

Original Article

EVALUATION OF UTERINE STRUCTURAL ABNORMALITIES; TRANS-VAGINAL SCAN VERSUS HYSTEROSCOPY

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Objective: To assess diagnostic accuracy of transvaginal ultrasound for uterine structural abnormalities as core part fertility work up taking hysteroscopy as gold standard.

Methods: This cross sectional study was conducted at Radiology Department of Lahore General Hospital in duration of six months. 385 cases were enrolled who reported infertility. TVS was performed in the same cycle. All sonographic examinations were done by an expert radiologist with 10 years of experience. The endometrial cavity was inspected in two perpendicular plane sagittal and transverse views. Irregularities, thickness, echo pattern and any distortion of the endometrium were noted. All patients underwent hysteroscopy. I also recorded the findings in the patients who underwent hysteroscopy after transvaginal scan.

Results: The mean age was 33.2±6.97 years. Mean duration of infertility was 3.15±2.13 years. Agreement between trans-vaginal scan and hysteroscopy in evaluating the uterine structural abnormalities causing infertility was assessed as 229(59.48%).

Conclusions: Conclusively, TVS structural abnormalities can be identified and hence we can lessen the investigation burden cost on couples who are to undergo a lot of investigations at the same time to find out structural abnormalities.

Keywords: infertility, sonography, trans-vaginal scan, hysteroscopy, structural abnormalities.

Introduction

Infertility in humans can be labeled if conception does not occur after 12 months of routine regular sexual contact of couple without using good preventive measures for pregnancy. There are many biological and other cause of infertility, including some that medical intervention can treat.¹ Estimates from 1997 suggest that worldwide “between three and seven per cent of all [heterosexual] couples or women have an unresolved problem of infertility. Many more couples, however, experience involuntary childlessness for at least one year: estimates range from 20-35% are due to female infertility, and 25-40% are due to combined problems in both parts.² In 10-20% of cases, no cause is found.² The most common cause of female infertility is ovulatory problems which generally manifest themselves by sparse or absent menstrual periods.³ The following causes of infertility may only be found in females. For a woman to conceive, certain things have to happen: vaginal intercourse must take place around the time when an egg is released from her ovary; the system that produces eggs has to be working at optimum levels; and her hormones must be balanced.⁴

For women, problems with fertilization arise mainly from either structural problems in the

fallopian tube or uterus or problems releasing eggs. Infertility may be caused by blockage of the Fallopian tube due to malformations, infections such as chlamydia and/or scar tissue. For example, endometriosis can cause infertility with the growth of endometrial tissue in the Fallopian tubes and/or around the ovaries. Endometriosis is usually more common in women in their mid-twenties and older, especially when postponed childbirth has taken place.⁵ Approximately 20% of all cases of female infertility is caused by tubal abnormalities.⁶

Another major cause of infertility in women may be the inability to ovulate. Malformation of the eggs themselves may complicate conception. For example, polycystic ovarian syndrome is when the eggs only partially developed within the ovary and there is an excess of male hormones. Some women are infertile because their ovaries do not mature and release eggs. Infertility affects 40% of females with polycystic ovaries.⁷ Uterine leiomyomas are most frequent abnormality seen in females with almost as prevalent as incidence is around 70%.⁸ Fibroids can cause infertility in 5-6% of patients in 5-6% of patients and may be only reason for infertility in 1-2.4%.⁹ Another major uterine abnormality implicated in infertility are endometrial polyps. According to one prospective study 32% of 1000 patients undergoing IVF were found to have uterine polyps.¹⁰ Other factors that can

affect a woman's chance of conceiving include being overweight or underweight, or her age as female fertility declines after the age of 30. The basic evaluation can be performed by an interested and experienced primary care physician or a gynecologist.

In a study, TVS was carried out in 789 cases before hysteroscopy. TVS and hysteroscopy results showed that there was 50% agreement in case of uterine polyps, 30% in case of uterine fibroids, 42% in case of endometrial hyperplasia, 16% in case of intra uterine adhesions and 27% in case of uterus didelphus.¹¹ In another comparative study of TVS and hysteroscopy, TVS was successful in explaining infertility in 52.5% of cases while hysteroscopy detected 95% cases. The final agreement between both methods was moderate and significant correlation between the two with the hysteroscopy being a better diagnostic tool. The strength of agreement is considered to be moderate.¹²

The rationale of the study is to find the degree of agreement in detection of different structural abnormalities of females reproductive viscera commonly involved in causing infertility on transvaginal ultrasound which is cost effective, easy to perform, non-invasive and in less time as compared to hysteroscopy which is invasive, expensive and sometimes requires anesthesia. There is hysteroscopy that is commonly applied as gold standard, is invasive procedure but the results are seen similar as diagnosed with the TVS. In a study comparing TVS with hysteroscopy, the degree of agreement was almost comparable, though TVS could be one of the best initial diagnostic modality.¹⁴ This study can facilitate healthcare practitioner to adopt and advise a more accurate initial technique to deal with the female cases presenting with the issue of infertility which can also lessen the investigation burden cost on couples who are to undergo a lot of investigations at the same time to find out structural abnormalities.

Method

A total of 385 cases were enrolled who reported infertility. After approval from hospital ethical committee and informed consent from participants of study, women fulfilling the inclusion criteria (Women of child bearing age between 22-45 years, women with primary

infertility as per history, women who had regular unprotected intercourse for more than one year.) were selected from Outpatient Department. Women were asked for their demographics including name, address, and marriage date/year and contact details. TVS was performed in the follicular phase of the cycle (days 5-13) after cessation of bleeding using an Esote Doppler with a transvaginal 6 MHz probe. Structural Abnormalities on trans-vaginal ultrasound, lesions which are commonly implicated in infertility were evaluated on Trans-vaginal ultrasound. endometrial polyps, uterine fibroids, adhesions, endometrial hyperplasia and didelphus uterus. All sonographic examinations were done by an expert radiologist with 10 years of experience. The endometrial cavity was inspected in two perpendicular plane sagittal and transverse views were evaluated. Irregularities, thickness, echo pattern and any distortion of the endometrium were noted. Uterine cavity abnormalities including polyp lesions, uterine fibroids, uterine congenital anomalies such as septum, adhesions and endometrial hyperplasia were investigated. All patients underwent hysteroscopy. All this information was recorded in a pre-designed proforma (attached). The data analysis was carried out using computer based statistical package for social sciences (SPSS) 20 version.

Results

The mean age 33.21 ± 6.97 years. A total of 136(35.32%) cases were <30 years old and 249(64.68%) females were 30-45 years old. The mean duration of infertility was 3.15 ± 2.13 years. The mean BMI in this study was 28.21 ± 4.06 . There were 138(35.84%) obese and 247(64.16%) non-obese females. There was positive agreement between TVS and hysteroscopy noted as the kappa statistics was 0.12 mentioned in the (Table-1).



Fig-1: Endometrial polyp on ultrasound.

When data was stratified for age, duration of infertility and BMI, The agreement was statistically significant for both age groups (<30 years and >30 years) i.e. Kappa-value =0.267, p-value <0.001, for duration of disease i.e. Kappa-value = 0.121, p-value =0.009 and with respect to BMI i.e. Kappa-value=0.275, p-value <0.001.



Fig-2: Endometrial polyp on hysteroscopy.

Table-1: Percentage of agreement between transvaginal scan and hysteroscopy among the study population.

		Hysteroscopy			P-value	K-value
		Yes	No	Total		
Trans-vaginal scan	Yes	134(64.7%)	73(35.3%)	207(100.0%)	0.00	0.32
	No	26(28.0%)	67(72.0%)	93(100.0%)		

Sensitivity=83% Specificity= 48% PPV= 64% NPV= 72%

Table-2: Impact of Effect Modifiers on the Agreement between TVS and Hysteroscopy among study population.

		Agreement		K-value
		Yes	No	
Age Groups (Years)	<30	108(47.2%)	28(17.0%)	0.32
	30 or more	121(52.8%)	128(82.1%)	
BMI	Obese	110(48.0%)	28(17.0%)	0.27
	Non obese	119(52.0%)	128(82.1%)	
Duration (years)	< 5 years	190(83.0%)	112(71.8%)	0.12
	= 5 years	39(17.0%)	44(28.2%)	

Discussion

Infertility is a widespread phenomenon that affects approximately 10-15% of the couples around the world.¹⁵ There are several congenital or acquired uterine disorders, which cause infertility in the females. The acquired uterine abnormalities that are responsible for female infertility include polyps, some types of fibromas, adenomyosis, and some endometrial disorders such as intrauterine

adhesions. On the other hand, the congenital uterine anomalies account for about 3% among the infertile women and is categorized in seven classes.¹⁶ Sonography is known as the first imaging modality in the investigation of the female pelvis to detect the mentioned disorders among the infertile females. It is an “accurate, non-invasive, and cost-effective” modality, which provides useful knowledge for the detection and characterization of the possible female infertility factors.¹⁷ All infertile women undergo an initial ultrasound pelvic exam (baseline sonography) to investigate the probable causes of infertility. A careful pelvic ultrasound, particularly transvaginal sonography (TVS), can detect the uterine abnormalities, ovarian disorders, and other pathologic conditions, which lead to female infertility.¹⁸ Therefore, it can help the midwives, physicians, gynecologists, and infertility experts to examine the infertile women and make better treatment choices for these patients. Hackeloer examined the role of ultrasound in investigation and management of female infertility in a review article in 1984. He precisely described the uterine abnormalities, ovarian disorders, and adnexal masses, which cause infertility using ultrasound images.¹⁹ Recently, Hrehorcak and Nargundhave published a review study on the new perspective of diagnosing female infertility by advanced ultrasound techniques. There are a number of reviews targeting this issue. All of them are written by radiologists and gynecologists and provide advanced and specific knowledge for the specialists.⁽²⁰⁾ Diagnostic hysteroscopy is not widely performed in the office setting, one of reasons being the discomfort or pain produced by the procedure. Patient compliance and visualization quality were proved in multicentre randomized controlled trial- to be strongly related to: instrument diameter, anatomical difficulties determined by patient's parity and experience of the surgeon.²¹ Mini-hysteroscopy compared with conventional hysteroscopy was associated with less pain, less failure rate and better visualization, probably due to the less-traumatic passage through the cervical canal and the internal cervical os. Three-dimensional (3D) sonographic imaging offers some potential advantages over conventional two-dimensional (2D) techniques. The 3D image offers the true coronal view of the uterus, which is not routinely available in 2D imaging. In gynecologic applications, the internal structural details are more important than the surface rendering, except in the diagnosis of müllerian anomalies.²² A study reported the final agreement between both methods was moderate and significant correlation

between the two with the hysteroscopy being a better Diagnostic tool. The strength of agreement is considered to be moderate.¹² In another comparative study of TVS and hysteroscopy, TVS was successful in explaining infertility in 52.5% of cases while hysteroscopy detected 95% cases. Agreement of trans vaginal ultrasound and hysteroscopy with respect to polyp is 50%.¹¹ In current study agreement between trans-vaginal scan and hysteroscopy in evaluating the uterine structural abnormalities causing infertility was assessed as 229(59.48%). These findings are almost similar or better to previous quoted studies. Similarly another study reported that in 15 cases, endometrial carcinoma was confirmed by hysteroscopy and histopathological examination. Of these, malignancies were suspected based on previous ultrasound scans in 11 patients. In 95 cases, intrauterine polyps were detected. The success rate for predicting polyps by ultrasound examination was 65.1%. The agreement between ultrasound and hysteroscopic/histopathological findings was 72%. The secondary goal of making the description of the uterine cavity easier was not fulfilled. The prediction percentages for the criteria were low. The incidence of pathological findings in ultrasound findings labelled as anechogenic was 4.8%, suggesting a high negative predictive value. Thus, in spite of the better resolution of new ultrasound devices, their predictive value remains limited. Findings that are suspicious in ultrasound should be confirmed by hysteroscopy with biopsy.²³ The main findings of the study has showed that Hysteroscopy was successfully performed in all subjects. Hysteroscopy diagnosed pathological findings in 22 of 69 cases (31.8%). 3D-TVS demonstrated 84.1% diagnostic accuracy for detecting uterine cavity abnormalities in infertile women. A significant percentage of infertile patients had evidence of uterine cavity pathology. Hysteroscopy is, therefore, recommended for accurate detection and diagnosis of uterine cavity lesion.²⁴ in this study high negative predictive value was noted the which was due to presence of very small uterine follicle which was not detected on the TVS. Furthermore the segregation of the actual abnormality has resulted in the doubt to the decision to mark weather there lies an abnormality or not. Hence in order to be more specific and accurate any doubt in terms of presence of abnormality was placed in the negative group. Moreover another Prospective and comparative

study, India in a period of 13 months from August 2014 to September 2015 conducted on 60 subjects. The main finding of the study has illustrated that 60 patients were evaluated with diagnosis of primary and secondary infertility. Hysteroscopy showed alterations in 65%, predominantly uterine synechiae, chronic endometritis and endometrial polyp. Hysterosalpingography reported a sensitivity of 90% and a specificity of 100%, with a positive predictive value of 100% and a negative predictive value of 66.6%. The agreement between the two methods was moderate.²⁵ The result has showed that Hysteroscopy diagnosed endometrial polyps in 197 out of 679 cases (24.5%). TVS confirmed the hysteroscopy findings in 174 of 197 (88.3%) cases. The sensitivity, specificity, and positive and negative predictive values of TVS compared to hysteroscopy in the detection of endometrial polyps were 88.3%, 91.9%, 81.6% and 90.8%, respectively. Hence, TVS is both a cost-effective and non-invasive method for the diagnosis of intrauterine lesions such as polyps. When used in conjunction with a saline infusion, it can be a proper alternative for diagnostic hysteroscopy that saves time and enables the surgeon to perform the operative hysteroscopy procedure with greater accuracy.^{26,27}

Conclusion

Through this study, we found a moderate agreement (59.48%) between trans-vaginal scan and hysteroscopy in evaluating the uterine structural abnormalities causing infertility. So, by opting TVS structural abnormalities can be identified and hence we can lessen the investigation burden cost on couples who are to undergo a lot of investigations at the same time to find out structural abnormalities.

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