The potential use of urinary βhCG for managing pregnancies of unknown location (PUL): correlating urinary and serum βhCG levels using two immunoassays

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Declarations of interest

None
Introduction

Pregnancy of Unknown Location

“triage”

LOW risk (60-90%)
- Intrauterine Failed PUL

HIGH risk (10-40%)
- Ectopic Persistent PUL

LOW risk (60-90%)

HIGH risk (10-40%)
Introduction

• Serum hCG
• 0 & 48 hours
• hCG ratio
  (hCG 48 hours/ hCG 0 hours)

• In early pregnancy, **urinary** hCG measurement is either ‘positive’ or ‘negative’

• Urinary hCG quantification is used in routine clinical practice with other conditions (GTD)$^{1,2}$

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• ~20% hCG is excreted in the urine after degradation to subunits and nicked forms

• hCG is stable and does not require immediate measurement

• Patients can post urine samples from home – much more convenient

AIM: assess the utility of urine hCG quantification in a PUL population

Methods

- Prospective
- Single-centre (Queen Charlottes’ & Chelsea Hospital), Early Pregnancy Unit
- 11/2013 – 05/2014
- Ethical approval obtained: Imperial College Healthcare Tissue Bank - written consent was obtained from all women
- All samples analysed at the Charing Cross Trophoblast Unit
Methods

80 PUL

0 hr 48 hr

CX-RIA assay

- hCG
- Cr

Immulite 2000 assay

0 hr 48 hr

320 samples
Methods

CX-RIA assay
In-house specialist assay developed at Charing Cross Hospital

Immuliite 2000 assay
Commercially available chemiluminescent immunometric assay

Both undergo stringent regular internal and external quality checks
RESULTS: Agreement between the two assays

SERUM Bland-Altman plots

Spearman correlation:
≥0.99

Mean percent difference:
near 0%

URINE Bland-Altman plots
Results: PUL final outcome

- FPUL: 33 (41.3%)
- VIUP: 11 (13.8%)
- NVIUP: 19 (23.8%)
- EP/PPUL: 17 (21.3%)
<table>
<thead>
<tr>
<th>Assay</th>
<th>Variable</th>
<th>AUC</th>
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</thead>
<tbody>
<tr>
<td>CX-RIA</td>
<td>Log(hCG ratio, urine)</td>
<td>0.84</td>
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<tr>
<td></td>
<td>Log(hCG ratio, serum)</td>
<td>0.93</td>
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<tr>
<td>Immulite</td>
<td>Log(hCG ratio, urine)</td>
<td>0.83</td>
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<tr>
<td></td>
<td>Log(hCG ratio, serum)</td>
<td>0.94</td>
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Low-risk versus High-risk

<table>
<thead>
<tr>
<th>Assay</th>
<th>Variable</th>
<th>AUC</th>
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</thead>
<tbody>
<tr>
<td>CX-RIA</td>
<td>hCG ratio, urine</td>
<td>0.69</td>
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<td>hCG ratio, serum</td>
<td>0.77</td>
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<td>Immulite</td>
<td>hCG ratio, urine</td>
<td>0.69</td>
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<tr>
<td></td>
<td>hCG ratio, serum</td>
<td>0.79</td>
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Conclusions

- Urinary hCG quantification is used routinely for other pregnancy conditions.
- It has not been validated in a PUL population – this pilot study assessed potential clinical utility.
- Serum βhCG ratio remains a better predictor of PUL outcome.
- However, urinary βhCG ratio has shown encouraging results in identifying different types of low-risk PUL.
- It also shows some utility in discriminating low and high-risk PUL.
- Further clinical studies are required to assess the use of urinary βhCG as a routine test for PUL.
- It could provide significant benefits for women.
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