

Last reviewed by Department Renal Medicine December 2010

PREVENTION OF CONTRAST NEPHROPATHY

Definition

A rise in serum creatinine of $\geq 50 \mu\text{mol/L}$ after intravenous or intra-arterial contrast.

This small rise in creatinine does not usually lead to permanent renal sequelae but is associated with increased in-hospital morbidity & mortality. Bigger rises in creatinine may accelerate the need for dialysis.

Assessing the Risk

Low e GFR $>60 \text{ ml/min}$.

Medium (10% risk) eGFR 25-60 ml/min-

40% risk if

- decline in renal function is progressive before contrast
- volume depletion
- multiple contrast studies
- heart failure
- diabetes,
- myeloma.

High (50% risk) eGFR 15-25 ml/min

Estimating the GFR

The estimated GFR (eGFR) is usually available on the computer pathology results

If not, calculate the GFR using the Cockcroft Gault Formula:

$$\text{Creatinine Clearance} = [(140 - \text{age}) \times \text{weight (kg)}] / [\text{Serum creatinine (umol/l)} \times 0.814]$$

(Multiply answer x 0.85 for females)

Clinical Features

Renal failure is predominantly non-oliguric.

Dialysis is rarely required ($<1\%$) except in High-risk group.

Permanent small loss of renal function is not uncommon.

Acute renal failure with and without the requirement for dialysis increases in-hospital and later mortality, hence the significance of this disorder.

Prevention for medium and high risk (not required for low risk)

1. Check with the radiologist whether intravenous or intra-arterial contrast is mandatory
2. Use **non-ionic iso-osmolar contrast (Iodixanol)** – aim for use of <70mls in total.
 - Ask whether CO₂ angiography can be used instead
 - Avoid Gadolinium for MRI if eGFR <30ml/min to avoid nephropathy and/or nephrogenic systemic sclerosis
3. ***When procedure is planned:***
 - Normal saline @ 1ml/kg/hr for 6 hours before contrast, during contrast and for at least 6 hours after the procedureAND
 - N-Acetylcysteine (NAC) 600mg (3ml in 200ml orange juice or other flavoured drink) bd orally the day before and the day of the procedure. ***Only these 4 doses are necessary***
4. ***If procedure is urgent or patient is 'nil by mouth':***
 - Intravenous normal saline
 - @ 3ml/kg/hr for 1 hour **pre-procedure**
 - then 1ml/kg/hr **during procedure** and
 - 1ml/kg/hr for 6 hours **post-procedure** (maximum fluid rate 300ml/hr pre contrast and 100ml/hr post contrast).

Notes:

- I. Oral hydration with water alone is inadequate to prevent contrast nephropathy
 - II. There is currently considerable uncertainty about the relative merits of saline vs. bicarbonate intravenously with some believing these to be equivalent, others favouring superiority of bicarbonate.
 - III. There is also debate over the merits of NAC; in general, data favour use of oral N-acetylcysteine but this may sometimes be unavailable in our pharmacy. In such cases just use normal saline as above. Data on the routine use of ivi N-acetylcysteine are inconclusive and as such the simpler regimens recommended above are employed routinely.
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5. Cease non-steroidal anti-inflammatory drugs before contrast.

6. Cease metformin at least 12hrs, preferably 48hrs, before procedure to avoid lactic acidosis & restart once it is clear that baseline renal function has not altered.
7. *If patient is fluid overloaded do not use intravenous saline; use oral NAC as above:*
8. Strategies which probably do not work include Theophylline, Atrial Natriuretic Peptide, Nifedipine, Captopril, Fenoldopam, Dipyridamole, Mannitol, Frusemide., ascorbic acid

Evaluation

- It is the clinician's responsibility to assess whether renal insufficiency and/or other risk factors for contrast nephropathy exist before the procedure.
- Check serum electrolytes and creatinine and eGFR pre contrast.
- Check electrolytes and creatinine within 48 hrs of contrast in medium and high-risk patients
 - If renal function has deteriorated check again by day 5 at the latest.
- Do not recommence non-steroidal anti-inflammatory drugs until creatinine has returned to pre contrast base line

Key Points

- Determine whether the patient is at risk of contrast nephropathy.
- If the procedure is planned then use intravenous saline beginning at least 1 hour and preferably 6 hrs before the procedure in most cases.
- If the patient is fluid overloaded use oral NAC as above.

Selected References

Original protocol references:

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