

**EFFICACY OF NON CONTRAST COMPUTED TOMOGRAPHY OF  
THE ABDOMINOPELVIC REGION FOR EVALUATING NONTRAUMATIC ACUTE  
ABDOMINAL EMERGENCIES****Dr. Betül Tiryaki Baştuğ\***

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**ABSTRACT**

Contrast-enhanced abdominal CT is an imaging method that uses x-rays which has the potential to cause cancer. And also risk of contrast-enhanced CT include: Allergy to contrast agent and Contrast-Induced Nephropathy. So we wonder if there is any benefit of contrast material for image quality for abdominopelvic emergent applications in our radiology unit. The study was designed as a retrospective investigation. In random 100 patient were selected from 1188 abdominal CT scans that taken for nontraumatic emergent reasons. On 32 patient contrast agent was used. In this group in 1 patient cholecystitis, in 1 patient pyelonephritis, in 1 patient appendicitis, in 1 patient strangulated umbilical hernia and in 1 patient ovarian cyst rupture were detected. In 3 patient ileus were detected. There weren't any pathology on 24 patient. When previous ultrasonographies and radiographies were evaluated then we saw that these pathologies could be diagnosed on non-contrast CT images with the help of previous applications. All these findings have been thought that only in 1 patient contrast agent usage was effective. Non contrast CT of the abdomen and pelvis is likely a reliable diagnostic modality for the evaluation of acute nontraumatic abdominal pain in the emergency department. Radiologists and other physicians must be aware of the risk factors for reactions to contrast media. So contrast-enhanced CT may still be done if the benefits greatly outweigh the risks and it is important to minimize contrast material usage.

**KEYWORDS:** Abdominal CT, Emergent pathologies, Contrast agent efficacy.**INTRODUCTION**

Contrast-enhanced abdominal CT is an imaging method that uses x-rays which has the potential to cause cancer. And also risk of contrast-enhanced CT include: Allergy to contrast agent and Contrast-Induced Nephropathy. So contrast-enhanced CT may still be done if the benefits greatly outweigh the risks and it is important to minimize contrast material usage. So we wonder if there is any benefit of contrast material for image quality for abdominopelvic emergent applications in our radiology unit.

**MATERIALS AND METHODS**

The study was designed as a retrospective investigation. In random 100 patient (49 male, 51 female) were selected from 1188 abdominal CT scans that taken for nontraumatic emergent reasons. Imaging was performed by using Toshiba Alexion multi-detector row CT scanner capable of acquiring 16 sections per gantry rotation. A detector configuration of  $16 \times 0.625$  mm and a pitch of 1.75 was used. Gantry rotation time was 0.5 second. A tube voltage of 140 kVp and a tube current between 100 and 380 mA were used, depending on the

size of the patient. The reconstruction section and interval thickness was 5 mm. All image data were sent electronically to a picture archiving and communication system workstation for interpretation. The contrast medium used in all patients was used with an iodine concentration of 350 mg/mL. Each patient received 0.70 g iodine per kilogram (1.78 mL/kg) at an injection rate of  $0.058 \text{ (mL} \cdot \text{sec}^{-1})/\text{kg}$ . The volume and rate of contrast material administration were based proportionately on a 70-kg adult receiving 45 g iodine intravenously at 0.9 g/sec. The injection duration was calculated to be approximately 30–31 seconds. The postcontrast images were evaluated from data acquired during the portal venous phase of liver enhancement. The scan delay for all patients was determined by using automated triggering hardware and dedicated software.

**RESULTS**

Group was divided into two parts according to contrast agent usage. On 32 patient contrast agent was used. In this group in 1 patient cholecystitis, in 1 patient pyelonephritis, in 1 patient appendicitis, in 1 patient strangulated umbilical hernia and in 1 patient ovarian cyst rupture were detected. In 3 patient ileus were detected.

There weren't any pathology on 24 patient. When previous ultrasonographies and radiographies were evaluated then we saw that appendicitis, cholecystitis, ileus, strangulated hernia and ovarian cyst rupture could be diagnosed on non contrast CT scans with the help of ultrasonographies and radiographies. To determine the width of disease, complications and to distinguish from renal masses, pyelonephritis may require contrast. All these findings have been thought that only in 1 patient contrast agent usage was effective.

## DISCUSSION

Since their introduction in the 1950s, organic radiographic iodinated contrast media (ICM) have been among the most commonly prescribed drugs in the history of modern medicine. Adverse effects from the intravascular administration of ICM are generally mild and self-limited; reactions that occur from the extravascular use of ICM are rare.<sup>[1]</sup> Nonetheless, severe or life-threatening reactions can occur with either route of administration.<sup>[2]</sup> Radiologists and other physicians must be aware of the risk factors for reactions to contrast media, use strategies to minimize adverse events, and be prepared to promptly recognize and manage any reactions to the contrast media.<sup>[3]</sup> The data suggested that at least 50% of hypersensitivity reactions to contrast media are caused by an immunologic mechanism. Skin testing appears to be a useful tool for diagnosis of contrast medium allergy and may play an important role in selection of a safe product in previous reactors.<sup>[4]</sup>

Adverse reactions to ICM are classified as idiosyncratic and nonidiosyncratic.<sup>[5]</sup> Idiosyncratic reactions typically begin within 20 minutes of the ICM injection, independent of the dose that is administered. A severe idiosyncratic reaction can occur after an injection of less than 1 mL of a contrast agent. Mild symptoms include the following: scattered urticaria, which is the most commonly reported adverse reaction; pruritus; rhinorrhea; nausea, brief retching, and/or vomiting; diaphoresis; coughing; and dizziness. Moderate symptoms include the following: persistent vomiting; diffuse urticaria; headache; facial edema; laryngeal edema; mild bronchospasm or dyspnea; palpitations, tachycardia, or bradycardia; hypertension; and abdominal cramps. Severe symptoms include the following: life-threatening arrhythmias, hypotension, overt bronchospasm, laryngeal edema, pulmonary edema, seizures, syncope and death. Nonidiosyncratic reactions include the following: bradycardia, hypotension, and vasovagal reactions; neuropathy; cardiovascular reactions; extravasation; and delayed reactions. Other nonidiosyncratic reactions include sensations of warmth, a metallic taste in the mouth, and nausea and vomiting.

Contrast-induced nephropathy (CIN) is defined as the impairment of renal function and is measured as either a 25% increase in serum creatinine (SCr) from baseline or 0.5 mg/dL (44  $\mu$ mol/L) increase in absolute value, within

48-72 hours of intravenous contrast administration. For renal insufficiency (RI) to be attributable to contrast administration, it should be acute, usually within 2-3 days, although it has been suggested that RI up to 7 days post-contrast administration be considered CIN; it should also not be attributable to any other identifiable cause of renal failure. Following contrast exposure, SCr levels peak between 2 and 5 days and usually return to normal in 14 days.<sup>[6]</sup>

CIN is the third leading cause of hospital-acquired acute kidney injury. It is associated with a significantly higher risk of in-hospital and 1-year mortality, even in patients who do not need dialysis. The number varies depending on the definition used for CIN; the contrast agent characteristics, including the type, amount, duration, and route of administration; preexisting risk factors; and length of follow-up (including the day of measurement of postcontrast serum creatinine).

In patients without risk factors, the incidence may be as low as 2%. With the introduction of risk factors, like diabetes, the number rises to 9%, with incidences being as high as 90% in diabetics with CKD. Therefore, the number and the type of preexisting risk factors directly influence the incidence of renal insufficiency. It is also procedure dependant, with 14.5% overall in patients undergoing coronary interventions compared to 1.6-2.3% for diagnostic intervention, as reported in literature.<sup>[7]</sup> The incidence of CIN in patients older than age 60 years has been variously reported as 8-16%.

Contrast media (CM) act on distinct anatomic sites within the kidney and exert adverse effects via multiple mechanisms. They cause a direct cytotoxic effect on the renal proximal tubular cells, enhance cellular damage by reactive oxygen species, and increase resistance to renal blood flow. They also exacerbate renal vasoconstriction, particularly in the deeper portions of the outer medulla. This is especially important in patients with chronic kidney disease, because their preexisting abnormal vascular pathobiology is made worse by the effects of CM.<sup>[8,9]</sup>

Agents are classified as high, low, or iso-osmolar, depending on their osmolality in relation to blood. Low-osmolality contrast media is actually a misnomer, since these agents have osmolalities of 600-900 mOsm/kg and so are 2-3 times more hyperosmolar than blood. High-osmolality contrast media are 5-7 times more hyperosmolar than blood, with osmolalities greater than 1500 mOsm/kg. Molecular structure of CM refers to the number of benzene rings. Most CM that were developed in the 1990s are dimers with 2 benzene rings. Dimeric CM, while nonionic and with low osmolality, have high viscosity, which may influence renal tubular blood flow. The ratio of iodine to dissolved particles describes an important relationship between opacification and osmototoxicity of the contrast agent. The higher ratios are more desirable.

Many physicians who refer patients for contrast procedures are not fully informed about the risk of CIN. A survey found that less than half of referring physicians were aware of potential risk factors.

The reported incidence of CIN might be an underestimation. SCr levels normally rise by day 3 of contrast administration. Most patients do not remain hospitalized for so long and there is no specific protocol to order outpatient SCr levels 3-5 days after the procedure.

Patients with risk factors for CIN should be educated about the necessity of follow-up care with their physicians with a postprocedure SCr estimation, especially if the initial procedure was done on an outpatient basis.

### CONCLUSION

Non contrast CT of the abdomen and pelvis is likely a reliable diagnostic modality for the evaluation of acute nontraumatic abdominal pain in the emergency department. Radiologists and other physicians must be aware of the risk factors for reactions to contrast media. So contrast-enhanced CT may still be done if the benefits greatly outweigh the risks and it is important to minimize contrast material usage.

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