ORIGINAL ARTICLE

Comparison of Transabdominal and Transvaginal Sonography in the Diagnosis of Ectopic Pregnancy

SAFDAR ALI MALIK, SHUMAILA MALIK, AYESHA MAQBOOL.

ABSTRACT

Introduction: Ultrasonography now plays a pivotal role for the assessment of gynecological patients due to its wide-availability, good resolution, low cost and lack of ionizing radiation. Ultrasound gives information about function and morphology of pelvic organs.
Objective: To compare transabdominal and transvaginal sonography in the diagnosis of ectopic pregnancy.
Study design: Cross-sectional analytic study.
Study setting: The study was conducted in the Alnoor diagnostic center, Lahore.
Study duration: Study duration was from 1st September 2008 to 15th August 2009.
Subjects and methods: 100 hundred patients were included in the study. All women with suspension of ectopic pregnancy were evaluated by both transabdominal and transvaginal sonography. Diagnosis made transabdominal and transvaginal sonography ultrasound was confirmed by histopathology.
Sampling technique: Non-probability convenient sampling.
Results: Ultrasonographic findings of ectopic pregnancy were seen, including presence of extra uterine gestational sac or complex mass 91 %, absence of gestational sac in uterus 94%, fluid in the pouch of douglus 67%, thick endometrial lining or pseudo gestational sac 35%, enlargement of uterus 6%. More than one finding was seen in several patients.
Most common age group with pelvic masses was between 26-30 years. Image quality and anatomic detail were better in 84% cases with TVS and in 54% cases with TAS approach. There was a significant difference in the image quality, between two modalities. Diagnostic information of these modalities was almost equivalent. TAS diagnosed 84% while TVS 93%.
CONCLUSION: TVS is better at detecting subtle abnormalities than TAS. However TAS is important for giving an initial overview of the pelvis and should be performed when the urinary bladder is full. If the TAS closely identifies a live intrauterine pregnancy and normal adenexa or if the TAS detects a live ectopic pregnancy study can usually be stopped. The TAS is also important to look for findings outside of the pelvis, in particular abdominal ascites. TVS usually be used in conjunction with, and not as a substitute for, TAS. TVS is best used when TAS is not conclusive, or when immediate confirmation of an intrauterine pregnancy is desired.
Key words: Ectopic pregnancy, TAB (Transabdominal ultrasound), TVS (Transvaginal ultrasound), IUCD (Intra uterine contraceptive device), PID (Pelvic inflammatory disease).

INTRODUCTION

The technologic revolution of the 20th century has improved diagnostic capabilities of ectopic pregnancy. Therefore, diagnosis of unruptured ectopic pregnancy has become feasible and even mandatory. The main achievement in the treatment of ectopic pregnancy over the past 110 years is the dramatic decrease in the mortality rate from 72- 90% in 1880 to 0.14% in 1999[1].

Incidence of extrauterine pregnancy has increased from 0.5% thirty years ago to a present day 1-2% of all pregnancies (the sum of all reported live births, abortions and ectopic pregnancies) and it is steadily increasing in UK, Europe and USA[2,3,4]. In USA, the incidence has increased six fold between 1970 and 1992, with ectopic pregnancy rate of 16.1 per 1000 pregnancies in 1992[4]. In the UK the incidence of ectopic pregnancy is 11.5 per 1000 pregnancies with four deaths (a rate of 0.4 per 1000 ectopic pregnancies)[2]. The confidential inquiry into maternal deaths in U.K (1994-1996) reported 12 deaths from an estimated 33,550 ectopic pregnancies during that period[3].

Ultrasonography now has a pivotal role for the assessment of gynaecological patients due to its wide availability, good resolution, low cost and lack of ionizing radiations. A scan should be seen as a part of the overall clinical assessment of the patient[1]. It should never be looked at in isolation. An accurate

680, Alnoor Diagnostic Centre, Shadman, Lahore ,Pakistan. Correspondence to Prof. Safdar Ali Malik, Department of Radiology, FJMC, Lahore

scan can enable the clinician to avoid surgery in some cases and select the correct surgical approach in others.[3,4] It will not diagnose the cause of all presenting complaints; however, the failure to demonstrate pathology can be highly reassuring and avoid the need for further investigation[1,4].

Ultrasonographic examination during the reproductive period in married females is most often performed by transvaginal route[3]. However, this examination could also be performed transabdominally, transrectally and by transperineal route. Transabdominal sonography should still be the initial sonographic technique for routine evaluation of female pelvis followed by transvaginal sonography[1]. Masses have such a typical macroscopic appearance that a fairly confident diagnosis can be made on the basis of their macroscopic appearance alone[2].

This had been demand of the patient and clinician to provide a rapid and accurate diagnosis with a minimum of investigation, invasive procedure and by economic constraints of patient admission. This had led me to study the comparison of transabdominal and transvaginal sonographic diagnosis of ectopic pregnancy. By the result of this study, we were able not only to define which modality was better in this evaluation of ectopic pregnancy but also to outline a better management plan.

SITES OF ECTOPIC PREGNANCIES

i) Fallopian tube: Fallopian tube is the commonest site of ectopic pregnancy and accounts for 95% of all cases[5]. Within the fallopian tube ampulla is the most common site (70%) followed by isthmus (12.0%), fimbrial (11.1%) and interstitial (2.4%)[6]. Rupture of ectopic in the interstitial part of the tube, though rare is associated with particularly severe hemorrhage.

ii) Ovaries: Ovary is the second commonest site of ectopic pregnancy and is -responsible for 1.5% of all ectopic pregnancies. Intrauterine contraceptive devices are involved in the pathophysiology of ovarian ectopic pregnancy[7].

iii) Abdominal Cavity: Abdominal ectopic pregnancy occurs in 1.3% of all ectopic pregnancies[8]. When it occurs its early diagnosis is difficult, owing to the atypical presentation and' the low index of suspicion for this rare condition[1].

iv) Cervical Pregnancy: Cervical ectopic is very rare life threatening type of ectopic pregnancy and seen in 0.1% of all ectopic pregnancies[9]. The condition is usually difficult to differentiate from the cervical phase of an incomplete abortion or bleeding cervical fibroid.

v) Hetrotopic pregnancy: Hetrotopic pregnancy is an uncommon obstetric entity with variegated symptomatology[10]. Incidence of hetrotopic pregnancy varies from 1:4000 to 1:6000 of spontaneous conceptions. Infertile women with history of ectopic pregnancy, tubal surgery or disease are at increased risk for hetrotopic pregnancy when they undergo in vitro fertilization[8,10].

The risk factors i.e. pelvic inflammatory disease, tubal factor infertility, previous tubal pregnancy etc share common mechanism of action namely interference with fallopian tube function. Normally, an egg is fertilized in the fallopian tube and then travels down the tube to the implantation site[11]. Any mechanism that interferes with the normal function of fallopian tube during this process increases the risk of ectopic pregnancy.

OBJECTIVES

The objective of the study was to compare transabdorminal with transvaginal sonography in the diagnosis of ectopic pregnancy.

MATERIALS AND METHODS

The study was conducted in the Alnoor Dignostic Center, 680 Shadman Lahore. The study was completed in fourteen months. Non-probability convenient sampling.

Inclusion criteria

- Clinically suspicion of ectopic pregnancy.
- Pelvic or lower abdominal pain.
- Raised serum beta HCG level.

Exclusion criteria

- Above 40 years of age.
- Known gynecological malignancy.
- Known urogenital anomalies.

Data collection: The personal demographic data about each patient was collected on a specially designed proforma. Routine investigations were seen. After explaining the whole procedure informed consent was obtained. Transabdominal sonography was performed with full bladder using a 3.5 MHz convex probe. Presence or absence of mass was confirmed. Findings of 100 hundred cases of clinically suspected ectopic pregnancy were included in the study. Patients having detectable mass were included for further study. Special attention was given to the parameters like anatomical detail, image quality and provisional diagnosis. Immediately after this scan patients were asked to empty their bladders completely. Endovaginal scanning with 7MHz probe was done in the same patients using standard technique in the presence of female staff. Findings of the transvaginal scan were also recorded in the same Performa. Patients were referred for surgery. After surgery histopathological findings were obtained.

Data analysis: The collected data was analyzed accordingly using SPSS version 11. The investigation will be presented as positive and negative and will be

calculated as frequency distribution. Histopathology will be considered as gold standard and it will be compared with transabdominal and transvaginal sonography. This will be calculated by using sensitivity, specificity, positive predictive value and negative predictive value.

RESULTS

Ultrasound is a time-tested modality in the characterization of pelvic pathologies. Recent advances in computerization and broad application of ultrasound software with improved resolution & diversity of probes has made it a more acceptable first line investigation in much of the human body cavities. In our study, we have compared the transvaginal scanning with transabdominal ultrasound findings in women with suspected ectopic pregnancy.

Mean age of the patients was found to be 27.5 years. Maximum numbers of patients were between 26-30 years i.e. 50 % (Table 1). Regarding risk factors most frequent were infertility in 15.0%, previous abdominopelvic surgery 12.5% and history of PID 7.5%. Other risk factors included history of induced abortion 5.0%, recurrent ectopic pregnancy 5.0%, contraceptive pill use 2.5%, IUCD in situ 2.5%, history of ovulation induction 2.5% and previous bilateral tubal ligation 2.5%. Overall clarity of resolution was also better at least 2-3 times using TVS probe (Table 4). When both modalities were compared for correct diagnosis, the sensitivity of diagnosis of suspected ectopic pregnancy by TAS scan findings is 82.3%, specificity 93.3%, positive predictive value is 98.5%, and negative predictive value is 48.2% and the accuracy rate of 84% (table 5). The sensitivity of diagnosis of suspected diagnosis of ectopic pregnancy by TVS scan findings is 92%, specificity 93.3%, positive predictive value is 98.7% and negative predictive value is 70% and the accuracy rate of 93% (table 6).

As for as misdiagnosed cases were concerned, TAS fail to diagnose 16% of cases while only 3 % of cases were not diagnosed by TVS (Table 7).

Table 1: Distribution of cases by age (n=100)

Age	**=n**	**%age**
21-25	30	30.0
26-30	50	50.0
31-35	20	20.0
Mean ± S.D.	27.5 ± 2.5 yrs	

Table 2: Distribution of cases by parity (n=100)

Parity	**=n**	**%age**
Nullipara	15	15.0
1-3	45	45.0
4-6	15	15.0
> 6	25	25.0
Mean ± S.D.	2.3 + 1.3	

Table 3: Symptoms of ectopic pregnancy (n=100)

Symptoms	**=n**	**%age**
Lower abdominal pain	83	83
Irregular vaginal bleeding	70	70.0
Amenorrhea	57	57
Shock	7	7
Syncopal attack	17	17
Asymptomatic	12	12

Table 4: Ultrasonographic findings (n=100)

Findings	**No.**	**%age**
Presence of extrauterine gestational sac or complex mass	91	91
Absence of gestational sac in uterus	94	94
Fluid in the pouch of Douglas	67	67
Thick endometrial lining or pseudogestational sac	35	35
Enlargement of uterus	6	6

Table 5: Results of transabdominal scan findings (histopathology as gold standard) (n=100)

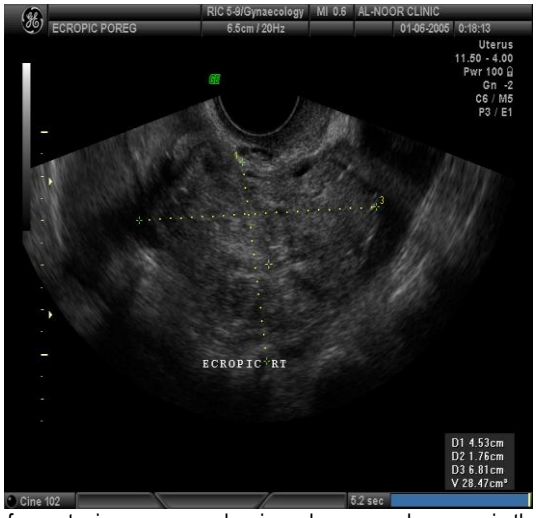
Tests results	**Ectopic pregnancy**	**Normal**
Test positive	True positive (a) 70	False positive (b) 1
Test negative	False negative (c) 15	True negative (d) 14

Table 6: Results of transvaginal scan findings (Histopathology as gold standard)

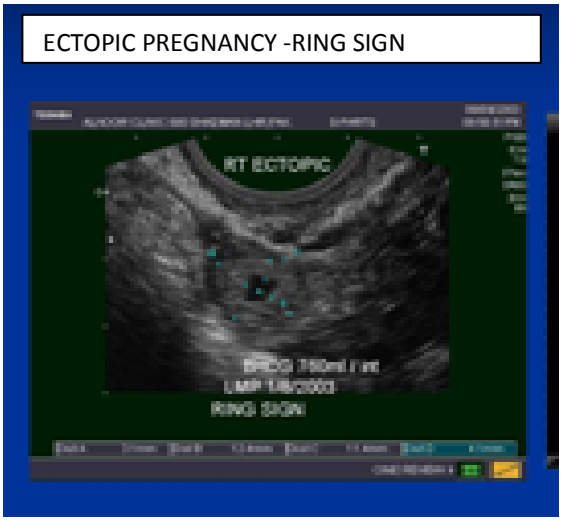
Test results	**Ectopic pregnancy**	**Normal**
Test positive	True positive (a) 79	False positive (b) 1
Test negative	False negative (c) 6	True negative (d)14

Table 7: Misdiagnosed cases on transabdominal and transvaginal ultrasound scanning.

Diagnosis	**Transabdominal**	**Transvaginal**
Ectopic pregnancy	16	3



TVS of an ectopic pregnancy showing a large complex mass in the right adnexal area with minimal fluid in culled cell



TVS showing ring sign of an early unraptured ectopic pregnancy

TVS showing dilated fallopian tube due to Hematoma with ectopic pregnancy

TVS showing intra uterine gestational sac and left adnexal complex mass showing ectopic pregnancy

DISCUSSION

The uterus and ovaries may be visualized by both transabdominal and transvaginal techniques. Traditionally transabdominal ultrasound was used to visualize pelvic viscera and it remained the first line of investigation until now. However, transvaginal ultrasound has the advantage that the transducer is nearer the midline pelvic structures and may therefore be of a higher frequency, which improves the resolution of the image. This method of scanning is preferred in the early detection of pregnancy and in the assessment of abortion and ectopic pregnancy. The higher frequency limits the depth of penetration of the ultrasound wave and more laterally situated pelvic masses are often better assessed by transabdominal scanning.

Our study reveals that important sonographic findings of early pregnancy were most likely to be seen transvaginally than transabdominally. The features of the disease were not clear as compared to the transvaginal ultrasound. In addition the resolution of scanning was much poor on transabdominal scan.

Our finding explains that texture of the uterus & ovaries was seen to be more elaborative on TVS. However, in high placed ovaries and pathologies pertaining to the fundal region of bulky uteri features were less conclusive with TVS simply because of low penetration depth of this probe. In India Pal A et al conducted a study in which maximum number of cases occurred with maximum incidence of ectopic pregnancy in age group of 26-30 years[12]. Most of patients had low parity i.e., 1-3 which is quite similar with study documented by Afridi et al in which 56% of cases of ectopic pregnancy occurred in patient with low parity of 0-2 as compared to our study 45% of patients had parity 1-3 (Table 2 showed parity rate)[13].

High risk factors were present in 55% of patients similar with study conducted by Paul A et al in which 65% of patients had high risk factors (Table 3 shown risk factors)[12].

Pain was commonest symptom (83%) followed by vaginal bleeding in 70% of cases and amenorrhoea (57%). These results are quite similar with study of Pal A. et al (Table 4 show clinical presentation)[12]. In another study irregular vaginal bleeding was commonest symptoms followed by abdominal pain and 33% of patients were admitted in state of shock as compared with 9% of patients with shock in study conducted by Afridi et al[13].

Our study reported that correct diagnosis was 84% on TAS and 93 % on TVS. Diagnostic accuracy was 82% and 89% for TAS £ TVS respectively in the same study of Nausheen F et al[14].

In our study we have found that on transabdominal scan, confusion about diagnosis of a mass is 16% as compared to the 3% of the transvaginal scan.

Khan RL in 2001 reveals in his study that fallopian tube is the most common site for the ectopic pregnancy and the chances was 95%; our study is also in accordance with Khan RL but the rate is 96% which is slightly higher. Reason for the increased rate is may be multiparity in our population[5].

In 2002, Bouyer J explored in his study that ovary is the second commonest site and the rate is 1.5%. Our study revealed that the rate of ovarian and interstitial ectopic pregnancy is 1%[7].

Molinaro TA in his study document that the incidence of hetrotopic pregnancy is 1%. According to our study the percentage is 0.5 % which may be increased in cases of in vitro fertilization[10].

Mitra AG in India in 2000 conducted a study which demonstrates that cervical ectopic is very rare and is seen in 1% of all pregnancies. In present study the ratio is only 0.5%[9].

The earlier demonstration of an intrauterine pregnancy is the single most important contribution of TVS in the evaluation of patients presenting with suspected ectopic pregnancy. Dashefsky et al; In a series of suspected ectopics found all 19 normal intrauterine pregnancies were identified by TVS compared to only 11 of 19 for TAS. In addition, TVS identifies 7 of 16 abnormal uterine pregnancies compare with 3 of 16 for TAS[15]. Our observations are that in the normal gestational sac, the intra decidual sign and double- decidual sign can be used to identify the intrauterine pregnancy before visualization of the yolk sac and the embryo. The double decidual sign is to be distinguished from the decidual cast or pseudogestational sac of ectopic pregnancy. Our study also demonstrates that a decidual cast is an intrauterine-fluid collection surrounded by a single decidual layer as opposed to the two concentric rings of the double decidual sign. We suggest that TVS improves differentiation of the decidua, which produces the pseudogestational sac, from choriodecidual reaction of the double-decidual sign of the intra uterine pregnancy. Dillon et al added in his study that color-flow Doppler imaging may further help distinguish a gestational sac from decidual cast[16].

TVS has improved demonstration of nonspecific findings in patients with ectopic gestations[17]. Fleischer et al using TVS; reports an ectopic tubal ring in 49% of patients with ectopic pregnancy and in 68% of unruptured tubal pregnancies[17]. Our study is in concordant with previous studies that tubal ring can usually be differentiated from a corpus luteum cyst because the corpus luteum cyst is eccentrically located with a rim of ovarian tissue. The tubal ring is a concentric ring created by the trophoblast of the ectopic pregnancy surrounding the chorionic sac. It is also noted that ring is often within a hematoma that may be confined to the fallopian tube or may extend outside of it.

CONCLUSION

We have concluded that ultrasound is the basic imaging modality used to evaluate ectopic pregnancy. Transabdominal ultrasound should be the initial technique employed for this purpose, whereas TVS is better in resolution as compared to the TAS. Diagnosis of the ectopic pregnancy can be made with TVS alone but TAS should always be used in conjunction with TVS.

REFERENCES

1. Gruzinskas JG. Miscarriage, ectopic pregnancy and trophoblastic disease. In: Edmonds DK, editor. Dewhurt's textbook of obstetrics and gynecology for postgraduate. 6th ed. London: Blackwell science;1999;61-75.
2. Hudson CN, Setchell ME. Treatment of ectopic pregnancy. In: Howkin J, editor. Shaw's text book of operative gynaecology. 6th ed. New Delhi: Livingstone;2001;172-81.
3. Fernandes AM, Ribeiro LP, Moraes FH, Meira PC, Sollero CA, Yamada EM. Prevalence of ectopic pregnancy liable to surgical treatment in a public hospital from 1995 through 2000. Rev Assoc Med Bras 2004;50:413-6.
4. Shah N, Khan NS. Ectopic pregnancy: presentation and risk factors. J Coll physicians Surg Pak 2001; 11:387-8.
5. Khan RL. Ectopic pregnancy. In: Khan RL, editor. Gynecology. 3rd ed. Lahore: Publication M;2001:153-62.

6. Chohan MA. Ectopic Pregnency. In: Chohan MA, editor. Fundamentals of gynaecology. Lahore: Publication MAR; 2001:83-94.
7. Bouyer J, Coste J, Fernandez H, Pouly JL, Sipra N. Sites of ectopic pregnancy: a 10 year population-based study of 1800 cases. Hum reprod 2002;17: 3224-30.
8. Raul A, Margara, Trew GH. Ectopic pregnancy. In: Shaw RW, Soutter WP, Stanton SL, editors. Gynecology. 3rd ed. London: Living stone; 2002:329-42.
9. Mitra AG, Harris OM, Conservative Medical Advanced. Cervical ectopic pregnancies. Obstet Gynecol Surv 2000; 55:385-9.
10. Molinaro TA, Barnhart KT. Ectopic Pregnancies in unusual locations. Semin Reprod Med 2007;25:123-30.
11. Condous G. Ectopic pregnancy: Risk factors and diagnosis. Aust Fam Physician 2006;35:854-7.
12. Pal A, Gupta KB, Sarin RA. Study of ectopic and high risk factors in Himachal Pardesh. J Indian Med Assoc 1996;94:172-3.
13. Afridi B and Maqsood. Ectopic Pregnancy. Pakistan J Obstret Gynecol 1991;4:55-59.
14. Nusheen F, Iqbal J, Faruqi NJ. Transabdomianl sonography comparison with trans vaginal sonography. Annals 2004;10:444-6.
15. Dashefsky SM, Lyon EA,Levi CS et al. Suspected ectopic pregnancy: Endovaginal and transabdominal ultrasound. Radiology 1988;169:181-184.
16. Dillon EH, Feycock AL, TaylorKJW. Pseudogestational sacs: Doppler ultrasound differentiation from normal or abnormal intrauterine pregnancies. Radiology 190:176(2):359-364.
17. Fleischer AC, Pennell RG, McKee MS et al. Ectopic pregnancy: Features at transvaginal sonography. Radiology1990;174:375-378.