

Ultrasound: An extension of clinical examination

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Aims and objectives: To study the impact the use of portable ultrasound can have for the benefit of the patients when used by doctors other than radiologist, in this case surgeons.

Methods: Ultrasound performed by surgeons in the pre-operative, operative and post-operative period was studied. Patients presenting to the Hospital with acute abdomen was subjected to ultrasound. They were either pre-operative or post-operative patients. Five patients were scanned intraoperatively. The impact of these scans to the patients as well as the clinicians was studied.

Results: This is an ongoing study and preliminary results of the scans show two pre-operative diagnosis of acute appendicular collection and one acute hydronephrosis. In the operation room, ultrasound was done on 5 cases. On three occasions, it was to locate renal stones so that it could be extracted with ease. On two of the case, it was to confirm the adequacy of common bile duct exploration thereby allowing primary closure of the common bile duct. Post-operatively, it was used in four cases of which in two cases post-operative hemorrhage were detected timely within hours. In the other two cases, the surgical team was assured that the patient's complaint was not surgically related.

Conclusion: Ultrasound should be an extension of the clinical examination when indicated and all clinicians should be proficient in its use in their respective fields

Keywords: ultrasound, non-radiologist, surgeons, per-operative ultrasound

How many of us as residents and even as attendings would have liked or like to scan our patients to arrive at an appropriate diagnosis, be it in the casualty, out-patient department, wards, intensive care units and even in the operation theater to arrive at a timely diagnosis? This would have allowed timely and objective treatment of the patients. Bearing thing in mind, in Germany and Japan, training in ultrasound is an integral part of the surgical residency training programs. Practice domains and turf wars had deterred its spread in UK and USA¹. But increasingly physicians around the globe are embracing ultrasound in their clinical practice. Endoscopic and laparoscopic ultrasounds are routinely performed by surgeons in western centers. We believe that we too should follow suit if we are not to lag behind. Hence this study has been undertaken to see if there are any benefits to ultrasound practiced by clinicians.

Materials and methods

Patients, who presented with acute abdomen in the hospital either before or after surgery when the radiology service was not available, were included in the study. Ultrasound was also preformed intra-operatively in five patients. Scanning was done by surgeons. Altogether thirteen scans were performed.

Three of the scans were pre-operative scans. Five scans were intra-operative and four scans were post operative. Micromax ultrasound system manufactured by Sonosite Corporation was the unit used for scanning (Fig 1). The transducer used is phase array transducer as that is the only transducer available to us.

For intra-operative scanning, sterility was ensured by threading the transducer through a sterile cloth tube as is done for diathermy connector and the head of the transducer was covered by sterile glove (Fig 2). Three patients presenting with severe abdomen pain in the clinic were scanned.

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Five patients were scanned intra-operatively. Two were scanned to ensure completion of common bile duct stone extraction and three to localize renal stones. Post-operatively four patients were scanned. Two patients were scanned five to six hour after surgery, one 52 year old lady after an uneventful laparoscopic cholecystectomy and the other 27 year old man following a difficult left hernioplasty where the adherent omentum was difficult to reduce. Both had tachycardia, low blood pressure and decreased urine output. Both were scanned in the post-operative bed itself. Two of the others were scanned five and eight days after operation- one a 72year old lady and another 25 year old female, both after uneventful laparoscopic cholecystectomies (Fig 3).

Results

Of the three patients scanned in the clinic before surgery, two revealed right iliac fossa collection and the third had marked hydronephrosis secondary to ureteric stone (Fig 4). On surgery, 26 year old pregnant lady had acutely inflamed appendix surrounded by omentum and the 46 year old man had diffuse peritonitis following a burst appendix. The lower third ureteric stone in the third patient was successfully fragmented the next day.

Of the five patients scanned intra-operatively, two were scanned after open extraction of stones from the common bile duct, three stones in one of the patients and a solitary stone in the other (Fig 5). After confirming the absence of further stones, the common bile duct was closed primarily with 3/0

vicryl without a T-tube². The abdominal drain was removed on the third day and both the patients were discharged on the fourth. Three other patients were scanned for localization of renal stones. The stones were extracted and post operative KUB (Kidney, Ureter, and Bladder) X-ray was devoid of radio-opaque shadows.

Of the four patients scanned in period following operation, two of the patients scanned hours after surgery for suspected post-operative hemorrhage had free fluid in the abdomen (Fig 6). Both were opened immediately, omental bleeders were ligated and both the patients made an uneventful recovery.

The other two patients scanned post-operatively were a 70 year old lady complaining of right upper quadrant pain on the 4th post-operative day of laparoscopic cholecystectomy. The scan did not show any fluid collection but what looked like pneumonic consolidation of the lower lobe of the right lung. This was proved to be so on chest X-ray. Another 25 year old female patient (who had been discharged 8 days following laparoscopic cholecystectomy) phoned the surgeon at 4 am and landed up in the hospital at 4:15am with excruciating upper abdominal pain. To the relief of the surgeon, abdominal scan showed neither fluid in the abdomen (secondary to delayed bile leak) nor an enlarged pancreas. Patient was diagnosed to have severe gastritis and did well with a dollop of Tricainegel syrup.



Fig 1: Portable ultrasound unit



Fig 2: Sterility of intra-operative scanning

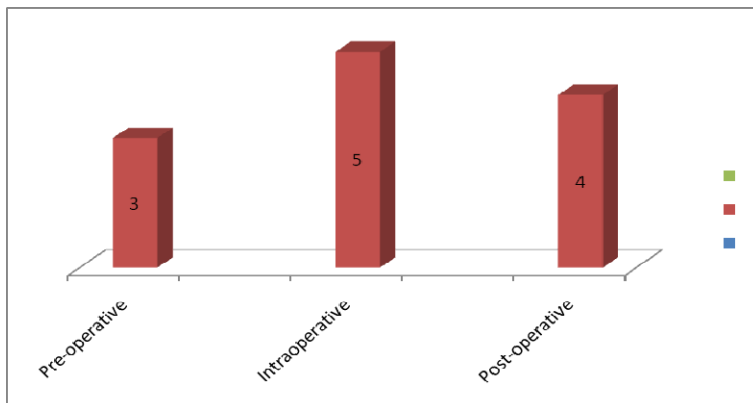


Fig 3: Distribution of the patients scanned

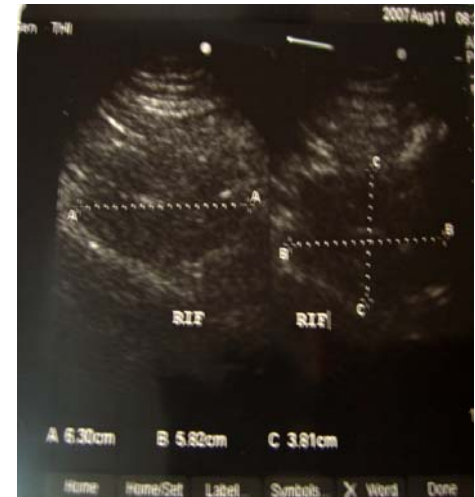


Fig 4: Right iliac fossa collection

Table 1: Diagnosis according to the period of the Scan

Pre-Operative	Intra-Operative	Post-Operative
Appendicitis	Completion CBD stone extraction	Post-operative bleeding after lap cholecystectomy
Appendicular perforation	Completion of CBD stone extraction	Post-operative bleeding after hernioplasty
Hydronephrosis	Localization of renal stones	Basal pneumonia
	Localization of renal stones	Acute severe gastritis
	Localization of renal stones	

Discussion

Ultrasound is being increasingly used by practicing clinicians for the full benefit of the patients whether it is emergency physicians, critical care physicians, anaesthesiologists, gynecologists, orthopedic surgeons or general surgeons and surgeons of other disciplines. Surgeons first in Europe and recently in United States have embraced ultrasound as key diagnostic tool in many areas of clinical practice³.

The first educational model on how surgeons can learn ultrasound was published by Han and

colleagues from Emory University⁴. The issue addressing the learning curve for FAST was conducted by Shackford and colleagues from the University of Vermont⁵.

Optimizing saphenous vein site selection is carried out by Doppler ultrasound in cardiovascular surgery⁶. Roberto Santambrogio and colleagues from Milan, Italy have concluded that intra-operative ultrasound

can localize invisible and nonpalpable nodules at the time of thoracoscopy⁷. In neurosurgical suite, localization of subcortical brain tumors is easily accomplished with ultrasound⁸. Ultrasound is invaluable diagnostic technique in orthopedics and

applications are limited only by lack of experienced sonographers⁹. Ultrasound technology represents an ideal mechanism by which the regional anesthesiologist can attain the safety, speed and efficiency of general anesthesia¹⁰.

Many have pointed out the superiority of intra-operative ultrasound over CT in detection of metastasis in gastrointestinal malignancies¹¹. Diagnostic peritoneal lavage is archaic with the introduction of FAST (Focused Assessment with Sonography in Trauma). Great strides have been made both in diagnostic and interventional breast sonography.

The opportunities afforded by ultrasound seem almost boundless but due to turf war among doctors, its adoption by clinicians has been slow paced. But physicians have now realized that clinical considerations must supersede all other considerations. No specialty owns the right to any specific technologies or procedures¹.

This study highlights the immense benefit that can accrue to the patient and the peace of mind for the surgeon if ultrasound is at his or her disposal. Like all weapons, this can be a two edged sword if not used properly and wrong diagnosis is made by superficially trained person can do more harm than good¹².

Conclusion

The use of ultrasound is limited only by the limitation of its users. Our initial experiences with it show that it enhances both our clinical competence and confidence. The benefit to the patients is immense. As the results in our limited study show common bile duct can be closed primarily without the morbidity of a T-tube². It is of immense use in detecting lesions intraoperatively, in our case renal stones but more frequently for malignant lesions. Post operative complications are detected sooner with greater objectiveness and therefore managed expeditiously.

Portable ultrasound has come as a godsend for clinicians and patients alike. It holds boundless potential in all specialties of medicine. We and many others in the medical fraternity believe that

ultrasound should be an extension of the clinical examination. Thus the students of medicine should be initiated to it from the beginning of their medical career.

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