

## CONTRAST ENHANCED ULTRASOUND IN BLUNT ABDOMINAL TRAUMA

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The value of ultrasound in haemodynamically stable patients is controversial since the presence or absence of free intra-peritoneal fluid does not correlate well with the presence or absence of organ injuries. Free intra (or retro-) peritoneal fluid is not always found in patients with blunt abdominal organ injuries, including major injuries.

In order to enhance the sensitivity of ultrasound for the detection of intra-peritoneal injuries, some investigators advocate to perform a complete abdominal ultrasound study by a well trained operator to depict both free fluid and organ injuries. Recent series reported a 41% sensitivity of ultrasound for the direct depiction (parenchymal analysis) of organ injuries and concluded that a normal ultrasound can not be relied on as a sole criteria to exclude an intra-abdominal major injury.

Because of the potential of severe bleeding and/or delayed complications of the liver, spleen and kidneys injuries, the emergency physician is usually reluctant to immediately discharge a patient with an history of abdominal trauma, based on a normal abdominal ultrasound as sole imaging modality.

The advent of second generation ultrasound contrast agents, characterized by an outstanding stability and resistance to pressure, which allows a prolonged examination time after a single i.v. bolus, could reconsider the place of ultrasound in the abdominal evaluation of trauma patients.

### DOES CONTRAST-ENHANCED US IMPROVE THE SENSITIVITY OF US IN TRAUMA ?

Since July 2002, we routinely use contrast-enhanced ultrasound in trauma patients at the Geneva University hospital for research purpose. **We aim to determine if contrast-enhanced ultrasound could play a role in a busy emergency center, to replace or complement CT in some specific situations. Our preliminary experience on 210 consecutive trauma patients, 88 of them with CT proven organ injury, shows that contrast enhanced US significantly increases the sensitivity of US to detect solid organ injuries. When compared to CT results, considered gold standard, admission, and contrast-enhanced ultrasounds had a detection rate of 40% (35/88) and 80% (70/88) to depict a solid organ injury respectively.**

After exclusion of low-quality examinations, contrast-enhanced ultrasound still missed 18% of solid organ injuries, including two liver grade 3 and two spleen grade 2 injuries (none did require surgery or embolization). So far, contrast-enhanced ultrasound cannot be directly recommended to replace CT in the exclusion of liver or spleen trauma. However, based on our (non statistically significant) observations, we speculate that missed injuries could be minor injuries (contusions) which do not require surgery or embolization. If confirmed by larger series, then contrast-enhanced ultrasound could be used to precise the nature of a parenchymal injury (contusion or laceration), in complement to CT results (i.e. extension of a laceration to the major hepatic veins).

In our series, five vascular liver (n=1) and spleen (n=4) injuries (pseudoaneurysms) were detected at CT; all were demonstrated at contrast-enhanced ultrasound. In spite of the small number of vascular injuries reported in our series, which does not allow any statistical analysis, our observations as well as those reported by Catalano, suggest that enhanced ultrasound could be an interesting alternative to control CT for the detection of delayed pseudoaneurysms. Indeed, up to 75% of these vascular injuries have been reported to appear within 3 days after admission for a splenic laceration. Performing a control CT is not always feasible, when the patient is unconscious and/or has multiple associated injuries. In such cases, an enhanced ultrasound examination could be an optimal and efficient tool to check splenic injuries for pseudoaneurysms without recruiting too many medical resources.

## CONCLUSION

Our preliminary data suggest that contrast-enhanced ultrasound:

- Cannot replace CT to exclude the presence of a solid organ traumatic injury.
- Could be a useful alternative to CT to detect delayed splenic pseudoaneurysms (further series required).
- Could be a complement to CT to differentiate contusion from lacerations (further series required).

## References

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