Persistent Nephrogram Sign on Performing Computed Tomography: A Case Report

Ahmet Aslan1,2, Sevde Nur Emir2, Fatma Kulali2, Fatih Karagüzel2, Yaşar Bükte2

Abstract

A persistent nephrogram sign is described as the prolonged renal cortical retention of iodine-based contrast media and striking parenchymal enhancement in the kidneys on performing unenhanced computed tomography. It can be seen after the administration of iodine-based contrast media in patients with contrast-induced nephropathy or renal insufficiency. This case report aimed to describe the persistent nephrogram sign and inform clinicians about contrast-induced nephropathy in light of the current medical literature.

Keywords: Iodine-based contrast medium, computed tomography, kidney, nephrogram sign, acute kidney failure.

Introduction

At present, computed tomography (CT) is commonly used for diagnosis and treatment. In particular, contrast-enhanced CT is important for evaluating the characterization and localization of existent pathologies and their relationship with other anatomic structures and for revealing damages to solid organs and veins in trauma cases. However, contrast-induced nephropathy (CIN), which develops at higher rates in patients with acute renal failure (ARF), severely affects patient’s quality of life (1). Renal functions should be in the normal range for contrast media to be used, or nephron-protective measures should be taken for patients with renal dysfunction.

Here, we present the case of a patient who showed a persistent nephrogram after undergoing intravenous (IV) contrast-enhanced CT along with the review of the relevant literature.

Case Report

An 82-year-old male patient was admitted to the emergency department with chief complaints of sudden-onset difficulty in breathing and severe chest pain. His physical examination revealed that his respiratory sounds were rough, and there were crepitant rales in the basal parts of both his lungs during auscultation. Because of the prediagnosis of aortic dissection or pulmonary embolism, IV contrast-enhanced thoracic CT angiography was planned for the patient. His serum creatinine levels were within the normal reference range (1.07 mg/dL). No finding in favor of dissection was observed in the aorta and main vascular structures in the CT angiography. There was no filling defect consistent with thrombus in the pulmonary trunk and its main branches. Peribronchial thickening was observed in the basal parts of the lungs. The patient was hospitalized with a prediagnosis of pneumonia, and IV antibiotic therapy was initiated.

The following day, because the patient developed sudden-onset abdominal pain and diarrhea, laboratory analyses were performed, and serum creatinine levels were found to be higher than the normal reference range (3.25 mg/dL). No finding in favor of dissection was observed in the aorta and main vascular structures in the CT angiography. There was no filling defect consistent with thrombus in the pulmonary trunk and its main branches. Peribronchial thickening was observed in the basal parts of the lungs. The patient was hospitalized with a prediagnosis of pneumonia, and IV antibiotic therapy was initiated.

The presence of mesenteric ischemia could not be assessed because contrast media were not used. Both kidney parenchyma were hyperdense, and there was hypodensity from the cortices to the hilus. Moreover, contrast media due to excretion were observed in small quantities in both pelvocalyceal systems. These observations in the kidneys were considered to indicate a persistent nephrogram owing to contrast media accumulation (Figure 1a, b). The patient’s medical history revealed that he previously had cerebrovascular and coronary artery diseases. He was treated for CIN and ARF at the Department of Nephrology.
Verbal informed consent was obtained from the patient for presenting this case.

Discussion

CIN is a clinical picture in which renal dysfunction occurs within 3 days following the administration of IV iodine-based contrast media, without any other cause (serum creatinine level increase of >25% or 44 mmol/L) (1). CIN is considered to be the third most common cause of hospital-acquired ARF after operation and hypotension (2). The pathophysiology of CIN is still unclear. However, renal medullary ischemia associated with renal vasoconstriction is considered to induce the development of this condition. There are patient- and contrast media-related risk factors for the development of CIN. Known renal failure and diabetes mellitus (DM) are the most important risk factors of CIN (3). In addition, congestive heart failure, myocardial infarction, hypotension, anemia, and advanced age are other risk factors. The risk factors related to contrast media include intra-arterial injection, use of more than one contrast media in recent days, and use of high-dose and high-osmolality contrast media (1-4).

The most important and most predictable risk factor for the development of CIN is renal failure. According to the international guidelines for the use of contrast media, before the use of iodine-based contrast media, the renal function should be evaluated in patients aged >60 years and with a history of dialysis, renal transplant, single kidney, renal cancer and surgery, hypertension or DM requiring medical treatment, and metformin usage (4). In addition, the osmolality of contrast materials was demonstrated to be associated with CIN (5). New watersoluble, non-ionic, and low-osmolality contrast agents (iohexol, iopamiro, etc.) have been developed for preventing the development of CIN. In our case, increased serum creatinine levels and the indication of a persistent nephrogram in CT despite the use of non-ionic low-osmolality contrast media suggests the relationship of this condition with age and existing disease of the patient.

In the literature, prolonged renal cortical retention of contrast media has been considered to indicate a persistent nephrogram. Although its mechanism is not exactly known, it has been hypothesized that contrast media are accumulated in the proximal tubular cells with vacuolation (6). According to another study, contrast media become persistent depending on the decrease in the tubular transit rate.

For the prevention of CIN, the clinical course of the patient should be well-analyzed, and clinicians and radiologists should consult each other for the cessation of nephrotoxic agents. Moreover, it is important to avoid contrast-enhanced examinations as far as possible, consider alternative diagnostic methods, determine high-risk patients and take protective measures for them before and after the procedure in obligatory cases, and select low-osmolality contrast media and use them as little as possible (2, 3, 7).

Conclusion

Iodine-based IV contrast media should be carefully used particularly in patients aged >60 years even if they have a normal renal function. Sufficient hydration should be ensured before and after the examination, and patients should be followed up with regard to the development of CIN.

Informed Consent: Verbal informed consent was obtained from patient who participated in this study.

Peer-review: Externally peer-reviewed.


Acknowledgements: The authors thank to Abdülbaki Ağacıkiran and Aslıhan Semiz Oysu.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

2. Gleeson TG, Bulugahapitiya S. Contrast-induced nephropathy. AJR Am J Roentgenol 2004; 183: 1673-89. [CrossRef]


