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A Comparative Study between Transabdominal and Transvaginal Ultrasound Techniques in Early Detection of Ectopic Pregnancy

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Abstract

Aim of the study : to assess the diagnostic accuracy of transabdominal and transvaginal ultrasound technique in the detection of ectopic pregnancy among pregnant women, to compare and evaluate the transabdominal ultrasound findings with that of transvaginal ultrasound findings and to determine which of the ultrasound findings are more likely to indicate the presence of an ectopic pregnancy. The cross sectional study was carried out in the department of Radiology and Imaging, Elweya Hospital, Fatimat AL-Zahraa Hospital and Baghdad Hospital, from October 2020 to April 2021 to compare the accuracy of transvaginal ultrasonography and transabdominal ultrasonography in early detection of clinical suspected cases of ectopic pregnancy. The present study consists of 81 cases of clinical suspicion of ectopic pregnancy. The patients underwent both transvaginal and transabdominal ultrasonography. “Operative diagnosis” was considered gold standard against which accuracies of two diagnostic modalities were compared. Transabdominal ultrasound technique showed a sensitivity (77.9%), specificity (25%) , positive predictive value (95.2%) , negative predictive value (5.5%) and accuracy of transabdominal ultrasonography as a diagnostic modality in early detection of suspected ectopic pregnancy were (75.3%) . whereas transvaginal ultrasonography was found to have 96.1%% sensitivity, 75%% specificity, 98.6% positive predictive value, 50% negative predictive value and 95.1% accuracy. Transvaginal ultrasound technique was superior to transabdominal ultrasonography in early detection of suspected ectopic pregnancies .so, transvaginal ultrasonography is important for early and accurate diagnosis of ectopic pregnancy.

Keywords: ectopic pregnancy, transabdominal ultrasound, transvaginal ultrasound.

Introduction

Ectopic pregnancy is defined as any intra or extra uterine pregnancy in which the fertilized ovum implants outside the uterine cavity which is not conductive to its growth and development. (1) . It is a life threatening condition affecting approximately 2% of all pregnancy. (2) . It is the most

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important cause of maternal mortality and morbidity in the first trimester. [3] Because of its increasing incidence and its impact on the fertility in the future , it is assuming greater importance. [4]. The main problem of ectopic pregnancy is non- specific clinical presentation. Both typical and atypical clinical presentation can mimic other condition as in early pregnancy, salpingitis , torsion or ruptured ovarian cyst, endometriosis , appendicitis, diseases affecting urinary tract, bleeding corpus luteum etc. Therefore early detection of ectopic pregnancy is a major challenge for clinician to avoid life threatening bleeding or consequent infertility.

Ultrasound technique has become an important tool in the early detection of suspected ectopic pregnancy [5] . It is a cheap, simple, widely available, rapid and noninvasive diagnostic modality for fast detection, presence and location of pregnancy. Abdominal ultrasound technique is performed with adequate bladder using transducer frequency of 3.5 MHz . However Abdominal ultrasound accuracy can be affected by factors such as obesity, insufficient filling of bladder and obscuration of pelvic structures by bowel gas. These problems can be reduced by the use of vaginal ultrasound technique of high resolution and high frequency transducer in the range of 7 MHz as well as the transducer is closer to pelvic organs than it is with the abdominal method. In addition, improved resolution may be achieved by using higher frequency transducer [6] .
Few studies carried out abroad to compare accuracy of transabdominal & transvaginal ultrasonography in detection of ectopic pregnancy but no such study yet done in our country. So, the study was carried out to see whether transvaginal ultrasonography is superior to transabdominal ultrasonography in the detection of the patient of suspected ectopic pregnancy by comparing the findings of the two imaging techniques with that of operative findings and thus to find out the sensitivity, specificity and accuracy of transvaginal ultrasonography & transabdominal ultrasonography in the early detection of ectopic pregnancy. Management of the ectopic pregnancy can be medical as well as surgical.

Material and Methods

This study is cross sectional study and it was carried out in the department of radiology and imaging, Elweya Hospital, Fatimat AL-Zahraa Hospital and Baghdad Hospital, from October 2020 to April 2021 on the patients with clinical suspicion of ectopic pregnancy. All data were collected in the pre designed structured Performa. Details of demographic characteristics , clinical symptoms and signs, diagnostic tools used , treatment as well as risk factors for ectopic pregnancy . 81 cases were selected according to the inclusion and exclusion criteria. Suspected clinically and incidentally detected cases of ectopic pregnancy were included in my study and those having normal or abnormal intrauterine pregnancy were excluded , those with unavailability of operative findings were excluded, those who had admitted methotrexate treatment also excluded in my study.
Transabdominal ultrasound technique was performed by 3.5 MHz probe with full bladder. Transvaginal ultrasound technique was performed by 7.5 MHz frequency convex probe

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immediately after the abdominal scan with an empty bladder using standard technique. Imaging of the uterus and adnexa were performed in both sagittal and transeverse planes. During ultrasound examination, special note was made on presence of adnexal mass, peritoneal collection in Cul-De-Sac and hepatorenal pouch, extrauterine gestational sac and embryo withor without cardiac activity. The criteria for diagnosis of ectopic pregnancy included an extrauterine gestational sac containing a foetus or a foetal pole or an empty extrauterine sac. Solid or complex adnexal mass, peritoneal collection, peudogestational sac were considered suggestive and correlated with pregnancy test . All patients underwent surgery report were collected.

After collection of the data sensitivity, specificity, accuracy, positive and negative predictive values of individual transabdominal and transvaginal ultrasonography in the diagnosis of ectopic pregnancy were calculated by appropriate statistical formula. Comparison between transabdominal and transvaginal ultrasonographic findings was done by using Fisher's Exact Test. P value <.05 was considered to be significant.

Results

In the present study, the total number of ectopic pregnancy was 81 cases with pregnancy test were positive. It was found that the majority of ectopic pregnancies occurred in the females between age group (25-30 years) (35.8%).

Table1. The distribution of studied sample according to age

Parameters	Number of patients	percentage
Age Group		
19-24Y	21	25.9
25-30Y	29	35.8
31-36Y	26	32.1
37-42Y	5	6.2
M±SD	28.67	5.572

Multigravida represents the maximum percentage of all cases (90.1%).

Table2. The distribution of studied sample according to Clinical symptoms

parameters	Number of patients	Percentage
Vaginal bleeding		
No	40	49.4
yes	41	50.6
Site of pain		

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lower abdominal	26	32.2
right iliac fossa	24	29.6
left iliac fossa	23	28.4
lower abdominal and back	7	8.6
No pain	1	1.2

Vaginal bleeding represents (50.6%) of all cases, it means more than half of patients presenting with pain. Abdominal pain is the most common presenting features . in my study , the site of pain is determined and the lower abdominal pain represents (32.2%) of all cases.

Regarding the risk factor of ectopic pregnancy, previous surgery recoded 54.3% of all cases and 39.5% of 81 patients represents caesarean surgery. While pelvic inflammatory diseases recoded 44.4% .

The most commonly observed transvaginal ultrasonography abnormalities were the adnexal findings which were highly suspicious for ectopic pregnancy. In 81 patients adnexal masses were detected in 67 patients (82.7%) . 25 patients of the 67 patients contained , a gestational sac with or without viable or non-viable fetus and one case mass with cyst. while in other patients detected sac without mass in 6 patients only.

In other hands, by Transabdominal ultrasonography ultrasound technique , the adnexal mass was observed in 62 patients (76.5%) , 8 patients of the 67 patients was with sac and 9 patients with cyst. The difference in adnexal finding and adnexal sac are statically highly significant p-value of both findings < 0.005 .

Intrauterine finding (sac, IUCD, collection of fluid with or without IUCD, sac near the uterine scar). We detected 9 sac by transabdominal technique, and 10 sac by transvaginal technique as well 3 sac near the uterine scar. Fluid collection 4 cases by transabdominal technique, 8 by transvaginal technique. The difference in intrauterine findings is not significant p-value < 0.304. but the difference in the intrauterine sac is significant p-value < 0.050.

Fluid collection in cul-de-sac and morison pouch , as well , the important criteria for ectopic pregnancy. The difference are highly significant for collection of fluid in cul-de-sac p-value is < 0.000 , and signifant for pouch of morison , p-value is < 0.031.

The study result revealed that sensitivity of transabdominal and transvaginal ultrasound techniques was 77.9% , 96.1% respectively. Specificity of both techniques was 25% , 75% respectively. Diagnostic accuracy of transabdominal ultrasound technique was 75.3% whereas that of transvaginal ultrasound was 95.1%. positive predictive value and negative predictive value of transabdominal technique was 95.2%, 5.5% and that of transvaginal technique was 98.6%, 50%.

There was no mortality in my study.

Table 3 : distribution of sample according to Type of tubal pregnancy surgically

Type of tubal pregnancy	Number of patients	Percentage
infundibulum	4	6.1

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Ampullary	44	66.7
Cornual	5	7.6
Isthmus	8	12.1
Fimbria	5	7.6

Ultrasound Findings

Picture (1) patient of 22 years old of 6 gravida, 1 parity and of 4 abortions

Trans-abdominal ultrasound detect that uterus is normal size homogenous myometrium, no focal lesion, empty cavity.

No free fluid in cul-de-sac. Both ovaries are normal.

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Picture (2) patient of 22 years old of 6 gravida, 1 parity and of 4 abortions

Trans-vaginal ultrasound detect that uterus is bulky uterus with single irregular gestational sac , no fetal pole is seen .

Left adnexa hyper echoic heterogeneous mass with internal hypo echoic ,left ectopic gestational sac with small internal fetal pole .

Marked free fluid in cul-de-sac.

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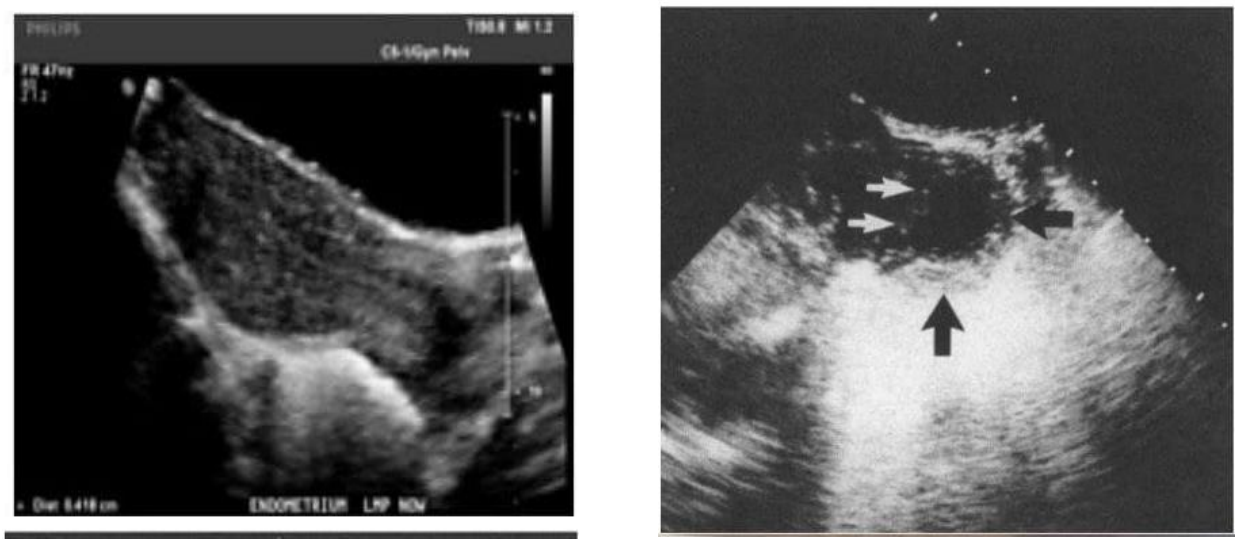
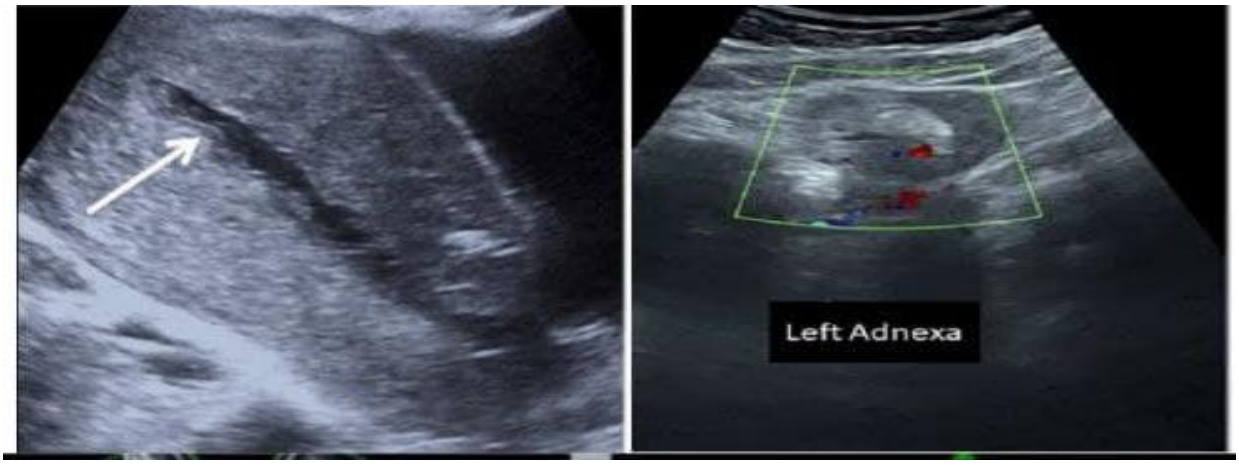


(A) (B)

Picture3. Patient of 20 years old of gravida 3 and 3 parity no having abortion.

(A) Transabdominal ultrasound both adnexa not seen clearly not excluded ectopic pregnancy.
(B) Tranvaginal ultrasound detects left adnexa with small gestational sac no fetal pole is seen.



Picture4. Transabdominal ultrasound: antiverted uterus of normal size.

Endometrium thichness contains fluid or blood

There is an enlarged sac – like structure seen in the lower uterine segment with surrounding echogenic area (hematoma). Left adnexa mass is not clear (gases abdomen). Picture not excluded ectopic pregnancy.

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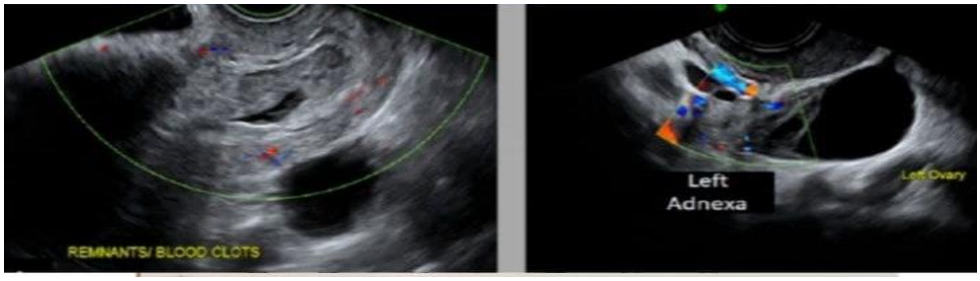

Picture 5 Transvaginal ultrasound excluded ectopic pregnancy.

Antiverted uterus of normal size . endometrium thickness contain fluid collection (blood). There is an elongated sac-like structure seen in the lower uterine segment with surrounding echogenic area (hematoma). Left adnexa echogenic mass with peripheral vascularity. Picture of heterotopic pregnancy.

Discussion

Sonographic detection of women with suspected ectopic pregnancy requires correct interpretation of both intrauterine and extrauterine findings. Some patients may have more than one finding. Presence of intrauterine pregnancy virtually excludes an ectopic pregnancy except in heterotopic pregnancy which identified with the presence of intrauterine gestation with adnexal mass. so the presence of intrauterine gestation does not exclude the ectopic pregnancy unless absence of adnexal mass.

Of greatest clinical significance is the fact that 60.6% of the patients had unraptured ectopic pregnancies that were ameanable to treatment by salingotomy thereby saving the tube for future reproductive effort.

High-resolution transvaginal ultrasonography appears to have much to offer in facilitation of the recognition of both intrauterine and ectopic gestational sacs. As well the approximately total examining time for transvaginal ultrasound technique is much less than that of transabdominal tecghnique (about 5 minute comparing with 10 minute) . Because the high number of referral patients to maternity hospital , the scanning made fast , excluding the tinny details so as trying to accommodate the daily referral patients.

In summary, transvaginal ultrasonography has added a new dimension to the early detection and diagnosis of ectopic pregnancy with enhanced ability to localize and identify an ectopic gestational sac, provide further architectural detail in the case of a complex adnexal mass, and allow more sensitive detection of small amounts of free fluid in the cul-de-sac. The clinical benefit to the patient is the greater opportunity of the physician to attempt and achieve tubal salvage. Therefore the tranvaginal technique should be the protocol for the pre-natal care center so that reducing the overload of the maternity hospital . (daily examining >40 patients).

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Because of the probability of distortion of normal pelvic anatomy in patients at risk for ectopic pregnancy, the additive value of systematic transabdominal and transvaginal scanning should not be ignored.

Conclusion

Ultrasound is safe, quick and non-invasive in diagnosis ectopic pregnancy and hence management of patients suspected to have ectopic pregnancy. Interestingly, transvaginal ultrasound is a reliable imaging tool for fast early detection of ectopic pregnancy.The presence of a complex mass associated with absence of an intra-uterine gestational sac is the ultrasound findings, the more likely to indicate the presence of an ectopic pregnancy, except in heterotopic ectopic pregnancy which is associated with intrauterine pregnancy with the presence of adnexal mass.

Furthermore, the fallopian tubal pregnancy is the most common type of ectopic pregnancy in majority of cases.

Ectopic pregnancy is a major cause of maternal death and morbidity in the first trimester. Finding of transvaginal ultrasound technique in detecting ectopic pregnancy is more than that of transabdominal ultrasound technique.

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