



## Correlation of Computed Tomography with Ultrasound to Assess the Patients having Acute Abdominal Pain

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### Abstract

**Background-** Computed tomography examinations associated with radiation exposure. Ultrasound before CT is an advantages step for acute abdominal pain. The purpose of this study was to evaluate the diagnostic accuracy and additional information found in clinical diagnose in CT scan report than compared ultrasound report.

**Aim and Objectives-** To compare findings between ultrasound and CT in patients with acute abdominal pain.

**Material and method-** A prospective study was carried out on 30 patients who undergo ultrasound or computed tomography scans.

**Result-** Result of this study is that CT scan is a more reliable investigation than ultrasound except for some of these findings like Gall bladder pathology, grading of Hydronephrosis, and minimum free fluid in the peritoneal cavity.

**Conclusion-** The study shows positive result. CT scan is a more reliable investigation than ultrasound except for some of these findings like Gall bladder pathology, grading of Hydronephrosis, and minimum free fluid in the peritoneal cavity.

**Keywords:** USG, CT, Abdomen. X-ray, MHz, Radiation

### Introduction

#### Ultrasound

The human hearing range limits covers from approximately 20 Hz to 20 kHz. Vibration with frequencies higher than 20 kHz are termed as ultrasonic waves. Ultrasound is a diagnostic imaging modality. Those ultrasound beams are used in diagnostic imaging and have frequencies ranging from 1 MHz- 20MHz. Ultrasound imaging works on the basis of piezoelectric crystal<sup>(1)(2)</sup>.

which is located near the face/front of transducer (probe). Ultrasound waves are produced by the vibration of crystals. A sound beam is similar to X-

rays in that both are waves transmitting energy. But X-rays are electromagnetic waves does not need medium for propagation <sup>(3)</sup>. Sound waves are mechanical waves which need medium for propagation. Transition of sound is independent of frequency and depends that is compressibility and density of material. Sound travels slowest in gases, at intermediate velocity in liquids and most rapidly in solid. All body tissues, except bone behave like liquids and therefore they all transmit sound at about the sound velocity. A velocity of 1540m/sec is used as an average for body tissues <sup>(5)</sup>.

#### Computed Tomography

Computed tomography is a diagnostic modality which works on the ionizing radiation i.e. x-rays but it is different from x-ray machine. CT scan images provide more detailed information than a plain x-rays do. Patient lies on a couch then x -ray tube rotates around the patient (360<sup>0</sup>) in the gantry within the scanner multiple x-ray projections pass through the patient <sup>(6)(7)</sup>. As the x-ray leaves the patient, they are picked up the detectors and transmitted to a computer. Then computer reconstructs the image from data (send by detectors) of multiple projections using reconstructions algorithm. The multiple projections of a slice of an organ are acquired at different - different angles. Thus, CT scan can produce detailed images of many structures inside the body, including the internal organs, body vessels and bone. CT has best spatial resolution <sup>(8)</sup>.

### **Role of Ultrasound and Computed Tomography in Abdominal Pain Different-Different Cases**

Patients with acute abdominal pain are accompanied by abdominal tenderness and rigidity includes bile duct obstruction, abdominal mass, acute appendices. Diagnostic imaging is widely used for patients with acute abdominal pain. Ultrasound and computed tomography (CT) are both modality of choice for evaluation in these cases but there is specific limitations for ultrasound and CT scan. Ultrasound has limitations of bowel gas and obesity of patient which cause hindrance to imaging of organ and lesion. Ultrasound is painless, low cost and harmless modality. CT scan involves the use ionizing radiation which is harmful for patients and technicians. There may be motion artifact due to only slight of patient <sup>(9)</sup>. Due to this drawback of CT scan, ultrasound is first choice for imaging of acute abdominal pain, for the additional information and for proper diagnosis then doctor prescribe for CT <sup>(10)(11)</sup>. However, Total 30 numbers of patients were included in this study.

diagnoses should not be missed or delayed and thus the most accurate imaging technique should be used.

### **Aim**

The aim is to analyze the role of ultrasound and CT in the patient of acute abdominal pain, to evaluate the number of patients having different clinical finding then that of computed tomography from previously performed ultrasound studies.

### **Methodology**

#### **Data Collection**

Data has been collected over the 6 months from 1 October 2018 to 30March 2019. Under the supervision of experts and existing radiologist along with the existing radio technologists in the Radiology Department in SGT hospital and research institute.

#### **Study Population**

The population consisted of all age patients with known or unknown abdominal problems undergoing USG & CT scans of the abdomen.

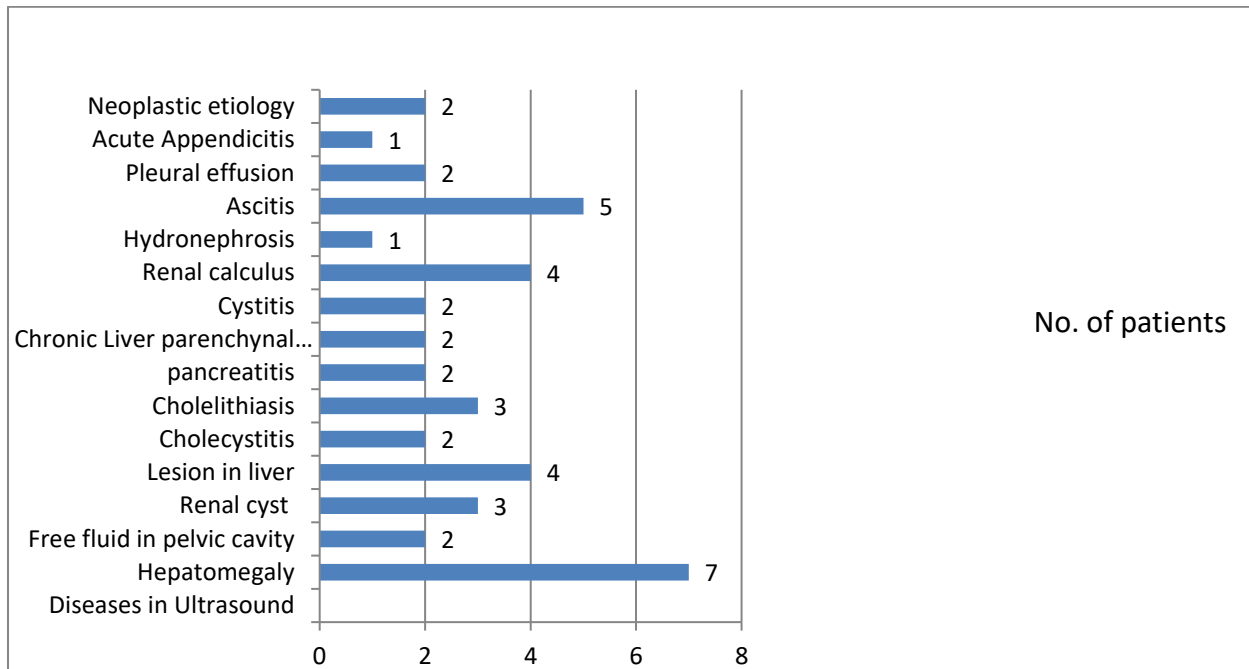
#### **Sample size:**

In this study, I used the most appropriate routine protocols of all Abdomen USG & CT scans. Total 30 patient's data is collected. Patients who undergone for both US & CT examination for acute abdominal pain.

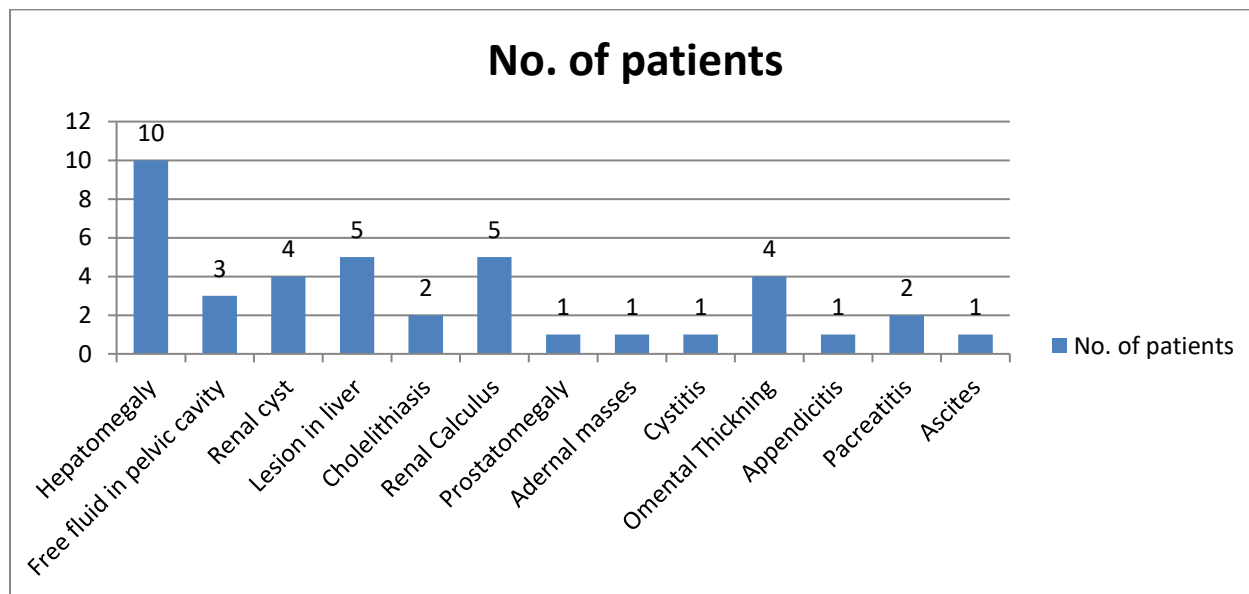
### **Result**

Firstly, ultrasound scan was performed on each patient and that particular patient is then advised to go through a CT scan in order to confirm the findings of USG and other findings not seen on USG if present. The resulted report of CT and Ultrasound was analyzed and evaluation has been done and is concluded.

**Graph 5.1** this data shows the total no. patients in ultrasound of various pathologies



**Graph 5.2** This data show the total no. patients in CT of various pathologies



Ultrasound scan considered to be more reliable than CT scan for these findings (Gall bladder pathology, grading of Hydronephrosis, and minimum free fluid in the peritoneal cavity) which were present in this study in around 4 patients. (Graph no. 5.3)

CT scans considered being more reliable as compared to USG for these findings (adrenal masses, omental Thickening, pancreatitis, gut look pathology) which

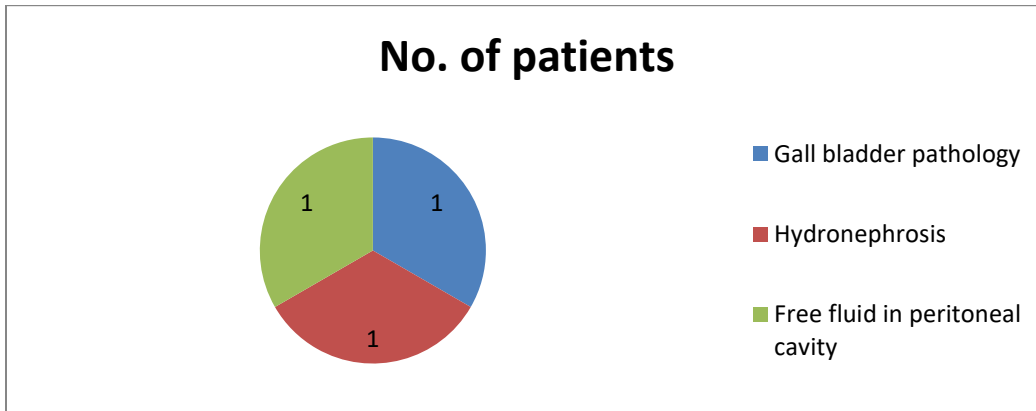
were present in this study in around 10 patients. (Graph no.5.4)

For some of these findings (renal calculus, liver abscess, organomegaly) both modalities have given the same result which were present in this study in around 10 patients. (Graph no.5.5)

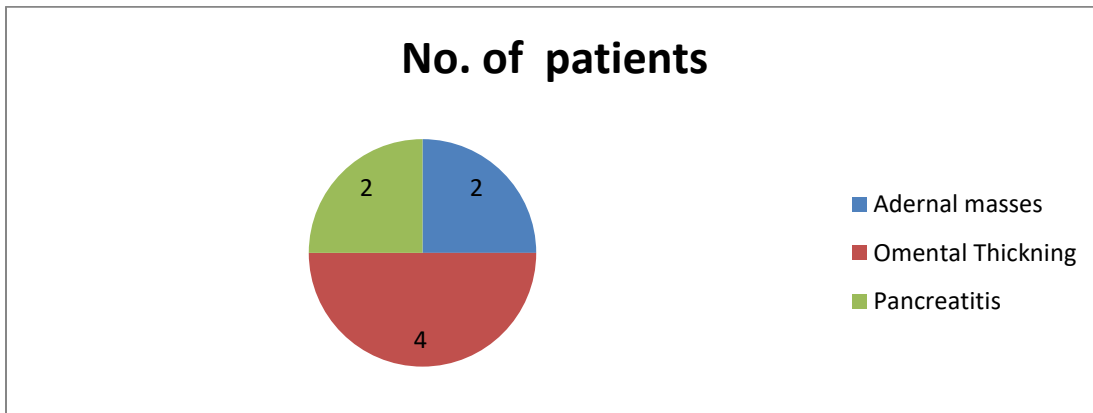
Rest of the patients USG findings like gall bladder pathology, grading of Hydronephrosis and minimum free fluid in the peritoneal cavity are not coinciding

with the CT findings adrenal masses, omental Thickening, pancreatitis, gut look pathology and vice versa. (Graph no. 5.6)

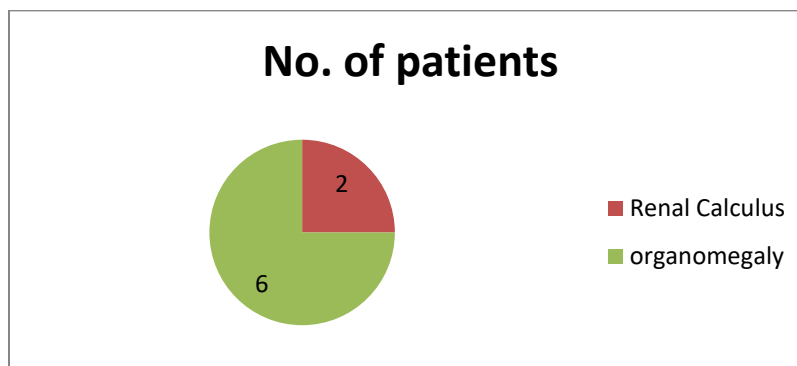
**Graph 5.3** This data shows the specific findings of ultrasound



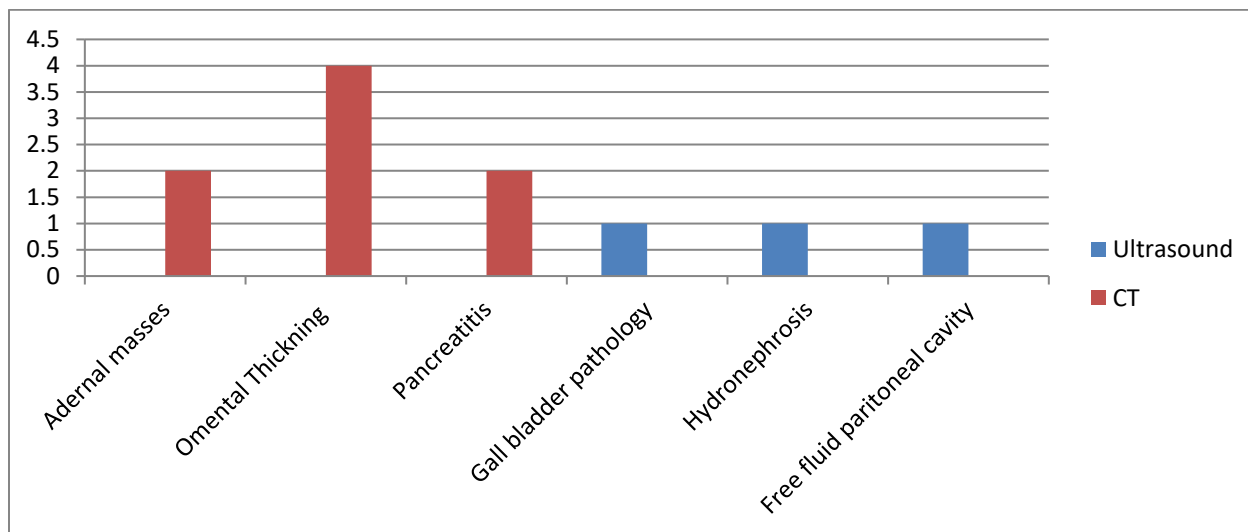
**Graph 5.4** shows the specific findings of CT



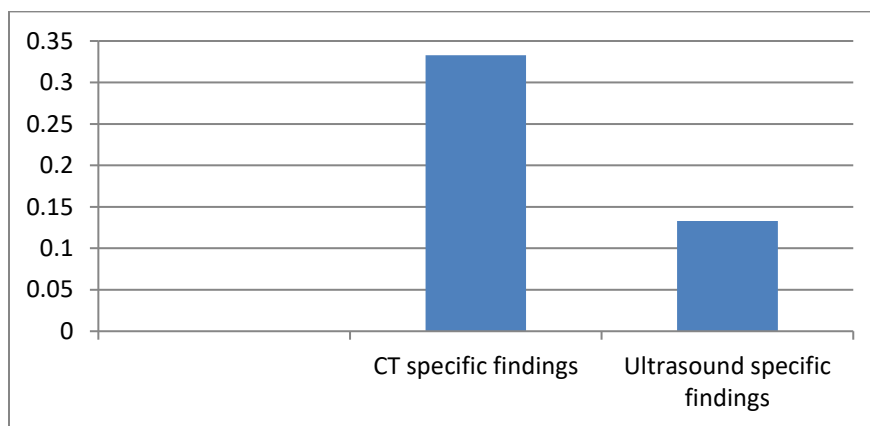
**Graph 5.5** shows the same findings in CT and Ultrasound



Graph 5.6 shows the different findings of CT and Ultrasound with no. of patients



Graph6.1 shows the rate of specific finding of both modalities CT and Ultrasound



### Discussion and Conclusion

Many researchers worldwide have published their research for role of CT and USG in the patients of abdominal pain. Many variations in the result have been seen as well.

Research was done by Randen A.W et.al in which result was based on sensitivity, Predictive values (positive Predictive value, negative Predictive value) in variation of diseases (acute appendicitis, acute diverticulitis, acute cholecystitis, bowel obstruction)

In this research comparison between ultrasound and CT examination in acute abdominal pain patients. In which result was based on diseases. To evaluate which modality is more reliable in acute abdominal pain. To discuss various abdominal pathologies separately to explore the preferred type of imaging modality. The resulted report of Computed

tomography and ultrasound has analyzed and evaluation has been done and result is concluded.

Inference of this study is that CT scan is a more reliable investigation than ultrasound except for some of these findings like Gall bladder pathology, grading of Hydronephrosis, and minimum free fluid in the peritoneal cavity.

### Reference

1. van Randen A, Laméris W, van Es H, van Heeswijk H, van Ramshorst B, ten Hove W et al. A comparison of the Accuracy of Ultrasound and Computed Tomography in common diagnoses causing acute abdominal pain. *European Radiology*. 2011;21(7):1535-45.
2. Bhagat S, Gauba N, Singh S, Singh A, et al. Assessment And Comparison Of Abdominal

- Masses By Sonography And Computed Tomography. *JEMD* 2014;3(01):84-94.
3. Kim H, Sim J. Value of Us in Patients with Equivocal CT Findings of Acute Appendicitis: Comparison with CT Reassessment. *Ultrasound in Medicine & Biology*. 2017;43:S172-S73.
  4. Ravindernath M, Reddy G. Comparison of efficacy of CT scan and ultrasound in patients with blunt abdominal trauma. *IJAM*2017;4(2):370.
  5. Adedin N, Shahriar A, Uddin Ahmed A, Mohiuddin A, Sultana J, Ghafoor N et al. Comparison of Ultrasonography and Computed Tomography to Evaluate the Causes of Biliary Obstruction. *Euroasian Journal of Hepato-Gastroenterology*. 2012;:98-103.
  6. Kapoor D, Gothecha D. Comparative study of Sensitivity of Ultrasonography and Multiple Detector Computed Tomography in diagnosing various causes of Non Traumatic Acute Abdomen. *IJMSci*. 2017;.
  7. Laméris W, van Randen A, Bipat S, Bossuyt P, Boermeester M, Stoker J. Graded compression ultrasonography and computed tomography in acute colonic diverticulitis: Meta-analysis of test accuracy. *European Radiology*. 2008;18(11):2498-2511.
  8. Srivastava D. Comparative Study of CT and Ultrasonography in Blunt Abdominal Trauma. *JMSCR*. 2018;6(2).
  9. Abu-Zidan F, Sheikh M, Jadallah F, Windsor J. Blunt abdominal trauma: Comparison of ultrasonography and computed tomography in a district general hospital. *Australasian Radiology*. 1999;43(4):440-3.
  11. Reich B, Zalut T, Weiner S. An international evaluation of ultrasound vs. computed tomography in the diagnosis of appendicitis. *IJEM* 2011;4(1).
  12. Mazzei M, Guerrini S, Cioffi Squitieri N, Cagini L, Macarini L, Coppolino F et al. The role of US examination in the management of acute abdomen. *Critical Ultrasound Journal*. 2013;5(Suppl 1):S6.
  13. Reiman T, Siegel M, Shackelford G. Wilms tumor in children: abdominal CT and US evaluation. *Radiology*. 1986;160(2):501-5.
  14. van Randen A, Bipat S, Zwinderman A, Ubbink D, Stoker J, Boermeester M. Acute Appendicitis: Meta-Analysis of Diagnostic Performance of CT and Graded Compression US Related to Prevalence of Disease. *Radiology*. 2008;249(1):97-106.
  15. Gupta S, Singh G, Gupta A, Singh H, Arya A, Shrotriya D et al. Pseudomyxoma peritonei: An uncommon tumor. *IJMPO*. 2010;31(2):58.
  16. Frick M, Feinberg S, Stenlund R, Gedgaudas E. Evaluation of abdominal fistulas with computed body tomography (CT). *Computerized Radiology*. 1982;6(1):17-25.
  17. Reiman T, Siegel M, Shackelford G. Wilms tumor in children: abdominal CT and US evaluation. *Radiology*. 1986;160(2):501-5.
  18. Kaiser S, Frenckner B, Jorulf H. Suspected Appendicitis in Children: US and CT— A Prospective Randomized Study. *Radiology*. 2002;223(3):633-38.
  19. Terasawa T, Blackmore C, Bent S, Kohlwes R. Systematic Review: Computed Tomography and Ultrasonography To Detect Acute Appendicitis in Adults and Adolescents. *Annals of Internal Medicine*. 2004;141(7):537.
  20. Luks F, Lemire A, St.-Vil D, Di Lorenzo M, Filiatrault D, Ouimet a. blunt abdominal trauma in children: the practical value of ultrasonography. *The Journal of Trauma: Injury, Infection, and Critical Care*. 1993;34(5):607-11
  21. Potter A, Chandrasekhar C. US and CT Evaluation of Acute Pelvic Pain of Gynecologic Origin in Nonpregnant Premenopausal Patients. *RadioGraphics*. 2008;28(6):1645-5.