinated contrast material, also visualization of uterine and extra-uterine pathology and identification of follicle (Tinas- Richmn, 1984). To identify acquired abnormalities (fibroids, endometrial polyps, adenomyosis, uterine synechiae and cervical stenosis) (Steinkeler, 2009; Kaproth-Joslin, 2013). To identify congenital ovarian anomalies Gonadal dysgenesis is a congenital anomaly in which gonadal tissue is replaced by fibrous stroma with no germ cells (Choi, 1998). This condition is referred to as streak gonads. The most common form of this condition is secondary to Turner syndrome (45X0 karyotype). US is not performed to identify this condition. The diagnosis of this condition is based on clinical, biochemical, and karyotype identification. US demonstrates small oval to linear fibrous tissue within the broad ligament with absence of normal-appearing ovaries.

Endometriosis: It is the implantation of endometrial glands and stroma outside the endometrial cavity, primarily affecting the ovaries and peritoneal surfaces of the pelvis (Okeke *et al*., 2011; Chamie *et al*., 2011) about 15% of all women develop endometriosis during their active menstural life (James, 1979). Previous reports have estimated that endometriosis, affect as many as 40% of infertile women and is the sole factor contributing the infertility in 15% (Harold, 1985).

There are two forms of endometriosis:

- Diffuse endometriosis which consist of multiple tiny endometrial implants involving the pelvic viscera and their ligamentum attachment.
- Localize form consist of one or a few discrete endometrioma or chocolate cyst. This form is usually symptomatic and discovered as pelvic mass (Seibel *et al*., 1981).

Situation of endometriosis

- Internal endometriosis or a denomyosisa condition in which islet of endometrium penetrate from basal layer of endometrium into the myometrium of the uterus.
- External endometeriosis: results from the presence of actively functioning endometrial tissue in an aberrant location. Any organ of the body may be involved, most common site is cul-de sac, pelvic organ, including ovaries, Fallopian tubes, uterus, rectosegmoid colon and bladder, although implants have been found in such distant location as the lungs (John Howkins, 1971; Seibel, 1981; Harold, 1985).

Sonographic Appearance of endometriosis: Ovarian lesions often present as cyst with hemorrhage (endometroma), deep invasion of endometriosis on the peritoneum resulting in fibrosis and muscular hyperplasia. Ultrasound of an endometroma demonstrates a thick-walled complex cyst with homogeneous low level echoes, often called chocolate cyst, and may have small calcification along the wall of the cyst (Kaproth-Joslin *et al*., 2013; Okeke, 2011). It is difficult to visualize peritoneal implants with ultrasound but can be suspected if there is tethering of the bowel or if the ovaries are in close approximation to the uterus (Fayez, 1987; Okeke, 2011). Most masses were separate from uterus continuity with uterus and or an irregular shape indicated extensive disease with associated adhesion of the uterus. A very irregular mass also indicates the probability of involvement of adjacent organ such as the bladder and colon [2,41]. James -W *et al* ;described the U.S findings in 25 patients with surgically proven endometriosis. The masses were characterized by four different U.S patterns, in this 25 patients 31 lesions were classified:

- Cystic lesion of average size 4-8 cm, these cyst either had irregular inner wall or Smooth well-defined inner wall. The cyst either sonolucent or had internal septation.
- Poly cystic pattern all had enlarged ovary.
- Mixed cystic masses with focal clusters of irregular echogenic tissue lining the cystic wall and projecting centrally.
- Solid mass.

Beverly-G,etal;examined 13 patient with histological proven diagnosis of endometriosisand their U.S findings listed 1n table (Jones, 1995). Harold -Friedman, *et al*; their study was undertaken to determine the usefulness of uterine pelvic U.S examination in detection of endometriosis by correlating U.S finding and laproscopic findings. In 85 patients 48 patients (56.5 %) had no Iaproscopic evidence of endometriosis. 37 patients (43.6%) had endometriosis only 8 of these had abnormal Sonogram of these patients only 4 had sonographic abnormalities that corresponded to laproscopically identified endometriosis. Thus U.S is successful in detecting endometriosis in only4 patients (10.8%) of 37 patients. U.S is neither sensitive nor specific in diagnosing endometriosis (Harold, 1985).

Efficacy of HSG in Evaluating endometriosis: Although endometriosis may cause tubal abnormalities on HSG, efficacy of radiographic evaluation in this disease is not clear. Johnson -WK, Gelfand, *et al*; concluded that the radiographic examinations were reviewed and tubal status noted in each patients, criteria for tubal abnormality is included in complete or absent filling and ampullary dilatation or convolution. Radiographic sensitivity was 40% and Specificity was 83% Positive predictive value was 21% Endometriosis rarely cause radiographic abnormalities on HSG (Johngon, 1994).

Sonographic monitoring ofovarian foillicular development: The pelvic sonography is an accurate method for detecting and monitoring ovarian follicular development 23 due to the slight changes inthe size of the follicle prior to and immediately after ovulation and the occasion of similarity in appearance of pre and post-ovulatory follicle a single sonographic examination may be not always be an accurate determination of complete follicular maturation by the criteria of the sizealone (Horwitz, 1979; Kaproth-Joslin *et al*., 2013). All studies were carried out at 7 p.m on the 8th, 10th, 12th, throughthe 19th day of cycle (Robert, 1980). The follicles were first visible when their diameters were between 0.8and 1.0 cm, when not circular follicular diameter was recorded with respect to the largest measurable diameter (Anne Caban, 1981). In the beginning of a normal cycle one or many small follicles are visible on one or both ovaries (Reuter, 1989) after a diameter of 10-12 mm only one follicle is seen to grow to maturity and ovulation, the average rate of growth was estimated as 3 mm l day from the moment when the follicle become visible echographically, a rapid growth occurred few hours preceding the disappearance of follicle (Robert, 1980).

Sonographic Features of Ovulation: The follicular diameter at the time of ovulation ranged from (17-25mm) (Marik-Hulka, 1978). Kerini *et al*. (1979) reported average diameter of 23 mm as measured in 81 cycle on day before ovulation (Anne Caban, 1981). Robert- L, *et al*; (1980) mentioned that the diameter of follicle had increased to 2.7 +0.3 cm by the day preceding their disappearance (Robert, 1980). Lopata, *et al*, (1980) reported follicular size of approximately 20 mm for mature follicle (Taylor, 2008). Ovulation should occur within 48 hours of the development of an ovulating size (Reuter, 1989).

Sonographic features of Ovulation: These features include demonstration of an irregular border of the follicle and the presence of internal echoes within the follicle secondary to organization intra-follicular hemorrhage (Sadek Foda, ?), with evidence of fluid in the cul-de sac, one to two days after ovulation had occurred (Reuter, 1989; Taylor). Jueenan, *et al*; (1980) observed four sonographic appearance ofcorpus luteum including a cyst with an irregular border, a cyst containing internal echoes, complete disappearance of the cyst post-ovulation and there-appearance of a cyst post-ovulation (Anne Caban, 1981). Premature follicular repute is a phenomenon observed in patients with unexplained infertility. The cycle may have been infertile either because the ovum is too immature or because it is retained within deflated follicle.

Monitoring of Ovulation Induction with Gonadotropin: U.S is a valuable technique in the clinical treatment of infertility because it permits direct monitoring of ovarian follicle development in response to administration of gonadotropin (Sadow, 2014). When ovulation was treated with gonadotropins the No. of follicles was particularly high, these were as many as 3-6 per ovary follicles grew at different speeds and were often larger than the size at which atresia occurs in normal cycle (10-12 mm) (Anne Caban, 1981). It is possible that the follicular growth between 2.5-3.0 mm is veryrapid (a few hours) (Robert, 1980) follicular growth sometimes appear to stabilize with no increase in the diameter of echographic image for as long as several days, this is observed inconjuction with a lack of rise in plasma estradiol levels. When the dosage of HSG was increased estradiol level rose and echographic image indicated re-newed growth of the follicle. There was concern that in these cases induction of ovulation might lead to multiple pregnancies (Stanley,?; Anne Caban, 1981). The monitoring by U.S can help to induced ovulation at the best moment of follicular growth the follicle probably has to reach a certaindiameter to be able to rupture and lead to normal ovulation. If HSG isinjected too early or too late, luteinized un-ruptured follicle or chromosomal abnormalities might occur (Marik-Hulka, 1978).

Ultrasound in the ovarian hyperstimulated syndrome (ohss): The administration of Human Chorionic Gonadotropin in patient withmore than one ovulatory size follicle carries the risk of developing the ovarian hyper stimulation syndrome (Reuter, 1989) but it has also been described in patients with hydatidifrom mole , multiple gestation, chorioepithelioma ,as well as single gestation (Choi, 1998). The first indication of OHSS is a rapid increase in the size of anOvary containing multiple follicle in a patient who is receiving Human Menapousal Gonadotropin (Sadow, 2014). OHSS is characterized by enlarged ovaries containing multiple follicles, and it can be divided into 6 grades based on clinical lab-and U.S finding (Choi, 1998).

The ovarian appearance was invariably that varying amounts of intervening stromal element. Single identification cysts were measured up to 7cm, the more severe the grade of OHSS, the longer the single cysts were likely to be (Eng, 2007). In grade 2 single cysts of up to 4.5 cm and ovaries measure 5x5 cm, in grades 3 and 4, single cyst from 3-7 cm were seen and size of ovaries up to 12 x 12 cm (37) In grades 5 and 6, the size in greater than 12 x 12cm and there may be associated ascitis, pleural effusion electrolyte and blood volume disturbance, (Reuter, 1989). The incidence of OHSS in the infertile vary between 6-50% (McLaren, 2012). The role of U.S in this condition is shown to is shown to be in diagnosis for standing and follow-up. All follow-up U.S examinations were continued until there was clinical or U.S evidence of regression of severity of OHSS (Choi, 1998; James, 1979). The changes of OHSS will usually resolve with supportive therapyand withdrawal of the medication in 4-6 weeks (Choi, 1998; James, 1979).

Conclusion

HSG is a precious diagnostic method in primary infertility and it should be performed comparatively early in the quality of screening examination. Its high specificity for detecting tubal patency makes it a useful test. HSG is as accurate as laproscopy in the diagnosis of tubal patency or blockage and should remain as an integral part of female infertility investigation. Peritubal adhesion was the pathologic process most commonly missed by HSG and diagnosed subsequently by endoscopy. For Mullerian defect, HSG has been a primary diagnostic modality and it has an accuracy of 65% and when diagnostic protocol includes U.S examination with HSG for evaluation Mullerian defect, diagnostic accuracy improved to 90 %. Sonosalpingography technique was developed and its overall accuracy in diagnosis of tubal occlusion in 97%.U.S is a useful tool in the infertile patient for many reasons, among these are:

- It rules out pathology of cervix uterus, tubes and ovaries.
- It confirms an ovulation in patients when this is suspected clinically.
- for monitoring follicle development and to confirm the occurrence of ovulation in response to endogenous and exogenous hormone and determine the timing of ovulation.
- To time administration of HCG in patients with ovulatory -size follicles and to withhold administration of HCG in patients with more than two ovulatory - size follicle, (to prevent OHSS and multiple gestation).
- To prevent administration of HCG in patient in who the dominant follicle has developed on a side of an abnormal or absent tube.

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