Ultrasound in the emergency department

Emergency department ultrasound for the assessment of abdominal trauma: an overview

John Ross, MD

Diagnostic ultrasound (U/S) has been used in medicine for over 40 years, and reports describing the use of abdominal U/S in trauma date back to 1971. Recently, however, trauma ultrasonography has become a controversial issue in Canada.

U/S provides the speed and accuracy we associate with diagnostic peritoneal lavage (DPL) in a noninvasive format. It is safe, inexpensive, repeatable, accessible at the bedside, and requires little patient preparation. U/S is now the initial test for the assessment of blunt abdominal trauma in most European and Australasian centres. More recently U/S has become common in US trauma centres.

A focused abdominal sonogram in trauma (FAST) exam takes 5 minutes or less. The FAST scan examines the right upper quadrant, left upper quadrant, subxiphoid area, pelvis at the pouch of Douglas, and, in some cases, the paracolic gutters. But can FAST scans tell us which patients require surgery?

English-language publications document trauma U/S data from over 10,000 patients. These data suggest that U/S is 80–100% sensitive and 88–100% specific for detecting hemoperitoneum in adult, pediatric, blunt or penetrating abdominal trauma. Serial scanning over minutes to hours increases both sensitivity and specificity. Several studies have compared U/S, either single or serial, with DPL and CT. The figures presented in Table 1 are typical of the results of these studies.

Although sensitive for hemoperitoneum, U/S, like CT, has poor sensitivity (in the range of 50–60%) for hollow viscus and pancreatic injuries. Most studies report U/S...
specificities in the range of 94%\(^3\), however, unlike CT, U/S provides little organ-specific injury detail.

The algorithm in Figure 1 has been proposed as one way to incorporate FAST exams in the assessment of blunt abdominal trauma patients.\(^3\) This type of algorithm is used in many centres to guide initial and serial U/S examinations. One large North American trauma centre has decreased CT use from 26% to 11%, and DPL use from 38% to 10%\(^6\) by adding emergency department U/S as an initial screening test.

Some centres also use the size of fluid collections to guide therapy in trauma. Investigators at two centres have used scoring systems to determine the likelihood that trauma patients with varying free-fluid volumes will require laparotomy.\(^7,8\) These systems will require validation in other centres.

**Who should perform ED ultrasound?**

There is little doubt that U/S has a role in abdominal trauma.

<table>
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<tr>
<th>Table 1. Diagnostic parameters for ultrasound (U/S), computed tomography (CT) and diagnostic peritoneal lavage (DPL) in blunt abdominal trauma</th>
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</thead>
<tbody>
<tr>
<td><strong>U/S, %</strong></td>
</tr>
<tr>
<td>Sensitivity</td>
</tr>
<tr>
<td>Specificity</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
</tbody>
</table>

The question is: Who will perform the U/S study? Radiologist? Surgeon? Emergency physician (EP)? If a non-radiologist, how will they be trained, who will train them, and what quality assurance mechanisms will be instituted?

Several studies demonstrate that EPs and surgeons can perform U/S safely and accurately. Existing training programs vary in length from 2 to 200 hours, and advocates of ED U/S suggest that a curriculum be designed to teach FAST exams during surgical and emergency residency programs. In 1994, the Society for Academic Emergency Medicine (SAEM) published a comprehensive curriculum for ED U/S training.\(^7\) The SAEM guidelines suggest 40 hours of instruction and 150 U/S examinations, including aorta, gallbladder, kidneys, ectopic pregnancy and pericardium, as well as trauma.

The controversy becomes heated when emergency physicians gain confidence and extend the application of ED U/S to non-trauma. What are reasonable limits for non-radiologists performing U/S and how will these be determined?

**Controversies, turf, and the Canadian perspective**

This type of controversy is not new to emergency medicine, and emergency physicians tread on the turf of many other “vertical” specialists. We provide acute care to patients whose problems relate to all anatomic regions, and whose diseases are often considered the property of other specialties. It has been a long and painful process to carve
Ultrasound in emergency medicine

James Ducharme, MD

Although diagnostic imaging is, for the most part, the domain of radiologists, exceptions to this rule have developed. Cardiologists perform cardiac catheterization and echocardiography. Obstetricians have developed expertise in transvaginal ultrasound and fetal assessment. Why have some specialties embraced areas of imaging as theirs, while others — such as orthopedics and medicine — continue to rely on radiology? One reason is that radiologic expertise in these latter specialities is rarely required on a 24-hour basis and it can be provided without taking on an overwhelming workload. ED bedside ultrasonography, on the other hand, must be available 24 hours a day. Conditions requiring immediate (within 15 to 20 minutes) ultrasound (U/S) include expanding or leaking abdominal aneurysm, suspected ectopic pregnancy, and traumatic hemoperitoneum. When patients with these conditions are unstable they require even more rapid imaging — “real imaging” in the operating room.

Emergency physicians (EPs) in many emergency departments state that they lack rapid access to U/S because of resistance from their radiologists, in effect using the same arguments that other specialists have used. But unlike other specialties, to remedy this situation and make 24-hour U/S immediately available, all EPs in every department would have to master the technique. Anything less than this would establish a double standard of care in each department, eliminating the argument that immediate U/S is essential for optimal patient management. The appearance would be that EPs want to perform U/S for financial or turf reasons.

What has rapidly available U/S given us? Many US trauma centres are equipped with ED U/S. Despite this, few if any studies demonstrate that trauma outcomes have improved as a result. While U/S rapidly identifies intraperitoneal blood and perhaps decreases invasive peritoneal lavages, it does not identify hollow viscus injuries. A normal U/S does not allow patient discharge; nor does it rule out significant intra-abdominal injury. To date, therefore,