Pictorial Review of Urinary Tract Obstruction in Tc-99m MAG3 Renograms with Diuretic

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MAG3 Renogram
- Tc-99m MAG3 renograms are commonly used to assess renal outflow tract obstruction.
- The radiopharmaceutical (Tc-99m MAG3) is administered intravenously.
- Its arrival into the kidneys and excretion is monitored.
- Time activity curves provide graphical representation of renal uptake and excretion. Relative renal function can also be quantified.
- Post diuresis imaging, after administration of furosemide, can distinguish between complete obstruction, partial obstruction or dilated but non-obstructed systems.

Normal Renogram: 3 Phases
1. Flow Phase
   - Sharp upslope—suggest reduced perfusion
2. Cortical Phase
   - Peak of the renogram (1-3 minutes)—Decreased renal function produces delayed cortical uptake
3. Clearance Phase
   - Rapid excretion (after 3 minutes)

A normal MAG3 renogram. The tracer clears from the collecting system without need for diuretic.

Case 1: Bilateral Renal Outflow Obstruction
- There is asymmetric uptake in the two kidneys, R>L.
- Causes of asymmetric, decreased uptake in one kidney, could be due to renal artery or venous thrombosis, chronic obstruction or infections.
- Both kidneys show reduced upslope of the flow phase suggestive of reduced renal perfusion.
- Delayed cortical uptake implies impaired renal function.
- Retention of activity in both kidneys in the clearance phase with no significant response to IV frusemide suggests bilateral outflow tract obstruction.
- Below, CT of the same patient shows gross right PUJ dilatation and there is also left hydroureter.

Case 2a: Obstructed Left Kidney
- The flow phase and cortical phase are normal.
- Left kidney shows retention of activity in the clearance phase which does not respond to IV furosemide.
- The left kidney is obstructed as can also be seen in the dynamic planar images.

Case 2b: Partially Obstructed Left Kidney
- The patient from Case 2a went on to have an open left pyeloplasty. A repeat MAG3 renogram demonstrates retained activity in the left kidney. However, it now responds to IV furosemide which indicates a partially obstructed system.

Case 3: Dilated But Unobstructed Left Kidney
- Normal flow and cortical phases in both kidneys.
- There is slow clearance in the left kidney which continues post furosemide in keeping with a diluted but unobstructed system.

References: