CONTRAST-INDUCED ACUTE RENAL FAILURE

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INTRODUCTION AND INCIDENCE

Acute renal failure (ARF) can occur after radiologic procedures involving administration of contrast agents for angiography, intravenous urography (IVU), oral cholecystography, cholangiography and computerized tomography (CAT). However, the true incidence of this untoward effect is unknown. Large retrospective reviews, indicate that the incidence of contrast induced acute renal failure in the general population is low, being probably, greater for angiography (0.53%) than for IVU or CAT (0.15%) (1). In some series, the incidence of ARF after angiographic studies was as high as 13% (2-3). The greater incidence of renal complications following angiography may be the result of higher intrarenal concentration of contrast agent or of cholesterol embolization. These retrospective analysis, however, tend to underestimate the true incidence of this complication, since they include only the more serious cases requiring further medical attention but not the majority of cases with only mild and transitory rise in serum creatinine.

There are, unfortunately, only few prospective studies addressing this issue. In these studies the criteria usually used to determine renal failure is a rise in serum creatinine greater than 1 mg/dl or doubling of serum creatinine. These studies indicate that the prevalence of contrast induced renal failure may vary in relation to type of procedure (i.e., angiography vs IVU and/or presence of risk factors. In these prospective studies and in the absence of well identified risk factors, the incidence of contrast induced ARF is approximately 0.6% after IVU and 2% after angiography (1).

The incidence of this complication appears to be increasing. This is partially due to increased physician awareness of this complication and partially to the ever increasing use of radiological procedures with contrast agents even in patients with definite risk factors for contrast induced ARF.

RISK FACTORS

The prevalence of contrast induced ARF varies in relationship with the presence of risk factors (See Table I). Some of these factors are presently well recognized as definite predisposing conditions for ARF. Among those are, preexisting renal insufficiency, volume depletion, diabetes mellitus, multiple myeloma, hypoxia and previous radiocontrast induced ARF.
There is, however, a multitude of other factors which have been occasionally found to be present in concomitance with the onset of contrast induced acute renal failure and that are, therefore, considered as possible risk factors.

**TABLE 1**

**RADIOCONTRAST-INDUCED ACUTE RENAL FAILURE RISK FACTORS**

**Definite Risk Factors**

1. Pre-existing Renal Failure
2. Volume Depletion
3. Diabetes Mellitus
4. Multiple Myeloma
5. Hypoxia
6. Previous Radiocontrast Induced ARF

**Possible Risk Factors**

1. Arteriosclerotic Vascular Disease
2. Congestive Heart Failure
3. Concomitant Administration of Other Nephrotoxic Agents
4. NSAID
5. Advanced Age
6. Contrast Load
7. Ionic Composition and Osmolality of Contrast Agent
8. Cardiovascular Instability
9. Impaired Liver Function
10. Hypercalcemia
11. Vasculitis
12. Proteinuria
13. Uricosuria

**Pre-existing Renal Failure**

Pre-existing renal failure is undoubtedly the major risk factor for contrast induced ARF. Most of the retrospective surveys of this complication support this notion. More than 90% of the cases reported in the literature involve patients with previously impaired renal function. In the last few years a few prospective studies have addressed this problem and they have clearly demonstrated that there is a significant correlation between the incidence of contrast induced ARF and the degree of pre-existing renal failure. This incidence is of 1-2% in patients with mild renal insufficiency (serum creatinine < 1.5 mg/dl) (4-10); it is approximately 20% in patients with moderate renal failure (serum creatinine between 1.5 and 4.5) (4,11) and it increases to 63% in patients with serum creatinine than 4.5 mg/dl, (Fig 1) (4,11-2).