ORIGINAL ARTICLE

Study on Transvaginal Sonographic Diagnosis of Infertility: A Comparative Outcome With Clinical Correlations

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Abstract:

A cross sectional comparative study was done on transvaginal sonographic (TVS) findings to diagnose infertility in 110 patients attended the out-patient department of Obstetrics and Gynaecology at Bangabandhu Sheikh Mujib Medical University (BSMMU). The study was done with an object to asses the role of transvaginal ultra sonography as a sensitive detector for the diagnosis of poly cystic ovarian disease, endometriomas, leomyomas,retroversion of uterus,pelvic inflammatory disease, adnexal mass or pelvic tumour, congenital abnormalities of paramesonephric (miillarian) ducts and also its association with renal abnormalities. The age of the study patients ranged from 19-40 yrs. They were grouped into three categories. Amongst them 58 cases was represented with primary infertility which is 47.27 % of the total cases. In this study 37 patients was diagnosed by TVS as having PCOD amongst them 11 patients presented with oligomenorrhoea. Comparison between clinical correlation and TVS findings were done in which 15 patients clinically seemed to have with endometrioma with cyst formation which correlates 10 cases of TVS findings. TVS findings were normal in 21 patients. But they had come only with primary or secondary infertility. This study included only those patients whose husband's semen analysis is within normal range and no other male factor. These are the unexplained infertility.

Introduction:

Infertility means inability to conceive after one year of sexual life without any contraception. Sub fertility is a relative state of lowered capacity to conceive. Secondary infertility and sub fertility are the same states developing after an initial phase of fertility. Infertility is a global issue in health which afflicts millions of couples worldwide, despite the overcrowding and overpopulation. The extent of infertility varies considerably among countries. In many cultures the ability to have children is an important sign of an individual's worth. A woman's status in societies of many developing countries is often identified with her fertility; failure to have children can be seen as a social disgrace or a cause for divorce. Treatmen. for infertility is long, costly and often unsuccessful. However, recently the scene has changed radically.

Fertility vanes from time to time in the same individual. In the male these are not obvious except during childhood and, less absolutely,

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in old age, but in the female physiological infertility is seen before puberty, during pregnancy, during lactation and after the menopause. In any series of infertile marriages, the main etiological factors found in the female in about 40% of cases and about 35% of the husbands concerned have some degree of infertility. In 10-20% cases, a combination of factors operates and the rest have unexplained infertility[3]. About 8% of marriages prove sterile and another 10-12% produces only one or two children despite wishing to have more.

The special points on which information is required are ages, occupations, previous marriages, duration of marriage and the time during which contraception has been practiced, previous illness and operations[10]. Evaluation of dysfunction of ovulation, uterine abnormalities, tubal obstruction, endometriosis , PID and also cervical factors are needed to diagnose.

The goal of the infertility evaluation are to determine the probable cause of infertility, to provide accurate information regarding prognosis, to provide counseling, support and education throughout the process of ovulation and also to provide guidance regarding options for treatment.

The organization of the infertility evaluation is based on a consideration of the various individual factors required for successful reproduction [7].The best way to evaluate the factors that may cause infertility is a thorough, orderly investigation. A rational approach to infertility testing will comprise the routine blood tests (haemoglobin count) and chest x-ray (to rule out tuberculosis). A laparoscopy to detect common pelvic diseases is endometriosis and pelvic adhesions. Tests that detect the occurrence of ovulation in the females such as basal body temperature, endometrial biopsy, cervical mucus studies and post coital tests. These do not require hospitalization. Transvaginal ultrasonography is extremely useful, especially for foilicular studies [8]. It is also a valuable adjunct in modem gynaecological practice. The new vaginal probe ultra sonographic transducer are of a higher frequency i.e. 5.5-7.5 MHz. and closure proximity to structures being studied. TVS allows higher resolution imaging of pelvic structures especially to assess endometrial thickness, foilicular size and evaluation of adnexal mass. Therefore, this study was performed to determine the diagnostic value of transvaginal ultrasonography for ovular dysfunction, intrauterine and endometrial abnormalities and pelvic causes in patients with infertility [9].

This study was planned to determine whether vaginal probe Ultrasonography could demonstrate the pelvic causes of infertility by correlating the transvaginal sonographic findings with the clinical findings. The result of the study can be used in planning or designing further larger studies to evaluate the causes of infertility and in taking strategies for the management of patient with infertility.

Transvaginal Ultrasound and Infertility

Since its inception in 1983, transvaginal ultrasonography has become a useful and important diagnostic modality in the evaluation of gynaecological and obstetrical

disorders. It has clear superiority for improved visualization of pathologic and non-pathologic conditions of the pelvis as compared to trans abdominal technique. Superb imaging quality bas been achieved through technical advancement in instrumentation which makes it popular among sonologists as well as referring physicians.

Significant improvement has been achieved due to its ability to evaluate female pelvic structures, both by better localization of the disease to different organs and by better tissue characterization. The advantages of this approach are manifolds over trans abdominal technique. First, since the organs of interest are closer to transducer and there is no intervening fat and muscle layers which cause sound wave attenuation, organs such as uterus, ovaries and fallopian tubes can be imaged with higher ultrasound frequencies producing images of enhanced quality, due to greater axial and lateral resolution allowing small structures to be distinguished more clearly. As there is no sound wave deflection by bowel gas, which aids further improvement of image quality. Secondly, patients do not need to have an uncomfortably full bladder which is required in trans abdominal sonography to push the bowels upwards and create an "acoustic window" to the pelvis. Thirdly, there is no scanning delay for this purpose as there is no need to fill the bladder. Furthermore a fully distended bladder unavoidably distorts the anatomic relationships of the organs.

However, there are some disadvantages to TVS also. It is more invasive and has limited field of view. Although, the increased ultrasound frequency enhance resolution, it also decreases penetration resulting difficult visualization of objects which are far (more than 10 cm) away like ovaries that are located high and lateral. A growing graffian follicle with its estrogen production shows endometrial proliferation. This bio-endocrine assessment of endometrial response to estrogen initially and latter to progesterone is important to understand. Transvaginal ultrasonography is also helpful in visualization of pathologic lesions of ovary and adnexae. With its ability to differentiate between ovarian and extra ovarian lesions and with significant progression m visualization of fallopian tube in an attempt to detect tubal blockage.

Tubal obstruction is a factor in 20- 40 % cases of female infertility. This is a result of adhesions from previous surgery, endometriosis and also infection or a ruptured appendix. Ultrasonographic monitored fluid infusion (sonosalphingogram) has been favourably compared with x-ray hystero-salpingography to identifiy occluded fallopian tubes n.

Association of subfertility and infertility with polycystic ovarian syndrome (PCOS) has make the patient and their doctors more concerned about this condition. It is a common clinico pathologic entity represented by large polycystic or multi-follicular or sclerocystic ovaries confined by transvaginal sonography. It is the common cause of anovulatory infertility in women. These ovaries have a typical sonographic appearance and is recognized as a large, almost spherical ovary with multiple homogeneous cystic structures (immature or antral follicles <10 mm in diameter) crowded along its surface. This finding is quite often

described as the 'necklace pattern'. The hallmark of diagnosis of PCOD remains in sonographic identification of hyper-echogenic theca in the ovarian substance or surrounding the follicles.

By TVS diagnosis of focal intrauterine lesions, uterine malformations and leomyomas are easily delineated and approaching the sensitivity of hysteroscopy. Pelvic inflammatory disease (PID) is best diagnosed visually during laparoscopy, but most PID cases are mild and do not necessitate hospitalization. TVS seems very accurate in the diaanosis of presence or extention of frank pelvic inflammatory disease and also prormsmg m augmenting the outpatient diagnosis of PID among patients reffered for lower abdominal pain [18].

In addition to these conditions trans-vaginal sonography has also been described in the diagnosisof pelvic abscesses, pelvic mass, endometriomas, hydrosalphinx, intra uterine adhesions (Ashamari s syndrome) ,uterine hypoplasia and other developmental anomalies like mullerian or vaginal agenesis associated with infertility [18].

Infertility problem is a global problem and now infertile couples are more aware for the treatment of infertility. In clinical practice, by proper counseling and assurance with the help of appropriate diagnostic method we may find out the exact cause of infertility .'

Ultrasonography , anon invasive method being used in our country since 1982 . At the initial period, major application of the method was in obstetrical field. Introduction of trans vaginal sonography since 1995 has expanded the scope of use of Ultrasonography in assessment of endometrial thickness, ovarian volume, follicular development in relation to infertility management.

Transvaginal sonography is a good and economic method, involves very low mechanical energy and has no ionizing property as in x-ray. So far, the procedure is considered safe on the point of causing no cellular damage. Progressive advances in modem technologies brought about by significant developments in instrumentation have revolutionized the non-invasive evaluation in imaging, particularly by transvaginal Ultrasonography.

Now as adjunctive procedures Colour Doppler, Power Doppler etc, have enabled a further more precise approach in the field of diagnostic ultrasound to study female pelvis for infertility. Emergence of these techniques has proved not only a cost effective highly accurate but a/so a sensitive method and at the same time as patient friendly procedure in modem diagnostic era of infertility.

In this study it may be assumed that present study may help to establish transvaginal sonography as a new and reliable diagnostic method by which we will be able to proceed accurately with more confidence in diagnosing infertility.

Materials and method:

The cross sectional study was done on 110 patients of infertility studied at Department of Obstetrics & Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU) to assess the role of TVS in diagnosing infertility, compare between clinical correlation and TVS findings in infertility,

and to optimize the use of TVS in the management of infertility. The study included only the outpatient cases.

Inclusion criteria:

1. The patient seeking advice for infertility.
2. Both primary and secondary infertility cases.
3. Age limitation from 19yrsto 40yrs.
4. Duration of marriage at least lyr.

Exclusion criteria:

1. Husbands semen analysis abnormal or any other male factor.
2. Patients having chronic medical disorders or known endocrine disorders e.g. Diabetes Mellitus and Thyroid dysfunctions.

Results:

Table-I: Distribution of different types of infertility (n-110)

Types of Infertility	Number of patients	Percentage
Primary Infertility	58	52.73%
Secondary Infertility	52	47.27%
Total	110	100%

A total number of 110 women of primary and secondary infertility cases were included in this study. Amongst them 58 cases was represented with primary infertility which is 47.27 % of the total cases. Other 52 patients came with secondary infertility which is 52.73 % of the total cases.

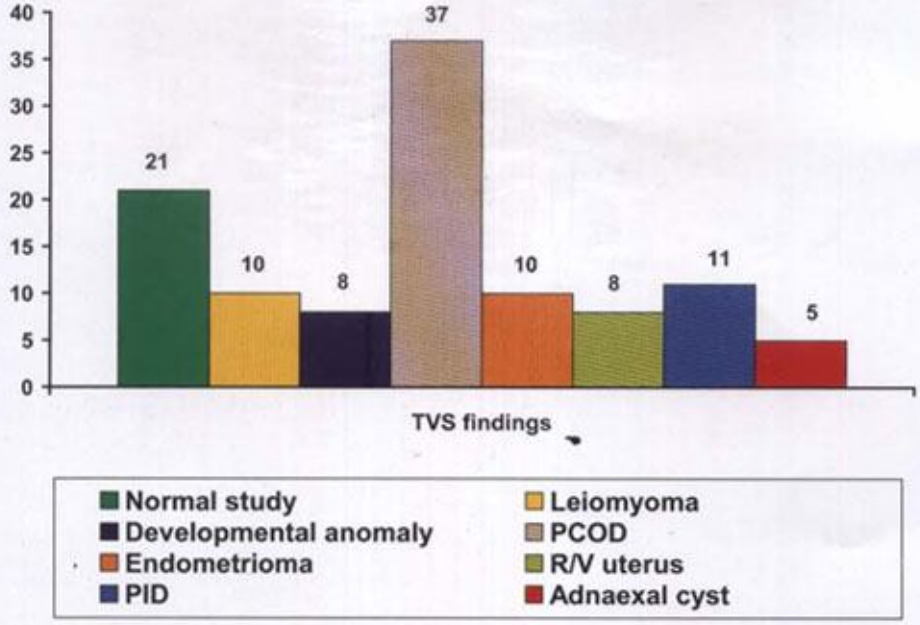
Table-II: Age distribution of the patients (n = 110)

Age (years)	Number of patients	Percentage
19-24	34	30.90%
25-32	51	47.38%
33-40	25	21.72%
Total	110	100%

The age of the study patients ranged from 19-40 yrs. They were grouped into three categories. The number of patients in 19-24 yrs age groups is 34 which is 30.90% of the study. Highest incidence of infertility was prevalent in are grouped within 25-32 yrs of age which is about 47.38% and the lowest incidence of infertility was prevalent in are grouped within 33-40yrs, which is 21.72% of the study.

A total number of 110 patients were included in this study out of which 10 cases were found to have Leiomyoma which is 9.09% of total cases, 10 cases having endometrioma which is also 9.09% . 8 cases had developmental abnormalities i.e. absent uterus, rudimentary uterus, ovarian agenesis, vaginal agenesis and short vagina. These were 7.15% of total cases. Normal findings of pelvis was found in 21 cases which is 19.25% of total cases. 1 leases had bulky uterus with PID. These groups are 10% of total study. 37 cases found to have PCOD, responsible for 33.65% of total number of cases. Retroverted uterus was found in 8 cases which is 7.27% of the study. Total 5 cases had adenexal cysts which is 4.50% of the total study.

Figure-1: TVS findings in infertile women (n =110)



In this study 37 patients was diagnosed by TVS as having PCOD amongst them 11 patients presented with oligomenorrhoea which is 29.72% of total number of cases. 04 patients found with amenorrhoea which is 10.82% of total cases. 3 patients had normal cycle which is 8.11% cases. 07 patients were obese which is 18.92% of cases and 12 cases presented with feature of hirsuitism which is 32.43% of total cases.

Figure-2: Different clinical presentation of PCOD (n-37).

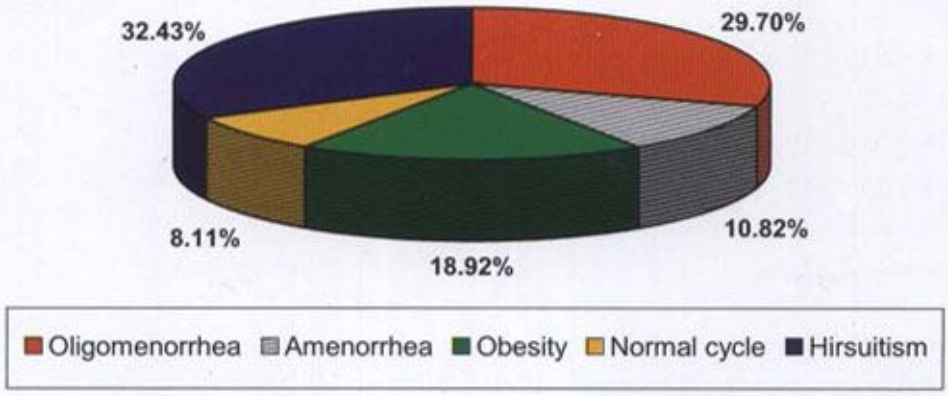


Table - III: Comparison between clinical co-relation and TVS findings

Clinical findings	Number of patients	TVS findings
Endometrioma	15	10
Developmental anomaly	10	08
Bulky uterus with PID	18	11
Leiomyoma	15	10
Normal findings	27	21
PCOD	40	37
Retroverted uterus	08	08
Adnexal cyst	03	05

The study included 110 patients. Comparison between clinical correlation and TVS findings were done in which 15 patients clinically seemed to have with endometrioma with cyst formation which correlates 10 cases of TVS findings. Remaining 5 cases had normal fmdings by TVS examination, 10 cases of developmental anomaly had seemed clinically, by TVS finding it was 08. 18 cases of bulky uterus with PID found by clinical examination, but it was 11 by TVS findings. Leiomyoma was in 15 cases by clinical examination, 10 cases detected by TVS. The study found 27 cases of normal fmdings of pelvis but by TVS it was 21 cases. PCOD cases was 40 by clinical findings but by TVS examination it was 37. The study showed 8 cases of retroverted uterus by clinical PA/ examination ,which had also similarity by TVS findings. Examination of the pelvis revealed 3 cases of adnaexal cyst but by TVS findings it was in 05 cases.

Table – IV: Ultrasonographic findings and their comparison in primary and secondary infertility

USG findings	Primary Infertility	Secondary Infertility
PCOD	20 (54.05%)	17 (45.94%)
Leiomyoma	06 (54.54%)	04 (36.36%)
Developmental anomaly	08 (100%)	0.00 (0%)
Endometrioma	07 (70%)	03 (30%)
Bulky uterus with PID	07 (63.63%)	04 (36.36%)
Retroverted uterus	05 (62.50%)	03 (37.05%)
Normal study	08 (38.09%)	13 (61.90)
Adnaexel cyst	02 (40%)	03 (60%)

The study showed the transvaginal sonographic findings and their comparison in different types of infertile patients. Total 10 cases of leiomyoma was found, out of which 06 was in primary infertility cases and 04 in secondary infertility patients. Total 10 cases of endometrioma was found, out of which 07 cases was in primary infertility and 03 was in secondary infertility patients. This study included total 08 cases of patients with developmental abnormalities andall of them found in primary infertility cases. By TVS finding total 21 had normal study of pelvic organs, out of which 13 cases was in secondary infertility cases and 08 cases was in primary infertility cases. Total 11 cases of PID with bulky uterus was found, in which 07 patients was primary infertility and 04 cases secondary infertility cases. Total 37 cases of PCOD was found in this study.

Retroverted uterus was found in 05 patients of primary infertility and in 03 cases of secondary infertility. Adenaexal cysts was found in total 05 cases of the study out of which 03 cases in secondary infertility cases and 02 cases in primary infertility cases.

Discussion:

Infertility is a global issue in reproductive health which affects millions of couples world wide. Now these couples are more aware for the treatment of infertility. By proper counseling and assurance with the help of appropriate diagnostic method we may find out the exact cause of infertility.

The study evaluated and compared the ultrasonographic findings in a consecutive series of the infertile women of both primary and secondary infertility cases. Total 58 patients were (52.72%) with primary infertility and 52 patients (47.27%) with secondary infertility. This result has similarity with the result of Sabrina QRashid's"[1] who were 64.8% and 60% for both primary and secondary infertility respectively.

Total 110 patients were divided into three age groups. Highest incidence of infertility was in the age group of 25-32 years and total 51 patients were in this group, which was 47.38% of the total patients. The mean age group of infertile patients is 29 years. In this study oldest patient was 40 years old and the youngest patient was 19 years old. The study is similar to the of De Inner eta[22] who found the highest incidence around 28 years of age group of patients

Leiomyomas are more common in infertile women. This can be either the cause or the effect of the leiomyoma There are various types of myomas. Submucous myomas interferes with implantation of the fertilized ovum, it hinders the ascent of the spermatozoa by distorting the uterus and tubes. In study there were 10 cases of leiomyoma which is about 9.09% of total cases of infertility. Among these 05 were submucous types fibroid polyp, 03 was intramural types of multiple small myomas and 02 was at the corneal end of the uterus. This study having similarity with the study of Fedel et al[21] who found transvaginal sonography to be 100% effective in diagnosing uterine myoma, which is responsible for infertility.

Endometriosis is fairly common disease in infertile women. It should be suspected in women with subfertility, dysmenorrhoea, dysperunia,or, chronic pelvic pain. In this study 10 patients (9.09%) presented with endometriomas. This finding was similar to that of other studies. Although the specificity of these findings has not yet been determined, the impression is that this sonographic feature is an excellent predictor for the diagnosis of endometrioma.These low-level echos probably represents degraded blood products associated with cyclic changes occurring during the menstrual cycle. In several cases an irregular geographic hyperechoic region internally corresponding to a more acute phase of haemorrhage has been seen. Features previously described in endometriomas using trans abdominal technique include internal septations.

The study has similarity with the study of Haney AF sandier found 5-20% of women develop endometriosis who consult with their physician for Infertility. Sandier MA25, alsofound same result.

The incidence of congenital anomaly is difficult to estimate as many women will

complete their reproductive life without any knowledge of the anomaly. Sonographic evaluation of internal genitalia shows presence or absence of uterus, fallopian tubes and vagina. The study found 8 (7.27%) cases had developmental defects. 2 cases were mullerian agenesis one of which was associated with left sided renal agenesis, one with hypoplastic uterus, one with short vagina, 2 with vaginal agenesis, in this cases abdominal ultrasonography was done to make the diagnosis. 2 cases with rumentary uterus one of which was with the absence of both ovaries.

In this study 8 cases (7.27%) of retroverted uterus in these infertile group of patients. Scases were fixed retrovertion. This might be due to the effect of endometriosis and pelvic inflammatory disease, a cause of infertility. Although women with retrovertion ordinarily conceive readily, a few finding it difficult and it is postulated that this *is* because the cervix is directed forwards away from the seminal pool. In this condition the axis of the cervix is directed upwards and backwards in relation to a line drawn through the long axis of the trunk. Jeffcoate's" report where 10-20% patients were within this range.

In this study TVS findings were normal in 21 patients. But they had come only with primary or secondary infertility. This study included only those patients whose husband's semen analysis is within normal range and no other malefactor. These are the unexplained infertility. This report is very near to Jeffcoate report where 10-20% patients are within this range[25].

In this study PID with bulky uterus was found in 11 cases which is 10% of the total cases. Amongst them primary infertility cases was 07 and secondary infertility cases was 04 in number. This study has similarity with the findings of Sabrina QRashid's study [29].

Tubal obstruction is a factor in 20%-40% cases of female Infertility. This is a result of adhesions from previous surgery, infection from a ruptured appendix or tubal pregnancy. The condition can be diagnosed by sonosalpbingography or sonohysterosalphingography with the help of TVS method .This is very easy process,can be done at OPD without anesthesia with minimum cost. This is a new method, which improved the positivity of TVS examination manifolds. It can help to see the patency of fallopian tubes. In this study 11 cases had been diagnosed as a case of PID which is (10%) of total studies. Cherney AH and Randoloph JE26 found 20% patient had PID which is similar to this result[33].

The diagnosis of PCOD is usually made biochemically but transvaginal sonography is useful in cases in which the diagnosis is uncertain or in the clinically unsuspected cases. As there is absence of ovulation there is persistence of follicles with the release of high level of estrogen. The patient appear to be associated with an increased risk of endometrial carcinoma as because the unopposed high level of eestrogens. The data of this study indicates 37 cases (33.63%) of PCOD amongst them primary infertility had in 20 cases and secondary infertility had in 17 cases. In this study PCOD patients presented with oligomenorrhoea 11(29.72%) cases, amenorrhoea 04(10.82%) cases, normal cycle 03(08.11%) cases, obesity 07(18.92%) cases, hirsuitism 12(32.43%) cases. The study has similarity with the study of Karen Purcell et af5 also described the same presentations.

The percentage of couples unable to achieve pregnancy naturally is increasing day by day. Factors such as the use of intrauterine devices and venereal diseases, associated with increasing sexual freedom have contributed to this high rate of infertility. In addition, delayed child bearing increases the need for intervention due to low fertility rates in older women. These were considered common reasons but with the advent of improved antibiotics their number has significantly decreased. This has been revealed in this study.

Conclusion:

Infertility is a sort of disability of women which affects physical and mental well being of the concerned couple and their position. So, proper evaluation of the cause is vital. At different times, different methods are used for evaluation of infertility. Recently transvaginal ultrasonography has been introduced as an important tool in the diagnosis of infertility. It has also started in our country in some selected centres.

The study was done with an object to asses the role of transvaginal ultra sonography as a sensitive detector for the diagnosis of poly cystic ovarian disease, endometriomas, leomyomas,retroversion of uterus,pelvic inflammatory disease, adnexal mass or pelvic tumour, congenital abnormalities of paramesonephric (miillarian) ducts and also its association with renal abnormalities. Transvaginal sonography can be more easily repeated in follow-up patient for folliculometry for the diagnosis of number and measurement of dominant follicle from its expected size which should be 20-22mm on Day-12 of the cycle. During followup follicles should be seen repeatedly on Day-3, Day-12 and Day-16 in conjunction of endometrial thickness with hormore profile of the patient should also be measured. The study can screen the normal ovularpatient from theanovular one. Specially in these cases patients partner shouldbe evaluatetor re-evaluateifor further investigation for success.

Transvaginal sonography is painless, quicker, cost effective and can be done as a routine casein the patient department.It can be used as a first-line diagnostic procedure for infertility in Bangladesh, thereby reducing the risk associatedwith operative and economic cost. But it demands costly equipment, special TVS probe as well as expertise.To establish first-line diagnostic method and also a non-mvasive sophisticated procedure for the diagnosis of infertility, larger studies are needed which may be multicentered.

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