



A Case Report of Primary Unruptured and Advanced Gestational Age Ovarian Pregnancy in a Low Resource Setting

Muhammad Asyraf Azizan^{1*}, Hii Ling Yen², Yew Cheng Boon³ and Mohamad Fadli Kharie⁴

¹Department of Obstetrics and Gynecology, Hospital Duchess of Kent, Malaysia

²Department of Obstetrics and Gynecology, Hospital Wanita dan Kanak-kanak Sabah, Malaysia

³Department of Obstetrics and Gynecology, Hospital Duchess of Kent, Malaysia

⁴Health Informatic Centre, Planning Division, Ministry of Health, Malaysia

Abstract

Introduction: The incidence of ectopic pregnancy has been reported as high as 11 cases over 1,000 pregnancies which 2% to 3% occurred among the women attending early pregnancy unit. Even the awareness of ectopic pregnancy is increasing among the women; the prevalence of ectopic pregnancy is showing an increasing in trend worldwide especially in developing countries due to the late presentation to seek for the treatment.

Case Report: We reported a rare case of ectopic pregnancy who occurred in middle half of pregnancy period. She was referred to tertiary centre where she was diagnosed having ovarian ectopic after MRI and surgical intervention.

Discussion: This is a rare case of ovarian ectopic as it presents at advanced gestational age. From our literature review, noted only 12 cases have been reported from a period of 1948 till 2020. Our patient also didn't have any risk factors for OP. The role of ultrasound technology especially with the presence of 3D image has increased sensitivity in detecting POP. Transvaginal ultrasound which provides more accurate diagnosis in detecting ectopic pregnancy, still reported as most operator dependent with only 2.53% detection rate as most of final diagnosis made intraoperatively. MRI provides excellent tissue contrast over the implantation sites besides to strategize the operation by looking at the involvement of surrounding organs and vessels in order to minimize the intraoperative complications. With advanced gestation age like our patient, total unilateral salphingo-ophorectomy is a method of choice as wide wedge resection of ovary will lose its function in a future.

Conclusion: Ovarian pregnancy has still rarely been diagnosed in this modern era. Its diagnosis mainly through surgical intervention despite the developing of transvaginal ultrasound and MRI. Surgical intervention remains the treatment of choice for most of the cases.

Introduction

An ectopic pregnancy is defined as fertilized oocyte implants outside the endometrial cavity. In 2016, MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries) collaboration has reported almost 5% of maternal death are directly related to ectopic pregnancy [1]. The incidence of ectopic pregnancy in United Kingdom has been reported as high as 11 cases over 1,000 pregnancies [2] which 2% to 3% occurred among the women attending early pregnancy unit [3]. Even the awareness of ectopic pregnancy is increasing among the women; the prevalence of ectopic pregnancy is showing an increasing in trend worldwide especially in developing countries due to the late presentation to seek for the treatment [4]. Ectopic pregnancy mostly occurs in fallopian tubes while 1% to 2% of ectopic pregnancy are non-tubal and occur in ovary, cervix, interstitium, omentum and caesarean scars [5]. Each ectopic pregnancy cause mother at risk of morbidity and even mortality if diagnosed late, due to potential massive intraabdominal bleeding, hemorrhagic shock and Disseminated Intravascular Coagulopathy (DIC) [6]. Ovarian ectopic pregnancy is defined as a non-tubal pregnancy which the fertilized oocyte implanted either inside or over the ovary. It is a rare form of ectopic pregnancy, which overall incidence of 0.15% to 3.0% has been reported worldwide [7]. The incidence of ovarian ectopic pregnancy has shown an increment along with the evolution of transvaginal ultrasound, histologic examination and magnetic

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*Correspondence:

Muhammad Asyraf Azizan, Department of Obstetrics and Gynecology, Hospital Duchess of Kent, Sandakan, Sabah, Malaysia, Tel: +60194565039;

E-mail: asyraf.azizan@moh.gov.my

Received Date: 01 Jul 2022

Accepted Date: 26 Jul 2022

Published Date: 01 Aug 2022

Citation:

Azizan MA, Yen HL, Boon YC, Kharie MF. A Case Report of Primary Unruptured and Advanced Gestational Age Ovarian Pregnancy in a Low Resource Setting. *Ann Clin Case Rep.* 2022; 7: 2273.

ISSN: 2474-1655.

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resonance in this current era [8-24]. Women who susceptible to get ovarian ectopic pregnancy are those with previous history of pelvic inflammatory disease, usage of intrauterine contraceptive device, polycystic ovarian syndrome, endometriosis, assisted reproductive treatment, previous adnexal surgeries and history of infertility [9]. However, risk factors of ovarian ectopic are still poorly studied. More studies and data are needed to assist in understanding and rapidly diagnosing ovarian ectopic so that prognosis will be improved. Although ovarian ectopic pregnancy is a rare occurrence, it often ends spontaneously in the first trimester. However, there are few reports of advanced gestational age ovarian ectopic up to 34 weeks' gestation due to limited resources of diagnostic tools or low resources country [10]. It also becomes life-threatening condition when it ruptures causing massive intraabdominal bleeding that led to hypovolemic shock and cardiorespiratory arrest. Here we report a rare case of 18 weeks ovarian pregnancy with alive fetus in the low resource center of Sandakan, Malaysia.

Case Presentation

A 24 years old young lady came to emergency department of Hospital Duchess of Kent, Sabah with chief complaint of lower abdominal pain for the past 1 month. She was currently at her third pregnancy with previous 2 successful full term normal vertex delivery uneventfully. Previous 2 deliveries were with previous husband. She was separated last year and remarry with a new local guy. She was well and healthy all the while until November 2020 when she had mild lower abdominal discomfort. The pain occurred intermittently but still tolerable that made her manages herself expectantly without seeking any medical attention. She didn't aware of pregnancy changes too. The pain was increasing in trend after a month that brought her to meet General Practitioner. She was tested positive for pregnancy and early trimester scan was done. Uterine fibroid with intrauterine pregnancy were detected. Due to increasing abdominal pain as possible due to degenerated fibroid, she was referred to emergency department of our hospital for further assessed by obstetrician. She immediately came to hospital with pain score of 10/10. Her vitals were normal. She was not tachycardic. She denied any per vaginal bleeding, urinary symptoms, bowel symptoms, anemic symptoms, shoulder tip pain, nausea or vomiting, or even passed out any product of conception. She has no previous medical illness or surgery done to her. All pregnancies were

uneventful. She also has no allergy history. She just remarries with a new local guy in September 2020. Her spouse was the first marriage with her. Both were social smoker but denied other high risk or social behaviors. She is a housewife while her husband works as a welder. Her menses was normal. She attained menarche at the age of 13 and since then she was having normal regular menses. She did not practice any contraception method with previous husband. She also never does any Pap smear test post-delivery. Her last childbirth was 8 years ago. All pregnancies were spontaneously conceived. She is generally normal built lady. Her weight was 55, while height was 160 that made her BMI 21.4. She was alert and fully conscious. Her blood pressure recorded as 117/70, pulse rate 82 and body temperature 36.7°C. Due to intense pain on arrival to ED, patient was given trial of paracetamol 1 g and subsequently pain score reduced to 1/10. She was looking well, with normal lung and heart auscultation. She was attempted abdominal scan by emergency physician and same result found as uterine fibroid in pregnancy, possible degenerated and subsequently was referred to Obstetrics and Gynecology team. She was brought to special gynecology assessment room where she was seen by obstetrician on call. Her abdominal examination noted lower abdominal mass palpable 18 weeks size, possibly gravid uterus by the evidence of Linea Nigra and striae gravidarum. However fetal movement unable to appreciate. Fetal poles also unable to palpate yet. No abdominal tenderness palpable. Uterus mobile site to site, no shifting dullness percussion noted. Symphysis fundal height was about 18 cm, correspond to clinical examination too. Ultrasound abdomen done subsequently, noted presence of singleton fetus underneath uterus which is located anteriorly. Empty uterus noted with thin endometrial lining. Fetus just behind the uterus, while placental mass adhered to the back of uterine wall. Fetal heart activity and movements were presence. Fetal parameters correspond to 15 weeks size with normal structures. No free fluid seen, nor adnexal mass. Left ovary looks normal while right ovary unable to visualize. Then, perineal examination done. Her vulval and vaginal appeared normal. Cervix axial, tubular and cervical opening appeared close. Pouch of Douglas was free, no boggy felt, no adnexal mass palpable too. No vaginal discharge or bleeding noted. Case was then discussed with consultant on call, and further discussed with fetomaternal specialist from tertiary center, which situated about 350 km from Sandakan city. Her case subsequently accepted and was planned for immediate transfer

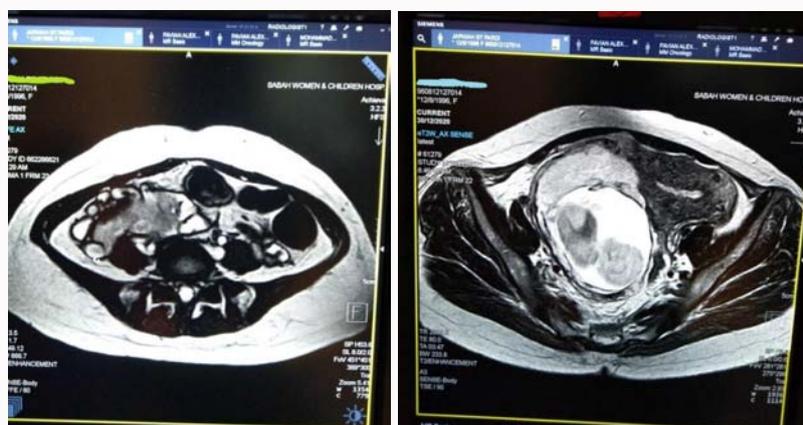


Figure 1: MRI shows an empty uterus and enlarged 5 cm × 6.6 cm 12.4 cm. Presence of singleton fetus within intact T2W hyperintense amniotic cavity in the pelvic cavity outside the uterus. It is located at the right adnexal displacing the uterus to the left side. Placenta is located mainly anteriorly abutting the right fallopian tube and peritoneal surface of the right lateral pelvic and abdominal wall. Left laterally, placenta extends over the right side of uterine wall. Right laterally, placenta compresses over right common iliac vein, however still patent. This placenta extends posteriorly with no extension to the rectum. No evidence of placental implantation on sigmoid. No free fluid and other pelvic structures look normal.



Figure 2: Above – Picture shows an enlarged uterus with mass extending to the right side. Below – an unruptured ovarian ectopic with fallopian tube overlying the mass.



Figure 3: Fresh conceptus of 15 weeks size gestation (18 weeks by period of amenorrhea) from ovarian ectopic.

to tertiary center after done 2 test Geneexpert PCR test for both patient and husband. She was planned to admit in Hospital Wanita and Kanak-Kanak Likas (tertiary center) for MRI examination, rescanning by fetomaternal specialist and counseling for further management after fully evaluation. Patient and husband counseled by O&G team Hospital Duchess of Kent thoroughly expected possible management and outcome also explain with empathy. Patient and husband accepted the case and put life as main priority. She was sent *via* helicopter to tertiary center and MRI proceeded on the next day. She was then counseled for exploratory laparotomy; KIV proceed due to the large size of the conceptus. Her operation was led by fetomaternal specialist and gynecologist specialist. Intraoperatively revealed an intact, non-dilated right fallopian tube adjacent to a large mass encompassed by the right ovary. This ovarian mass connected to the uterus via ovarian ligament. Right ureter was patent and mildly

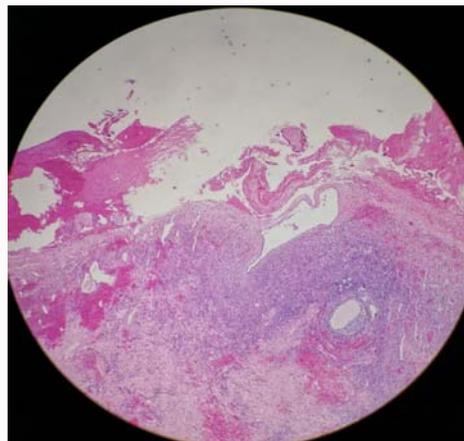


Figure 4: Macroscopy: Cut sections show a piece of ovarian tissue with pale brownish cut surface adhered to one edge of the placental tissue. Microscopy: Chorionic villi embedded on the outer surface of ovary.

dilated. An unruptured ~15 week's sized gestation was identified in the right ovary. Unilateral right salpingo-oophorectomy was performed in usual manner with concurrent removal of the ectopic pregnancy. Sample sent to histopathology for further evaluation. Postoperatively patient recovered well and discharged after postoperative day 3. Gross histopathological examination revealed a piece of placental tissue (160 grams) measuring 110 mm × 80 mm × 40mm with adjoining umbilical cord 65 mm long, 5 mm diameter. Serial sections of the placenta show a tan, brown area measuring 25 mm × 20 mm × 20 mm. There is an ovarian tissue with pale brown cut surface (60 mm × 30 mm × 10 mm) adhered to one edge of the placental tissue. No obvious tubular structure is seen. Microscopically, there is a disrupted fallopian tube with luminal collection of viable and degenerated chorionic villi, trophoblasts and fetal membrane admixed with fibrin and blood clots. There is also presence of ovarian tissue with chorionic villi and trophoblasts embedded the outer surface (capsule). Cystic follicles, corpus luteum and corpora albicantes are seen within the ovarian stroma. The umbilical cord is unremarkable. No molar changes seen.

Discussion

Our case is an extremely rare case of ovarian pregnancy which occurred in advanced stage of gestation. From our literature review, there were only 12 cases have been reported from a period of 1948 till 2020 [11]. Often, these are due to missed early antenatal check-up, unplanned pregnancy and low socioeconomic factor. Our patient presented with vague clinical symptoms. She just remarried to a local guy prior to the event and did not seek any medical attention due to financial constraint. This case agrees with the finding that reported nearly 74% of women unaware of ovarian pregnancy occurrence due to vague clinical presentation, died conceptus and spontaneous involution [12].

History

The classical clinical symptoms of OP are amenorrhea, abdominal pain, and vaginal bleeding [13]. However, our patient only developed acute abdominal pain with stable vital signs and absence of hemoperitoneum's sign. As it was reported that only 28% of cases been correctly diagnosed preoperatively, this patient also been misdiagnosed by primary care and emergency department [14]. Most of the POP will come with intraabdominal bleeding with circulatory collapse that endanger women's life as a complication of most ectopic

pregnancy. This is due to numerous numbers of blood vessels supply the ovaries, even directly branch off from aorta compared to fallopian tube [15]. Our patient also didn't have any risk factors for ovarian ectopic pregnancy. She was having spontaneous conception, not obese nor she had any history of fertility treatment, IVF treatment and embryo transfer which most of researchers believed among the strongest likelihood risk factor of having OP [16,17]. This finding agrees with the study by Shah, around 39.5% to 50% of women with ovarian ectopic pregnancy had none of these risk factors [16]. Usage of Intrauterine Contraception Device (IUCD) or Intrauterine Device (IUD) of 6 months up to 5 years has risk of ovarian ectopic pregnancy in 1 in 5 patients [18], however our patient was never been in any of the devices. IUD contributed to reduction of pick function of fallopian tube, retrograde movement of fertilized eggs and implantation in the ovary as a result of prostaglandin secretion which inhibit the peristalsis and normal function of fallopian tube [18]. However, Lehfeldt et al. [19] stated that IUD might have little protective effect against OP as it reduced intrauterine implantation and tubal implantation by 99.5% and 95%, respectively. The true relationship between IUD and OP remains debatable and requires further investigation [20]. The Assisted Reproductive Therapy (ART) has become more popular as there are increase of awareness among couples towards fertility treatment and availability of the services. ART also responsible for the occurrence of OP [21]. The usage of ovulation induction agents was believed able to increase production of steroid and over stimulate the ovaries due to the change of the estradiol/progesterone ratio. This will further stimulate uterine smooth muscle and tubal peristalsis which cause the backflow of embryo and implantation can occur in the ovary [22-24]. Some researchers reported that usage of tissue forceps and the high volume and pressure of culture medium injected into the uterus may also contribute to the uterine contractility system [25,26]. PID and abdominal surgeries also closely related to the occurrence of OP. This was due to the change of inherent uterine structure which led to ovarian inflammation. Ovulation barriers and fertilized eggs implanted in the ovary [27].

Investigation

The role of ultrasound technology especially with the presence of 3D image has increased the sensitivity of detecting OP [28]. Transvaginal ultrasound provides more accurate diagnosis in detecting ectopic pregnancy [29-31]. However, the detection of OP using transvaginal ultrasound is still low at the rate of 2.53% as it is still operator dependent. Hence, most of final diagnosis is still made intraoperatively [8]. In our center, lack of resources and newly graduated clinician with inexperience gynecology imaging further reduced the sensitivity in detecting ovarian pregnancy [32]. Luckily this patient presented as unruptured OP as ruptured OP even difficult to make a diagnosis as mixed clinical picture of sonographic evidence of abdominal mass and blood clots [17]. Our poor lady initially been diagnosed as uterine fibroid in pregnancy as the clinical scan showed anterior intramural fibroid that mimic uterine structure with fetus which believed normally growth inside uterus, below the fibroid. BHCG in OP showed higher than TP [33]. Goksedef even stated that ruptured OP cases even showed higher BHCG level compared to unruptured one [34]. Combined screening test of BHCG and TVS in diagnosing ectopic pregnancy showed high sensitivity and specificity with 96% and 97% respectively [35]. However, for this patient, we did not perform BHCG test as we were confident sure that she was having abdominal pregnancy and BHCG test would not give any further benefit as the management still the same which was delivering

the conceptus. Magnetic Resonance Imaging (MRI) has served as latest and modern diagnostic tool in detecting ectopic pregnancies especially [36-41], when TVS imaging is insufficient or equivocal as Choi et al. reported only 18% accuracy for preoperative diagnosis [42]. MRI provides excellent tissue contrast over the implantation sites allowing clinician to strategize the operation by looking at the involvement of surrounding organs and vessels in order to minimize the intraoperative complications. Alternatively, other method of diagnostic tools that can be considered is culdocentesis [43]. This is valuable when the physician is in doubt whether to proceed with diagnostic laparoscopy or laparotomy in patient who presented with fluid accumulation intra peritoneum with stable vital signs and atypical clinical symptoms. As overall, in diagnosing ectopic pregnancy, high index of suspicion is always needed to prevent from further risk of massive bleeding that can risk mothers' life if misdiagnose or late diagnosis [43]. Jia et al. [44] reported that most of OP presented with hemorrhagic anemia (25%) and shock (10%). 64% of the cases occurred over the right ovary compared to the left one (35%). No study found the exact mechanism, but possible location of sigmoid which covers the left ovary, may partly reduce the chance of embryo implantation of the left ovary [45,46]. Traditionally, POP has been established following Spiegelberg criteria in the last 139 years ago which mainly based on gross examination of adnexa since microscopical examination has not been well established during that time [47,48]. There are four components to look for; ipsilateral tube must be intact and separate from the ovary, the embryo sac must be located in the ovary, the ovary and embryo sac should be connected to the uterus by the ovarian ligament and the sac wall must be associated with the ovarian tissue. Recent reports mostly agreed that most of POP failed to meet all the 4 criteria's [49]. Wang et al. [50] suggested that classic Spiegelberg criteria should be updated by replacing "embryonic sac" criterion with "the identification of any evidence of product of conception such as chorionic villus, isolated trophoblast, implantation site and embryonic sac with or without fetal tissue within the affected ovary, while ipsilateral tube is intact or with no evidence of pregnancy. We also could not identify any embryonic sac within the adnexa through the examination of our patient; she is instead presented with intact fallopian tube and evidence of product of conception over the ovarian capsule. This case is classified as Secondary OP (SOP) [43]. POP is defined as fertilized ovum located within the ovarian follicle, resulting the pregnancy within the ovarian cortex, while SOP occurred when the fertilization ovum is implanted over the ovarian capsule. In theory POP causing low BHCG level due to poor implantation site and encapsulation by ovarian stroma [51]. However, some researchers disagreed with that classification as no reliable method able to differentiate either primary or secondary ovarian pregnancy when most of the cases presented with ruptured follicular structures upon pathologic examination [51]. However, the recurrence in SOP is rare and fertility is mostly preserved [52].

Treatment

With advanced gestation age like our patient, total unilateral salphingo-oophorectomy is a method of choice. Having said that, if it was detected during early trimester, the role of wide wedge resection of ovary might cause reduce the blood flow to the ovary and lose its function [53]. Those patients with non-ruptured OP, option can be given either conservative or prompt laparotomy. Risks and benefits for both options need to be fully discussed with patient and husband. Conservative treatment with injection of methotrexate or hyperosmolar glucose, have not yet become the mainstay of treatment

though they have been proved successful in several reports [54,55]. Even with persistently high BHCG in gestational trophoblastic disease, the role of methotrexate and etoposide still contemplated [56]. This make the clinical practice of using medical treatment is rare [57,58].

Conclusion

Ovarian pregnancy has remained diagnostic and clinical challenging in this modern era especially when it is presented during advanced gestation age as rarity of the cases and vague clinical symptoms. Clinicians should think of ovarian ectopic in advanced gestational age of ectopic pregnancy as anatomical suitability of ovary that favors the fetus survival. Surgical intervention and histopathological examination remains the reliable diagnostic tool despite the evolution of transvaginal ultrasound and MRI. Spiegelberg criteria should be removed in diagnosing ovarian ectopic as most of the cases, they did not follow the criteria listed. Surgical intervention either wedge or total salpingo-oophorectomy are the treatment of choice in managing patient with advanced gestational age of ovarian ectopic.

References

1. Knight M, Nair M, Tuffnell D, Kenyon S, Shakespeare J, Brocklehurst P, editors. On behalf of MBRRACE-UK. Saving Lives, Improving Mothers' Care - Surveillance of maternal deaths in the UK 2012-14 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-14. Oxford: National Perinatal Epidemiology Unit, University of Oxford. 2016.
2. O'Herlihy C. Centre for Maternal and Child Enquiries. Deaths in early pregnancy. Saving mothers' lives: Reviewing maternal deaths to make motherhood safer: 2006-2008. The eighth report of the confidential enquiries into maternal deaths in the United Kingdom. BJOG. 2011;118:81-4.
3. Kirk E, Papageorghiou AT, Condous G, Tan L, Bora S, Bourne T. The diagnostic effectiveness of an initial transvaginal scan in detecting ectopic pregnancy. Hum Reprod. 2007;22:2824-8.
4. Yeasmin MS, Uddin MJ, Hasan E. A clinical study of ectopic pregnancies in a tertiary care hospital of Chittagong, Bangladesh. Chattagram Maa-O-Shishu Hosp Med Coll J. 2014;13(3):1-4.
5. Bouyer J, Coste J, Fernandez H. Sites of ectopic pregnancy: A 10-year population-based study of 1800 cases. Hum Reprod. 2002;17:3224-30.
6. Scutiero G, Di Gioia P, Spada A. Primary ovarian pregnancy and its management. JSLs 2012;16:492-4.
7. Aydin T, Yucel B, Aksoy H, Ekemen S. Successful laparoscopic management of a rare complication after embryo transfer: Ovarian pregnancy. A case report and up-to-date literature review. Wideochir Inne Tech Maloinwazyjne. 2016;10(4):574-9.
8. Jia-Hua Zheng, Meng-Di Liu, Xiao-Jing Zhou. An investigation of the time trends, risk factors, role of ultrasonic preoperative diagnosis of 79 ovarian pregnancy. Arch Gynecol Obstet. 2020;302(4):899-904.
9. Comstock C, Huston K, Lee W. The ultrasonographic appearance of ovarian ectopic pregnancies. Obstet Gynecol. 2005;105:42-6.
10. Elif M, Yilmaz G, Ebru Z, Semra K, Şeyma Ö, Pınar K. A 34-week ovarian pregnancy: Case report and review of the literature. J Turk Ger Gynecol Assoc. 2013;14(4):246-9.
11. Kyler E, Joseph L, Pamela K, Barbara H, Clifford Y. Unruptured second-trimester ovarian pregnancy. J Obstet Gynaecol Res. 2015;41(9):1483-6.
12. Grimes HG, Nosal RA, Gallagher JC. Ovarian pregnancy: A series of 24 cases. Obstet Gynecol. 1983;61:174.
13. Robertson JJ, Long B, Koefman A. Emergency medicine myths: Ectopic pregnancy evaluation, risk factors, and presentation. J Emerg Med. 2017;53:819-28.
14. Choi HJ, Im KS, Jung HJ, Lim KT, Mok JE, Kwon YS. Clinical analysis of ovarian pregnancy: A report of 49 cases. Eur J Obstet Gynecol Reprod Biol. 2011;158:87-9.
15. Scutiero G, Di Gioia P, Spada A. Primary ovarian pregnancy and its management. JSLs. 2012;16:492-4.
16. Shah N, Khan NH. Ectopic pregnancy: Presentation and risk factors. J Coll Phys Surg Pak. 2005;15:535-8.
17. Zhu Q, Li C, Zhao WH, Yuan JJ, Yan MX, Qin GJ, et al. Risk factors and clinical features of ovarian pregnancy: A case-control study. BMJ Open. 2014;4(12):e006447.
18. Belfar H, Heller K, Edelman DI, Hill LM, Martin JG. Ovarian pregnancy resulting in a surviving neonate: Ultrasound findings. J Ultrasound Med. 1991;10(8):465-7.
19. Melcer Y, Smorgick N, Vaknin Z, Mendlovic S, Razieli A, Maymon R. Primary ovarian pregnancy: 43 years' experience in a single institute and still a medical challenge. Isr Med Assoc J. 2015;17(11):687-90.
20. Shaw JL, Dey SK, Critchley HO, Horne AW. Current knowledge of the aetiology of human tubal ectopic pregnancy. Hum Reprod Update. 2010;16(4):432-44.
21. Killick SR. Ultrasound and the receptivity of the endometrium. Reprod Biomed Online. 2007;15(1):63-7.
22. Paltiel Y, Eibschitz I, Ziskind G, Ohel G, Silbermann M, Weichselbaum A. High progesterone levels and ciliary dysfunction—a possible cause of ectopic pregnancy. J Assist Reprod Genet. 2000;17(2):103-6.
23. Seshadri S, Shirley P, Jaiganesh T, Uchil D, Jolaoso A. *In vitro* fertilisation and embryo transfer for bilateral salpingectomies results in a ruptured ovarian ectopic pregnancy due to a tubal stump fistula: A case report and review of the literature. BMJ Case Rep. 2010;2010:bcr09.2009.2291.
24. Ko PC, Liang CC, Lo TS, Huang HY. Six cases of tubal stump pregnancy: Complication of assisted reproductive technology? Fertil Steril. 2011;95(7):2432.e1-4.
25. Lesny P, Killick SR, Robinson J, Raven G, Maguiness SD. Junctional zone contractions and embryo transfer: Is it safe to use a tenaculum? Hum Reprod. 1999;14(9):2367-70.
26. Shan N, Dong D, Deng W, Fu Y. Unusual ectopic pregnancies: A retrospective analysis of 65 cases. J Obstet Gynaecol Res. 2014;40(1):147-54.
27. Ghi T, Banfi A, Marconi R, Iaco PD, Pilu G, Aloysio DD, et al. Three-dimensional sonographic diagnosis of ovarian pregnancy. Ultrasound Obstet Gynecol. 2005;26(1):102-4.
28. Tamai T, Koyama T, Togashi K. MR features of ectopic pregnancy. Eur Radiol. 2007;17(12):3236-46.
29. Condous G, Okaro E, Khalid A. The accuracy of transvaginal ultrasonography for the diagnosis of ectopic pregnancy prior to surgery. Hum Reprod. 2005;20(5):1404-9.
30. Brown DL, Doubilet PM. Transvaginal sonography for diagnosing ectopic pregnancy: Positivity criteria and performance characteristics. J Ultrasound Med. 1994;13(4):259-66.
31. Ling G, Wenrong S, Lihua W. Ultrasound classification and clinical analysis of ovarian pregnancy: A study of 12 cases. J Gynecol Obstet Hum Reprod. 2019;48(9):731-7.
32. Goyal LD, Tondon R, Goel P, Sehgal A. Ovarian ectopic pregnancy: A 10 years' experience and review of literature. Iran J Reprod Med. 2014;12(12):825-30.

33. Zhu Q, Li C, Zhao WH, Yuan JJ, Yan MX, Qin GJ, et al. Risk factors and clinical features of ovarian pregnancy: A case-control study. *BMJ Open*. 2014;4(12):e006447.
34. Goksedef BP, Kef S, Akca A, Bayik RN, Cetin A. Risk factors for rupture in tubal ectopic pregnancy: Definition of the clinical findings. *Eur J Obstet Gynecol Reprod Biol*. 2011;154(1):96-9.
35. Gracia CR, Barnhart KT. Diagnosing ectopic pregnancy: Decision analysis comparing six strategies. *Obstet Gynecol*. 2001;97(3):464-70.
36. Ha HK, Jung JK, Kang SJ. MR imaging in the diagnosis of rare forms of ectopic pregnancy. *AJR Am J Roentgenol*. 1993;160(6):1229-32.
37. Tamai K, Koyama T, Togashi K. MR features of ectopic pregnancy. *Eur Radiol*. 2007;17(12):3236-46.
38. Takahashi A, Takahama J, Marugami N. Ectopic pregnancy: MRI findings and clinical utility. *Abdom Imaging*. 2013;38(4):844-50.
39. Koroğlu M, Kayhan A, Soylu FN, Erol B. MR imaging of ectopic pregnancy with an emphasis on unusual implantation sites. *Jpn J Radiol*. 2013;31(2):75-80.
40. Hamada S, Naka O, Moride N, Higuchi K, Takahashi H. Ultrasonography and magnetic resonance imaging findings in a patient with an unruptured interstitial pregnancy. *Eur J Obstet Gynecol Reprod Biol*. 1997;73(2):197-201.
41. Kataoka ML, Togashi K, Kobayashi H, Inoue T, Fujii S, Konishi J. Evaluation of ectopic pregnancy by magnetic resonance imaging. *Hum Reprod*. 1999;14(10):2644-50.
42. Choi HJ, Im KS, Jung HJ, Lim KT, Mok JE, Kwon YS. Clinical analysis of ovarian pregnancy: A report of 49 cases. *Eur J Obstet Gynecol Reprod Biol*. 2011;158(1):87-9.
43. Roy J, Sinha Babu A. Ovarian pregnancy: Two case reports. *Australas Med J*. 2013;6:406-14.
44. Zheng JH, Liu MD, Zhou XJ. An investigation of the time trends, risk factors, role of ultrasonic preoperative diagnosis of 79 ovarian pregnancy. *Arch Gynecol Obstet*. 2020;302(4):899-904.
45. Strandell A, Waldenstrom U, Nilsson L, Hamberger L. Hydrosalpinx reduces *in-vitro* fertilization/embryo transfer rates. *Hum Reprod*. 1994;9(5):861-3.
46. Elwell KE, Sailors JL, Denson PK, Hofman B, Wai CY. Unruptured second-trimester ovarian pregnancy. *J Obstet Gynaecol Res*. 2015;41(9):1483-6.
47. Kraemer B, Kraemer E, Guengoer E. Ovarian ectopic pregnancy: Diagnosis, treatment, correlation to Carnegie stage 16 and review based on a clinical case. *Fertil Steril*. 2009;92:392.e313-395.
48. Spiegelberg O. Zur casuistik der ovarialsch wangerschaft [The reasons of ovarian pregnancy]. *Arch Gynaekol*. 1878;13:73-6.
49. Sergent F, Mauger-Tinlot F, Gravier A. Ovarian pregnancies: Reevaluation of diagnostic criteria. *J Gynecol Obstet Biol Reprod (Paris)*. 2002;31:741-6.
50. Wang Y, Chen H, Zhao M, Fadare O, Zheng W. Primary ovarian pregnancy: A case series and analysis. *Int J Gynecol Pathol*. 2019;38(1):85-91.
51. Resta S, Fuggetta E, D'Itri F. Rupture of ovarian pregnancy in a woman with low beta-hcg levels. *Case Rep Obstet Gynecol*. 2012;2012:213169.
52. Gray CL, Ruffolo EH. Ovarian pregnancy associated with intrauterine contraceptive devices. *Obstet Gynecol*. 1978;10:132-4.
53. Razieli A, Schachter M, Mordechai E, Friedler S, Panski M, Ron-El R. Ovarian pregnancy—a 12-year experience of 19 cases in one institution. *Eur J Obstet Gynecol Reprod Biol*. 2004;114(1):92-6.
54. Delplanque S, Le Lous M, Flévin M, Bauville E, Moquet PY, Dion L, et al. Effectiveness of conservative medical treatment for non-tubal ectopic pregnancies: A multicenter study. *J Gynecol Obstet Hum Reprod*. 2020;20:101762.
55. Di Luigi G, Patacchiola F, La Posta V, Bonitatibus A, Ruggeri G, Carta G. Early ovarian pregnancy diagnosed by ultrasound and successfully treated with multidose methotrexate. A case report. *Clin Exp Obstet Gynecol*. 2012;39(3):390-3.
56. Juan YC, Wang PH, Chen CH, Ma PC, Liu WM. Successful treatment of ovarian pregnancy with laparoscopy-assisted local injection of etoposide. *Fertil Steril*. 2008;90:1200.
57. Mittal S, Dadhwal V, Baurasi P. Successful medical management of ovarian pregnancy. *Gynecol Obstet*. 2003;80:309-10.
58. Kiran G, Guvan AM, Kostu B. Systemic medical management of ovarian pregnancy. *Int J Gynecol Obstet*. 2005;91:177-8.