

Renal stone ultrasound diagnosis: analysis of factors associated with false negatives

Authors

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Introduction

– Diagnostic ultrasound (US) is commonly used in young patient for the detection of renal calculi as a non-ionising radiation technique alternative to CT.

– **Study Aim:** Evaluate possible factors associated with the False Negative Rate on US compared with non-enhanced CTKUB in detecting renal calculi.



Methods

- Retrospective study
- All patients who underwent US between 01/01/2014 – 31/03/2015 followed by non-enhanced CTKUB within 1 year at our Institution (n = 220)
- **Exclusion:** Ureteric stones
- **Data collection:** Demographics and reports from RIS (Soliton)

- **Data analysis:** Excel
- **Reference standard:** CTKUB



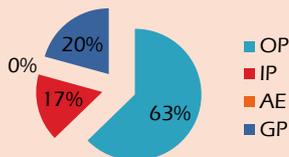
Results

126 patients with reported calculi on CTKUB

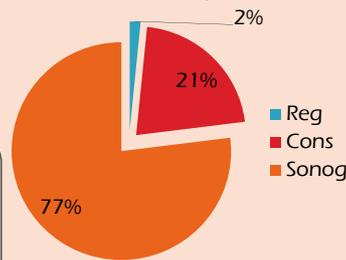
Comparison with US:

- 94/126 (74.6%) reported calculi on US (True Positive Rate)
- 32/126 (25.4%) reported no calculi on US (False Negative Rate, FNR)

Source of Referral for US



Ultrasound Operator



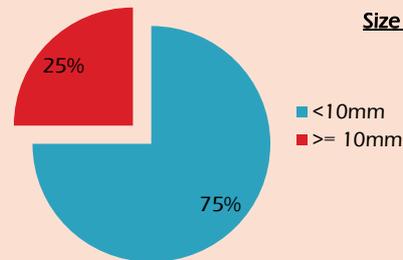
Demographics:

Average patient age [yrs]: 57.5
 M:F ratio: 0.6
 Average time US to CT (days): 74.9

Assessing factors associated with US FNR:

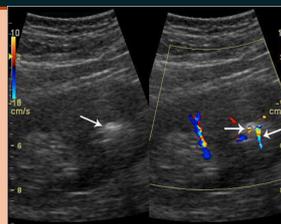
- US operator (Consultant / Radiology Registrar / Sonographer): no statistically significant difference between operators
- Gender, mean age and mean time between US and CTKUB were not associated with FNR
- The majority (75%) of calculi missed on US had a reported size of less than 10 mm (p-value = 0.0047)

Size of calculi on CTKUB missed on US:



Discussion

- US is a useful non-ionising modality for assessing the kidneys in younger patients, although the sensitivity for renal calculi is unreliable.
- Subsequent CT examination of our patients showed that size of a calculus is a statistically significant factor in its detection on US.
- Patient's age / gender and time between US and CTKUB did not significantly affect the FNR.
- The majority of calculi missed on US were less than 10mm in size. It is therefore important to realise the limitations of US particularly in detecting echogenic renal calculi on a background of echogenic renal sinus fat.
- Twinkling artefact is considered the most specific sign for identifying renal stones ^{1,2}



Conclusion

- Limitations of US in detection of renal calculi should be recognised by all US practitioners.
- Calculi above 10mm may be identified clearly on US, however smaller calculi can be easily missed.
- Where there is clinical suspicion of renal calculi in younger patients, low dose unenhanced CT imaging should be the primary choice of investigation.

References

- [1] Sorrenson *et al.*: B-mode ultrasound versus color doppler twinkling artifact in detecting kidney stones. *Journal of Endourology* 2013 27(2).
- [2] Vallone *et al.*: US detection of renal and ureteral calculi in patients with suspected renal colic. *Critical Ultrasound Journal* 2013 5(Suppl 1):S3.