

Application value of transvaginal ultrasound combined with abdominal ultrasonography in the diagnosis of ectopic pregnancy.

Su Jilian, Qin Jiale*, Wang Junmei, Luo Jiamin, Li Haili

Department of the Second Ultrasonography, Women, s Hospital, School of Medicine, Zhejiang University, No.2 Xueshi Road, Hangzhou, PR China

Abstract

Objective: To explore the application value of transvaginal ultrasound combined with abdominal ultrasonography in the diagnosis of ectopic pregnancy, and provides the basis for early diagnosis of ectopic pregnancy.

Methods: The clinical data of 106 cases of patients with ectopic pregnancy diagnosed by operation or conservative treatment admitted to our hospital from December 2011 to December 2013 were analysed retrospectively, all patients were examined by transvaginal ultrasound and abdominal ultrasonography in order to observe whether there were abnormality in the ovary or beside uterus of the patients, and the positive rate and missed diagnosis rate of ectopic pregnancy were compared among transvaginal ultrasonography group, transabdominal ultrasonography group, and two combined examinations group.

Results: The positive rate of yolk sac, fetal bud, heart beat and pelvic effusion through abdominal ultrasonography were all significantly lower than that of transvaginal ultrasonography ($P<0.05$); in 101 cases of patients with ectopic pregnancy diagnosed by the combination of vaginal ultrasound and abdominal ultrasound, the diagnostic accordance rate was 95.28%, and 5 cases were missed diagnosis, accounting for 4.72%; in 79 cases of patients with ectopic pregnancy diagnosed by simple abdominal ultrasound, the diagnostic accordance rate was 74.53%, and 27 cases were missed diagnosis, accounting for 25.47%; in 82 cases of patients with ectopic pregnancy diagnosed by simple transvaginal ultrasonography, the diagnostic accordance rate was 77.36%, and 24 cases were missed diagnosis, accounting for 22.64%. Compared with simple abdominal ultrasound and transvaginal ultrasound, the difference of diagnostic accordance rate by transvaginal ultrasound combined with abdominal ultrasound were statistically significant ($P<0.05$). However, the diagnostic accordance rate of transvaginal ultrasonography and abdominal ultrasonography were similar, and the difference was not statistically significant ($P>0.05$).

Conclusion: Transvaginal ultrasound combined with abdominal ultrasound can significantly improve the diagnostic accordance rate of ectopic pregnancy, provide a more convenient and quicker diagnostic method, and improve the accuracy of diagnosis. Thus, it is worthy of clinical application.

Keywords: Ectopic pregnancy, Transvaginal ultrasound, Abdominal ultrasound, Diagnostic value.

Accepted on November 7, 2017

Introduction

Ectopic pregnancy (Ectopic pregnancy) refers to the process of abnormal pregnancy such as fertilized eggs developing outside the uterus cavity, which is also called exfetation. An ectopic pregnancy occurs when a fertilized ovum implants outside the endometrial cavity. The name 'ectopic' is derived from the Greek word 'ektos', meaning 'out of place'. Complicating 1-2% of all pregnancies, ectopic pregnancies are a life-threatening emergency since they can invade maternal blood vessels, causing catastrophic haemorrhage. Over 98% of all ectopic pregnancies implant in the Fallopian tube [1]. It has many causes, which is one of the more common gynecologic acute abdomen. In early stage, patients have abdominal pain or

irregular vaginal bleeding, and if not treated in time, there may be a danger in life [2]. The current treatment is mainly based on whether the patient has the requirement of secondary pregnancy. Generally, conservative treatment and surgical treatment are performed [3,4]. Epidemiological investigation and research showed that the early treatment of ectopic pregnancy was effective, and the prognosis was good, therefore, early diagnosis and early treatment played an active and important role in the prognosis of patients with ectopic pregnancy. At present, the clinical examination mainly relies on B-ultrasonic, and transabdominal ultrasonography and transvaginal ultrasonography are important examination methods for the diagnosis of ectopic pregnancy. Wong et al.

reported that 108 transvaginal ultrasound was used in the assessment of 148 patients clinically suspected of having an ectopic pregnancy [5]. Another research also showed the diagnostic effectiveness of an initial transvaginal ultrasound scan in detecting ectopic pregnancy [6]. In addition, Thapa et al. has revealed the role of transabdominal ultrasound in detection of ectopic pregnancy [7]. However, each of them has advantages, and there are also some differences in diagnostic accordance rate, which can provide important information for clinic [8,9]. In order to improve the diagnostic accuracy rate of ectopic pregnancy, and to reduce the missed diagnosis, the application value of transvaginal ultrasound combined with abdominal ultrasonography in the diagnosis of ectopic pregnancy was discussed in this study, and the results are reported as follows.

Data and Methods

General information 106 cases of patients with ectopic pregnancy diagnosed by operation or conservative treatment admitted to our hospital from December 2011 to December 2013 were selected. The patients were aged 19–43 y old with an average of (26.4 ± 4.6) . There were 79 cases of induced abortion or birth history with the average number of menolipsis days $(45 \pm 12 \text{ d})$. Among them, 39 cases had menopause history, 45 had no clear menopause history, and 22 patients were unable to determine whether or not they had menopause history; in 106 cases, 72 cases were complicated with irregular vaginal bleeding, and 34 cases without vaginal bleeding. Before admission, 64 cases had abdominal pain, manifested as dull pain, bearing-down pain, angina or tearing pain, and there were 13 cases of dizziness, syncope, shock and other symptoms. In addition, 29 patients had only history of menopause with no signs of discomfort. And all the patients with conservative treatment could meet the standard [10] (blood β -Human Chorionic Gonadotropin (β -HCG) $<2000 \text{ U/L}$, tubal pregnancy diameter less than 4 cm, and no obvious abdominal bleeding).

Method

Examination method MINDRAY Midray Dc-6ExpertII (Shenzhen, China), Futian FukuDA UF-810XTD (Futian, China) and Toshiba Aplio 400 (Japan) ultrasonic diagnostic instrument were used for examination, and frequency of transabdominal probe was 3.5 MHz, frequency of transvaginal probe was 7.5 MHz. When abdominal ultrasonography was used, patients were supine, and probe was used for three-dimensional inspection; when transvaginal ultrasound was used, bladder lithotomy position of patients was taken. After sterilization of vaginal ultrasound probe, put it on the condom and put it into the vaginal fornix for multiple range examination. The uterus size, endometrial thickness, intrauterine pregnancy sac or not, enclosed mass in adnexal area or not, effusion in pregnancy sac and pelvic cavity or not, etc. were mainly observed.

Drugs for conservative treatment

The patients were treated with mifepristone 25 mg/time, 2 times/d, combined with Methotrexate (MTX) (Yuekang Pharmaceutical Group co. LTD, Beijing, China) 1 mg/kg by intramuscular injection. Blood β -HCG was measured 4 d and 7 d after treatment, and if it decreased exponentially, observation was continued. If it decreased $<15\%$, then MTX was taken. After 14 d of taking drugs, if blood β -HCG decreased and kept consecutively negative for 3 times, abdominal pain relieved or disappeared, vaginal bleeding decreased or stopped, it meant success for conservative treatment [9].

Surgical treatment

Continuous epidural anesthesia was chosen, and the lower edge of navel was taken for puncture. Carbon dioxide (CO_2) was injected into abdominal cavity, after the pressure was up to 15 mmHg (1 mmHg=0.133 kPa), 10 mm trocar and laparoscope were put in, 5 mm trocar inserted into the two lower and side abdomen under direct vision was seen as the surgery operating hole. Different operations were performed according to the location of the ectopic pregnancy. The patient who had bleeding on the wound should be treated with electrocoagulation for hemostasis and the pelvic cavity should be cleaned. In the embryo, if there was an original cardiac tube pulsation, MTX 25 mg would be injected into mesosalpinx at the affected side during the operation of fetal removal. The blood HCG values were followed up till normal after operation [10].

Ethical consideration

The study was carried out in compliance with the Declaration of Helsinki of the World Medical Association, and according to a protocol approved by Women's Hospital, School of Medicine, Zhejiang University, the approval number is 2011013. The objectives of the study were explained to the study participants and verbal consent was obtained before interviewing each participant.

Statistical methods

All the data were statistically analysed by SPSS17.0 software, and χ^2 test was adopted for count data, $P<0.05$ meant the difference was statistically significant.

Result

Examination results

Comparison of transabdominal and transvaginal ultrasound 79 cases of patients was detected with adnexal masses by transabdominal ultrasonography, and 68 cases with pelvic effusion. 82 cases of patients were totally detected with adnexal masses by transvaginal color Doppler ultrasound diagnosis, and 81 cases with pelvic effusion. The positive rate of yolk sac, fetal bud, cardiac and pelvic effusion by abdominal

Application value of transvaginal ultrasound combined with abdominal ultrasonography in the diagnosis of ectopic pregnancy

ultrasound detection were significantly lower than those of transvaginal ultrasound ($P < 0.05$), as seen in Table 1.

Table 1. Comparison of the detection results of the two methods (case (%)).

Examination approach	Cases	Pregnan cy sac	The yolk sac, the fetal bud or the heart tube pulse can be seen	Pelvic effusion
Transabdominal ultrasonography	106	7 (6.6)	23 (21.7)	68 (64.2)
Transvaginal ultrasonography	106	9 (8.5)	39 (36.8)	81 (76.4)
χ^2 value		0.27	5.836	4.474
P value		0.603	0.016	0.034

Examination results of the combined two

In 106 patients, 72 patients complicated with irregular vaginal bleeding were determined with ectopic pregnancy, 29 patients were determined without vaginal bleeding again by transvaginal ultrasound examination; in 106 cases with obvious clinical symptoms before admission, 77 cases were confirmed ectopic pregnancy by B-ultrasonic examination, but 29 patients had only a history of menopause, and 5 cases who had no signs of discomfort missed diagnosis.

Diagnostic accordance rate and missed diagnosis rate of the three kinds of examinations

101 cases of patients were diagnosed with ectopic pregnancy by combination of vaginal ultrasound and abdominal ultrasound. The diagnostic accordance rate was 95.28%, and 5 cases were missed diagnosis, accounting for 4.72%; 79 cases of patients with ectopic pregnancy were diagnosed by simple abdominal ultrasound, and the diagnostic accordance rate was 74.53%, 27 cases were missed diagnosis, accounting for 25.47%; 82 cases of patients with ectopic pregnancy were diagnosed by simple vaginal ultrasound, and the diagnostic accordance rate was 77.36%, 24 cases with misdiagnosis accounted for 22.64%. The difference of diagnostic accordance rate between transvaginal ultrasound combined with abdominal ultrasound and simple abdominal ultrasound and simple transvaginal ultrasound was statistically significant ($\chi^2=17.814$, 14.421 , $P < 0.05$). However, the diagnostic accordance rate of vaginal ultrasonography and abdominal ultrasonography were similar, and the difference was not statistically significant ($\chi^2=0.234$, $P > 0.05$), as seen in Table 2.

Table 2. Comparison between transvaginal ultrasound combined with abdominal ultrasound and simple abdominal ultrasound and simple transvaginal ultrasound (case (%)).

	Transvaginal ultrasound and abdominal ultrasound	Simple abdominal ultrasound	Simple transvaginal ultrasound
--	--	-----------------------------	--------------------------------

Cases of ectopic pregnancy examination	101	79	82
Diagnostic accordance rate	95.28%	74.53%	77.36%
Cases of missed diagnoses	5	27	24
Rate of missed diagnosis	4.72%	25.47%	22.64%
χ^2 value	17.814	14.421	0.234
P value	$P < 0.05$	$P < 0.05$	$P > 0.05$

Discussion

In this study, we found that transvaginal ultrasound combined with abdominal ultrasound can significantly improve the diagnostic accordance rate of ectopic pregnancy.

Ectopic pregnancy is one of the most common gynecological acute abdomen. Because inflammation of fallopian tube lumen or around it causes poor patency of the lumen and prevents the normal operation of the fertilized eggs, making them stay, implant and develop in fallopian tube, which causes the disease. And it often leads to tubal abortion or rupture [11]. The main clinical manifestations are menopause, abdominal pain, and a small amount of vaginal bleeding, while after the rupture, patients often suffer acute severe abdominal pain, vaginal bleeding, or even shock in severe ones. If not treated in time, it can be life-threatening. Therefore, early diagnosis and early treatment plays a positive and important role in the prognosis of ectopic pregnancy [12,13]. At present, clinical studies show that transabdominal ultrasonography and transvaginal ultrasonography are important examination methods for the diagnosis of ectopic pregnancy, and each of the two has its own advantages, which can provide important information for the clinic, but there are also shortcomings in the low rate of diagnostic accordance. Clinical studies showed that abdominal ultrasonography revealed gestational sacs 6 w after menopause, which greatly delayed the diagnosis time and increased the risk of rupture and bleeding in ectopic pregnancy. However, the transvaginal ultrasonography could confirm it 1 w in advance. Compared with abdominal ultrasonography, it significantly improved the diagnostic accuracy [14,15]. Condous showed that the sensitivity and specificity of transvaginal ultrasonography to detect ectopic pregnancy were 90.9% and 99.9%, respectively, with positive and negative predictive values of 93.5% and 99.8%, respectively. 90.9% of ectopic pregnancies in this study population can be accurately diagnosed using transvaginal ultrasonography prior to surgery [16]. In this study, the positive rates of yolk sac, fetal bud, heart beat and pelvic effusion, etc. detected by abdominal ultrasonography were significantly lower than those of transvaginal ultrasonography ($P < 0.05$). However, it is difficult to differentiate the true and false gestational sac by transvaginal ultrasonography, and has not very good recognition for patients without obvious signs and symptoms.

At this time, the combination with abdominal ultrasonography can increase the rate of diagnostic accordance.

To improve the diagnostic accordance rate of ectopic pregnancy, the authors used abdominal ultrasonography and transvaginal ultrasonography for combined examination. The results indicated that in 106 cases of patients, 101 cases were diagnosed with ectopic pregnancy with the diagnostic accordance rate of 95.28%, and 5 cases of missed diagnosis accounted for 4.72%. It was significantly higher than 74.53% of simple abdominal ultrasound and 77.36% of simple transvaginal ultrasound, the differences of which were statistically significant ($P < 0.05$). It greatly reduced the misdiagnosis rate of ectopic pregnancy. Therefore, for patients with definite ectopic pregnancy symptoms, whether by abdominal ultrasound or transvaginal ultrasound, ectopic pregnancy can be diagnosed clearly. While for the patients with obvious symptoms and signs, the combined examination of abdominal ultrasound and transvaginal ultrasound can significantly compensate for their respective shortcomings, and significantly improve the diagnostic accordance rate [17].

To sum up, transvaginal ultrasonography combined with abdominal ultrasonography can significantly improve the diagnostic accordance rate of ectopic pregnancy, provide more convenient and more efficient means of diagnosis for the clinic, reduce the pain of patients, as well as improve the accuracy of diagnosis. Thus, it is worthy of clinical application.

References

1. Tong S, Skubisz MM, Horne AW. Molecular diagnostics and therapeutics for ectopic pregnancy. *Mol Human Reprod* 2015; 21: 126.
2. Fan L. Clinical analysis on the reasons for ectopic pregnancy in 97 cases of patients. *Hainan Med* 2011; 22: 74-75.
3. Ding Y. Comparison of application value in diagnosis of early ectopic pregnancy by transvaginal ultrasound and abdominal ultrasound. *Chinese Journal of Medicinal Guide* 2009; 11: 401-402.
4. Jurkovic D, Wilkinson H. Diagnosis and management of ectopic pregnancy. *Pharmacoepidemiol Drug Safety* 2011; 342: 3397.
5. Wong W, Lee S, Tan W. EP10.11: Transvaginal ultrasound in the evaluation of deep infiltrating endometriosis. *Ultrasound Obstetr Gynecol* 2015; 46: 225-226.
6. Kirk E, Papageorghiou AT, Condous G, Tan L, Bora S. The diagnostic effectiveness of an initial transvaginal scan in detecting ectopic pregnancy. *Hum Reprod* 2007; 22: 2824-2828.
7. Thapa NB. Role of transabdominal ultrasound in detection of ectopic pregnancy. *J Coll Med Sci Nepal* 2016; 12: 134-136.
8. Yang X, Qian M, Ma F. The value of ultrasound in the diagnosis of ectopic pregnancy. *Med J Anhui Career Tech Coll* 2010; 9: 13-15.
9. Hu J. Application significance of transvaginal ultrasound and abdominal ultrasound in the diagnosis of early ectopic pregnancy. *China Foreign Med Treat* 2012; 20: 176-177.
10. Wang F, Gao M, Yin G. Ultrasonographic analysis of 62 cases of patients with tubal pregnancy by transvaginal ultrasound. *J Shanxi Med* 2010; 39: 234-235.
11. Huang X. The application of transvaginal ultrasonography in the diagnosis of early ectopic pregnancy. *J Bethune Med Coll* 2008; 12: 331-332.
12. Xing J. The value of transvaginal ultrasound combined with abdominal ultrasound in the diagnosis of ectopic pregnancy and staged ultrasonic image analysis. *Chinese Mod Doctor* 2012; 50: 83-86.
13. He M. Effect comparison of transvaginal ultrasound and abdominal ultrasound in the diagnosis of ectopic pregnancy. *Chinese Mat Child Health Care* 2011; 26: 3982-3983.
14. Chen S. Comparative analysis of abdominal ultrasonography and transvaginal ultrasound in the diagnosis of ectopic pregnancy. *J Hebei Med* 2012; 18: 193-195.
15. Wei Z, Hu X. The diagnostic value of transabdominal ultrasound and transvaginal ultrasound in the diagnosis of ectopic pregnancy. *Chinese J Gene Pract* 2010; 8: 1606-1607.
16. Condous G, Okaro E, Khalid A. The accuracy of transvaginal ultrasonography for the diagnosis of ectopic pregnancy prior to surgery. *Human Reprod* 2005; 20: 1404.
17. Wu Q. Ultrasonic diagnosis of heterotopic pregnancy. *J Ultrasound Clin Med* 2004; 6: 179-180.

*Correspondence to

Qin Jiale
 Department of the Second Ultrasonography
 Women's Hospital
 School of Medicine
 Zhejiang University
 PR China