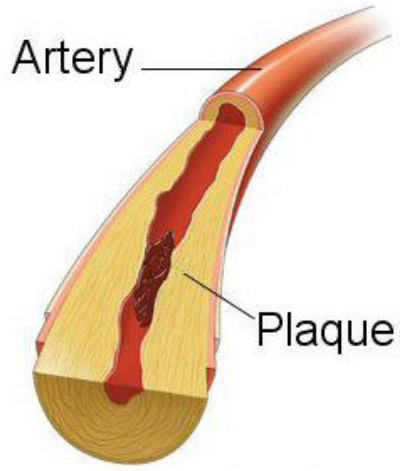
# Renal Artery Stenosis (RAS)
## Reno-Vascular Hypertension

Renal artery stenosis (RAS) is the narrowing of the artery that supplies blood to the kidney. If the narrowing is critical and the kidney does not get enough blood, hypertension (high blood pressure) can develop. This is called renal vascular hypertension (RVH). This is a common, uncommon cause of secondary hypertension. It does not usually happen until there is at least a 70% narrowing of the artery.



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Decreased blood flow through the renal artery causes the kidney to release increased amounts of a hormone. It is called renin. Renin is a strong blood pressure regulator. When it is high, it causes changes that lead to hypertension. Eventually the kidney not receiving enough blood may shrink in size and become less useful.

The high blood pressure that is produced can eventually damage and destroy the remaining kidney. This is called hypertensive nephrosclerosis. If both kidneys fail, it will lead to chronic renal failure.

### SYMPTOMS

Often high blood pressure is discovered on a routine blood pressure check. It may be the only sign that something is wrong. Other problems that may occur are:

- You may develop calf pain when walking. This is called intermittent claudication. It may be a sign of bad circulation in the legs.
- Inability to use certain blood pressure pills such as angiotensin-I (ACE-I) inhibitors or angiotensin receptor blockers (ARB's). These could cause sudden drops in blood pressure with worsening of kidney function.
- More than three antihypertensive medications may be needed for blood pressure control.
- New onset of high blood pressure if you are over 55.

### CAUSES

Most renal artery stenosis is caused by a hardening of the arteries (*atherosclerosis*). This is called Atherosclerotic Renal Artery Stenosis (AS-RAS). It is caused by a build-up of cholesterol (*plaques*) on the inner lining of the renal artery. A much less common cause is Fibromuscular Dysplasia (FMD). With it, there is an abnormality in the muscular lining of the renal artery. FMD-RAS occurs almost exclusively in women aged 30 to 40. It rarely affects African Americans or Asians.

### DIAGNOSIS

Your caregiver may find suggestions of this on exam if he finds bruits (like murmurs) on listening to your *abdomen* (belly) or the large arteries in your neck. Your caregiver may also suspect this there is a sudden worsening of your blood pressure when it has been well controlled and you are over age 60. Additional testing that may be done includes:

- One diagnostic method used for renal artery stenosis (RAS) is to measure and compare the level of renin, (blood pressure-regulating hormone released by the kidneys), in the right to the left renal veins. If the amount of renin released by one-side is markedly higher than the other, this identifies a high renin-releasing kidney consistent with RAS.
- FMD-RAS is often found on renal scan with ACE-inhibitor challenge, or ultrasound with Doppler.
- FMD responds well to angioplasty and stenting. The results of stenting in FMD are usually long lasting.

### RISK FACTORS

Most renal artery stenosis is caused by a hardening of the arteries. This is called *atherosclerosis*. Other risk

factors associated with the development of atherosclerotic RAS include the following:

- Carotid artery disease.
- Obesity.
- High blood pressure.
- Heredity.
- Old age.
- Fibromuscular dysplasia.
- Diabetes mellitus.
- Smoking.
- Hardening of the arteries.

## TREATMENT

- Renal vascular hypertension can be very severe. It can also be difficult to control.
- Medication is used to control high blood pressure (*hypertension*). Blood pressure medications that directly affect the renin angiotensin pathway can be used toe help control blood pressure. ACE inhibitors and angiotensin receptor blockers (ARB's) are often effective in patients with unilateral RAS. In some cases, patients with RAS are resistant to these medications.
- In patients with bilateral RAS, these medications must be used carefully. They may cause acute renal failure (ARF). If acute renal failure develops (if creatinine increases by more than 30%), the medication is discontinued. The patient is evaluated for bilateral RAS.
- Angioplasty and stenting may be used to improve blood flow. The goal is to improve the circulation of blood flow to the kidney and prevent the release of excess renin, which can help to decrease blood pressure. This helps to prevent atrophy of the kidney. In general, patients with AS-RAS should have stenting done. This is because plasty by itself has a high incidence of re-stenosis.
- Surgery to bypass the narrowing may be done. If the kidney with RAS has diminished in size or strength (*atrophied* ), surgical removal of the kidney may be advised. This is called *nephrectomy.*

## PROGNOSIS

Patients with fibromuscular dysplasia (FMD) RAS often have good, long-term results with angioplasty. But those with atherosclerotic RAS often have a recurrence. Even after partial or complete repair of the narrowed blood vessel, most patients still have hypertension. But they require less medication to control it.

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