Diagnosis of Ectopic Pregnancy in the Emergency Department

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learning objectives

• understand the problem of EP
• become familiar with roles of US and bHCG
• learn how to perform bedside pelvic US
• integrating BPU into your practice
• recognize common pitfalls of BPU

key points

• r/o EP by identifying IUP (with caveat)
• IUP is defined by GS + YS surrounded by myometrium
• interrogate the uterus thoroughly
• bedside US is the test of choice in unstable patients
• TVS and TAS are complementary
who are we talking about?

- pregnant patients in the 1st trimester
- UPT + (with exceptions)
- VB +/- or pelvic pain
- no prior US with IUP

- does this patient have an ectopic pregnancy?
- 3-13% prevalence in ED studies
- EP was leading cause of 1st trimester mortality (10%)
- increased pre-rupture detection = declining mortality


advances in diagnostic modalities

- pelvic ultrasound
- ICT = high resolution (5-8Mhz)
- serum bHCG

basic strategy

- identify location of pregnancy
- identification of IUP = r/o EP
- rate of heterotopic = 1/30000 >1/5000*
- IVF rate = 1/100
possible findings

- IUP (GS + YS) = discharge
- EP (-IUP, FF, adnexal mass) = ob/gyn
- indeterminate (-IUP) = correlate with bHCG
  - abnormal IUP
  - mole pregnancy

intermediate result

- bHCG<DZ: IUP, EP, embryonic demise
- bHCG>DZ: EP, embryonic demise, IUP

narrowing the differential

<table>
<thead>
<tr>
<th>Gestational Age</th>
<th>bHCG</th>
<th>IUP visualized by US</th>
</tr>
</thead>
<tbody>
<tr>
<td>3w</td>
<td>25-50</td>
<td></td>
</tr>
<tr>
<td>5w</td>
<td>1000-2000</td>
<td>gestational sac</td>
</tr>
<tr>
<td>5-6w</td>
<td>&gt;2000</td>
<td>GS+YS</td>
</tr>
<tr>
<td>6w</td>
<td>&gt;5000</td>
<td>GS+FP</td>
</tr>
<tr>
<td>7w</td>
<td>&gt;10000</td>
<td>cardiac activity</td>
</tr>
<tr>
<td>8w</td>
<td>&gt;100000</td>
<td></td>
</tr>
</tbody>
</table>
problems with protocol

• RUS unavailability
• increased ED LOS
• transport of unstable patients
• sending patients home with EP***

EPPU for EP

• US at the bedside performed by EP
• focused question: do I see an IUP?
• components:
  • transabdominal
  • RUQ of FAST
  • transvaginal

getting ready - 4P's

• probe selection
• patient prep - bladder should be emptied for TVS
• position - pelvic exam
• probe cover - cover the ICT with condom

ACEP Policy Statement

Emergency Ultrasound Imaging Criteria Compendium

Approved by ACEP Board of Directors: April 2008

This compendium contains the following sections:

• Acute
• History
• Evaluation/Imaging
• Polys Ultrasound

TVS coronal interrogation - visualize the entire uterus
TVS - left adnexa
recognizing IUP

- IUP =
- GS + YS or FP +
- surrounded by myometrium

gestational sac

- EP may present with pseudo-GS (10%)
- NO DDSS, irregular border, may contain echogenic material
- yolk sac?
GS + YS + surrounded

IUP = GS + YS in uterus

location, location

- GS should be within uterus
- beware peripherally placed GS
- may represent interstitial EP
- 5mm rule
- importance of TAS

fetal pole
ectopic location

- majority (97%) tubal
- interstitial/cervical 2%
- ovarian 1%

Fig. 1. The common ectopic locations of extrauterine gestation (ectopic pregnancy).

EP

- empty uterus
- secondary signs
  - free fluid (large FF, blood)
  - complex adnexal mass
  - pseudogestational sac
- EP still possible without secondary signs

Normal FF

Free Fluid
- TAS - ectopic pregnancy

- Free Fluid in RUQ scan predicts need for OR for ruptured EP

abnormal

- large GS without YS, or FP

outcomes of EPPU

N=1490 pts w/ 1st trimester symptoms

<table>
<thead>
<tr>
<th>IUP</th>
<th>Indeterminate</th>
<th>Embryonic demise</th>
<th>EP</th>
<th>Molar preg &lt;1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>70%</td>
<td>20%</td>
<td>8%</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

Demise ~50% IUP ~30% EP 15% Unknown 3%


risk of ectopic according to subclass

<p>| TABLE 4: Likelihood Ratio for Ectopic Pregnancy According to Ultrasound Subclassifications |
|---------------------------------|---------------------------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Ultrasound Class</th>
<th>Ectopic Pregnancy</th>
<th>Non-Ectopic Pregnancy</th>
<th>Total</th>
<th>Likelihood Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty uterus</td>
<td>25</td>
<td>69</td>
<td>94</td>
<td>2.2 (1.1–4.6)</td>
</tr>
<tr>
<td>Nonspecific fluid</td>
<td>4</td>
<td>26</td>
<td>30</td>
<td>1.0 (0.32–3.1)</td>
</tr>
<tr>
<td>Ectodermic material</td>
<td>2</td>
<td>37</td>
<td>39</td>
<td>0.33 (0.09–1.2)</td>
</tr>
<tr>
<td>Abnormal sac</td>
<td>1</td>
<td>35</td>
<td>36</td>
<td>0.17 (0.03–0.90)</td>
</tr>
<tr>
<td>Normal sac</td>
<td>0</td>
<td>29</td>
<td>29</td>
<td>0 (0–55)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>32</td>
<td>196</td>
<td>228</td>
<td></td>
</tr>
</tbody>
</table>

- empty uterus = strongest predictor for EP
- normal GS (no yolk sac) = EP very unlikely
accuracy of EPPU

in 10 trials of EPPU TVS, I miss (heterotopic) excellent specificity = when we detect IUP > almost always correct safe to discharge pts with IUP

ED LOS

4 studies showing 1-2hr decreased LOS if EP identifies IUP


ED LOS

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pitfalls - errors in thinking

- “let’s wait for the bHCG before performing the US”
- “I’ve never sent home a pt with EP”
“Let’s wait for the βHCG”

<table>
<thead>
<tr>
<th>βHCG (mIU/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25% Ectopic Pregnancy (Geometric Mean βHCG 18.58 mIU/mL)</td>
</tr>
<tr>
<td>20% Abnormal Intrauterine Pregnancy (9022 mIU/mL)</td>
</tr>
<tr>
<td>0% Normal Intrauterine Pregnancy (3012 mIU/mL)</td>
</tr>
</tbody>
</table>

- EP mean βHCG below DZ
- If only pt with βHCG > DZ scanned - miss 1/3-1/2 EPs
- Discriminatory zone and βHCG only apply to IUP, not EP
- IUP and EP can be visualized below DZ

Kuhn, M. A. Beta-human chorionic gonadotropin levels and the likelihood of ectopic pregnancy in emergency department patients with abdominal pain or vaginal bleeding. Academic emergency medicine. 2003

Pitfalls

- Heterotopic pregnancy
- Cornual ectopic pregnancy
- Pseudo-gestational sac
- State of the bladder
- TVS vs TAS - performing one without the other (see image)

Summary

- EPPU for possible EP is a valuable screening tool
- In most instances, IUP rules out EP, dec LOS
- Definition IUP = GS + YS surrounded by myometrium
- Bedside US is test of choice in unstable pts
- TAS and TVS are complimentary studies
selected bibliography