Transvaginal Ultrasonography and the Diagnosis of First-Trimester Bleeding or Pain

Christina Germeles, Harvard Medical School, Year 3
Gillian Lieberman, MD
Diagnostic Algorithm:

Woman with Positive B-HCG and Pain or Bleeding

Transvaginal Sonogram

Intrauterine Sac Identified?

YES

Gestational Sac Contents Normal?

YES

• Diagnose Normal IUP

NO

• Suspect Abnormal IUP

NO

Extraovarian Adnexal Complex or Solid Mass?

YES

• Likely EP

NO

• Early IUP

• Abnormal IUP

• EP

Adapted from Doubilet and Benson

Key: IUP = Intrauterine Pregnancy; EP = Ectopic Pregnancy
Transvaginal Ultrasonography (TVS)

I. **Advantages Compared to Abdominal US:**
   - Higher frequency improves image resolution.
   - Probe is closer to the uterus and ovaries.
   - Probe and free hand can be used to simulate a bimanual exam. Pelvic organs can be palpated and moved into view.

II. **Limitations Compared to Abdominal US:**
   - Some masses may be missed during TVS because they are larger than or outside of the probe’s more restricted field of view.

Given these factors, it is advisable to use abdominal US as an initial approach and then “zoom in” with TVS.
Meet Our First Patient

- WY, 29 year-old female, presents with acute pelvic pain and vaginal bleeding
- By LMP she is 6.5 weeks pregnant
- PMH: ectopic pregnancy 6/00
  - HSG revealed blocked tubes 11/00
- PE: mild left adnexal tenderness
- Serum B-HCG = 7912 mIU/ml
Hysterosalpingogram (HSG) Findings for WY

Contrast outlines lumen of retroverted uterus

Bilateral blockage of fallopian tubes at the cornua.
TVS Findings for WY (1)

- Uterus
- Endometrium
- Right Ovary
- Abnormal Left Ovary
Comparison: Normal Ovary

Follicles
Comparison: Ovary with Follicular Cyst

Follicular Cyst

Internal Iliac Artery

BIDMC
TVS Findings for WY (2)

Left Adnexal Mass

Gestational Sac?
TVS Findings for WY (3)

Gestational Sac

Motion Detection Vector

Tracing of Fetal Heart Beat

Tracing of Maternal Heart Beat

Time interval

❤️ Fetal Heart Rate = 130
TVS Findings for WY (4)

Gestational Sac

Fetal Pole (CRL) = 4mm
Diagnosis: WY

Our first patient had a left adnexal ectopic pregnancy.
TVS: Signs of Ectopic Gestation

I. Diagnostic sign:
   • Live embryo outside of uterus

II. Suggestive signs:
   • Empty uterus
   • Adnexal mass
   • Pseudogestational sac of EP
   • Free fluid in cul-de-sac
   • Ectopic tubal ring

III. Non-supportive signs:
   • Live IUP
   • Double decidual sign of early IUP

⭐ A normal US does not exclude EP! May need repeat US.
Meet Our Second Patient

- JR, a 30 year-old female, presents with left lower quadrant pain
- By LMP she is 7 weeks pregnant
- B-HCG = 13,000 mIU/ml
TVS Findings for JR (1)

Left adnexal fullness: Early IUP with Hemorrhagic Corpus Luteal Cyst vs. Ectopic Pregnancy? No IUP was identified.

We need close follow-up...
Our Second Patient Returns

- Two days later, JR returns for follow-up imaging
- At this time she still has left lower quadrant pain
- B-HCG = 17,000 mIU/ml
TVS Findings for JR (2)

Decidua Capsularis + Decidua Vera = “double sac”

Note: The left adnexal fullness which was noted on TVS at the first visit was not appreciated at this second visit. Presumably this represented a hemorrhagic corpus luteal cyst which had resolved over the interim two days.
Diagnosis: JR

Our second patient had a normal early intrauterine pregnancy with a resolved hemorrhagic corpus luteal cyst.
TVS: Signs of Normal Early IUP

• To diagnose an intrauterine fluid collection as a gestational sac it must contain an embryo, a yolk sac, or demonstrate the “double sac” sign.

• TVS landmarks according to gestation age:
  5 weeks = gestational sac
  5.5 weeks = yolk sac
  6 weeks = embryo

• TVS landmarks according to B-HCG values (IRP standard)
  1,000 mIU/ml = gestational sac
  7,200 mIU/ml = yolk sac
  10,800 mIU/ml = embryo
Meet Our Third Patient

• VB, a 40 year-old female, presents with cramping and vaginal bleeding with clots

• One week ago, TVS showed a 7 week IUP with cardiac activity

• She should be 8 weeks pregnant now
TVS Findings for VB

Uterus

Gestational Sac

Embryo CRL = 1.78 cm (8w2d)

Subchorionic Hemorrhage

BIDMC
Diagnosis: VB

Our third patient had a moderate subchorionic hemorrhage. This is a fairly common cause of first trimester pain and/or bleeding. VB went on to full term and the delivery of a normal baby.
Meet Our Fourth Patient

• LP, a 23 year-old female, presents with cramping and vaginal bleeding

• One month ago, TVS showed a 5 week IUP

• She should be 9 weeks pregnant now
TVS Findings for LP

Gestational Sac

CRL = 0.49 cm (6w2d)

Fetal Demise
Diagnosis: LP

Our fourth patient had a first trimester fetal demise. Her symptoms of cramping and bleeding were due to an impending spontaneous abortion.
Summary of Patients

All four patients that we have reviewed had a chief complaint of pelvic pain and/or vaginal bleeding. In addition, they were all pregnant as diagnosed by B-HCG.

TVS is the ideal tool to differentiate between the possible diagnoses in this scenario. Our four patients had an ectopic pregnancy, normal early IUP, subchorionic hemorrhage, and first trimester fetal demise respectively.

When the diagnosis is in doubt, arrange close follow-up and repeat TVS.
Let’s Discuss
Ectopic Pregnancy (EP)

Ectopic pregnancy remains the leading cause of first trimester pregnancy-related maternal mortality. It is critical to know how to promptly diagnose and treat this condition.
Female Reproductive Anatomy: Ectopic Implantation Sites

- Tubal Sites
  - Ampulla (80%)
  - Isthmus (15-20%)
  - Cornua (2%)
- Extratubal Sites (<1%)
  - Ovary
  - Cervix
  - Abdomen
Risk Factors for EP

- Tubal pathology
- Previous EP
- Previous tubal surgery (including tubal sterilization)
- In utero DES exposure
- PID
- Multiple sex partners
- IUD use
- Infertility
- Smoking
Assisted Reproductive Technologies (ART)

ART includes women treated with gonadotropins and/or IVF embryo transfer. In this population there is an ectopic pregnancy rate of 3-5% and a heterotopic pregnancy rate of 1%. Heterotopic pregnancy is defined as the presence of one embryo inside the uterus and another outside of the uterus. In the general population the incidence of heterotopic pregnancy is about 1:30,000.

These high rates of ectopic and heterotopic pregnancies in the ART population have been attributed to underlying tubal pathology. Deep fundal embryo transfer has also been implicated as this transfer site puts the embryo either inside or proximal to the fallopian tubes.
Natural History of EP

I. **Spontaneous Resolution:** Non-viable gestational products left in the tubes are usually resorbed completely although tubal obstruction may occur.

II. **Tubal Abortion:** Expulsion of embryo through fimbria. Possible outcomes include regression or reimplantation on ovary or in abdominal cavity.

III. **Tubal Rupture:** Usually causes life-threatening hemorrhage. Ruptured EP is still the major cause of first trimester pregnancy-related maternal mortality.

⭐ An untreated EP can be fatal!
Treatment of EP

I. Surgical:
   • Laparotomy vs. laparoscopy
   • Salpingectomy vs. salpingostomy

II. Medical
   • Systemic methotrexate
   • Direct injection of methotrexate, KCl, urea or prostaglandins into gestational sac under sonographic (or laparoscopic) guidance

III. Expectant Management
   • Follow serial B-HCG until <5 mIU/ml
Bibliography

Acknowledgements

I would like to thank Dr. Joe Makris for all of his help, including helping me find the PACS images.

I would also like to thank Beverlee Turner, Larry Barbaras and Ben Crandall.

Finally, thanks to Gillian Lieberman for being a wonderful course director.