Review Article

Cornual Pregnancy

Maria Gaetani, Daniele Di Gennaro, Antonella Vimercati, Amerigo Vitagliano, Miriam Dellino, Antonio Malvasi, Vera Loizzi, Vincenzo Pinto, Ettore Cicinelli, Edoardo Di Naro, Angelo Lacalandra, Gianluca Raffaello Damiani*

Department of Biomedical Sciences and Human Oncology, Gynaecologic and Obstetrics Clinic, University of Bari, Bari, Italy

Abstract

Cornual pregnancy (CP) is a subtype of ectopic pregnancy that is implanted in the interstitial segment of the fallopian tube which is defined as the tubal section crossing uterine muscular tissue. Widely recognized risk factors for CP are endometriosis, uterine leiomyomata, or pelvic inflammatory disease; all these diseases can cause tubal anatomic changes and consequently alter embryo physiological implant process. Many treatment options are available for this condition each one must be tailored according to patient and operating scenario. The incidence of uterine ruptures in the scarred uterus appears to be low, but the fear of it remains and therefore medical treatment might be favored over cornual wedge resection. The actual risk of uterine rupture after medical treatment is unknown. Multiple testing strategies exist to diagnose CP, but caution needs to be used to avoid a false diagnosis.

Keywords: Angular pregnancy, corneal, ectopic pregnancy, interstitial pregnancy

Definition

Cornual pregnancy (CP) is a subtype of ectopic pregnancy (EP) that is implanted in the interstitial segment of the fallopian tube which is defined as the tubal section crossing uterine muscular tissue.

Fallopian tube proceeds from tubal ostium for 1–2 cm superiorly and laterally away from uterine cavity until tubal isthmic portion begins outside the uterine fundus. Intramural tubal section, which thickness is about 0.7 mm can expand significantly before rupture and may remain asymptomatic until 7–16 weeks of gestation.[1]

CP accounts for 2%–4% of all ectopic pregnancies with a mortality rate of 2.0%–2.5% due to the large size fetus can reach before uterine rupture and consequent high hemorrhagic risk being this zone highly vascularized.[2]

If an anatomical and clinical evaluation is made it will be a hard job to distinguish between interstitial and CP, that's why many authors consider these conditions as the same, but also, we have to recognize angular pregnancy (AP) as a single different pathological entity. AP indeed, is implanted near the uterine-tubal junction but in the uterine cavity, this implies a very different clinical behavior: Pregnancies are generally viable in a range between 25% and 69% of cases but with 18% risk of spontaneous abortion and 28% risk of uterine rupture with consequent severe hemorrhage, Furthermore, although the trend for EP has been constantly increasing over the past 30 years, unilateral twin ectopic pregnancies have remained anecdotal, just approximately 106 cases described in literature.[3-7]

Risk Factors

Widely recognized risk factors for CP are endometriosis, uterine leiomyoma, or pelvic inflammatory disease; all these diseases can cause tubal anatomic changes and consequently alter embryo physiological implant process. For the same reason, previous surgery like salpingectomy, assisted

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Address for correspondence: Dr. Gianluca Raffaello Damiani, Department of Obstetrics and Gynecology, University of Bari, 1 Clinic, Bari, Italy.
E-mail: damiani14@alice.it

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reproductive techniques, and other types of surgeries seem to have an important role in CP pathogenesis.[8]

The authors have also found that damaged tubes are more frequent sited in proximal ectopic tubal pregnancies including cornual ones.[9]

Diagnostic Workup

Symptoms

CP diagnostic workup can be challenging because physician have to diagnose it fast before its evolution in a life-threatening condition. Early symptoms that patients show are common with others benign pathologies. CP can present with many different signs and symptoms depending on blastocyst implantation site.

Symptoms do not differ from tubal EP clinical presentation. If tubal rupture and subsequent hemoperitoneum have already occurred, patient will present acute abdominal pain and tenderness. Hemodynamic stability can also be compromised if blood loss is consistent. Even women with unruptured pregnancy may also present pelvic pain or vaginal bleeding.

In diagnostic workup of EP, serum dosage of β-human chorionic gonadotropin (β-hCG) is used either for initial diagnosis and follow-up.

β-human chorionic gonadotropin

In the first trimester, for a normal implanted pregnancy, β-hCG concentration doubles about every 2 days. EP may present rising or stable β-hCG levels. Serial measurement is needed to confirm viability. When an abnormal increase in β-hCG concentration is evidenced, nonviability is assumed, and more investigations must be done to differentiate a miscarriage from an EP.[10] When a pregnancy cannot be found inside the uterus in a patient with b-hCG values higher than 2000 mIU/mL, physician must consider this situation very suspicious of EP until surely excluded.[11] Based on a review of β-hCG levels with known pregnancy locations, a level of 1500 IU/ml has been proposed as the appropriate with trans-vaginal ultrasound. A higher level (6500–7000) needs to be used with transabdominal imaging. However cautionary publications have documented viable intrauterine pregnancies t were not seen by ultrasound with β-hCG levels as high as 4000 IU/ml. β-hCG levels are drawn 48 h apart, and the level should roughly double if the pregnancy is normal. The predictive value of β-hCG rise has been studied: a rise of <67% predicts abnormal pregnancy with 95% certainty, while a rise of <53% give 99% of certainty. Using the lower cutoffs necessarily risks delayed or missed diagnosis.[12,13]

Imaging

In initial pregnancy work up, "double sac sign" is used to document the intrauterine location of pregnancy. Early gestational sac, indeed, implanting into the uterine cavity, appears surrounded by two concentric rings representing the normal decidual reaction surrounding chorionic ring. This sign is fundamental for differentiation of eccentric intrauterine from interstitial EP.[14] At Ultrasound examination CP shows "interstitial line sign" an echogenic line between the eccentrically located gestational sac and endometrial cavity. Furthermore, gestational chamber appears surrounded by myometrium [Figure 1a-c].[15]

3D volume acquisition ultrasound can locate even more precisely interstitial pregnancy, reason why this technique is often used in presurgical evaluation.[16]

With the high tissue resolution and the multi-planar imaging potential, magnetic resonance imaging (magnetic resonce imaging) is a useful tool in differential diagnosis from AP.[17]

Management

Many treatment options are available for this condition each one must be individualized according to patient and operating scenario. Medical management consist of Methotrexate (MTX) administration, surgical management includes mainly laparoscopic or even laparotomic cornuostomy or cornuotomy while expectant management is not frequently used in this particular condition due to high uterine rupture risk.

Medical management

MTX is the most common medical treatment for of early EP with an overall success rate of 91% but just of 66.7% in cornual ectopic.

MTX is a chemotherapeutic agent that inhibits DNA synthesis and as result kills high proliferating trophoblastic cells.

Ideal candidates to systemic MTX administration are women that show no severe abdominal pain, clinically stable and with EP with diameter smaller than 35 mm with no detectable heartbeat and with a serum β-hCG level <1500 IU/L.[18]

Higher probability of MTX treatment failure is found for patients with more than 9 weeks amenorrhea, β-hCG values >5000 IU/L, crown-rump length >10 mm, embryo with detectable cardiac activity.[19-21]

Maternal previous illnesses and risk factors should always be considered before administration. Some of MTX side effects can be life threatening conditions like gastric perforation, lung fibrosis, pneumonitis, kidney failure, cirrhosis, and marrow suppression. Most common adverse effects are at expense of gastroenteric system like bloating, transient mild elevation in liver enzymes or adenostomatitis.

Randomized controlled trials shows that MTX is equally successful to surgery in certain cases of EP.

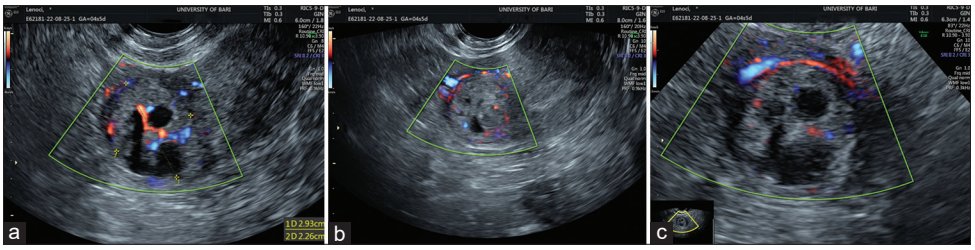

Figure 1: From the left: (a) Enlarged uterine horn is highlighted; (b) after horn incision cornual pregnancy can be clearly seen; (c) myometrial reapproximation can start

MTX is administered at a single dose of 50 mg/m^2.

Serum β-hCG levels are measured on days 4 and 7 to check if there is a decrease of these values by more than 15%. If a decrease is found, β-hCG levels are then measured weekly until <15 IU/l. If the level does not decrease by 15%, a new transvaginal ultrasound examination should be considered to exclude ectopic fetal cardiac activity and the presence of hemoperitoneum. Even endometrial stripe thickness measured at ultrasound examination can be a useful indicator of treatment success.

Obviously, before starting MTX administration, certain diagnosis of EP should be made. As the majority of ectopic pregnancies appears as inhomogeneous masses, it is advisable to repeat β-hCG dosage after 48 h. If β-hCG levels are dropping, expectant management is the most appropriate. If β-hCG levels are rising, physician should repeat transvaginal scan to check if ultrasound finding is clearer excluding intrauterine pregnancy possibility.[22,23]

In CP scenario, MTX is frequently ineffective because this condition is recognized at an advanced gestational age and is accompanied by high serum beta-hcg levels.[24]

Local MTX injection, when possible, can be a choice. Treatment is performed with hysteroscopy under ultrasound guidance. Being the patient under local anesthesia, drug injection is made in the gestational sac and in the near myometrium. This procedure when applicable has showed very good outcomes.[25]

Surgical Management

Surgical methods to remove CP include cornuostomy which consist of incision of the uterine horn with removal of the conceptus, cornual wedge resection, typically combined with an ipsilateral salpingectomy. Only for early diagnosed interstitial pregnancies, an interesting new approach can be used: Hysteroscopy assisted laparoscopic salpingectomy.[26,27]

Studies demonstrated that patients who undergo to laparoscopic cornuostomy had a shorter operating time, lower blood loss quantity, and also a higher subsequent conception chance than women treated with laparoscopic wedge resection.[28]

Furthermore, cornual wedge resection carries an increased risk of uterine rupture due to the loss of myometrium and extensive uterine scarring but with lower future recurrence of the pathologic condition.[29]

In cornuostomy procedure, laparoscopic access is preferably gained placing one umbilical optic trocar and three more suprapubic ancillary trocars.[30]

Primary objective in this kind of surgical intervention is to minimize hemorrhagic risk. To gain this we have different strategies to use.

Before starting incision, diluted vasopressin can be injected in the myometrium into the peri-cornual area. Different types of suture can be used to reduce intraoperative blood loss.

Purse string suture can be placed around the base of the cornual ectopic, it will act like a tourniquet if knot is kept tight. This encircling suture helps in reducing vascularity of the interstitial region and also to stabilize the EP bulge during surgery. Square suture is carried through the posterior and anterior cornual walls and then carried back through the anterior and posterior wall at a point 2 cm lateral to the initial knot. Endoloop device can also be placed at the horn base.[31] Incision is given over the bulge with Harmonic scalpel. EP is removed using forceps or by hydrodissection.[32] Some surgeons prefer reapproximate myometrial bed edges with a 2-mattress suture followed by a continuous running suture, but other authors have used successfully even single interrupted sutures. At the end of the procedure, the purse string suture is then removed and hemostasis is carefully checked.[29,30,32]

Cornual wedge resection is a more demolitive procedure characterized by a larger myometrial resection. In general, one 11 mm optical trocar and 2 or 3 ancillary suprapubic trocars are placed.

Surgeon locates enlarged uterine horn, salpinx, and round ligament on the same side are then removed to avoid future EP risk. To reduce pregnancy size, an aspiration needle can be inserted in the ectopic sac diminishing amniotic fluid quantity. Encircling suture is placed at the cornual base to obtain a tourniquet effect and reduce blood loss. While keeping

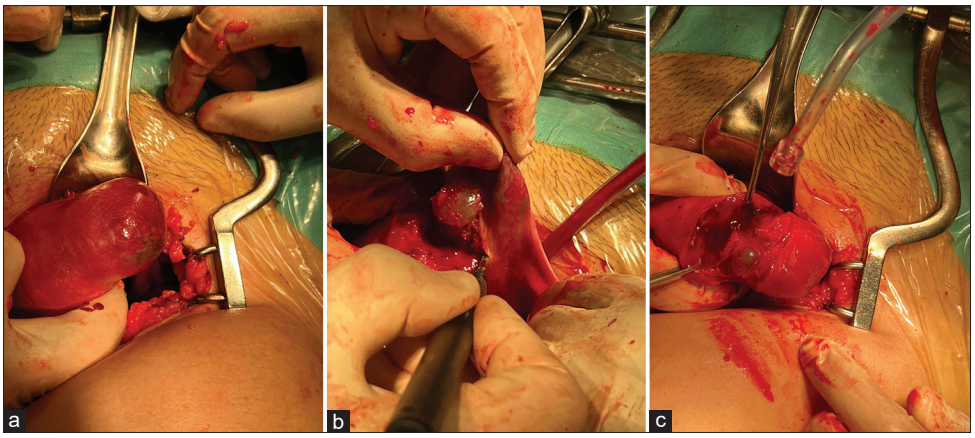

Figure 2: (a-c) Right horn cornual pregnancy with vascular surrounding ring fire

tension on the knot, cornual excision is made with bipolar instruments and the conceptus is easily removed. For this procedure, automatic staplers can be used for their capacity of reducing operative blood loss and reapproximating myometrial borders. Two layers continuous barbed suture or even single layer multiple sutures are used for myometrial reconstruction.[28,30,32-34]

Between novel surgical approaches we must cite hysteroscopy assisted laparoscopic salpingectomy. This technique consists of dissecting CP from uterine wall with hysteroscope. In the next step, surgeon pushes form the outside EP to the tube with laparoscopic grasper. Then, a unilateral salpingectomy is performed. This approach is suitable only for early diagnosed cornual pregnancies but has many advantages like short operating time and minimal blood loss.[26]

In choosing best kind of surgery for this condition, the authors feel to say that traditional laparotomic approach continues to play a major role given the high hemorrhagic risk and urgent intervention that ruptured CP needs [Figure 2a-c]. In our experience, Pfannenstiel incision is performed, access to peritoneal cavity is gained, abdominal retractor is placed to ensure a better view and sufficient maneuvering space to the surgeon. At this point, the laparotomic cornuostomy steps are the same of the laparoscopic one. Finally, the decision–the treatmentt is strictly linked to successful fertily furthermore in case of recurrent CP. The role of the variable timeframes to recurrence ranges from 5 to 60 months. It is interesting to note that two patients had uneventful vaginal deliveries after cornual wedge resection and one after local MTX injection in case of treatment of recurrent CP.

Conclusion

CP is a potential life-threatening condition who needs a fast resolutive therapy. In the last years minimally invasive approaches are developing and they are gradually more safe and easy to learn. Anyway laparotomic approach stills a safe choice in the emergency scenario, especially in hemodynamic instable patients. Medical therapy also, when clinical situation allows medical therapy, should always be considered given the low complication and the good success chances.

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Conflicts of interest

There are no conflicts of interest.

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