

ORIGINAL REPORT

Factors affecting the incidence of contrast-induced nephropathy in patients undergoing computed tomography[☆]



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KEYWORDS

Contrast-induced nephropathy;
Acute kidney injury;
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Abstract

Objective: To analyze the incidence of contrast-induced nephropathy in a cohort of patients undergoing computed tomography (CT) with intravenous iodinated contrast material. To evaluate the efficacy of N-acetylcysteine in preventing contrast-induced nephropathy.

Patients and methods: This prospective observational study was carried out in the months comprising March 2016 through July 2016. We selected the first five patients scheduled to undergo CT examination each day who agreed to participate and signed the informed consent form. We recorded patients' cardiovascular histories, chronic treatments, and indications for the CT examination. We measured blood levels of creatinine and urea before and after the CT examination. We used the Modification of Diet in Renal Disease (MDRD-4) equation to estimate the glomerular filtration rate. We analyzed the type and dose of contrast material. We recorded whether N-acetylcysteine was administered before the CT examination. We used SPSS 15.0[®] to compare means and proportions. Statistical significance was set at $p < 0.05$.

Results: No incidents of contrast-induced nephropathy were detected in any of the 202 patients included [mean age, 63.92 ± 12 years (range 22–87); 57.4% male; 21.8% diabetic; 39.6% hypertensive; 87.1% had $\text{MDRD4} \geq 60 \text{ ml/min/1.73 m}^2$ (89.45 ± 14 , range 62.36–134.14) and 12.9% had $\text{MDRD4} < 60 \text{ ml/min/1.73 m}^2$ (45.38 ± 11 , range 9.16–58.90)]. The most common indication for CT examinations was oncologic (81.2%). The only contrast agent administered was iopamidol;

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the mean dose was 107.83 ± 11 ml (range 70–140). The mean interval between pre-CT and post-CT laboratory tests was 4.06 ± 1 days. Only 13 patients received N-acetylcysteine; 9 of these had $\text{MDRD} < 60 \text{ ml/min/1.73 m}^2$ and 4 had $\text{MDRD} \geq 60 \text{ ml/min/1.73 m}^2$ ($p = 0.000$).

Conclusions: The incidence of contrast-induced nephropathy was not significant in patients with glomerular filtration rates greater than $30 \text{ ml/min/1.73 m}^2$: these favorable results might be due to analyzing only scheduled examinations and to using relatively low doses of a “nonionic” iodinated contrast agent.

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PALABRAS CLAVE

Nefropatía por contraste;
Insuficiencia renal aguda;
Tomografía computarizada

Incidencia de nefropatía por contraste en pacientes sometidos a tomografía computarizada: ¿qué factores la condicionan?

Resumen

Objetivo: Analizar la incidencia de nefropatía por contraste en una cohorte de pacientes sometidos a tomografía computarizada (TC) con contraste yodado intravenoso. Valorar los resultados de la nefroprotección con N-acetilcisteína.

Pacientes y métodos: Estudio observacional prospectivo, entre los meses de marzo y julio de 2016. Los pacientes seleccionados tenían programada una TC. Se incluyeron los primeros 5 pacientes de cada día, que aceptaban participar y firmaban el consentimiento informado. Se registraron antecedentes cardiovasculares, tratamientos crónicos e indicación de la TC. Se determinó la creatinina y la urea en sangre pre-TC y pos-TC. El filtrado glomerular se determinó por MDRD-4 (*Modification of Diet in Renal Disease*). Respecto al contraste, se analizó tipo y dosis. Se registró el uso de N-acetilcisteína anterior a la TC. Estadística: SPSS 15.0[®] utilizando comparación de medias y proporciones. Significación: $p < 0,05$.

Resultados: No se detectó ninguna NC en 202 pacientes estudiados. Datos globales: edad: $63,92 \pm 12$ años (rango 22-87); 57,4% varones; 21,8% diabéticos; 39,6% hipertensos; 176 pacientes tenían $\text{MDRD} \geq 60 \text{ ml/min/1,73 m}^2$ ($89,45 \pm 14$, rango 62,36-134,14) y 26 $\text{MDRD} < 60 \text{ ml/min/1,73 m}^2$ ($45,38 \pm 11$, rango 9,16-58,90). La principal indicación de TC fue oncológica (81,2%). El único contraste administrado fue iopamidol, en dosis de $107,83 \pm 11$ ml (rango 70-140). El intervalo de días entre analíticas fue de $4,06 \pm 1$ días. Solo en 13 pacientes se administró N-acetilcisteína: en 9 con $\text{MDRD} < 60 \text{ ml/min/1,73 m}^2$ y en 4 con $\text{MDRD} > 60 \text{ ml/min/1,73 m}^2$ ($p = 0,000$).

Conclusiones: La incidencia de NC es no significativa en la cohorte estudiada con un filtrado glomerular superior a $30 \text{ ml/min/1,73 m}^2$: la realización de TC de forma “programada”, utilizando un contraste yodado “no iónico” en dosis relativamente baja, es un factor que quizás explique estos resultados favorables.

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Introduction

Contrast-induced nephropathy (CIN) is defined as an acute decline of the renal function in a short period of time (2–7 days) after the administration of radiological contrast agents.¹ It is characterized by an absolute increase of serum creatinine with respect to its basal value of at least 0.5 mg/dl, or by a relative increase of 25%.^{2,3} Its estimated incidence has been established between 0.6% and 2.3% in the general population, and in up to 40% in high-risk patients (with prior renal decline and diabetics).⁴ However, during the last few years there has been controversy on the existence of CIN in patients with normal renal function; and even in patients with renal failure, the risk of CIN is probably lower than we traditionally thought.¹ In a recent prospective study conducted

by Moos et al. this is the case after studying nearly 1000 patients with an average age of 60 years old; the glomerular filtration rate (GFR) of 88.8% of these patients was $\geq 60 \text{ ml/min/1.73 m}^2$, and only 58 of them were at risk of developing CIN, that only occurred in 2 patients, which leads us to think that the incidence of CIN is low, even in patients who do not receive prophylactic hydration.⁵ Another retrospective study that included 193 patients with serum creatinine levels $>1.2 \text{ mg/dl}$ questioned the role of IV contrast and the overestimation of CIN.⁶

Our goal was to analyze the incidence of CIN in a cohort of outpatients who were scheduled to one computed tomography (CT) scan with IV iodinated contrast and assess the results of nephroprotection with N-acetylcysteine.

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