

# Epidemiology and risk factors

## Definition and Diagnosis of patients with contrast-induced nephropathy

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Although there is no universally accepted definition, contrast-induced nephropathy refers to the development of acute renal impairment following the intravascular administration of radiocontrast in the absence of other identifiable causes of renal failure. Most studies have used a 25% elevation in serum creatinine (SCr) or an absolute increase of 0.5 mg/dL 2 to 7 days following contrast administration. Most patients are nonoliguric. As an example, in a prospective study that compared nonionic and ionic contrast agents, among approximately 40 patients who developed contrast nephropathy, none were oliguric. Thus injury is usually manifested only by an increase in the serum creatinine.

### Epidemiology

The reported incidence of radiocontrast-induced nephropathy varies widely depending on the presence or absence of risk factors, (primary chronic kidney disease), the amount and type of agent administered and the exact radiologic procedure. According to virtually all reports, among patients who have no risk factors, the risk of contrast nephropathy is negligible (ie,  $\leq 1$  percent). Among high risk patients (especially those with diabetes and CKD), the reported risk following percutaneous angiography with or without intervention is 10 to 20 percent].

### Pathophysiology

Studies show evidence of acute tubular necrosis (ATN) but the mechanism by which ATN occurs is not well understood. The two major theories are that ATN is caused by renal vasoconstriction resulting in medullary hypoxia, possibly mediated by alterations in nitric oxide, endothelin and/or adenosine, and that ATN is a direct result of the cytotoxic effects of the contrast agents.

### Patients at risk

The most commonly identified risk factors for contrast-induced nephropathy are listed in the following list. Most have been identified through retrospective analysis of databases cataloging coronary angiographic

procedures. Unfortunately, periprocedural hydration and an accurate assessment of comorbidity have rarely been captured in these data sources, so estimates of the risk attributable to individual factors are unreliable. **Patient Related:** Chronic kidney disease, Diabetes mellitus Urgent/elective procedure, Intra-aortic balloon pump, Congestive heart failure, Age, Hypertension, Low hematocrit, Hypotension, Left ventricular ejection fraction <40%. **Not Patient Related:** Contrast properties, High osmolar contrast, Ionic contrast, Contrast viscosity, Contrast volume, Patients.

## Conclusion

Contrast nephropathy is a generally reversible type of acute kidney injury that occurs soon after the administration of radiocontrast media. The reported incidence of contrast-induced nephropathy varies widely, largely depending upon the presence or absence of risk factors, primarily including underlying chronic kidney disease. The risk is very small among patients with baseline normal renal function, even among diabetic patients. The risk increases with the severity of underlying renal dysfunction, especially among diabetic patients. The risk is also higher among patients with heart failure or hemodynamic instability. The risk increases as the volume of contrast agent increases but there is no “safe” dose below which acute kidney injury does not occur. The risk varies with various types of contrast agents, particularly hyperosmolal ionic contrast agents.