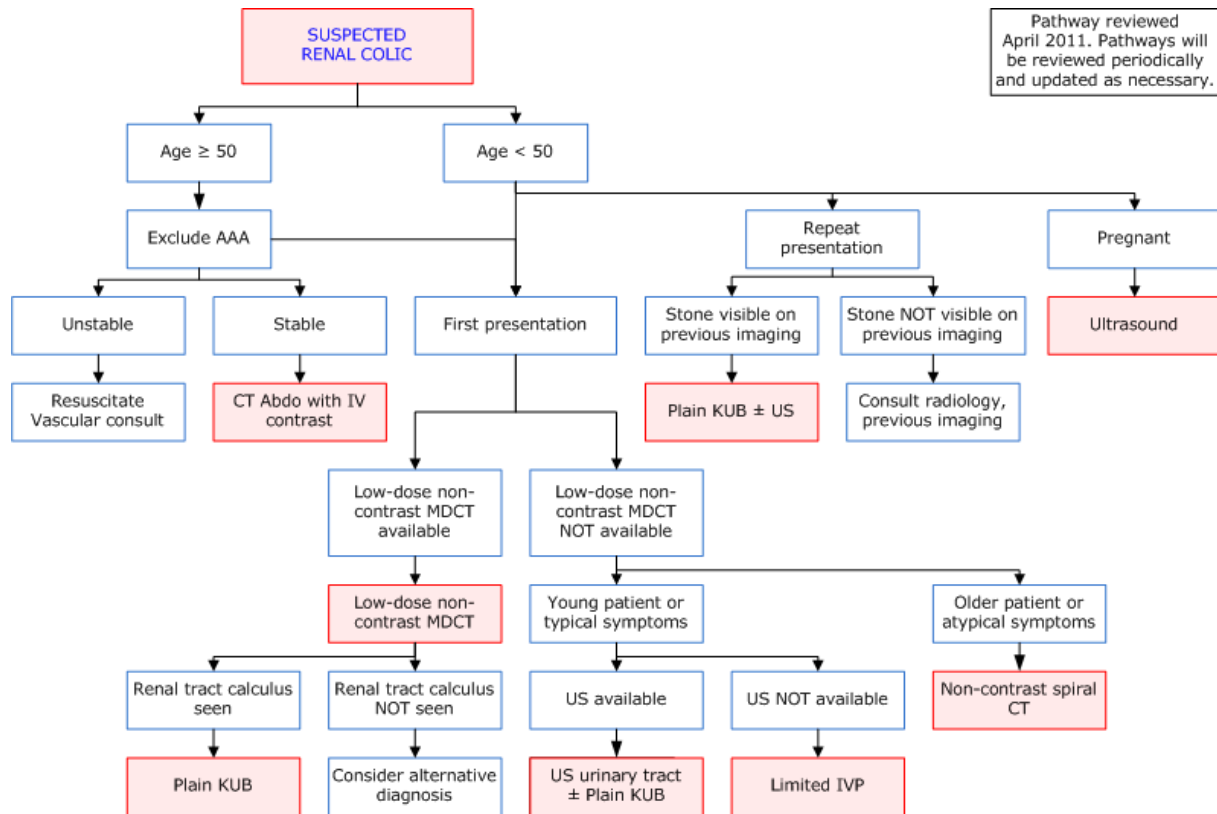




## DIAGNOSTIC IMAGING PATHWAYS

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### TEACHING POINTS

- Abdominal aortic aneurysms (AAA) are commonly misdiagnosed as renal colic. It is important to exclude AAA in older patients, particularly if they demonstrate any haemodynamic instability (including transient hypotension). [29](#)
- Non-contrast enhanced CT scan is the most accurate way of detecting calculi in the renal tract, but a standard dose protocol leads to a significantly higher radiation exposure than a limited intravenous urogram (pyelogram).
- However, an ultra-low dose CT scan gives an acceptably low radiation exposure and is of acceptable accuracy for detecting calculi or most alternative causes of pain.
- In young patients with typical symptoms of renal colic, plain x-ray and ultrasound is an acceptable initial combination.
- In pregnant patients, ultrasound is the investigation of choice.

### NON-CONTRAST COMPUTED TOMOGRAPHY

- Considered the gold standard imaging test for the investigation of renal colic.
- Radiation dose reduction is important as renal colic patients are typically young and have a high rate of recurrent presentation. CT scans can expose patients to significant amounts of radiation if "standard" protocols without dose reduction are used. [28](#)

- A number of studies have shown Non-Contrast Computed Tomography (NCCT) to be superior to Intravenous Pyelography (IVP) in the diagnosis of renal colic. [1-5](#)
- NCCT has a sensitivity of approximately 97% and specificity of 98% compared to IVP with 69% and 94% respectively. [5](#)
- The vast majority of urinary tract stones are radio-opaque on NCCT, regardless of their calcium content. Patients with HIV undergoing indinavir therapy sometimes form stones that are not radio-opaque on NCCT. [6,7](#)
- Other benefits of CT include:
  - Increased speed with comparable or lower costs than IVP. [23-25](#)
  - Avoidance of the use of contrast material and its inherent disadvantages (allergic reactions, impaired renal function and increased costs)
  - Demonstration of an alternative diagnosis for the patient's symptoms, such as appendicitis or diverticulitis in approximately 10% of cases. [8](#)
- Although NCCT is more accurate at diagnosing renal colic, it is doubtful whether it improves patient outcome. [11](#)

## NON-CONTRAST COMPUTED TOMOGRAPHY (LOW DOSE PROTOCOL)

- Recent studies using multidetector CT (MDCT) machines and "Low-Dose" protocols have shown sensitivities of 93-97% and specificities of 86-97%, when compared to standard CT and radiation doses equal to or lower than that of IVP. [10,20-22](#)
  - Two studies demonstrated no difference in detecting alternative or additional pathology between "Low-Dose" and "Standard Dose" protocols. [10,21](#)
  - One study reported radiation doses equivalent to one plain KUB film and a sensitivity of 97% and specificity of 95%. [22](#)
  - Earlier studies using "Low-Dose" MDCT protocols reported increased rates of false positive and false negative results in obese patients. [10,20](#) More recent studies have not reported similar difficulties. [21,22](#)

## LIMITED INTRAVENOUS PYELOGRAPHY

- Involves the administration of intravenous contrast medium and the taking of sequential plain radiographs to demonstrate signs of renal tract obstruction. A plain radiograph of the kidneys, ureters and bladder (KUB) and a cross kidney tomogram are often taken prior to the administration of contrast.
- Prior to the proven efficacy of non-contrast CT (NCCT), IVP was considered the imaging test of choice for the investigation of suspected renal colic.
- Has a reasonable sensitivity and specificity for the detection of stones, but is not as accurate as NCCT. [5](#)
- Disadvantages: [12](#)
  - Less sensitive and specific than NCCT [5](#)
  - Potential risk of allergy or nephrotoxicity due to use of contrast media
  - Poor visualisation of non-genitourinary conditions which may be causing the patient's symptoms (eg. appendicitis, diverticulitis etc)
  - More time consuming than NCCT
  - Similar or increased cost to NCCT due to use of contrast material and longer length of stay. [23-25](#)
- "Low-Dose" MDCT is now recommended in place of IVP for evaluating patients with renal colic.

## ULTRASOUND

- Does not involve the exposure of patients to radiation and is therefore the procedure of choice for pregnant women. [13](#)
- High specificity (90%) but low sensitivity (10-50%) for the diagnosis of ureteric stones. [4,14](#)
- Greater than 90% sensitivity and specificity for the detection of urinary tract obstruction. [15](#)
- Plain film radiography in combination with ultrasound has shown a sensitivity of 77-79% and specificity of 90-92.7% for calculus detection. Stones missed on ultrasound however, are typically small (<5mm) and pass spontaneously. [26,27](#)

## PLAIN RADIOGRAPHY OF THE KIDNEYS, URETERS AND BLADDER (KUB)

- Sensitivity of 45-59% and specificity of 64-77% for detecting ureteric calculi. [16-18](#)
- Identifies radiopaque stones which are usually calcium-containing, struvite and cystine stones. Uric acid stones however, are usually radiolucent and are unlikely to be detected.
- Plain film radiography in combination with ultrasound has shown a sensitivity of 77-79% and specificity of 90-92.7% for calculus detection. Stones missed on ultrasound however, are typically small (<5mm) and pass spontaneously. [26,27](#)
- A KUB has limited clinical utility but it may be most useful after a stone is detected on NCCT to determine if it is radiopaque. This will enable the progress of the stone to be followed using plain radiography alone. [19](#)

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