



# Diagnostic Imaging Pathways - Hypertension (Renovascular Cause)

## Population Covered By The Guidance

This pathway provides guidance on the imaging of adult patients with suspected renovascular hypertension.

**Date reviewed: January 2012**

**Date of next review: 2017/2018**

**Published: January 2012**

## Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

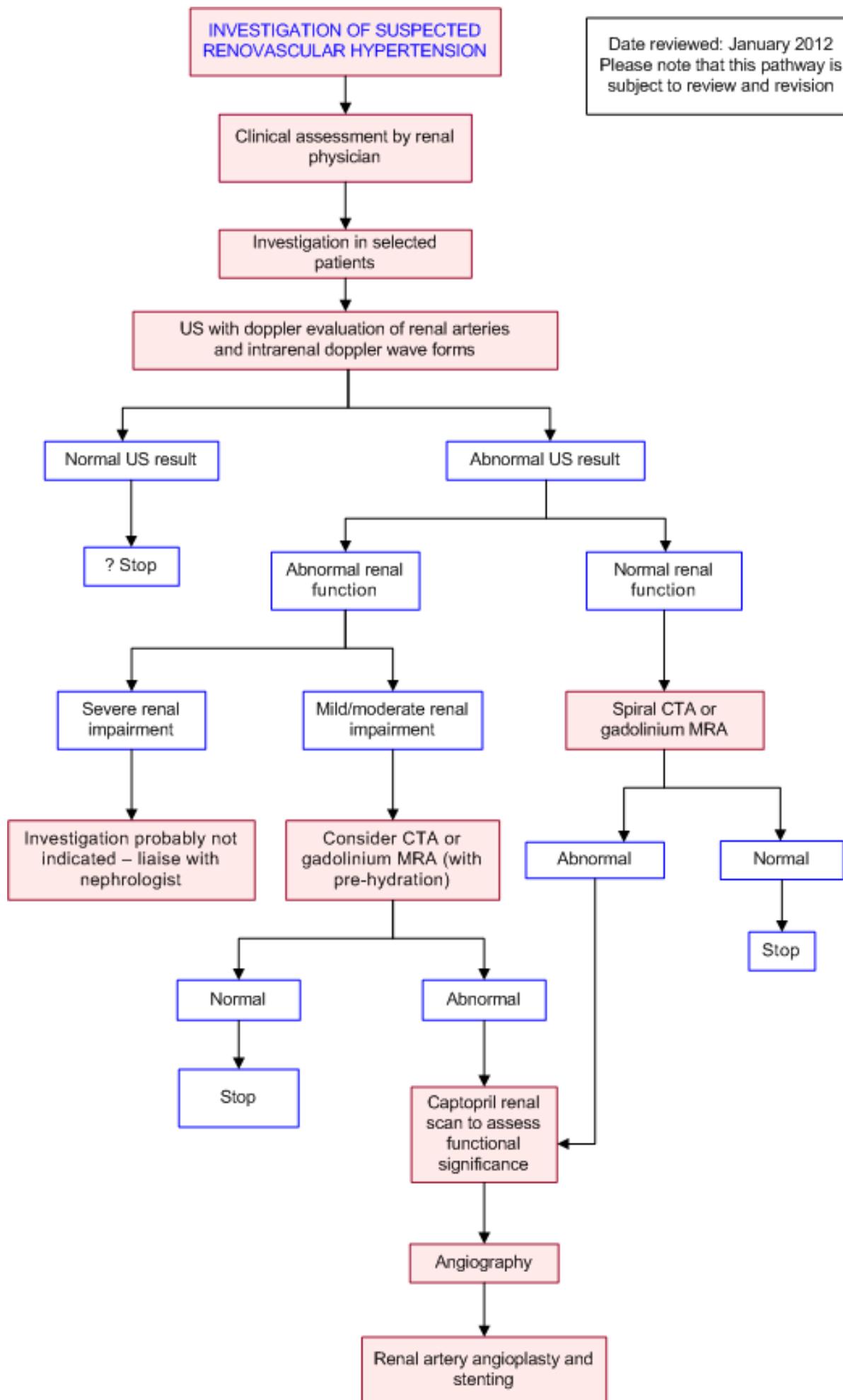
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

## Pathway Diagram



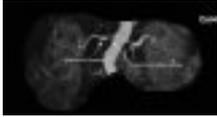
Date reviewed: January 2012  
 Please note that this pathway is subject to review and revision



## Image Gallery

*Note: These images open in a new page*

1



### Bilateral Renal Artery Stenosis

Image 1 (Magnetic Resonance Angiography): Coronal image demonstrating bilateral renal artery stenosis.

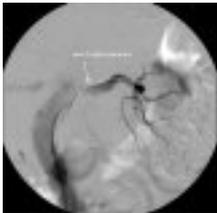
2a



### Bilateral Renal Artery Stenosis

Image 2a, 2b and 2c (Digital Subtraction Angiography): Pre- and post-stent images of bilateral renal artery stenosis.

2b



2c



## Teaching Points

- The suspicion of renovascular hypertension requires high clinical acumen
- Initial investigation is with an US of the kidneys, with Doppler interrogation of the renal arteries. The accuracy is dependant on the experience of the operator
- Further non-invasive investigation is based on the patient's renal function. MRI with Gadolinium or CT Angiography are suitable tests
- Nuclear scintigraphy with Captopril enables assessment of renal function
- Angiography is the 'Gold Standard' and permits therapeutic intervention

## Angiography

- "Gold standard" for detection of renal artery stenosis [7](#)
- Provides therapeutic opportunity
- Disadvantages: invasive with a risk of complications, expensive, requires administration of iodinated contrast material and exposure to ionising radiation

## Captopril Renal Scan

- Assesses perfusion, function, transit time and response to captopril
- Currently used to determine functional significance of detected renal artery stenosis
- Inferior to other imaging modalities as a diagnostic test for renal artery stenosis [3](#)
- Captopril renal scan assessment of renal function can predict response to therapy [15](#)
- Sensitivity of 64-93% and specificity of 71-97% for detection of renal artery stenosis when angiography used as standard of reference [3](#)
- Limitations:
  - False negative studies due to poor absorption of oral captopril [7](#)
  - False positives due to stenosis proximal or distal to the main renal artery [7](#)

## Spiral Computed Tomography Angiography (CTA)

- Alternative to gadolinium MRA
- ~95% sensitivity and specificity [3](#)
- Advantages - can identify non-renal causes of hypertension, and visualisation of both the arterial lumen and wall allows improved differentiation between truncal and ostial stenosis [7](#)
- Disadvantages - ionising radiation, failure to identify small arteries <2mm and accurately assess renal arteries beyond renal hilum [7](#)

## Further Investigations

- A recent double-blinded randomised controlled trial (ASTRAL) involving 806 patients with atherosclerotic renovascular disease has shown that endovascular revascularization plus medical therapy is no better than medical therapy alone in patients with atherosclerotic renovascular disease with respect to renal function, blood pressure, renal or cardiovascular events, or mortality. In addition, revascularization carries substantial risk like amputation of limb and death [22](#)
- This suggests that there is little/no benefit in further investigating these patients in the absence of any therapeutic consequence. However in selected cases consideration of stenting or surgery may still be appropriate. Decision in those circumstances should be made after the patient has been assessed by the renal team and/or vascular surgeon

## Gadolinium Magnetic Resonance Angiography (MRA)

**Note warning regarding gadolinium in severely impaired renal function** [Further information](#)

- Most accurate non-invasive modality for detecting renal artery stenosis (>95% sensitivity and specificity) [3,8](#)
- However due to the associated risk of nephrogenic systemic sclerosis caused by gadolinium containing contrast agents among patients with chronic kidney disease, caution should be taken while performing this investigation in patients with chronic kidney disease [20,21, 23-27](#)
- Use of cyclic agents(e.g. gadoterate, gadobutrol and gadoteridol) are more appropriate [25](#)
- Advantages [7](#)
  - Non-invasive
  - No radiation

- Combined with other MR techniques can assess the significance of stenosis
- Can differentiate between truncal and ostial stenosis
- Disadvantages
  - Risk of nephrogenic systemic sclerosis among patients with chronic kidney disease [20,21](#) and is the most important factor limiting their use
  - Not sensitive for distal artery or segmental renal artery stenosis (limited visualisation of intrarenal arteries) [7](#)

## High Clinical Probability

Consider renovascular hypertension when [14](#)

- Newly diagnosed hypertension presents with features that are atypical of essential hypertension such as young or very old patients, no family history, severely elevated blood pressure, epigastric bruit or coexisting clinical indicators of atherosclerosis (i.e. ischaemic heart disease, cerebral or peripheral vascular disease, or
- Resistant hypertension, or
- Angiotensin-converting enzyme (ACE) inhibitor or angiotensin-II- receptor antagonist therapy is associated with increasing plasma creatinine levels

## Renal Artery Angioplasty And Stenting

- A recent double-blinded randomised controlled trial (ASTRAL) involving 806 patients with atherosclerotic renovascular disease has shown that endovascular revascularization plus medical therapy is no better than medical therapy alone in patients with atherosclerotic renovascular disease with respect to renal function, blood pressure, renal or cardiovascular events, or mortality. In addition, revascularization carries substantial risk like amputation of limb and death [22](#)
- Since available data from randomized trials have not shown a benefit of revascularization over medical therapy, revascularization should be reserved for patients in whom aggressive medical therapy has failed and for patients who are participating in clinical trials [20](#)

## Ultrasound

- Best screening tool for renovascular hypertension [1,2](#)
- Ultrasound assesses renal size and morphology and Doppler gives information regarding blood flow velocities and waveform
- 63-100% sensitivity and 73-100% specificity for renal artery stenosis [3](#)
- A renal resistive index value of at least 0.8 reliably identifies patients with renal-artery stenosis in whom angioplasty or surgery will not improve renal function, blood pressure, or kidney survival [4](#)
- Patients with abnormal US or high clinical suspicion of renal artery stenosis need to be further evaluated with MRA or CTA [56](#)
- Advantages: non-invasive, relatively inexpensive, does not involve the use contrast material and no exposure to ionising radiation
- Limitations: difficult in obese patients and where breath holding and cooperation are poor [7](#)

## References

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

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## Further Reading

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