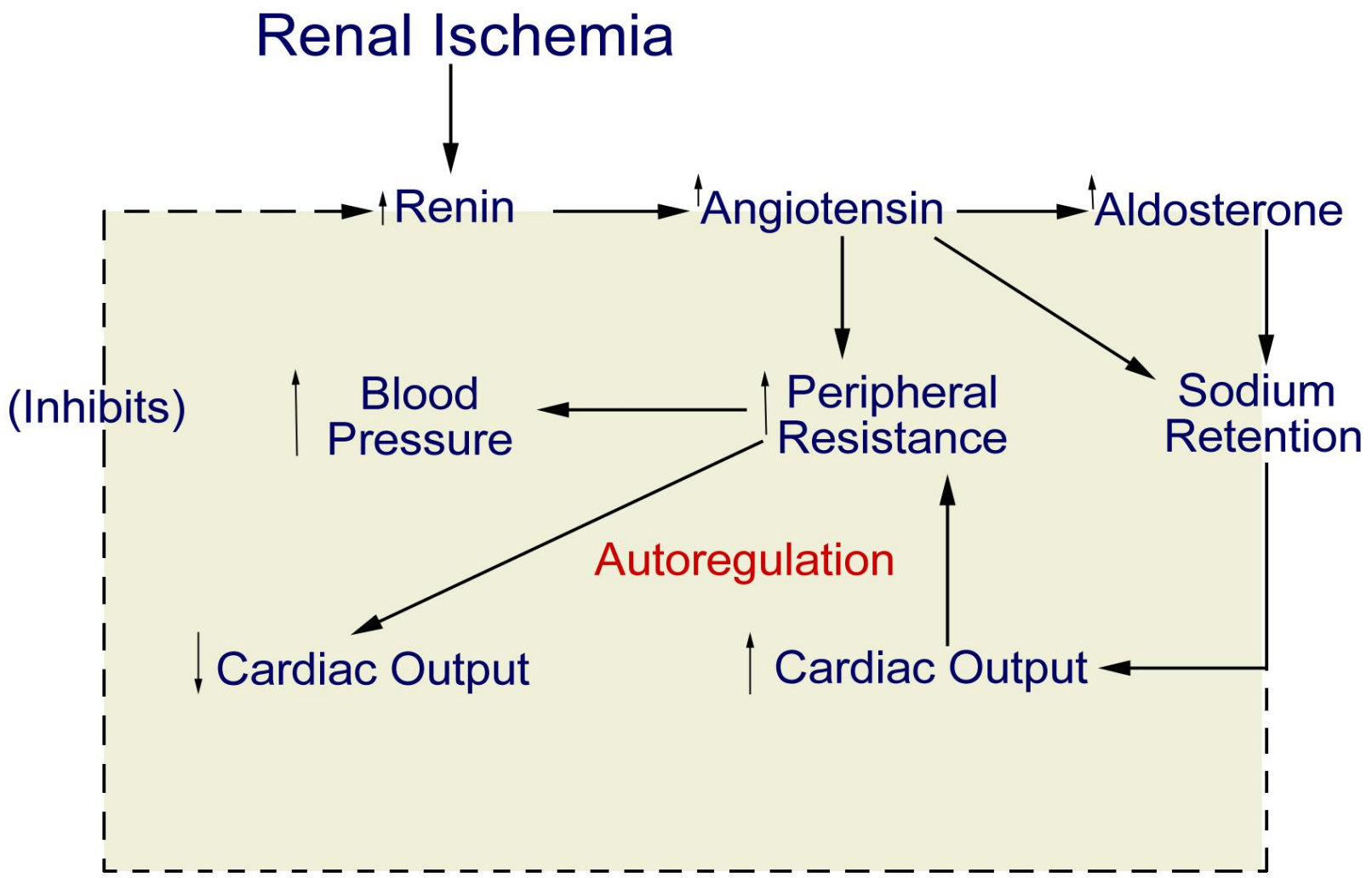
Renovascular Disease

- Disease affecting blood vessels of kidney
  → arterial narrowing → reduced renal blood flow
- Common cause of **secondary hypertension**
- Patho-physiology common to all conditions causing renal artery narrowing
- Clinical course of individual conditions is diverse

Pathophysiology



Causes

- Atherosclerotic disease (⅔)
- Fibromuscular dysplasia (⅓)

- Cholesterol embolic disease
- Acute arterial thrombosis or embolism
- Takayasu's arteritis
- Polyarteritis nodosa
- Transplant renal artery stenosis

Atherosclerotic Disease

- >60 years
- Men > Women
- Affects proximal 1/3 of main renal artery
- Important cause of ESKD
- With hypertension → increased mortality

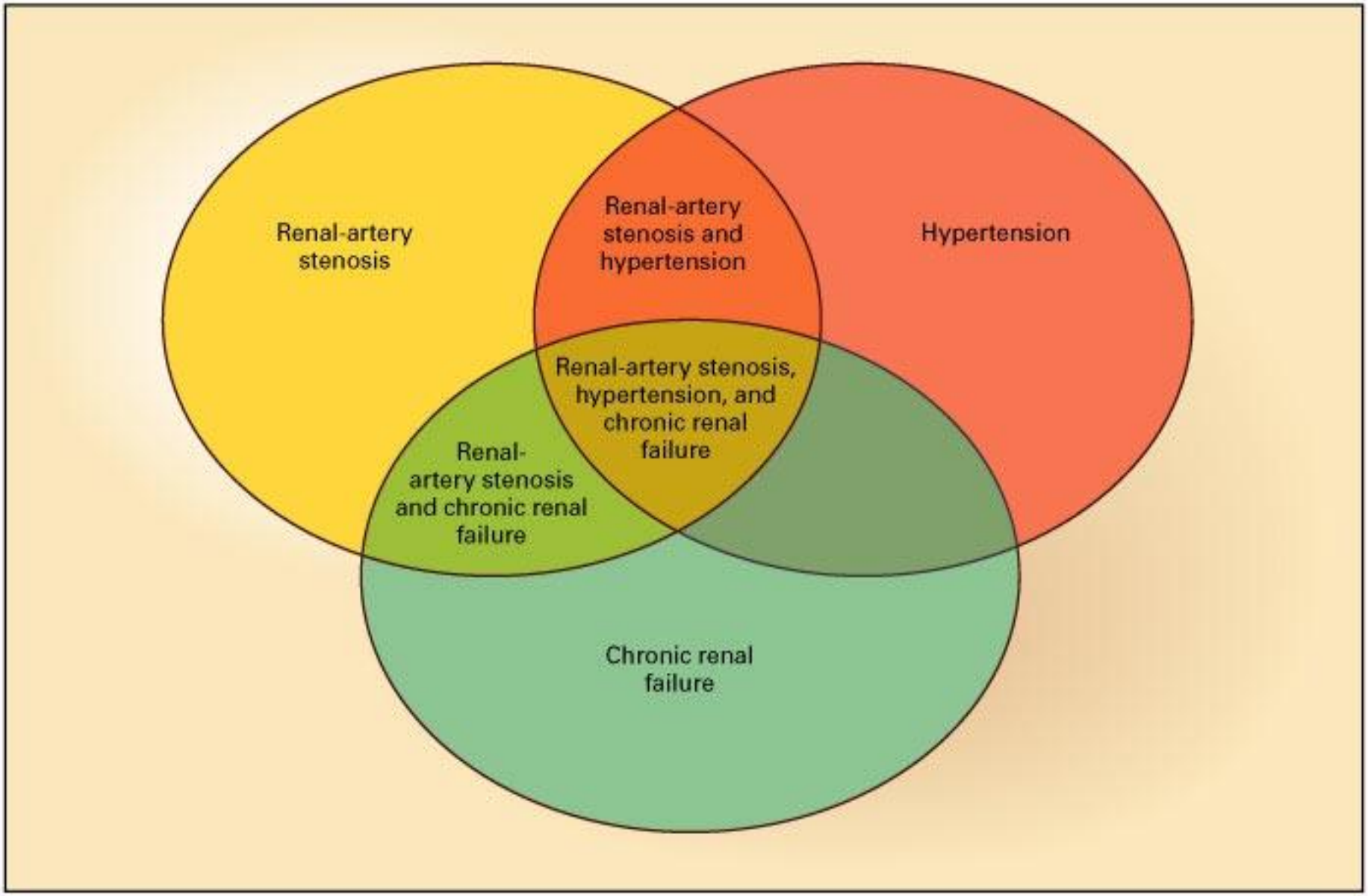
Fibromuscular Dysplasia

- < 40 yrs
- Women > Men
- Affects distal 2/3 & branches of renal arteries
- Curable cause of severe hypertension

Presentations

- Hypertension
- Chronic kidney disease
- Acute kidney injury with ACE inhibitors
- Flash pulmonary oedema
- Congestive cardiac failure
- Worsening renal function with ACE inhibitors

Interrelation among Renal-Artery Stenosis, Hypertension & Chronic Kidney Disease



History – Suspect If….

- Onset of HPT in patients <30 years without risk factors
- Abrupt onset of severe HPT
  (>160/100 in patients >55 years)
- Severe or resistant HPT despite appropriate multi-drug antihypertensive therapy
- Abrupt increase in BP in patients with previously well-controlled HPT
- No family history of HPT
- Smoking

Past Medical History

- Acute sustained rise in s.creatinine with ACE inhibition
- Unprovoked hypokalemia
  (s.potassium <3.6 mEq/L - often with metabolic alkalosis)
- Symptoms of atherosclerotic disease elsewhere
  (sp if >50 years)
- Recurrent pulmonary oedema
- Moderate-to-severe HPT with unexplained atrophic kidney or asymmetric kidneys of >1.5 cm difference on imaging

Examination

- Signs of long-standing HPT
  ie. displaced, heaving apex
- Pulmonary oedema / congestive heart failure
- Advanced hypertensive retinopathy
- Abdominal bruit (in 46%)
  also heard in 9% with essential HPT
  innocent bruits commoner in younger patients
  Systolic-diastolic bruits with HPT more suggestive
- Absent or weak peripheral pulses (PVD)
- Signs of chronic kidney disease

Hypertensive Retinopathy

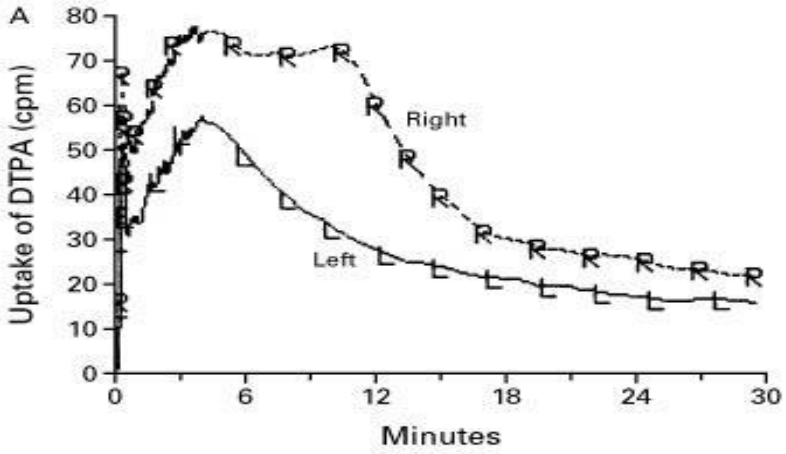
Investigations

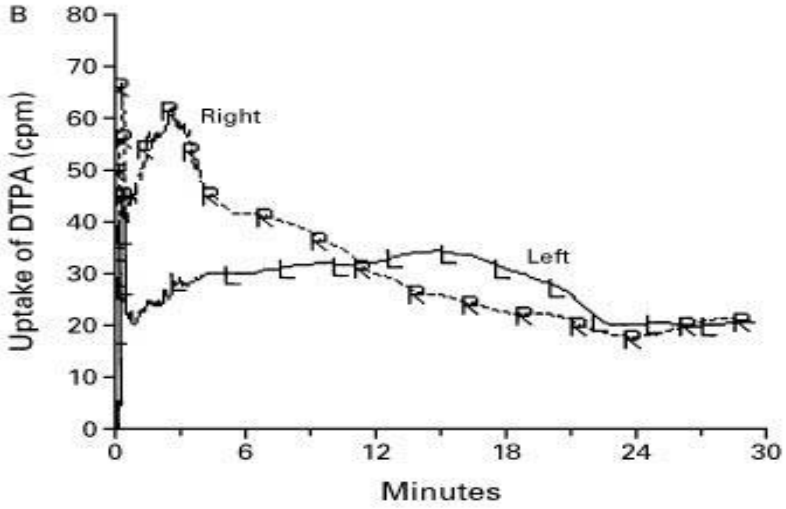
- **Investigate only those who can undergo corrective proceedures, if renovascular disease was detected**
- Plasma Renin – *increased*
- Renal vein Renin - *increased in ischaemic kidney*
- Doppler ultrasound scan - *unequal/small kidneys*
- Captopril DTPA scan - *total & differential renal function, worsening with Captopril*

Investigations

- Helical (Spiral) CT scanning - *high sensitivity & specificity*
- Magnetic resonance angiography (MRA) - *high sensitivity & specificity for atheromatous RAS*
- Renal angiography - *gold standard* - *conventional or digital subtraction studies*

DTPA Scan with Captopril - Left Fibromuscular Dysplasia





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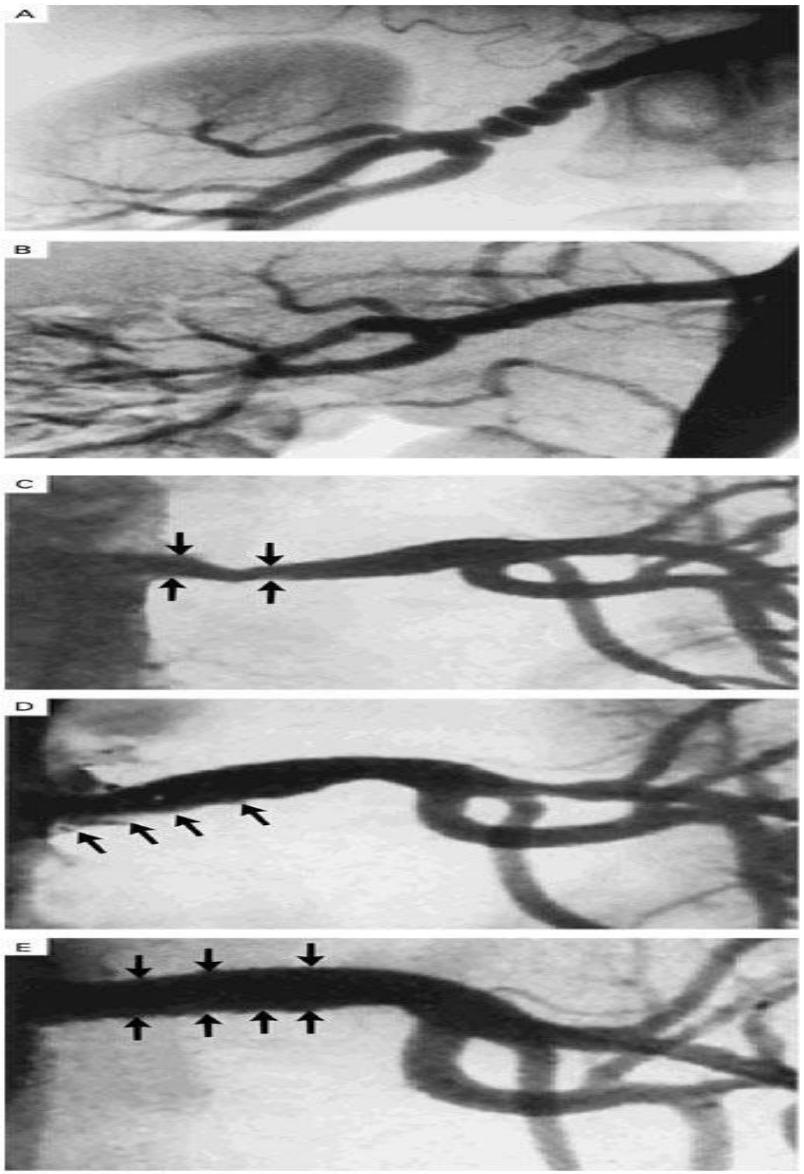
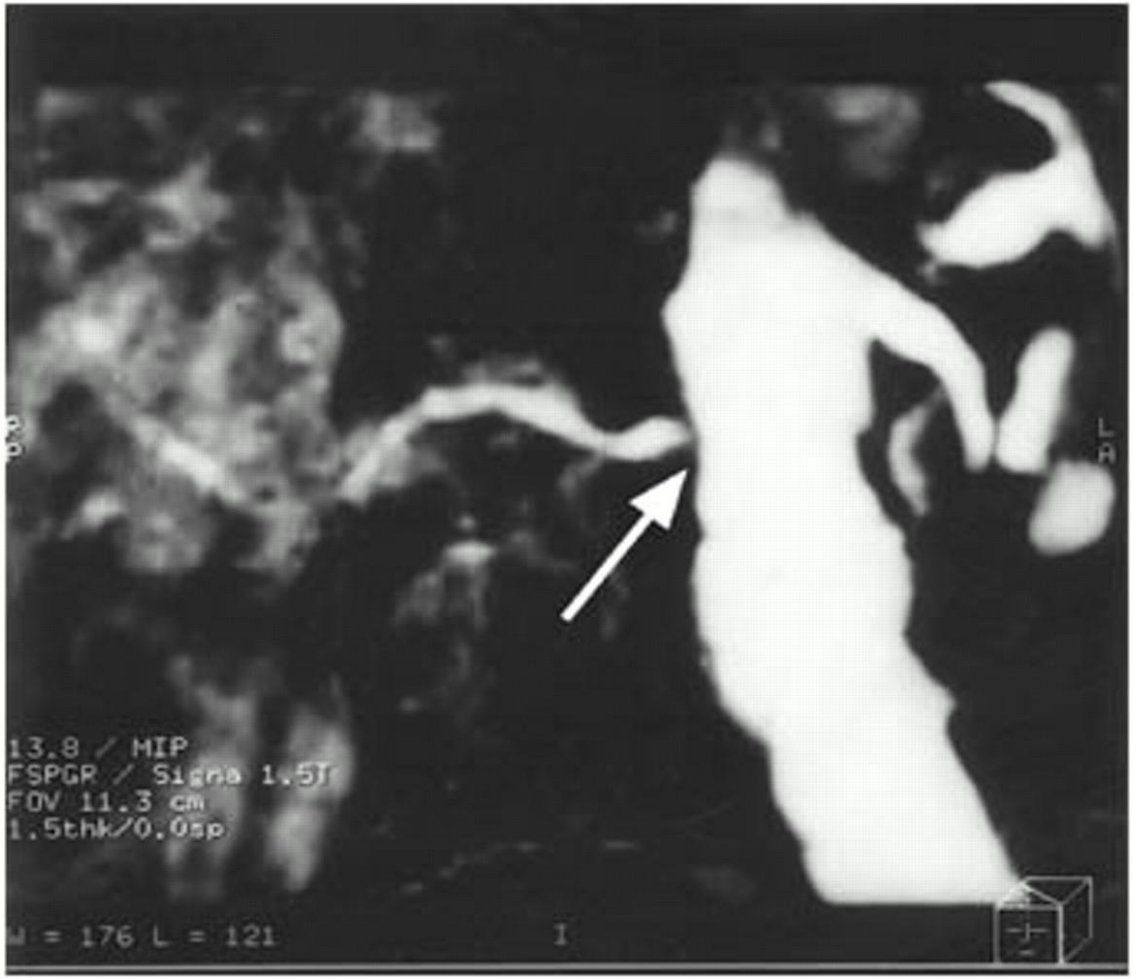
Angiographic Appearance of Renal-Artery Stenosis



MRI Angiogram of the Abdominal Aorta Showing Severe Stenosis of the Right Renal Artery at Its Origin (Arrow)



Medical Management

- Antihypertensive drug therapy
- Control other risk factors for atherosclerosis – stop smoking, statins to reduce cholesterol, aspirin
- Percutaneous transluminal renal angioplasty (PTRA) – better for sub-total occlusion, fibro-muscular, unilateral disease
- PTRA with stenting

Drug Therapy

All classes of anti-hypertensives can be used

- **ACE inhibitors & ARBs**

  most effective

  minimizes ischaemia-induced rise in angiotensin

  decreases blood flow through stenotic kidney

  If single kidney or bilateral renovascular disease → BP falls rapidly → sudden deterioration in renal function

  reverses on stopping drug

  increase in s.creatinine up to 35% above baseline acceptable

  not a reason to withhold ACEI/ARB unless hyperkalaemia develops

- Beta-blockers
- Diuretics with/without ACE inhibitors
- Calcium channel blockers

Surgical Revascularization

A) **Atherosclerotic disease**

Complication → cholesterol embolisation

Cure or improvement in 80-90%

Peri-operative mortality <5%

B) **Fibromuscular dysplasia**

Cure in 50%

Morbidity low

BUT results not significantly better than with renal angioplasty

Summary

- Renovascular disease reduces blood supply to kidneys
- Renal ischaemia activates Renin-Angiotensin-Aldosterone mechanism
- Common cause of secondary hypertension
- Older patients → atherosclerotic disease
  Younger patients → fibromuscular dysplasia

- Can present as chronic kidney disease, heart failure or acute deterioration with ACEI or ARB
- Should be suspected in some special situations with hypertension
- Angiography is the best investigation but MRA & Spiral CT also useful

- Medical management of HPT with any drug class
- Angioplasty & stenting for fibromuscular dysplasia, but best managed with optimising anti-hypertensive therapy
- Surgical revascularisation beneficial in localised atherosclerotic disease

PBL

- A 25 year old man is referred to the medical clinic by his GP for further investigation of persistently elevated blood pressure.
  - What is your differential diagnosis?
  - What further clinical features would you like to elicit in his history and on examination?
  - How would you investigate this patient?
  - What treatment is indicated initially, and in the long term?