CONTRAST MEDIA OPTIMIZATION IN PATIENTS WITH CHRONIC KIDNEY DISEASE DURING THE TREATMENT OF CRITICAL LIMB ISCHEMIA

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CONTRAST AGENTS FOR ENDOVASCULAR USE

- Iodine.
- C02
- Gadolinium (NSF)
NEPHROGENIC SYSTEMIC FIBROSIS

• Rare syndrome that involves fibrosis of skin, joints, eyes, and internal organs

• In 2006, the link between NSF and gadolinium-containing contrast agents was made.

• FDA and European agencies considered gadolinium agent contraindicated in patients with an estimated glomerular filtration rate under 30 ml/mn.
NSF (NEPHROGENIC SYSTEMIC FIBROSIS)

✔ As a result:

- We cannot use gadolinium in IR as a radio opaque agent in patients with impaired kidney function

- We cannot use MRA with gadolinium as a non invasive test for screening / work up patient with CLI
• Iodine
• CO₂
CO$_2$ AS CONTRAST AGENT

- Classic approach for CO$_2$ use is a closed-system with a 50 cc syringe.
- Angiogdroid. Power injector can deliver a steady amount of CO$_2$ that provide better image quality.
- Angio suite capabilities: software sum up images

- Main concern: quality of the exam unpredictable
- Patient habitus dependent.
[Carboxyangiography in subhepatic venous exploration].

[Article in French]

[A new method of phlebography: carboxyangiography extended to exploration of the venous system and more precisely, to study of the supra-hepatic veins].

[Article in French]
Bendib M, Toumi M, Boudjellab A.
IODINE

- Allergy to contrast media.
- Chronic Kidney Disease.
IODINE

• CLI patients:

✓ Comorbidities:
  • Diabetes mellitus
  • Renal failure
• CIN is one of the major causes of hospital-acquired acute kidney injury and represents about 12% of the cases.

• A meta-analysis that included 40 studies, found a
  – 6% incidence of CIN after CT
  – 9% incidence of CIN after peripheral angiography
• Iodine: (How can we optimize?)

  – Volume
  – Concentration
HIGH DILUTION APPROACH

10%  20%  30%  40%  50%  100%
STRATEGIES FOR CONTRAST MEDIA SAVINGS

• First step: look for available studies

• Recent CTA (from the institution of from OSH)

• CT of the pelvis. (inflow)

• MRA is prohibited in this group of patients.
  – TOF MRA (non contrast MRA sequences)
STRATEGIES FOR CONTRAST MEDIA SAVINGS

- Information about the inflow (CTA, CT pelvis, Non contrast MRA...)

- Access (retrograde or anterograde access), ipsilateral or contralateral.

- Angiograms (selective) at the time of the interventional procedure
  - Require less volume of contrast.

✓ High dilution approach
• CLI
• Diabetes
• Hypertension
• eGFR <30
• Long procedure.
• Multiple angioplasties
  – Atherectomy
  – Balloon angioplasty
  – Drug eluting balloons
  – Control angiograms

  – Total dose of contrast media:
  ✔️ 16 cc
• 2cc contrast/6cc saline
• Injected volume 4cc
• Total amount of contrast media:
  \[ \frac{2}{8} \times 4 = 1cc \]
Ratio:
3cc contrast / 6cc saline
Volume injected: 7cc
Total volume of contrast: 2.3 cc
HIGH DILUTION APPROACH

• Close monitoring of the contrast injected.

• Use high dilution (selective angiograms).

  – Each injection:
    • We write down the concentration of the contrast and volume injected on the table
    • Based on the image quality obtained we can adjust both ratio and volume
    • Learning curve
    • Volume between 15 cc and 25 cc when treating CLI patients at Cleveland Clinic Abu Dhabi
COMBINED APPROACH

• Combined CO₂ and High dilution contrast media technique

• CO₂ : Overview, localization of the lesion

• Plan for the angioplasty/stenting.

• Switch to contrast media for accurate sizing, lesion assessment and control angiogram post angioplasty/stenting.
CONCLUSION

• Interventionists:

✓ We are responsible:

  – Contrast media administration.
  – Optimization is a requirement.
  – Simple measures have great impact on patient outcomes.