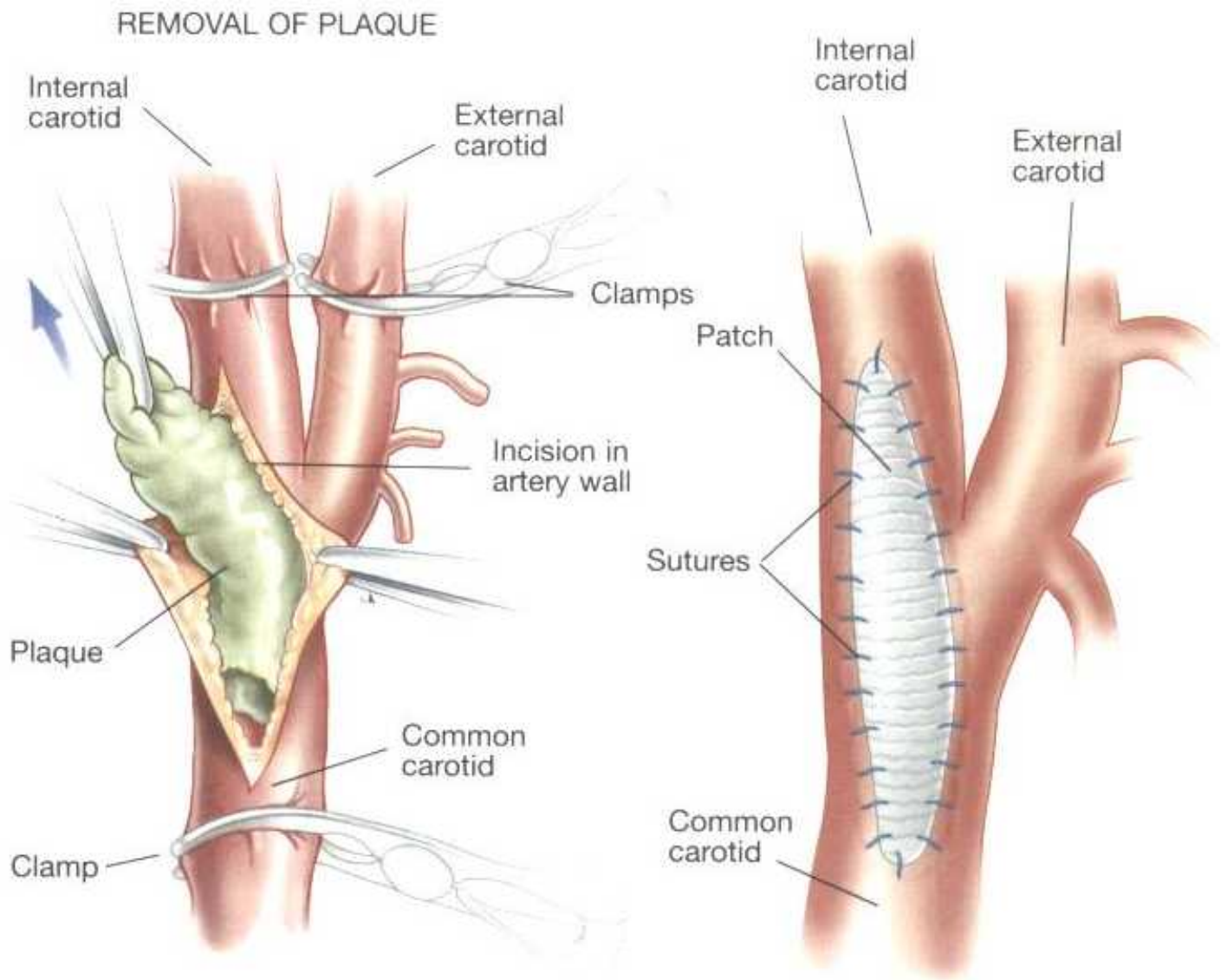


Carotid Endarterectomy for Carotid Artery Disease.



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The Disease

There are 4 main arteries taking oxygen and nutrients to the brain and related structures including the eye. The brain is very sensitive to an interruption to its blood supply, and can be permanently affected after just minutes.

The main disease of the carotid arteries is atherosclerosis causing narrowing and possible embolic **blindness or stroke**.

Carotid artery disease does not usually cause pain, rather manifests with neurological dysfunction which can last from seconds or be permanent. The main way in which a carotid artery narrowing represents a risk is by sending small particles of clot and debris (called emboli) into the brain (See Figure 1).

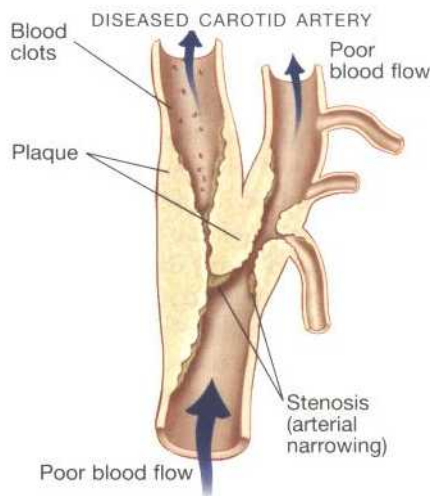


Figure 1. A diseased carotid artery sending emboli into the brain.

Symptoms and Complications

- **Asymptomatic** – many do not know they have a carotid narrowing.
- **Transient Ischaemic Attack (TIA)** - these are a 'mini-stroke'. They are a neurological dysfunction which may last for seconds to 24 hours. The neurological change may be sensory or cause weakness, can occur in the face, arms or legs and the speech.
- **Amarausis Fugax** – this is transient loss of vision in one eye, and is a TIA of the retina.
- **Blindness** in one eye.
- **Stroke (CVA)** - a permanent neurological deficit which can be devastating or fatal. Many strokes are caused by carotid disease. Greater than 50% of strokes present without other warning signs of a carotid narrowing.

Risks of Stroke

There have been several large studies which show that in patients with a carotid narrowing over 70% who have had TIA or Amarausis Fugax, the risks of a stroke with medical management is approximately 25% in 5 years.

Likewise, studies have shown that in patients with an asymptomatic carotid stenosis of >70%, the risks of a stroke is approximately 12% in 5 years without treatment of the carotid narrowing.

Investigations

There are multiple investigations used for the investigation of carotid disease. These include:-

- **Duplex scan** with an ultrasound probe. Usually very accurate.
- **Angiography** of the carotids and cerebral vessels - carries a small risk of stroke and other complications.
- **CT scan** of the brain and its arteries
- **MRI scan** of the brain

Treatment Options

- **Conservative Management** – this is important in all patients with carotid disease. This includes controlling blood pressure, reducing cholesterol and lipid levels in the blood, the use of Aspirin therapy and stopping smoking.
- **Anticoagulation** with warfarin
- **Carotid Endarterectomy** – Used in conjunction with medical management in some cases to further lower the stroke risk.
- **Carotid Bypass** - uncommon.
- **Carotid Stenting** – this is a newer technology which does not involve surgery. It is not superior to surgery and in some cases it has worse results. The long term effects are still uncertain.

The treatment depends on the location of the atherosclerosis, the degree of narrowing, the presence or absence of symptoms, the other medical conditions suffered by the patient, history of previous endarterectomy or neck surgery/radiotherapy and the patients age.



Open Surgery

The surgery aims to remove the atherosclerotic disease from the carotid artery.

Under anaesthetic, an oblique incision approximately 10cm long is made in the neck and the arteries above and below the disease are carefully exposed. The important nerves are identified and preserved. Blood thinning medication is used before the blood flow is temporarily interrupted with clamps. Often a **shunt** is inserted to allow the blood flow to continue to the brain. The atherosclerotic disease is **removed**, as is illustrated below (See figure 2). The artery is closed with fine vascular sutures. Often a **patch** of synthetic material is used to help close the artery without narrowing it. The vessels are flushed to remove any residual debris and blood flow is restored. The suture line is checked to ensure it is not bleeding before a drain is inserted and the wounds closed.

Re-do surgery can be more challenging.

The incision will lead to a numb patch of skin under the chin, which will abate over time.

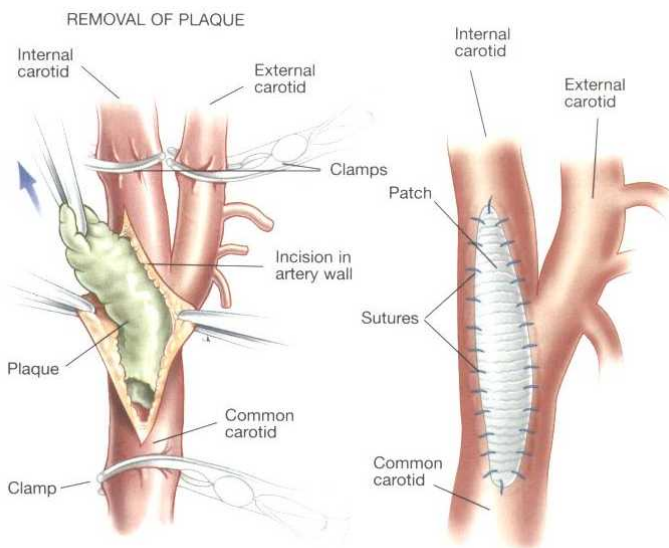


Figure 2. The Carotid Endarterectomy Surgery

Expectations

Carotid endarterectomy has been shown to **halve the risk of having a stroke** in the subsequent 5 years in both the symptomatic group and the asymptomatic group who have a stenosis greater than 70%. In the symptomatic group, the risk is reduced from 25% to 12%, and in the asymptomatic group, the risk is reduced from 12 to 6%.

Some patients with uncontrolled symptoms and a narrowing **less** than 70% can also reduce their stroke risk with surgery.

Side effects and Complications

Unfortunately, no treatment is perfect or without risk. While not exhaustive, the more common and important risks are outlined below.

General risks include-

- **Death** 0.1-2%
- **Heart Attack**
- **Blood Pressure changes.**
- **Superficial Wound Infection.**
- **Deep Venous Thrombosis** – a clot in the deep veins of the leg.
- **Pulmonary Embolus** – a clot traveling to the lung, which can occasionally be life threatening.

The specific risks include:-

- **Major Stroke** – ~1 - 8% depending on the indication/symptoms and lesion. Usually **1-2%**.
 - May require an urgent return to theatre
- **Nerve Damage** - Mostly transient and subtle. Occasionally permanent.
 - Voice changes – 8-35%
 - Swallowing (IX) – uncommon.
 - Tongue (XII) - 5-8%
 - Angle Mouth (V) - 2%
- **Bleeding** - ↑ 6%. May require urgent return to surgery.
- **Recurrence** - ~ 10% over 10 years.
- **Patch Infection** - < 1%, requiring further surgery.
- **False Aneurysm Formation** - <1%, requiring further surgery.
- **Numbness** – This is in the area under the front of the chin – it is expected. It is usually necessary to shave with an electric shaver rather than a blade for several months.

