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Analysis of ectopic pregnancies admitted to emergency department

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ABSTRACT

Objectives: Ectopic pregnancy (EP) may cause significant morbidity and mortality. In this study, we aimed to evaluate the demographic characteristics, presence of risk factors and diagnostic parameters of the patient with EP and predicting parameters for ruptured EP.
Methods: Patients who presented to emergency department (ED) and diagnosed as EP within one year were included to the study. The demographic characteristics, β-human chorionic gonadotropin (β-HCG) levels, transvaginal ultrasonography (TVUSG) findings, treatment protocols, pathology reports and hemoglobin levels at the time of admission to ED were obtained from patient files and hospital automation system and statistical analysis was performed.
Results: Total 35 patients were included to the study. The mean age of the patients was 30 ± 5.6 years. Among the patients, 46% had a history of caesarean section (C-section). The complaints of the patients at presentation, their age, gestational week and the β-HCG levels were found to be inefficient in predicting ruptured EPs. TVUSG was found statistically significant in terms of demonstrating ruptures in EP. The ratio of salpingectomies was observed to be higher in the surgical treatment of ruptured EPs.
Conclusions: C-section was most frequently seen with EP. There is no absolute diagnostic parameter for predicting ruptured EPs and TVUSG may be a clue for diagnosis. The final diagnosis is made through surgery.

1. Introduction

Ectopic pregnancy (EP) is defined as the implantation of the fertilized ovum outside the uterine cavity. This condition occurs in 1–2% of pregnancies. Unless diagnosed and treated at an early phase, EP may cause significant morbidity and mortality.[1] The most frequently observed site for EP is the fallopian tubes, although atypical sites such as the cervix, ovaries, abdomen or the caesarean section (C-section) scar may be observed in less than 10% of the patients.[2] Patients most frequently present to the emergency department (ED) with abdominal pain and vaginal bleeding, rarely syncope, hemorrhagic and hypovolemic shock, shoulder pain, and urinary or gastrointestinal complaints. The β-human chorionic gonadotropin (β-HCG) test and transvaginal ultrasonography (TVUSG) are used for the diagnosis of EP. Both tests are inconclusive in the early phase of the pregnancy and sometimes a surgical approach is required for the differential diagnosis.[3,4]

Among ectopic pregnancies, 18%–35% of patients lead to ruptures.[5,6] The clinical manifestation of ruptured EP may begin very insidiously and may lead to life-threatening massive hemoperitoneum requiring emergency surgery. Sometimes the only method for the differential diagnosis is laparoscopy.[7] Although the β-HCG test and TVUSG are used for the diagnosis of ectopic pregnancy, they are not adequate for the diagnosis of ruptured EPs.[3,8,9]

Knowing the probable risk factors, reliability of the diagnostic parameters, and the possibility of a rupture and finally diagnosing the EP in the ED is of utmost importance. Confusion about the diagnosis of ectopic pregnancy and the lack of predefined criteria for an early diagnosis of ruptured EP present serious challenges for both the patient and the doctor.[8]

The aim of this study is to evaluate the demographic characteristics, diagnostic parameters and applied treatments of the patients with ectopic pregnancies who present to ED in order to conduct a risk stratification and define the prognostic factors.

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2. Material and Methods

The study was planned in a retrospective manner. The patients who presented to ED – which has an annual turnover of 200.000 patients - between 1 January 2013 and 31 December 2013 were screened. Total 1535 female patients aged 18 years and above who had various symptoms and were found to have positive β-HCG tests were detected. Of these patients, 35 patients who were prediagnosed ectopic pregnancy according to β-HCG and TVUSG findings were included to the study.

The demographic characteristics, hemoglobin and β-HCG levels at the presentation to ED, transvaginal ultrasonography (TVUSG) findings, treatment protocols, and pathology reports of the remaining 35 patients were recorded from the patient files. The 35 patients included in the study were classified according to Barnhart's "Risk Scoring for Nonviable Pregnancy of Unknown Location" and the risk stratification was performed (Table 1).[10] The 3rd stage shock accompanied by hypotension and tachycardia was defined as hemodynamic instability.[11]

The statistical analysis of our data was performed using the "SPSS for Windows Version 16.0" software. Spearman's correlation and the Chi-square and the Mann–Whitney U tests were employed in the analysis.

3. Results

Among the patients who presented to ED within one year, 35 patients were diagnosed with EP. The causes for seeking medical assistance were abdominal pain in 20 patients (57%), abdominal pain with vaginal bleeding in 14 (40%) patients, and syncope in 1 patient (3%). The mean age of the patients was 30 ± 5.6 years and the age range varied between 21 and 42 years. Among the patients, 7 (20%) were primigravida.

In terms of patient operation history, 16 patients (46%) out of 35 had a history of C-section, 2 patients (6%) had previously experienced EP, 1 patient (3%) had a tubal ligation, 8 patients (23%) has abortion and/or curettage, and 2 patients (6%) had a history of intrauterine device (IUD) and 16 (45.7%) had no history of abdominal surgery.

During the presentation to ED, 33 out of 35 patients had stable vital signs, while 2 were hemodynamically unstable. The hemoglobin values of all the patients were over 10 g/dl at presentation (Normal value: 11.5–16 g/dl).

The mean gestational age of the patients according to the last period was 6 ± 1.5 weeks, with a minimum of 3 weeks and a maximum of 10 weeks. The mean blood β-HCG value was 3560 ± 4137 mU/ml, with a minimum of 17 and maximum of 19,900 mU/ml (Normal value: 0–10 mU/ml).

Table 1
Scoring System for nonviable pregnancies.

	Variable	Numeric score
1	Age	
	18<	+1
	38>	+3
2	History of ectopic pregancy	
	1	+2
	2 or more	+3
3	Bleeding	+4
4	History of miscarriage	−1
5	BHCG>2000 mIU/ml	−1

The total score may vary between −2 and 10. Total scores between −1 and −2 indicate low risk, scores between 0 and 4 show medium risk and scores ≥5 point to a high risk.

The diagnosis of ectopic pregnancy in the 35 patients included in the study was made through β-HCG and TVUSG. The TVUSG during the presentation to ED were conducted by a gynaecologist-obstetrician or a 3rd year gyn-obs. resident. The TVUSG findings are presented in Table 2.

Among the 35 patients, 25 (71.6%) underwent laparoscopic surgeries, 6 (17%) were treated through laparotomies, and 4 (11.4%) received medical treatment with methotrexate. Sixteen (51.6%) out of the 31 patients who were surgically treated have undergone salpingectomies, while 14 (45.1%) have undergone salpingostomy. The location of EP could not be discovered in 1 patient. The pathology results of the 31 patients referred for surgery are presented in Table 3.

The risk classification of the 35 patients according to Barnhart's scoring revealed that 2 (5.7%) were high-risk, 19 (54.3%) were moderate risk, and 8 were (22.9%) low risk patients. The same classification indicated no risk in 6 patients (17.1%).

The diagnosis of ruptured EP was made by the pathology. Among the 31 patients who had undergone surgery, ruptured EP was observed in 11 patients (35.5%). The complaints of the patients at presentation, their age ($p = 0.49$), gestational week ($p = 0.19$) and the β-HCG levels ($p = 0.23$) were found to be inefficient in predicting ruptured EP. When the detection of pelvic or abdominal fluid in the TVUSG was taken as an indication of a rupture, TVUSG was observed to be statistically significant in terms of demonstrating ruptures in EP ($p = 0.019$). The ratio of salpingectomies was observed to be higher in the surgical treatment of ruptured EPs ($p = 0.002$).

4. Discussion

The predisposing factors, risk stratification and the factors affecting the prognosis in ectopic pregnancy are yet to be cleared.[8] Although various risk factors have been blamed for EP, 50% of the patients are free of any risks.[12] According to the study by Ankum et al, women with a history of ectopic pregnancy, tubal surgery, or tubal pathologies are under a high risk, while those with previous genital infections, infertility, and multiple sexual partners are under moderate risk for EP.[13] In the study by Barnhart et al, previous EP has been found as the strongest risk factor and pelvic inflammatory disease was the weakest risk factor, while previous C-section, nontubal pelvic surgery, or cervical infections were observed to be irrelevant in terms of ectopic pregnancy.[12] In a study conducted in Papua New Guinea, sexually transmitted infections were found to be the greatest risk factor for tubal pregnancies.[14] Age, use of IUDs, previous abdominal or tubal surgery, C-section, and previous ectopic pregnancy which were found as a risk factors by studies were investigated in our study patients.

Tubal damage is regarded as the most prominent factor in the pathogenesis of EP. According to this hypothesis, the myoelectrical activity of the fallopian tubes are disturbed with advancing age and the risk for ectopic pregnancy may increase.[3] In our study, similar ratios of ectopic pregnancy were observed during the 2nd and 3rd decades of life, while these ratios diminished in the 4th decade.

Table 2
TVUSG findings and pathology results.

TVUSG	Number of patients
EP	12 (34.3%)
Pelvic fluid	10 (28.6%)
Fluid in the adnexa + EP	11 (31.4%)
Intra-abdominal fluid	1 (2.9%)
Intra-abdominal fluid + EP	1 (2.9%)
Total	35 (100%)

Table 3
Pathology results.

Pathology results	Number of patients
EP	19 (61.3%)
Ruptured EP	11 (35.5%)
No Focus	1 (3.2%)
Total	35 (100%)

Among the patients, 46% had a history of C-section and this was the most prominent one among the evaluated risk factors. However, in a study comparing the risk of ectopic pregnancy following normal vaginal deliveries and C-section, no statistically significant relationship was observed between C-section and EP.[15] According to the statistical report of the Ministry of Health for 2011, the ratio of C-sections in our country is 47%.[16] This high ratio may be associated with the C-section as the most prominent risk factor in our study. The high ratio of C-sections may have also increased the frequency of ectopic pregnancies among younger women. According to the risk scoring by Barnhart, no risk was observed in 6 patients. In our study, the sensitivity of the scoring was observed to be 83%, while false negativity was found as 17%. The varying results observed in the studies may be affected by environmental factors. Sociocultural awareness and difficulties in accessing healthcare, as well as early marriages and high ratios of C-section in our country may be factors influencing the results.[16]

The β-HCG test used for the diagnosis of pregnancy. But, β-HCG test cannot distinguish between intrauterine and extrauterine pregnancy. Nor can it indicate if the EP has ruptured. For a single measurement of β-HCG, a 1500–3000 IU/l gestational sac should be visible in the USG and this may be the differential test value for β-HCG.[3] In the study by Kohn et al, the mean β-HCG value was found as 1886 mIU/ml in ectopic pregnancy and it was significantly lower than normal pregnancies. In the same study, β-HCG was observed to be more relevant in distinguishing between a normal pregnancy and an abnormal one, rather than between a normal pregnancy and EP.[17] In the study by Silva et al, the doubling time and the differential test value were found to be similar to normal pregnancies in 15–20% of ectopic pregnancies.[18] Studies have demonstrated that the single-measurement of β-HCG level, doubling time, or increase/decrease rates are not reliable markers for ectopic pregnancy.[3] In our study, the mean β-HCG value was 3650 IU/l. A study has shown that β-HCG values > 3000 IU/l and gestational age >8 weeks increases the risk of rupture.[7] In a similar study, especially β-HCG values > 5000 IU/ml and advanced gestational age were found to increase the risk of rupture. The age, parity, history of ectopic pregnancy and hematocrit levels were not observed to increase the rupture risk.[9] In the study by Sindos M. et al, previous EP and parity were found to be risk factors, while the gestational age was a borderline risk factor for rupture formation.[19] In our study, we have observed that the rupture of the ectopic pregnancy is unrelated to the age, parity, gestational week or β-HCG levels of the patients ($p > 0.05$).

Another step of the diagnosis of EP is ultrasonography. In the study by Shalev E. et al, the sensitivity of TVUSG in the diagnosis of EP was found as 87%, while is specificity was 94%.[20] In another study, the observation of fluid in the pouch of Douglas during the ultrasonography was demonstrated to increase the risk of ruptures.[7] In our study, all the patients were prediagnosed through TVUSG and this prediagnosis was surgically confirmed in 31 patients except for the 4 patients treated with methotrexate. Among the patients included in the study, TVUSG was found to be efficient in distinguishing ruptured ectopic pregnancies. The sensitivity of TVUSG in demonstrating ruptured EP was calculated as 50%, while its specificity was 8%.

A ruptured ectopic pregnancy may manifest itself with abdominal pain, rebound, and hemorrhagic/hypovolemic shock.[3] Its treatment is usually surgical and unstable patients undergo laparotomies, while stable patients are applied laparoscopies.[21] The study by John L. Hick et al did not point to any correlation between the volume of the hemoperitoneum and the vital signs in ruptured EP.[21] Also in our study, no correlation was observed between the ruptured EP and the vital signs or the complaints leading to the presentation to ED. In our study, 71% of the patients were applied laparoscopies. One of the 2 patients in a preshock underwent a laparotomy, which was performed based on the clinical experience and due to the hospital conditions and the uncertainty of the diagnosis, rather than the ruptured ectopic pregnancy or the vital signs. The superiority of salpingectomy to salpingostomy is unclear, and in case the other tube is also damaged, salpingostomy should be the preferred method during the surgical management of the patient in order to try and preserve fertility.[1] In our patients, in case of ruptured ectopic pregnancies observed during the surgical procedure, the ratio of salpingectomies which carry a higher risk for complications including sterility was found to be higher.

5. Limitations

The retrospective design and the low number of study group is a limitation of our study. The inability to compare the risk factors with normal pregnancies has rendered these factors into epidemiological samples in our study. The lack of classified treatment protocols for the medical and surgical procedures to be applied to the patients constitutes another limitation.

6. Conclusion

According to our study, C-section is the most common seen risk factor for ectopic pregnancy. In our study, significant findings of EP and ruptured EP were observed using TVUSG. β-HCG and vital signs are inefficient in predicting and the final diagnosis is made through surgery. Prospective studies are needed in order to perform risk stratification and to define accurate diagnostic criteria for EP and ruptured EP.

Conflicts of interest

The authors declare that there is no potential conflict of interest.

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