**PRESENTATION**

An alteration of renal function can happen in the days following the injection of Iodinated Contrast Media (ICM). This is one of the risks patients must be informed of.

ICM induced nephropathy is defined by an increase in serum creatinine by more than 42 µmoles/l and/or 25%.

Induced renal failure is rare in the absence of risk factors, but it affects about 20% of patients with risk factors. It is then a cause of over morbidity. The signs are an elevation of creatininaemia and a diminution of the clearance of creatinine in the 72 hours following the injection of ICM.

**RISK FACTORS**

Detect patients with risk factors, so as to be able to take the measures necessary to weaken the severity and the after-effects of contrast medium induced renal failure. Alternative imaging techniques which do not require the administration of ICM (ultrasonography, MRI with an injection of gadolinium chelates…) should be considered. The significant risk factors are the following:

- **Pre-existing renal failure:** it has to be taken into account when the clearance of creatinine is under 60ml/mn and/or when creatininaemia is over 105µmoles/l for men and 80µmoles/l for women.

Renal function can be measured accurately in clinical practice by calculating the rate of creatinine clearance using Cockcroft and Gault’s formula:

\[
\begin{align*}
\text{Cl}\text{creat (ml/mn)} &= 1,23 \times (140 - \text{age}) \times \text{weight}/\text{creat plasm (µmoles/l for man)} \\
\text{Cl}\text{creat (ml/mn)} &= 1,04 \times (140 - \text{age}) \times \text{weight}/\text{creat plasm (µmoles/l for woman)}
\end{align*}
\]

When creatinine clearance is under 30ml/mn and/or when creatininaemia is over 200µmoles/l, ICM should not be used except in cases of absolute necessity, and specialist advice must be sought before the examination.
- **diabetes with nephropathy**
- **renal hypoperfusion** (especially dehydration, hypotension, hypovolaemia, nephrotic syndrome, decompensated cirrhosis, precarious hemodynamics, heart failure …).

**use of nephrotoxic drugs or drugs that have an effect on renal function** (diuretic drugs, AINS, Coxib, platinum derivatives, …).

- **myeloma with proteinuria**.
- **injection of ICM in the three previous days**.
- **Age over 65 years old** makes the presence of risk factors more likely.

### PRACTICAL PROCEDURE BEFORE AND DURING THE EXAMINATION

A questionnaire designed to elicit the risk factors should be used:

- Do you suffer from diabetes?
- Do you have hypertension?
- Do you have a renal disease?
- Do you suffer from any other illness?
- Are you on medication?
- Do you have a less than three month old blood test with creatinine level?
- Age, sex, weight.

It is advised to measure the serum creatinine level (or have a less than 3 months old measurement in the absence of intercurrent events) before administering ICM if one (or several) of the risk factors is present. The measurement should be taken again within 2 or 3 days following the injection of ICM.

In the absence of such risk factors, serum creatinine measurements are not necessary.

If possible, discontinue nephrotoxic drugs; Non steroid antiinflammatory drugs must be particularly avoided when ICM are used. There should be an interval of 7 days between sessions of anticarcinogenic chemotherapy, especially if they involve platinum derivatives.

Metformin exposes to lactic acidosis by diminution of its renal clearance. Treatments with derivatives of metformin should be stopped for 48 hours following the injection of ICM. Stopping them 48 hours before the examination is not recommended anymore. The treatment should be resumed once the renal function has been checked.

There must be an interval of at least 3 days, up to 5 days if possible, between two injections of ICM, except in specific cases.
Hydration, at best with saline and bicarbonated fluids, is advised for all patients:
- orally: 2 litres of sodium and bicarbonate rich water during the 24 hours before and after contrast medium injection.
- parenterally if impossible orally: 100ml per hour of saline isotonic serum or bicarbonate isotonic serum in the 12 hours to and after the injection of ICM.

In case of severe heart failure, of decompensated cirrhosis, of nephrotic syndrome:
- diuretic drugs can be continued so as to maintain natriuresis.
- Hydration must be adapted to the cardiac function.

Low or iso-osmolality contrast media should be used in the presence of risk factors.
Regarding arteriography for diabetic patients with reduced renal function, the advantages of using an iso-osmolar ICM have been mentioned in a single study and have not been confirmed.

The benefits of administering N Acetyl Cystein in the presence of risk factors are controversial. If it is used, the patient should still be hydrated and risk factors should still be taken into account.

Using gadolinium chelates in X-ray imagery (scans…) instead of ICM is not warranted: with the same degree of opacification, their nephrotoxicity is not inferior to that of ICM, and the quality of the examination is not the same with an equivalent nephrotoxicity.

PRACTICAL CONDUCT AFTER THE EXAMINATION

For high-risk patients, the serum creatinine level will be measured 48 to 72 hours after the administration of ICM. In case of oliguria or a rise of more than 30% in creatininaemia after the injection, specialist advice must be sought.

IN CASE OF HAEMODIALYSIS OR PERITONEAL DIALYSIS

This is not a contraindication to the administration of ICM.

The injection is scheduled independently from dialysis sessions, and scheduling an extra session is unnecessary except in specific cases, in particular blood volume or cardio-vascular related issues.
SUMMARY

- Risk factors for contrast medium-induced renal failure should be systematically investigated. In their presence, the serum creatinine level will be measured before and after the injection of ICM, and the clearance will be measured with the Cockcroft formula.

For all patients
- An interval of 3 to 5 days between two injections of ICM is preferable.
- Keep the patients hydrated before and after the examination.

For the patients with one or several risk factors, or a clearance of creatinine between 30 and 60ml/mn
- Consider alternative imaging techniques.
- Keep the patients hydrated before and after the examination.
- Use low osmolality contrast agents.
- If possible, discontinue nephrotoxic drugs before the injection of ICM.

If the clearance of creatinine is under 30ml/mn
- The injection of ICM is rejected except in cases of absolute necessity.

For patients with dialysis
- In case of haemodialysis or peritoneal dialysis, the injection of ICM is scheduled independently from dialysis sessions, and no extra session is necessary except in specific cases, in particular those concerning blood volume or cardio-vascular conditions.

REFERENCES


