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THE ROLE OF ULTRASOUND IN THE DIAGNOSIS OF ECTOPIC PREGNANCY CONFIRMED BY HISTOPATHOLOGY.

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ABSTRACT

Objective: To confirm the accuracy of trans-vaginal ultrasound in the diagnosis of ectopic pregnancy compared with trans-abdominal ultrasound confirmed by histopathological study. Setting: A longitudinal prospective study was performed at A-Batool Gynecological, Obstetrical and Infertility Teaching Hospital located in Mosul, Iraq from 1st June 2009 to 1st June 2010. Subject: Four thousand two hundred patients in early pregnancy (1st trimester) were admitted to A-Batool hospital with abdominal pain and vaginal bleeding were examined by trans-abdominal ultrasound. **Results:** During the analysis, the incidence was (1.9%) and the peak incidence of age was (25-29) years. The peak incidence in low parity was (1-3) (44.30%). The incidence of risk factor was the ovulation induction of 20 patients (25.3%). The common clinical presentation was the abdominal pain of 75 patients (95.0%). The ultrasonic findings in trans-abdominal was 97, and in trans-vaginal 126. The operative findings were right tubal rupture (36.71%), right tubal pregnancy (27.85%) and the most frequent type the tubal (97.4%). The most familiar site was the ampullary (88.61%), and the most common side was the right side (65.83%). The Chi-square statistical test was used in this study, in trans-abdominal sonography: the sensitivity was (87.0%), specificity was (99.0%) and accuracy (99.0%), while in trans-vaginal sonography, the sensitivity was (92.0%), specificity (100.0%). and accuracy (100.0%). **Conclusion:** The ultrasound is the basic modality performed to assess ectopic pregnancy. Trans-abdominal sonography should be the initial technique whereas trans-vaginal is better in the resolution. The diagnosis of ectopic pregnancy can be made with trans-vaginal ultrasound alone, but trans-abdominal should always be in conjunction with trans-vaginal ultrasound.

KEYWORDS: Ectopic pregnancy - ultrasound – histopathology.

INTRODUCTION

A conceptus implanting outside the uterine endometrium is referred to as ectopic pregnancy (EP). The fallopian tube (FT) is the ordinary location for implantation, followed by the ovary and the abdomen. Ampulla, isthmus, and fimbrial interstitial are the most common tubal implantation sites in order of frequency.[1]

Ectopic pregnancy accounts for 1.3 to 2% of reported pregnancies in the USA in some forms. With the development of a sensitive as well as specific radioimmunoassay for the B-subunit of human chorionic gonadotropin (B-hCG) and high-resolution trans-vaginal sonography (TVS), the initial presentation of a woman with an EP is no longer as life-threatening as it once was. Despite this, ectopic pregnancies continue to be a major source of morbidity and mortality in the USA, costing over $295 million in 1998.[2]

The incidence rate of EP has risen dramatically during the past 30 years, as a consequence of injudicious antibiotic therapy, reconstructive tubal surgery, and the use of intrauterine contraceptive devices.[3]

Ectopic pregnancy is an acute emergency in the first trimester where surgery is the mainstay of treatment.[4]

High-resolution trans-vaginal ultrasonography has enabled the visualization of normal and abnormal embryonic development at an earlier stage and with greater details. The reliable diagnosis of EP depends on the physician's ability to recognize a normal intrauterine pregnancy and the wide spectrum of ultrasonographic appearances of trans-vaginal ultrasonography has enabled the EPs. Because none of these previously mentioned anatomic sties can accommodate placental attachment or a growing embryo, the potential for rupture and hemorrhage always exists.[5, 6]

The Anatomy of Female reproductive system

The internal organs of the reproductive system in women are: vagina, Uterus, FTs and Ovaries.

The vagina: Located between both the bladder and the rectum. It is a hollow tube approximately 3 to 5 inches long leading from the vulva to the cervix of the uterus. It possesses mucous membrane-lined muscle walls that allow it to contract and expand.[7]

The uterus: is located in the true pelvis. It is pear-shaped and has three parts; Fundus (above the level where the tubes come), body, and cervix (which extends into the vaginal canal).

The supra-vaginal cervix is the part above the vaginal canal. The vaginal cervix is the part in the vaginal canal. There is an internal and an external os.[8] It is approximately 3 inches in length and 2 inches wide. The uterus has a muscular thick-walled and is held in place by several ligaments and the pelvic floor muscles. The uterus has three layers; endometrium (inner mucous layer), myometrium (inner muscular layer), and perimetrium (outer serous layer covering the body of the uterus).

Anteversion refers to the normal 90^0 angle of the long axis of the uterus to the axis of the vaginal canal. Anteflexion refers to the long axis being bent forward even more and forming a 170^0 angle with the long vaginal axis and the axis through the internal os. This is a flexion of the uterus around itself (the body is bent) and is the normal position.[7,8]

The FT: There are two FTs connected at the top of the uterus and are approximately 4 inches long. They are also called the uterine tubes or oviducts. They are indirectly connected to the ovaries but have a fringed end called the fimbriae that is near the ovary. The fimbriae direct an ovum into the FT opening when it is discharged from the ovary. The FTs' lining is coated in cilia, which carry the ovum along the FT to the uterus.[8, 9]

The physiology of reproductive system

A better understanding of the normal reproductive physiology involved in establishing intrauterine pregnancies is of paramount importance in attempting to minimize the occurrence of this potentially serious illness. During normal conception, fertilization has often been assumed to take place in the distal portion of the FT that subsequently conducts the fertilized ovum to the uterine cavity where it implants. This presumption is based on two lines of evidence. The first pertains to the relatively brief period after ovulation when it is possible for an ovum to be fertilized. The second presumption relates to the fact that the majority of the time that elapses from the moment of ovulation to the arrival of the ovum in the uterine cavity is typically between three and six days - appears to be spent traversing portions of the distal FT.[10]

When the conceptus' transit along the FT is obstructed, such as by mucosal adhesions or aberrant tubal motility caused by inflammatory illness or endometriosis, the EP occurs. The mucosa and muscular tubal wall are easily penetrated by the trophoblast. EP mimics the uterus's placenta increta or placenta percreta. Blood enters the peritoneal cavity from the tube's insertion site, producing abdominal pain. EP is also linked to abnormal uterine bleeding following a period of amenorrhea, as well as Arias-Stella cells in the endometrium. By the 12^{th} week of pregnancy, a thin tubal wall ruptures. Tubal rapture is dangerous because it can cause fast exsanguination.[11]

Histopathology of ectopic pregnancy

Because the FT wall has deficient submucosal layer, pregnancy is simple: the fertilized ovum can burrow past the epithelium and implant within the muscular wall. Maternal blood rushes into the gaps within the trophoblast or neighboring tissue as the rapidly expanding trophoblast erodes the subjacent muscularis layer. The lack of resistance permits trophoblasts to penetrate early. The anatomic location of a tubal pregnancy can help determine the severity of the damage. Senterman *et al.* (1988) looked examined histological samples from 84 isthmic and ampullary pregnancies and found that half of the ampullary pregnancies were intraluminal, with the muscularis intact in 85% of the cases. Isthmic gestations, on the other hand, were found both intra and extraluminally, with higher tubal wall damage.[2] The EP was confirmed on histology as was the lack of an intrauterine pregnancy, the endometrial curetting demonstrating the Arias Stella reaction of glandular cells in a hyperactive secretory state.[12]

Clinical manifestations

As women seek care earlier, the ability to diagnose EP before rupture even before the onset of symptoms is not unusual. Despite the classic symptoms of amenorthoea vaginal bleeding and/or abdominal pain on affected side, there is no constellation of symptoms that secure the diagnosis with reliability.[2] Symptoms such as early onset occur - 7 weeks after LMP, abdominal pain, and vaginal bleeding. The Signs varies from abdominal tenderness (91.0%), 1^{st} trimester bleeding (79.0%), common associated findings including (Adnexal tenderness (54.0%), Amenorrhea) with early pregnancy symptoms, Cullen's sign (Periumbilical bruising), in addition to nausea, vomiting, diarrhea and dizziness.[11]

Differential diagnosis

The EP can be caused by a variety of illnesses, all of which should be examined such as Appendicitis, salpingitis, a burst corpus luteum cyst or ovarian follicle, urinary tract illness overian torsion, or spontaneous or threatening abortion are examples of these conditions.[11] Dysmenorrhea, Dysfunctional uterine hemorrhage, Urinary tract infection, Diverticulitis, and Mesenteric lymphadenitis were all possible diagnoses.[2]

Diagnosis

In most cases, the EP is discovered in the period of the first trimester of gestation. Although fetal viability cannot be determined until the time of delivery, the most frequent gestational age at diagnosis is 6 to 10 weeks. Risk factor documentation is an important element of the history-taking process, and asymptomatic patients with risk features may benefit from routine early imaging.[13,14] The detection of serum beta- hCG is the first diagnostic test in women with suspected EP. A negative beta-hCG test eliminates all possibilities of pregnancy, including EP.[15]

Trans-abdominal or trans-vaginal ultrasonography can be used to make the diagnosis if three criteria are met: (1) an empty uterus, (2) a gestational sac observed independently and less than 1cm from the most lateral edge of the uterine cavity, and (3) a thin myometrial layer enclosing the sac.[16] When the B-hCG level is higher than 1500 mlU per mL and the trans-vaginal ultrasound examination does not reveal an intrauterine gestational sac, an ectopic pregnancy is considered.[6]

In the absence of intrauterine gestation, the isolated detection of free intra-peritoneal fluid has been found to have a specificity of 69.0 percent and a sensitivity of 63.0 percent for the detection and finding of an extrauterine gestation. Echogenic fluid, in particular, has a significant positive predictive value for bleeding or ectopic pregnancy rupture. Tubal rupture is not related to the volume of hemo-peritoneum. Active hemorrhage from the fimbria, corpus luteum rupture, tubal abortion, or can all result in a considerable amount of hemo-peritoneum.[3]

Unlike the decidual cast, which is placed inside endometrial cavity, an early gestational sac is located within the deciduas. As a result of conforming to the endometrial canal, a pseudo-gestational sac is more likely to be elongated, whereas an intrauterine gestational sac is more likely to be round or oval in shape. A good indicator for separating early pregnancy from a pseudo-gestational sac is the presence of an echogenic core endometrial cavity with a gestational sac to the side. In the pseudo-gestational sac, the decidual reaction is usually <2 mm, but a continued intrauterine pregnancy is invariably linked with thicker endometrium.[5]

The ovaries should be checked to rule out ovarian involvement with the mass and to check for the presence of a corpus luteum cyst, an early pregnancy functional cyst. When a gestational sac is visible and contains an embryo with a quantifiable heart rate, an ectopic pregnancy can be verified 25% of the time. When the uterus is empty but a decidual ring is seen on the ipsilateral side as a corpus luteum cyst, it is most likely an ectopic pregnancy.[14]

Color-flow Doppler imaging may be helpful for the diagnosis of ectopic pregnancy. There is low resistance flow at the site of placental implantation, which is not seen in pseudo-sac of ectopic gestations. Color- flow Doppler imaging demonstrates sparse distribution of pulsatile vascular color pattern with a low-velocity arterial waveform (peak systolic velocity < 10 cm/second) and low diastolic flow (indicating high ectopic gestations) demonstrate high-velocity low-impedance Doppler flow signal. Taylor *et al.*, reported a high-velocity low-impedance flow in 54% of ectopic pregnancies in their series. However, this finding is also seen in a corpus luteum cyst.[3]

The treatment of ectopic pregnancy

The EP is capable of resolving on their own or through tubal abortion. However, due to growing symptoms or tubal rupture, roughly 90% of women with EP and blood B-hCG levels greater than 2000 IUL require operational intervention. Tubal rupture might develop when B-hCG levels in the blood are low or falling, or both. When trans-vaginal ultrasonography fails to indicate the position of the gestational sac and serum levels of B-hCG and progesterone are low and falling, expectant management should be considered. Because tubal rupture is a possibility, these individuals must be closely followed until their serum B-hCG content drops below 15 IUL. Almost many EPs at this point resolve instinctively without rupture.[13]

The aim of the study was to confirm the accuracy of trans-vaginal ultrasound in the diagnosis of EP compared with trans-abdominal ultrasound confirmed by histopathological study.

PATIENTS AND METHODS

A prospective study of 4200 women in early pregnancy (first trimester) attended to Al-Batool Gynecological and obstetrical teaching hospital in Mosul City. The women were self referred or referred by general practitioner or by private clinics from 1st June 2009 till 1st June 2010. The patients summated between ages of 15 years and 49 years, presented with abdominal pain with or without vaginal bleeding. The patients lying down in supine position and full bladder and examined trans-abdominally with transverse and sagittal section by using a device vivid 3, China (the Supplying Company), vivids the manufacturing company! 796 MB/sync. Master. C:N7HVAP 2007-32J, provided to the unit of ultrasound examination in 2007 with 3 probes and a printer. One vaginal probe of 7.5 MHz and 2 abdominal probes one 3.5MHZ and the other 7.5 MHz.

The gel used in trans-abdominal sonography is perectonechogel 2000. It assures the perfect transfer of the sound waves between probe and skin. Its advantage is that it is very friendly to the skin, takes care of probe, easy to remove, non-melting, resistant to temperature and economical, and its ingredients (water, carbopo 1934, glyceren, edta, propylenglycol, euxyl methyl parpen),

were produced by: Nassif cosmetic S.A.R, under license of C.K cosmetic. Cologne Germany.

Those patients who had been diagnosed as suspected ectopic pregnancy reexamined by trans-vaginal sonography. Ultrasound examination has become the main stay of early pregnancy diagnosis without harm or discomfort to the patient. The patients should lie down in lithotomic position with empty bladder, because full bladder can compress, distort and displace the ectopic gestation. The vaginal ultrasound probe will be enclosed with condom and will have been soaked in a disinfectant between uses without need to use coupling agent (gel). The trans-vaginal ultrasound probe works in the identical manner like the abdominal probe dose, but it is long and thin and it is usually a higher frequency probe which means that it generates images of higher resolution than trans-abdominal because trans-vaginal probe gets closer to the organs being viewed and looks at smaller area than trans-abdominal. Those patients who had been diagnosed as having suspected ectopic pregnancy were operated on under general anesthesia by using Pentothal (thiopental) 5m/kg through intravenous canula with monitoring of vital signs, laparotomy done and the specimen sent for histopathological study. The histological assessment was performed by skilled pathologists who were uninformed about the clinical, laboratory and imaging characteristics of the patients, by cutting of section with microtome and staining with hematoxylin and iosin. The early processing of large biopsy is important to avoid autolysis. Early dissection and sectioning are important to insure a proper fixation and avoid autolysis.
The patients asked for: name, age, family history, past history: Pelvic surgery and previous EP.

The statistical analysis done was Chi-square test by using the statistical program Minitab version 13, to find the significant by determining Sensitivity, specificity, (+ve) predictive value, (-ve) predictive value.

RESULTS

The patients involved in this prospective study were 4200, between the age of 15 and 49 years. This sample is analyzed according to the results of trans-vaginal sonography (TVS) and the result was 79 patients (1.9%) had ectopic pregnancy and those affected by other diseases were 4121 patients (98.1%). The incidence of ectopic pregnancy (the number of ectopic pregnancies per year) was (1.9%) as shown in Figure (1).

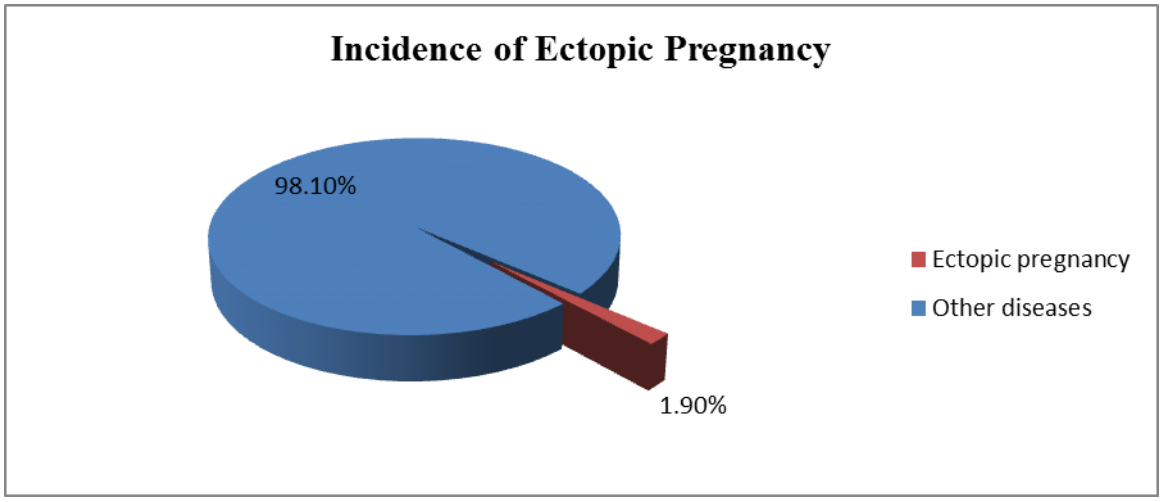

Figure 1: Incidence of Ectopic pregnancy.

Table (1) shows the incidence of ectopic pregnancy according to the age groups and demonstrates that the lower limit of age range was 15 years, the upper limit was 49 years and the mean age was 32 years. The peak age incidence was in (25-29) years. 7 patients out of 79 (8.87%) were in (15-19) years age group, 20 patients (25.32%) were in (20-24) years age group, 24 patients (30.38%) were in (25-29) years age group, 15 patients (18.98%) were in (30-34) years age group, 10 patients (12.66%) were in (35-39) years age group, 2 patients (2.53%) were in (40-44) years age group and one patient (1.26%) was in (45-49) years age group.

Table 1: The incidence of ectopic pregnancy according to age groups.

Age	No. of patients	%
15-19 years	7	8.87
20-24 years	20	25.32
25-29 years	24	30.38
30-34 years	15	18.98
35-39 years	10	12.66
40-44years	2	2.53
45-49 years	1	1.26
Total	79	100.0%

Table (2) shows the incidence of ectopic pregnancy according to the parity and reveals that the ectopic pregnancy is more common in low parity (1-3), 35 patients out of 79 (44.30%) are of low parity. Five

patients (6.32%) are nulliparous, 25 patients (31.64%) are gravid (4-6) and 14 patients (17.72%) are grand multiparous.

Table (2): The incidence of ectopic pregnancy according to the parity.

Parity	No. of patients	%
Nulliparous	5	6.32%
1-3	35	44.30%
4-6	25	31.65%
>6	14	17.72%
Total	79	100.0%

Table (3) shows the incidence of risk factors in ectopic pregnancy and demonstrates that the more frequent factor is ovulation induction in 20 patients out of 79 (25.3%), the pelvic inflammatory disease (PID) in 18 patients (22.7%), the intrauterine contraceptive device (IUCD) in 16 patients (20.25%), the use of contraceptive pills in 9 patients (11.39%), the history of previous pelvic surgery in 7 patients (8.8%), smoking in one patient (1.2%).

Table 3: The incidence of risk factors in ectopic pregnancy.

Risk factor*	No. of patients	%
Ovulation induction	20	25.3%
Pelvic inflammatory disease	18	22.7%
Intrauterine contraceptive device	16	20.25%
Oral contraceptive pills	9	11.39%
History of previous pelvic surgery	7	8.8%
Smoking	1	1.2%
History of previous ectopic pregnancy	0	0.0%
No risk factor	18	22.78%

*One patient may score more than one risk factor

Table (4) demonstrates clinical presentations of ectopic pregnancy and shows that the most frequent clinical presentation is the abdominal pain in 15 patients out of 79 (95.0%). The abdominal tenderness in 71 patients is (90.0%), the vaginal bleeding in 63 patients is (80.0%), the adnexal tenderness (cervical excitation) in 37 patients is (47.0%) and the dizziness (syncopal attack) in 28 patients is (35.0%), one patient may have more than one clinical presentation.

Table 4: The clinical presentations of ectopic pregnancy.

Clinical presentations*	No. of patients	% out of 79 patients
Abdominal pain	75	95.0%
Vaginal bleeding	63	80.0%
Abdominal tenderness	71	90.0%
Adnexal tenderness (cervical excitation)	37	47.0%
Dizziness (synocopal attack)	28	35.0%

*One patient may have more than one clinical presentation.

Table (5) shows the ultrasonic findings in TAS and TVS and clarifies that the most frequent finding is fluid in pouch of Douglas by TAS in 47 patients out of 79 (60.0%) and by TVS in 55 patients (70.0%). The adnexal mass was seen by TAS in 35 patients (45.0%) and by TVS in 47 patients (60.0%). The pseudo gestational sac was seen by TAS in 12 patients (15.0%) and by TVS in 16 patients (20.0%), and the less frequent was the live ectopic or gestational sac containing yolk sac or fetal pole which was seen by TAS in 3 patients (4.0%) and by TVS in 8 patients (10.0%). The total ultrasonic findings in TAS are 97, while in TVS are 126 and this means that the TVS is more sensitive than TAS, Chi-square is 0.239.

Table 5: The ultrasonic findings in trans-abdominal sonography (TAS) and trans-vaginal sonography.

Finding	Trans abdominal sonography	Trans vaginal sonography
	No. (%)	No. (%)
Fluid in pouch of Douglas	47(60.0%)	55(70.0%)
Adnexeal mass	35(45.0%)	47(60.0%)
Pseudo gest. sac	12(15.0%)	16(30.0%)
Live ectopic or gest. Sac containing yolk sac or fetal pole	3(4.0%)	8(10.0)

One patient may harbor more than one finding, which is found better in trans-vaginal examination.

Table (6) shows the ultrasonic finding of ectopic pregnancy according to the side and reveals that findings occur in 64 in the right side and 33 in the left side, the number of the patients in right side was 51 patients (65.82%) and the number of the patients in the left side was 26 patients (34.18%).

Table 6: The trans-abdominal findings according to the sides.

Findings*	Right side	Left side
	No. (%)	No. (%)
Fluid in pouch of Douglas	29(36.70%)	18(22.78%)
Adnexeal mass	25(31.64%)	10(12.66%)
Pseudo-gestational sac	8(10.12%)	4(5.06%)
Live ectopic or gest. Sac containing yolk sac fetal pole	2(2.53%)	1(1.26%)
Total	64(80.99%)	33(41.76%)
No. of the patients out of 79	51(65.82%)	16(34.18%)

*One patient may harbor more than one finding

Table (7) shows the operation had been done for 120 patients 21 patients out of 120 patients (17.5%) had ovarian cysts, 16 patients (13.3%) had pelvic inflammatory diseases, two patients (2.4%) had no pathology, one patient (%0.83)had twisted FT and one patient (0.83%) had appendicitis. patients (65.83%) had EPs proved by 79 histopathology. The right tubal rupture was the most frequent operative finding in 29 patients out of 79 (36.7%). The right tubal pregnancy was in 2 patients (27.84%).The left tubal rupture was in 14 patients (17.72%). The left tubal pregnancy was in 12 patients (15.19%) and abdominal ectopic pregnancy was in 2 patients (2.53%), the right tubal pregnancy seen more than the left tubal pregnancy.

Table 7: The operative findings.

Findings	No. (%)	
Right tubal rupture	29 (36.71%)	43(54.43)
Left tubal rupture	14(17.72%)	
Right tubal pregnancy	22 (27.85%)	34 (43.04%)
Left tubal pregnancy	12 (15.19%)	
Abdominal ectopic pregnancy	2 (2.53%)	
Total	79 (100.0%)	

Table (8) demonstrates the incidence of ectopic pregnancy according to the type and part of the FT and depicts that the higher incidence tubal ectopic is in 77 patients out of 79 (97.47%), the abdominal ectopic is in 2 patients (2.53%). 70 patients (88.61%) had ampullary tubal ectopic pregnancy which was the most common tubal ectopic pregnancy. 3 patients (3.79%) had fimberial ectopic pregnancy. 2 patients (2.53%) had isthemic ectopic pregnancy and 2 patients (2.53%) had cornual (interstitial) ectopic pregnancy.

Table 8: The incidence of ectopic pregnancy according to the type and part of the FT.

Findings*	No. of patients	% out of 79 patients
Abdominal	2	2.53%
Ampullary part of the FT	70	88.61%
Fimberial part	3	3.80%
Isthmic part	2	2.53%
Cornual (interstitial)	2	2.53%
Total	79	100.0%

Table (9) shows the ultra-sonic (abdominal) analysis of the 4200 patients, 2888 patients (68.76%) had threatened abortions, 546 patients (13.6%) were missed abortions, 252 patients (6.0%) were complete abortions, 210 patients (5.0%) were incomplete abortions, 126 patients were blighted ova, 120 patients (2.9%) were ectopic pregnancies, and 58 patients (1.386) were hydatidiform moles.

Table 9: The ultra-sonic (abdominal) analysis.

Findings*	No. of patients	% out of 79 patients
Threatened abortion	2888	68.765
Missed abortion	246	13.6%
Complete abortion	252	6.0%
Incomplete abortion	210	5.0%
Blighted ovum	126	3.0%
Ectopic pregnancy	120	2.9%
Hydatitdiform mole	58	1.38%
Total	4200	100.0%

Table 10 shows the results of screening test of trans-abdominal versus histopathology and displays that the sensitivity is 87.0%, specificity 99.0%, accuracy 99.0%, positive predictive value 57.0%, negative predictive value is 100.0%.

Table 10: Screening test of trans-abdominal versus histopathology.

Screening test		Gold stander Histopathology		Total
		+v	-v	
Trans-abdominal sonography	+ve	69	51	120
	-ve	10	4070	4080
Total		98	4121	4200

Table 11 demonstrates the screening test of trans-vaginal versus histopathology and shows that Sensitivity is 92.0%, Specificity 100.0%, Accuracy 100.0%. Positive predictive value is 88.0% and negative predictive value is 100.0%.

Table (11): Screening test of trans-vaginal versus histopathology.

Screening test		Gold standard histopathology		Total
		+ve	-ve	
Trans-vaginal sonography	+ve	73	10	83
	-ve	6	4111	4117
Total		79	4121	4200

THE DISCUSSION

Amenorrhoea with vaginal hemorrhage and lower abdominal discomfort is a common complaint among patients who report to the emergency department in the first trimester of pregnancy. The primary goal is to identify whether the patient is pregnant or not, as well as whether the pregnancy is normal viable intrauterine or ectopic. In this series, ultrasound was a useful technique; the focus was on trans-abdominal (TAS) and trans-vaginal sonography (TVS) correlation and confirmation by histology.

The incidence of EP, Pereira *et al.,* (2009) stated that the general incidence of EP raised throughout the mid 20th Century plateauing at around (2%).[17] Condous (2006) mentioned that the incidence of EP had risen to (2.0%) with the advent of early pregnancy units (EPU) and the use of high resolution trans-vaginal probes 14), Murray, H. et al., (2005) showed that the incidence of EP in the general population is about (2.0%).[13] In this series the incidence is (1.9%), so it is parallel with the above studies.

The age incidence, Udiqwe *et al.,* in Nigeria (2010) pointed that the peak age group in EP was 26-30 years and the lower age incidence was below 20 years and the upper age group was above 40 years old.[18] Malik *et al*., (2009) stated that the most common age group with pelvic mass was between (26-30) years, the mean age was 30 years.[19] In this series, the peak age incidence was (25-29) years, the lower age incidence was (15- 19) years (8.87%) and the upper age incidence was (45-49) years (1.26%), the mean age was 32 years, so it is consistent with the above studies.

According to the parity incidence, the authors Udiqwe *et al.,* (2010) mentioned that the prevalence is equal in both primigravida and secundigravida (low parity) was (36.1%) of their patients (32). Malik *et al*,. (2009) stated that (45%) of their patients of were low parity.[19] Thia *et al.,* pointed that (51.8%) of the patients were primigravidae.[4] In this current series, the results were (44.3%) of the sample were of low parity more or less near to the above studies.

The authors Aziz *et al.,* (2011) in a research performed in Saudi Arabia found at the incidence of EP in multiparous (4-6) parity was in (64%) of their patients.[20] In the present series (31.64%) of the patients were multiparous, which is different from Azizs study

because of all the patients in the above study had history of previous multiple abortions and the sample in this study is randomly chosen, some of them had history of previous abortion and some had not.

Udiqwe *et al.* (2010) mentioned that the prevalence of EP is lower in grand multiparous (> 6) parity was (13.1%).[18] In this series (17.72%) of the patients were grand multiparous, it slightly higher than Udiqwe's study that may be due to the contraception encouragement in their country.

As far as the risk factors are concerned documentation of risk factors is an essential part of history taking and asymptomatic clinic patients with risk factors may benefit from routine early imaging, Fageeh in Saudi Arabia (2008) points out that (3.8%) of the patients had ovulation induction as risk factor[21], the authors Bouyer *et al.,* (2002) stated that (4.9%) of their patients had ovulation induction.[36] in this series the ovulation induction was in (25.3%) of the patients, and this is much higher than the above studies which may be due to unscientific use se of clomiphine citrate for ovulation induction in the locality. Concerning intrauterine contraceptive device (UCD), Aziz (2011) stated that (4.5%) of the patients had IUCD in situ.[20] Fageeh (2008) found that (5.8%) of the patients had IUCD in place.[21] In this series (20.25%) of the patients had IUCD and this is higher than the above study, because IUCD is prohibited in Saudi Arabia, but it is widely used in our country. The use of oral contraceptive pills, Bouyer *et al.,* (2009) mentioned that the percentage of the patients with ectopic pregnancy who had history of previous use of oral contraceptive pills was (73.5%).[22] In this series, the result is (11.39%), and this is much lower than Bouyer's figure due to less use of oral contraceptive pills in our country.

The history of previous pelvic surgery, Aziz *et al.,* (2011) found that (18.0%) of their patients had previous pelvic surgery[20], and Bouyer *et al.,* (2002) found that (23.7%) of their patients had previous pelvic surgery.[22] In this series (8.8%) of the patients had previous pelvic surgery, this difference as the author believe is due to different surgical technique and variable surgical skills in different parts of the world.

Regarding smoking, Damotta *et al.,* in study done in Brazil in (2010) found that (19.1%) of their patients were smoker.[23] In this series (1.2%) of the patients were smoker, which is lower than Damotta's study because most of the women in our community are not smoker.

The history of previous EP, Bouyer *et al.,* (2002) stated that (84.1%) of their patients had no history of previous EP[22], in this series, all the patients had no history of previous EP and this may be due to the type of the sample.

The clinical presentations of ectopic pregnancy were varied, Udiqwe *et al.,* (2010) found that abdominal tenderness present in (100.0%) of the patients while syncopal attack developed in (63.8%) of their patients.[18] Thia *et al.,* (2009) stated that had and (97.0%) of the patients had abdominal pain, (79.0%) had vaginal bleeding, and (91.0%) had adnexal tenderness.[4] Tay *et al.,* (2000) mentioned that the presenting symptoms was vaginal bleeding in (80.0%) of the patients.[24] In this series, the abdominal pain was in (95.0%) of the patients, vaginal bleeding in (80.0%), abdominal tenderness in (90.0%), adnexal tenderness cervical excitation in (47.0%) and syncopal attack in (35.0%). These results are more or less similar with the above studies, but the syncopal attack is lower than Udiqwe's study, this difference may be because of most of the patients of Udiqwe's study presented with anemia due to poor socioeconomic status and due to severe loss of blood associated with tubal rupture were all their patients present with.

Trans-abdominal ultrasonic findings of Malik *et al.* in Pakistan (2009) showed that adnexal mass present in (91.0%) of their patients, fluid in the Cu-de-sac was present in (97.0%) of their patients and pseudo-gestational sac was present in (35.0%) of their patients.[3] Schurz *et al.* study in India (2007) stated that pseudo-gestational sac was present in (6.9%) of the patients.[25] Nassem *et al.* study in Karachi (2007) stated that adnexal mass and pelvic fluid was present in (76.0%) of the patients and the live ectopic was present in (8.4%) of their patients.[26] In this series, the fluid in pouch of Douglas was present in (60.0%) of the patients adnexal mass was present in (45.0%) of the patients, pseudo-gestational sac present in (15.0%) of the patients, and live ectopic was present in 4.0% of the patients. The difference between this study and the above studies due to differences in skills of interpretator, resolution of equipment and the time of presentation of the patients.

Trans-vaginal ultrasonic findings Periera *et al.,* in study done in Brazil (2009) found that adnexal mass was present in (24.75%) of their patients.[17] Adhikari *et al.,* in study in USA (2006) stated that complex adnexal mass in (61.0%) of their patients, echogenic fluid in the Cul-de-sac in (21.0%), and (13.0%) of the patients presented with live ectopic pregnancy[27], Condous *et al*. in study done in London (2005) found that (57.9%) of the patients had adnexal mass and (13.2%) of the patients had live ectopic pregnancy.[28] Suton (2003) stated that complex adnexal mass in (90.0%) of the patients, pseudo-gestational sac in (20.0%) of the patients and live ectopic in (25.0%) of the patients.[13] In this series the fluid in pauch of Douglas was in (70.0%) of the patients, adnexal mass was in (60.0%) of the patients, pseudo gestational sac was in (20.0%) and lives ectopic pregnancy in (10.0%) of the patients. These results were more or less near the above studies. The TAS showed 97 ultrasonic findings in 79 patients, while TVS showed 126 ultrasonic

findings in the same patients, that is mean that the TVS is more sensitive than TAS.

The side of EP Udiqwe *et al.* (2010) stated that (09.4%) of the sample had EP in the right side, while the remaining (30.6%) had left side EP.[18] This difference still the ampullary type is the main frequent type.

The analysis of patients in early pregnancy by trans-abdominal ultras-sound, Tuladhar *et al.,* in study done in Nepal (2009) stated that the normal pregnancy (threatened abortion) was in (66.8%), the missed abortion was in (10.5%), the incomplete abortion was (6.3%), the complete abortion was in (4.6%), the blighted own was in (4.0%), the ectopic pregnancy was in (2.3%) and hydatidiform mole was in (1.99%).[29] Kory *et al.,* in America (2000) mentioned that the patients presenting with vaginal bleeding in early pregnancy with or without abdominal pain and with positive pregnancy test were (40.5%) threatened abortions, (2.5%) were missed abortions, (18.0%) were incomplete abortions, (9.15%) were complete abortions and (1.4%) were ectopic pregnancies.[30] In this series, the results of analysis of 4200 patients in early pregnancy were (68.76%) had threatened abortion, (13.0%) had missed abortion, (6.0%) had complete abortion, (5.0%) had incomplete abortion, (3.0%) had blighted ovum, (2.9%) had EP and (1.38%) had hyditiform mole and this is in agreement with the above studies.

The sensitivity and specificity of TAS and TVS, Malik *et al.* (2009) stated that specificity of TAS was (84.0%) and specificity of TVS was (92.0%).[19] Condous *et al.,* (2005) mentioned that the sensitivity of TVS was (90.9%), while specificity was (99.9%).[28] Kirk *et al.,* in study done in London (2007) reported that the overall sensitivity of the initial TVS in the diagnosis of EP was (73.9%) with a specificity of (99.9%).[31] Wong *et al.,* in study done in Hong Kong (1998) stated that the sensitivity of TAS was (82.0%) and the specificity was (92.0%).[32] In this series, the sensitivity, specificity and accuracy of TAS were (87.0%), (99.0%) and (99.0%) respectively, which is nearly the same as the above studies, while those of TVS were (92.0%), (100.0%) and (100.0%) this is nearly the same as the above studies. But the TVS is higher than Kirk's study because their respectively and sensitivity of the examination was initial. This series also confirmed that the sensitivity, specificity and accuracy of TVS were higher than TAS.

The B-hCG serum level assessment Lipscomb *et al.,* (2000) stated that an intrauterine pregnancy is visible on TAS once B-hCG level have reached 6000-6500 mlU/dL, and experienced ultrasonographer should be able to identify a viable intrauterine pregnancy on TVS when B-hCG level as low as 2000 miU/dL, however, the threshold level at which an intrauterine gestational sac should always be seen is not known, thus each institution must develop its own lower limits for ultrasonographic detection of viable intrauterine pregnancy.[49] Condous *et al.,* (2005) stated that, unstable biased region does not significantly impair the detection of EP of unknown location, a single estimation of serum B-hCG is not only potentially incorrectly supportive, but also unaccommodating in excluding the EP.[42] In this series, only few of the patients did ß-hCG estimation because it is not available in the hospital, only 28 patients did it, because most of the patient presented acutely and no time for waiting for 3 days for the results of B-hCG.

From this study, the incidence of EP nearly the same as other studies, the age incidence (26.30%), EP was higher in low Parity (44.30%), ovulation induction the more frequent risk (25.3%), the abdomen pain was the most common frequent clinical presentation (95.0%), the right ampullary ectopic was most frequent ectopic (65.82%), the rupture ectopic lower than the other studies (54.42%) and the sensitivity, specificity and accuracy of TVS were higher than TAS.

CONCLUSIONS

The ultrasound is the basic modality used to evaluate EP. Trans-abdominal sonography should be the initial technique whereas trans-vaginal is better in the resolution. The diagnosis of EP can be made with trans-vaginal ultrasound alone, but trans-abdominal should always be in conjunction with trans-vaginal ultrasound.

Recommendations

I suggest to open a new unit for early pregnancy women "early pregnancy unit" (EUP) like other countries, to make trans-vaginal sonography as routine examination for early detection of EP and subsequently more appropriates treatment like medical by methotrexate or surgical by laparoscopy, so better prognosis and less complications and more preservation for future fertility.

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