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Research Article

If unnecessary computed tomography scans are performing for abdominal emergent pathologies in our radiology unit; retrospective study with comparing performed abdominal computed tomography scans with previous safer tests like ultrasound

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ABSTRACT

Background: Abdominal computed tomography (CT) is an imaging method that uses X-rays and may be done to look for cause of abdominal pain or swelling and fever, hernia, masses, ınfections, injury. Besides advantages, CT use ionizing radiation, which has the potential to cause cancer. So CT may still be done if the benefits greatly outweigh the risks and it is important to minimize unnecessary CT scans. While a CT scan may provide information, it is sometimes unlikely to change the treatment. This is exactly the type of scan that may be doing a patient more harm than good. So we wonder how we are performing nontraumatic emergent abdominal CT scans in our own radiology unit, if applications are more effective and least harmful.
Methods: In random 232 patients were selected from 1188 nontraumatic emergent abdominal CT scans in the last one year. Findings and previous ultrasonographies were compared and if CT scans brought additional information were examined.
Results: In 5 patients ileus, in 2 patients perforation, in 2 patients appendicitis and in 3 patients ureteral calculi were detected on CT that have not been detected on sonography. In 52 patients pathologies were detected on both ultrasound (US) and CT. 168 patients had not had any pathology. All these findings have been thought that only in 12 patients CT examinations were effective (3 for diagnosing and 9 for verifying secondary findings).
Conclusions: Doctors should consider whether some scans are doing more harm than good because CT scans may cause a large number of new cancers every year.

Keywords: Abdominal CT, Abdominal US, Emergent pathologies, Cancer

INTRODUCTION

An abdominal CT scan is an imaging method that uses X-rays to create cross-sectional pictures of the abdominal area.[1]An abdominal CT scan makes detailed pictures of the structures inside your abdomen very quickly. This test may be used to look for cause of abdominal pain or swelling, hernia, cause of a fever, masses and tumors, ınfections or injury, kidney stones and appendicitis. The abdominal CT scan may show problems with the gallbladder, liver, or pancreas, including acute cholecystitis, alcoholic liver disease, cholelithiasis, pancreatic abscess, pancreatitis and sclerosing cholangitis. The abdominal CT scan may reveal the following kidney problems; acute bilateral obstructive uropathy, acute unilateral obstructive uropathy, chronic bilateral obstructive uropathy, chronic unilateral obstructive uropathy, complicated UTI (pyelonephritis), kidney stones, kidney swelling (hydronephrosis), kidney or ureter damage, polycystic kidney disease and ureterocele. Abnormal results may also be due to abdominal aortic aneurysm, abscesses, appendicitis,

bowel wall thickening, retroperitoneal fibrosis, renal artery stenosis and renal vein thrombosis.

CT, or computed tomography, scans take X-rays from various angles and combine them to create cross-sectional images, and they involve much more radiation than traditional x-ray techniques.[1] Concern about potential harm from the scans has grown as their use has climbed steeply; researchers estimate that a third of the scans are unnecessary or could be replaced by safer tests like ultrasound or magnetic resonance imaging, which do not use radiation.

So we wonder how we are performing abdominal CT scans for nontraumatic emergent reasons in our own radiology unit, if applications are more effective and least harmful.

METHODS

The study was designed as a retrospective investigation. In random 232 patient (130 male, 102 female) were selected from 1188 abdominal CT scans (681 male, 506 female) that taken for nontraumatic emergent reasons in the last one year. 16 channel multislice CT scanner was used. Abdominal CT findings and previous ultrasonographies were compared and if CT scans brought additional information were examined.

RESULTS

Abdominal pain, vomiting, abdominal distension were the most common clinical symptoms. In the study group minimum age was 1 years and biggest one 100. In the study 97 patients were under 30 years of age, 76 patients were between 30 and 50 years and, 59 patients were over 50 years old. The average age was measured 43 in female patients and 39 in male patients.

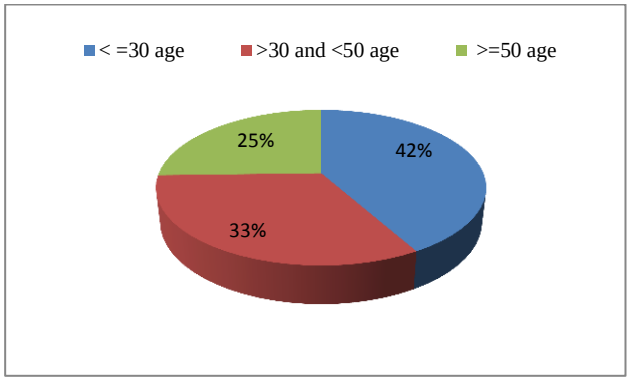

Figure 1: Age distribution of randomly selected patients.

In 10 patient's gallbladder, in 4 patients pancreatic and in 13 patients nephritic emergent pathologies were detected. In 5 patient ileus was detected. Appendicitis was detected in 17 patients. Strangulated umbilical hernia was detected in 8 patients. Perforation was detected in 2 patients. In 2 patient's tubo ovarian abscess and in 2 patients ovarian cyst ruptures were detected. In 1 patient rectus sheath hematoma was detected. 168 patients were normal on CT examination.

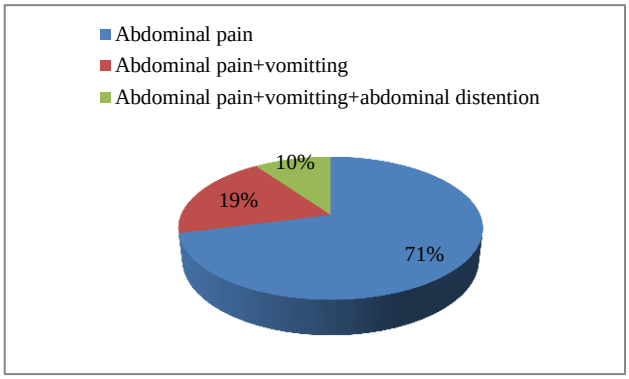

Figure 2: Distribution of the predominant clinical manifestations on randomly selected patients.

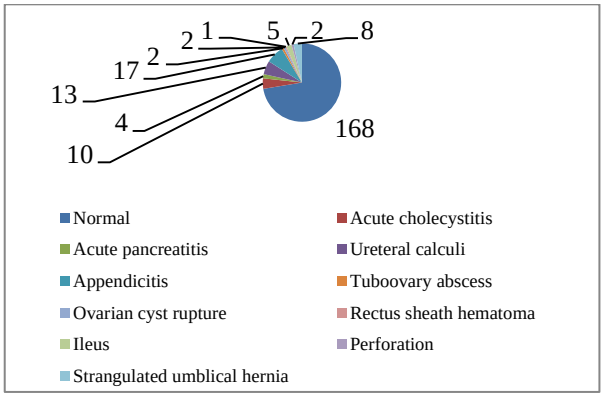

Figure 3: Distribution of abdominal emergent pathologies on randomly selected patients.

When compared with previous ultrasonographic findings, 10 patient gallbladder pathologies were detected on ultrasound which was detected on CT images. 11 distal ureteral calculi were detected on ultrasound which was detected on CT images. 2 ureteric stones in middle section were not seen on ultrasound that was detected on CT images but this situation was thought with secondary findings on ultrasound. In 14 patient's appendicitis were detected on ultrasound which was detected on CT images, in 3 patient's appendicitis were not seen on previous ultrasound. In 5 patients ileus was verified on CT images, on ultrasound dilatation of intestinal segments were seen on these patients. Perforation was suspected in 2 patients with secondary findings on ultrasound. Strangulated umbilical hernia was detected in 8 patients on both ultrasound and CT exams. In 2 patient's tubo ovarian abscess and in 2 patients ovarian cyst rupture were detected on transvaginal ultrasound and MR imaging might be preferred instead of CT. In 1 patient rectus sheath hematoma was detected on previous ultrasound. All these findings have been thought that CT

was really necessary only in 12 patients (3 for diagnosing and 9 for verifying secondary findings on ultrasound).

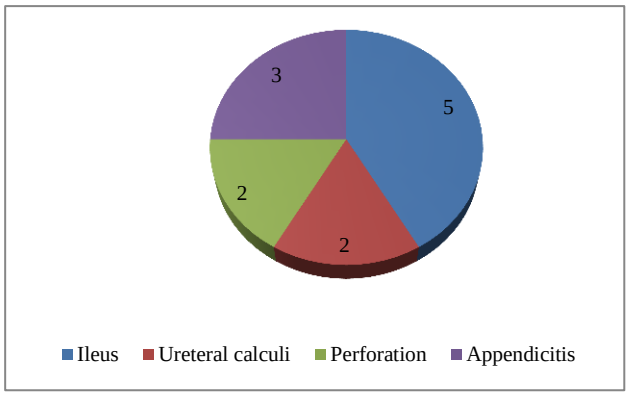

Figure 4: Distribution of emergent pathologies which detected on CT images that have not been detected ultrasonography on randomly selected patients.

DISCUSSION

The advent of computed tomography (CT) has revolutionized diagnostic radiology. Since the inception of CT in the 1970s, its use has increased rapidly. By its nature, CT involves larger radiation doses than the more common, conventional X-ray imaging procedures. There is direct evidence from epidemiologic studies that the organ doses corresponding to a common CT study (two or three scans, resulting in a dose in the range of 30 to 90 mSv) result in an increased risk of cancer. The evidence is reasonably convincing for adults and very convincing for children.[1]

Over the past three decades, computed tomography (CT) has proven to be central in imaging evaluation.[2] Multidetector technology continues to drive practice patterns by combining fast scanning with high quality data sets. This has resulted in new applications as well as improved use in traditional applications. CT is increasingly being used to replace conventional x-ray studies.[3] There has been an increasing frequency of relatively high-dose procedures including computed tomographic (CT) scanning.[4]

Risks of CT scans include allergy to contrast agent and exposure to radiation. CT scans expose you to more radiation than regular X-rays. Many X-rays or CT scans over time may increase your risk for cancer. While a CT scan may provide information, it is sometimes unlikely to change the treatment. This is exactly the type of scan that may be doing a patient more harm than good. Doctor must evaluate about this risk and the benefit of the test for getting a correct diagnosis of medical problem. So a CT scan may still be done if the benefits greatly outweigh risks and it is important to minimize unnecessary CT scans.

David Brenner, director of the center for radiological research at the Columbia University College of physicians and surgeons, said that young people were often given CT scans to diagnose kidney stones, appendicitis and dental problems, and that some of those scans could have been avoided by using other methods, like ultrasound or conventional X-rays.

The sharp increase in the use of CT scans did not surprise the authors of the report, who said advances in the technology had resulted in improved image quality that can greatly aid diagnosis. But the scans expose patients to high levels of ionizing radiation that can cause cancer in later years.

An estimated 70 million CT (for computed tomography) scans are performed in the United States every year, up from three million in the early 1980s, and as many as 14,000 people may die every year of radiation-induced cancers as a result, researchers estimate.

Familiarity with measures of CT radiation and the actual doses delivered by CT are important issues as they provide a basis for understanding the potential cancer risks from CT radiation. Moreover, these justify development of strategies to minimize radiation dose. Strategies include obtaining only necessary CT examinations and adjusting the examinations based on scan indication, region examined, and patient size. These strategies must also be combined with efforts by manufacturers in development and implementation of technology aimed at radiation dose management, as well as efforts in research, education, and CT standards and regulation.[2]

To determine which radiologic imaging procedures are optimal in a given situation, it is useful to have best estimates of the lifetime risks potentially associated with the radiation exposures. The potential public health importance of radiation exposures of the population from CT examinations, which are being performed with increasing frequency, is being recognized, and direct epidemiologic studies of their risks are now beginning.[5]

Cancer is a stochastic effect of radiation, meaning that the probability of occurrence increases with effective radiation dose. Unlike chemical or physical triggers for cancer, penetrating radiation hits molecules within cells randomly. Molecules broken by radiation can become highly reactive free radicals that cause further chemical damage. Some of this direct and indirect damage will eventually impact chromosomes and epigenetic factors that control the expression of genes. Cellular mechanisms will repair some of this damage, but some repairs will be incorrect and some chromosome abnormalities will turn out to be irreversible. Major damage normally results in the cell dying or being unable to reproduce. This effect is responsible for acute radiation syndrome, but these heavily damaged cells cannot become cancerous. Lighter damage may leave a stable, partly functional cell that may be capable of proliferating and eventually developing into cancer, especially if tumor suppressor

genes are damaged.[6] A latent period of decades may elapse between radiation exposure and the detection of cancer.

Radiation can cause cancer in most parts of the body, in all animals, and at any age, although radiation-induced solid tumors usually take 10-15 years, and can take up to 40 years, to become clinically manifest. Radiation-induced leukemia's typically require 2-10 years to appear.[6] Some people, such as those with nevoid basal cell carcinoma syndrome or retinoblastoma, are more susceptible than average to developing cancer from radiation exposure.[6] Children and adolescents are twice as likely to develop radiation-induced leukemia as adults; radiation exposure before birth has ten times the effect.

In industrialized countries, medical imaging contributes almost as much radiation dose to the public as natural background radiation. Collective dose from medical imaging grew mostly due to growing use of 3D scans that impart much more dose per procedure than traditional radiographs.

It has been estimated that CT scans performed in the US in 2007 alone will result in 29,000 new cancer cases in future years.[7] This estimate is criticized by the American college of radiology (ACR), which maintains that the life expectancy of CT scanned patients is not that of the general population and that the model of calculating cancer is based on total-body radiation exposure and thus faulty.[8]

CONCLUSION

Doctors and patients should consider whether some scans are doing more harm than good because CT scans may cause a large number of new cancers every year. Physicians must take this into account in deciding when a CT scan will be taken.

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