Research Article

Three-Dimensional Sono hystero salpingography: A Diagnostic Tool in Evolution of Infertility Cases.

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Abstract: Infertility is the most common health concern in young adults. The aim is to study the diagnostic role of 3-Dimensional sono hystero salpingography for detection of intrauterine lesions, extra uterine lesions and tubal pathology. It is a hospital based prospective, descriptive study in which 50 patients with normal uterine cavity at transvaginal ultrasound underwent infertility workup at our outpatient clinic. All patients underwent 3-Dimensional sono hystero salpingography. These were then subjected to diagnostic hysterolaparoscopy the following day. The results of both were compared and correlated. Sensitivity, Specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy of 3- Dimensional sono hystero salpingography was compared with diagnostic hystero laparoscopy in detecting intrauterine, extra uterine lesions and tubal patency. The sensitivity, specificity, PPV, NPV and accuracy of 3-Dimensional sono hystero salpingography was 71.4%, 100%, 100%, 95.58% and 96% respectively for detecting intrauterine lesions; was 90.91%, 92.3%, 79.9%, 97.3% and 92% for detecting ovarian pathology; and 97.6%, 87.5%, 97.6%, 87.5% and 96% for detecting tubal patency. For diagnostic hystero laparoscopy, considered as the gold standard, the sensitivity, specificity, PPV, NPV and accuracy was 100%. It was concluded that the diagnostic value of 3-Dimensional sono hystero salpingography is comparable to diagnostic hystero laparoscopy in detecting intrauterine lesions, extra uterine lesions and tubal patency. Thus 3-D SHSG should be included as a preliminary investigation in infertility work up in women with normal uterine cavity in transvaginal ultrasound.

Keywords: 3Dimensional sono hystero salpingography, diagnostic hystero laparoscopy, intrauterine lesions, tubal patency, ovarian pathology.

INTRODUCTION

Infertility is one of the most common health concerns in young adults. Structural abnormalities of the uterus and tubal patency may adversely affect reproductive outcome by interfering with implantation and with ovum and sperm transportation, thus causing infertility [1]. Current imaging techniques for evaluating the uterus, uterine cavity, ovaries and fallopian tubes include transvaginal ultrasound, hysterosalpingography, sonohysterography, laparoscopy, hysteroscopy and magnetic resonance imaging. Transvaginal ultrasound is increasingly being used as a first line of investigation. The uterus and ovaries can be visualized clearly, and pathologic lesions can be identified. However, reports of the diagnostic accuracy of TVUS are conflicting [2, 3]. Three-dimensional ultrasound (3D-US) is a new imaging technique, with ability to register the 3 planes simultaneously and to reconstruct new planes that are not visible at 2D-ultrasound, enabling visualization of the uterus and endometrial cavity from any chosen angle and in any arbitrary plane [4]. Three-dimensional sonography when combined with sono hystero salpinsography provides detailed information regarding internal and external contours of the uterus, without the need for radiation, contrast material or surgical intervention for diagnosis, thus obviating the need for other modalities such as hysteroscopy, MRI and hystero laparoscopy for diagnostic purpose alone. In the present era with increasing prevalence of infertility and advancement in technology, evaluation for the cause of infertility has become a bit simpler. The need is for diagnostic modality that is highly accurate as well as least invasive. This study is just a step forward in this series.

MATERIAL AND METHODS

This hospital based prospective, descriptive study was conducted in the Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur between April 2012 to july 2013 . 50 infertile women were recruited in the study with normal pelvic bimanual examination and normal transvaginal sonography. Informed consent was taken from all candidates. Sono

hystero salpingography was performed by a single operator using 3- dimensional ultrasound system with 5MHz transvaginal transducer between days 5 and 10 of menstrual cycle. With woman placed in lithotomy position, a sterile vaginal speculum was inserted and the cervix was cleaned with antiseptic solution. A Foleys catheter size no. 8 was placed just above the internal cervical os and the balloon was inflated with 1 to 2 ml of sterile saline solution for stabilization and occlusion of internal cervical os. The transducer was gently introduced into the posterior vaginal fornix and the solution containing solution of ciprofloxacin and hyaluronidase with dexamethasone was slowly introduced into the uterus while uterine distention was monitored. At this stage architecture of the uterine cavity was observed using 3D-SHG. Also fluid was pushed with high pressure in an attempt to look for flow in the tube which can be appreciated by the turbulence of fluid. The patients were then subjected to diagnostic hystero laparoscopy, the following day. All diagnostic hystero laparoscopies were done by the same operator to avoid inter observer variations.

Statistical analysis
All the data was entered in Excel sheet and analysed statistically using SPSS Version, Primer of biostatistics.

Sensitivity = True positives / (True positives + False negatives)

Specificity = True negatives / (True negatives + False positives)

PPV = True positives / (True positives + False positives)

NPV = True negatives / (True negatives + False negatives)

RESULTS
Patient Profile
50 patients were included in the study. Assuming 92% sensitivity of 3- dimensional sono hystero salpingigraphy, sample size was calculated at 80% study power, alpha error – 0.05 and relative allowable error of 10%, sample size thus obtained came out to be 34 patients. Assuming 12% drop out rate, the sample size came out to be 41 which was then rounded off to 50 cases.

The mean age of cases was 26.58 ± 4.19 years and the mean duration of infertility was 4.33 ± 3.06 years. Out of 31 cases of primary infertility, 3-dimensional sonosalpingography revealed bilateral tubal patency in 28 (90.32%) cases and blockage either unilateral or bilateral in 3 (9.68%) cases. Out of 19 cases of secondary infertility, bilateral patency was seen in 14 (73.70%) cases and block in 5 (26.32%) cases. Thus, 3-dimensional sonosalpingography revealed bilateral patency in 42 (84%) cases and blockage in 8 (16%) cases in the study group (Table-1).

Comparison between 3-dimensional sono salpingography and laparoscopy was revealed; 3-dimensional sono salpingography showed bilateral patency in 42 cases ,out of which laparoscopy showed patency in 41 cases. Blockage was seen in 8 cases with 3-dimensional sono salpingography, out of which laparoscopy showed blockage in 7 cases. Overall the concordance between the two methods was 96%. The sensitivity, specificity, PPV and NPV of 3-dimensional sono salpingography was 97.6%, 87.50%, 97.6% and 87.5% respectively with accuracy of 96%. Agreement for the two methods was compared by Kappa index value and it was 0.73, showing good agreement between the two methods.(Table -2)

3-dimensional SHG picked up additional findings like fibroid in 2 (4%) cases, 2 (4%) cases of mullerian anomalies and 1 (2%) case of endometrial polyp (Table-3). Comparison between 3-dimensional SHG and hysteroscopy revealed: - 3-D SHG showed normal uterine cavity in 45 cases and hysteroscopy revealed normal uterine cavity in 43 cases. 2 cases were of flimsy intrauterine adhesions present in the fundal region near the ostia. Abnormal findings were seen in 5 cases in 3-dimensional SHG, all of which were also seen on hysteroscopy. Thus, for assessing the uterine cavity 3D SHG has sensitivity, specificity, PPV and NPV of 71.43%, 100%, 100% and 95.58% respectively and an accuracy of 96% (Table-4).

For detection of ovarian pathology by 3-dimensional sonography, normal ovaries were seen in 37 out of 50 cases. These were confirmed normal by laparoscopy in 36 cases. Out of 13 cases detected abnormal in 3-D sonography, 3 were normal looking in laparoscopy. This is because of the presence of small multiple follicles seen in ultrasound, but the size of the ovary was normal, hence laparoscopy view was assumed to be normal. To detect ovarian pathology, 3-dimensional sonography showed the sensitivity, specificity, PPV and NPV of 90.91%, 92.3%, 79.9% and 97.3% respectively and accuracy of 92% (Table-5).

Table 1: Distribution of Cases According to Interpretation of Tubal Findings in 3-Dimensional Sono salpingography

Type of Infertility	Total (n)	B/L Patent (%)	Blocked U/L / B/L (%)
Primary	31	28(90.32%)	3(9.68%)
Secondary	19	14(73.70%)	5(26.32%)
Total	50	42(84.00%)	8(16.00%)

$\chi^2 = 1.346$ d.f. = 1   P < 0.2

Table2: **Accuracy of 3-Dimensional Sono salpingography in Diagnosis of Tubal Patency**

3D SSG	Laparoscopy with Chromopertubation		Total
	B/L Patent	**U/L or B/L Blocked**	
B/L Patent	41	1	42
U/L or B/L Blocked	1	7	8
Total	42	8	50

$\chi^2 = 2.488$ d.f. = 1   P < 0.11   NS

Table 3: **Uterine Findings on 3-Dimensional Sono hysteron salpingography**

Findings	No. of Cases	%
Normal	45	90.00
Endometrial Polyps	1	2.00
Fibroid	2	4.00
Mullerian Anomaly	2	4.00

Table 4: Accuracy of 3-Dimensional Sono hystero salpingography in Assessment of Uterine Cavity Abnormalities

3-Dimensional SHSG	Diagnostic Hysteroscopy		Total
	Normal	**Abnormal**	
Normal	43	2	45
Abnormal	0	5	5

Table 5: Accuracy of 3-Dimensional Sono hystero salpingography in Diagnosing of Ovarian Pathology

3-Dimensional SSG	Diagnostic Laparoscopy		Total
	Normal	**Abnormal**	
Normal	36	1	37
Abnormal	3	10	13

DISCUSSION

Hystero laparoscopy is considered asthe gold standard technique for diagnosing tubal, peritoneal and intrauterine pathology. But it has the disadvantage of being an invasive procedure associated with morbidity and mortality. With the discovery of ultrasound, its use in the management of infertility was an expected development. Using transvaginal ultrasound,the uterus and ovaries can be visualized and also tests for tubal patency can be done by sonosalpingography, but the reports of diagnostic accuracy of ultrasound are conflicting .

Three-dimensional SHSG provides more precise anatomical sections for exploring the uterine cavity, the relation of myomas to the cavity, and for detecting endometrial polyps. In addition, 3D-SHSG has the advantage of simultaneous assessment of the uterine cavity and outer uterine contour, which enables differentiation between the arcuate, septate, and bicornuate uterus as well as ovarian pathologies. Additionally 3D ultrasound has role in assessment of ovaries and is helpful for measuring and evaluating follicles which is an added advantage over laparoscopy.

The present study evaluated the diagnostic performance of 3-dimensional sono hystero salpingography in detecting intrauterine lesions in infertile women with normal findings at transvaginal ultrasound. In our study, comparison between 3-dimensional sono hystero salpingography and laparoscopic chromopertubation, showed an overall concordance rate of 96%. The sensitivity, specificity, PPV,NPV of 3- dimensional sono hystero salpingography in detecting tubal patency was 97.6%,87.5%,97.6%,87.5% respectively with an accuracy of 96%.Agrement between the two methods was 0.73 as calculated by kappa index which shows good agreement.The results are similar to study conducted by Junjira Sutiipichate et al.; [5] to study tubal patency where PPV was 96.97% (95% CI 84.70 - 99.50), NPV was 88.89% (95% CI, 56.50 - 98.00), sensitivity was 96.97% (95% CI, 84.70 - 99.50) and specificity was 88.89% (95% CI, 56.50 - 98.00). When comparing the two modalities with regard to detection of intrauterine lesions, the results were similar to study done by Wahid El Sherbeny et al [6] in 180 infertile women with a normal uterine cavity at transvaginal ultrasound, who then underwent infertility workup with 3D-SHG and office hysteroscopy. Also, Ludiwin A et al.; [7] studied 117 women with infertility to estimate the diagnostic accuracy of 3-dimensional sonohysterography. Hysteroscopy was performed in conjunction with laparoscopy which detected 23 arcuate, 60 septate, 22 bicornuate and 12 normal uteri. 3D-SHG showed perfect diagnostic accuracy of 100% in general detection of uterine abnormalities. Thus the high diagnostic value of ultrasonographic tools

questions the need for endoscopy in detection of common congenital uterine anomalies.

CONCLUSION

3-dimensional sono hystero salpingography is a practical, non-invasive, cost-effective, less time consuming and efficient primary diagnostic tool to assess women with infertility. Its sensitivity, specificity and diagnostic accuracy is comparable to hystero laparoscopy, which is the gold standard for evaluation of infertile women. But, the later is invasive, requires hospital admission and operative skill and has an inherent risk of surgery and anaesthesia. Thus, in the hands of skilled practitioner, with a good technological basis, 3-dimensional sono hystero salpingography can replace the invasive methods, as a preliminary diagnostic tool in infertility work up and endoscopies reserved for women with abnormal findings in 3DSHSG, requiring therapeutic intervention.

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