Hull and East Yorkshire Hospitals NHS Trust

Gangrenous Cholecystitis

Does Ultrasound Contrast Improve Detection? Systematic Review & Meta-Analysis.

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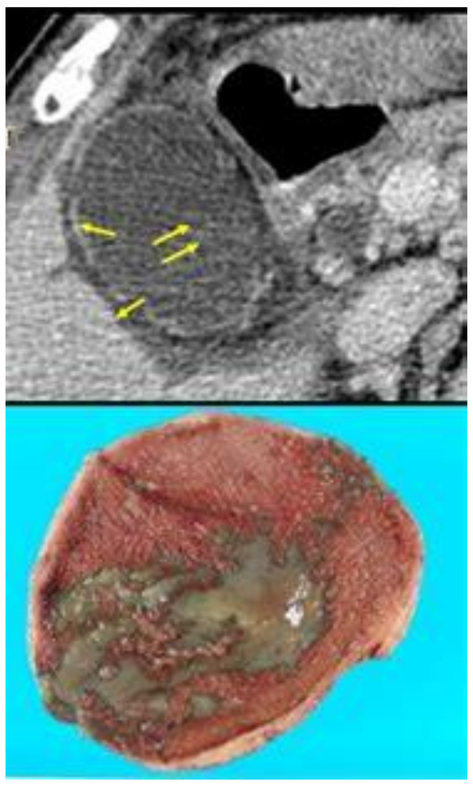
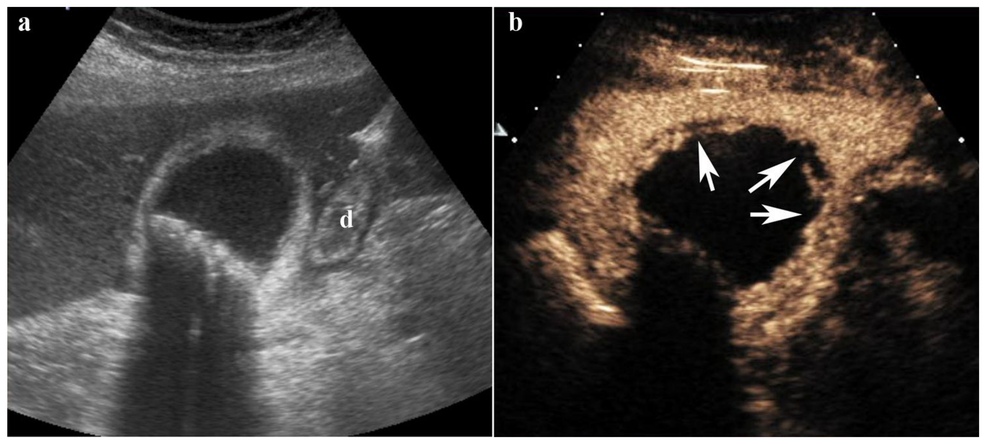
Background

Gallstones are a common phenomenon; with incidences increasing as obesity increases. 20% of people with gallstones will develop cholecystitis. Around 36% of cholecystitis cases progress to gangrenous cholecystitis (GC); ischemia of the gallbladder walls due to increased intraluminal pressure. GC can rapidly progress to perforation, resulting in peritonitis and sepsis. As such, GC has high mortality rates (15-50%).

CT is the imaging gold standard for diagnosing CG, with the direct advantage over US of contrast use for visualisation of areas of ischemia in the gallbladder walls (GBW). However CT involves ionising radiation, delayed diagnosis and greater financial implications. This review aim was to compare diagnostic accuracy of CEUS to cholecystectomy for detection of gangrenous cholecystitis pre-operatively.





Reliability of studies

The three studies were found to have moderate methodological quality in line with QUADAS-2. All studies were prospective with blinding of the CEUS operators to histology results. However histologists where not blinded to CEUS and laboratory results in all three studies. Two studies had a short (<24hr) interval between CEUS and surgery, however one study operated up to 8 days later, allowing time for progression to necrosis, which may have contributed to the false negatives of CEUS.

CEUS – the new CT?

CEUS was as sensitive, but not as specific as CT for diagnosis. CEUS highlights perfusion defects in the GBW to diagnose GC, therefore may be a less expensive, readily available and quicker radiological option for patients with suspected GC.

Pitfalls of CEUS:

- Stone shadowing mimicking perfusion defects
- Other complications of cholecystitis (e.g. haemorrhage) result in vascular interruption and CEUS is unable to differentiate these. CEUS unable to overcome usual ultrasound limitations - obesity, organ situs, bowel gas, operator skill and patient condition.

Benefits of CEUS compared to CT:

- Lower rates of adverse contrast reactions.
- Microbubbles respiratory excreted so pose no renal threat, therefore reducing requirement for renal function assessment.
- No ionising radiation.
- Portability.

Initial issues for CEUS introduction:

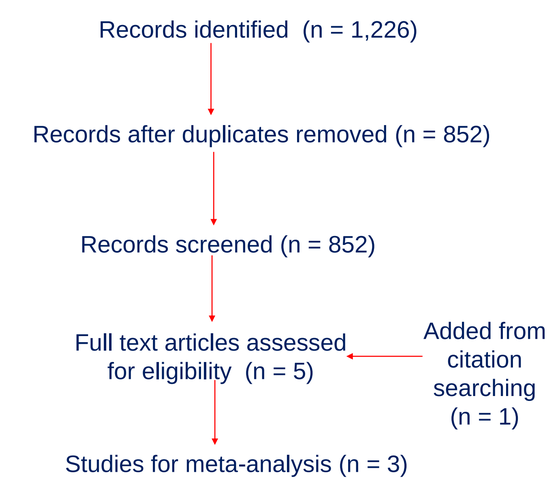
- Financial implication – training for image interpretation and cannulation

Methodology

- Search terms identified using MSH.
- 1,226 electronic studies retreived.
- 1 study identified using backwards citing.
- Inclusion criteria applied - 3 studies to be eligible.
- Study quality assessed using QUADAS-2
- Data extraction performed then meta-analysis.

Medical Subject Headings (MSH)

Contrast Enhanced Ultrasound	Gangrenous Cholecystitis
CEUS	Acute Complicated Cholecystitis
Contrast Enhanced Ultras*	Compl* Cholecystitis
Microbubble*	Phlegmonous Cholecystitis
Sonog*	Necrot* Cholecystitis
Contrast Enhanced Sonog*	
Ultraso*	



Inclusion criteria

Adults presenting with suspected GC who had undergone CEUS and cholecystectomy with histological analysis

Sufficient data to construct 2x2 contingency tables.

Studies written in English, no geographical restrictions.

Study Limitations

- English studies only
- No grey literature
- No hand-searching
- Titles screened by only one author

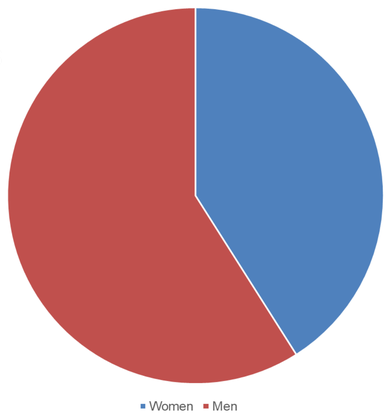
Results

Three prospective cohort studies, totalling 233 patients included. Mean patient age was 66.9. 45% female and 55% male.

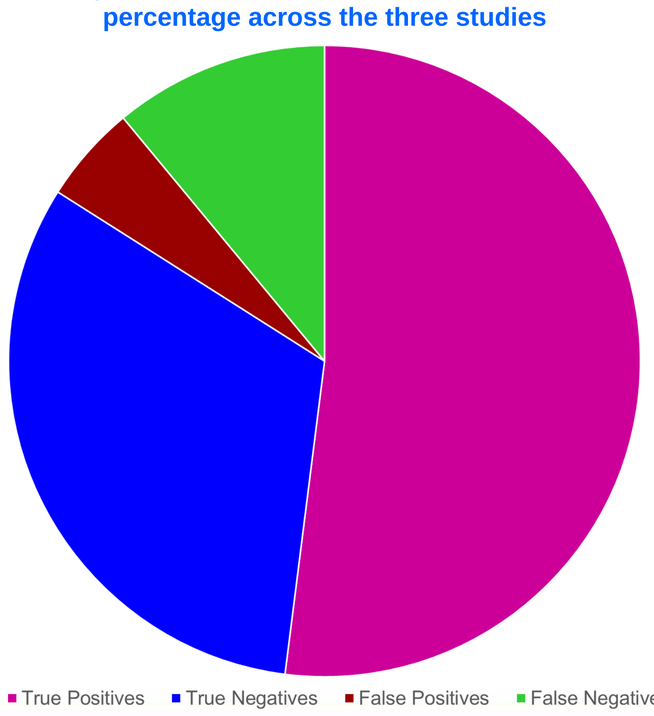
89 patients excluded due to; did not undergo cholecystectomy, declined consent to CEUS or had cholecystectomy more than 24hr after CEUS. 147 patients (63%) were found with GC at histology; 59% men, 41% women.

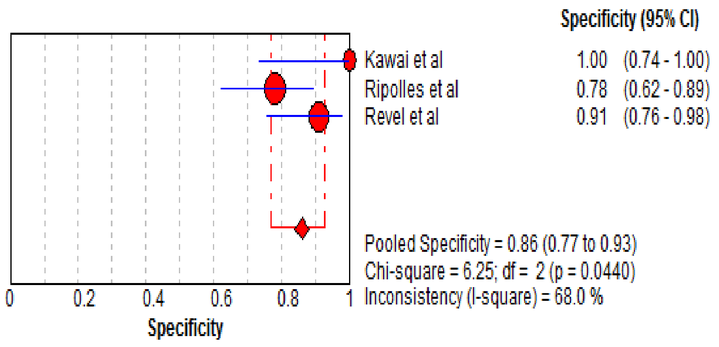
- Pooled sensitivity - 83% (76-89% 95% CI)
- Pooled specificity 86% (77-89% 95% CI).
- Heterogeneity low across the studies.
- CEUS diagnosed 12 false positives; 5 due to perforation.
- 25 false negatives.

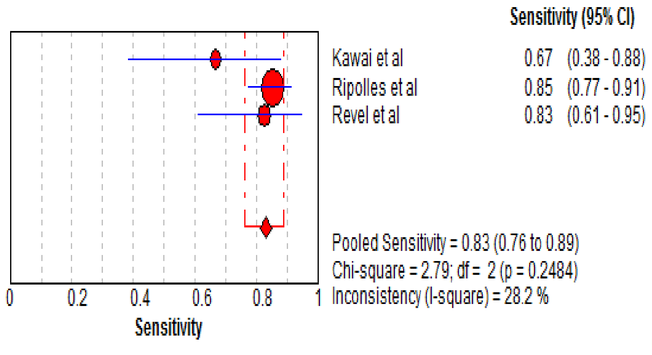
Percentage found to have GC at histology



Diagnostic accuracy of CEUS as a combined percentage across the three studies







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