

### Introduction

1. Carotid-cavernous fistulae are spontaneous or acquired abnormal connections between the carotid arterial system and the venous cavernous sinus behind the eye. It is basically classified in direct and indirect type.
2. The symptoms of CCF include pulsating bulging of the eye (proptosis), redness and swelling of the conjunctiva, increased pressure in the eye (glaucoma), loss of vision in the eye, double vision, pain, intracranial hemorrhage and neurological deficit.
3. As many as 90% of patients with direct carotid-cavernous fistulas (CCFs) may lose vision if not treated.
4. Indirect (dural) CCFs spontaneously resolve in 20-50% of patients. Of patients with untreated dural CCFs, 20-30% experience loss of vision.
5. This procedure will be performed by interventionist. The procedure will generally be performed under X-ray guidance.

### The Operation / Procedure

1. The procedure will be performed under local anesthesia or general anesthesia and aseptic technique.
2. The interventionist will puncture an artery at the groin region (mostly right side) with a needle. After the needle is correctly positioned, a slender guidewire is placed through the needle into the blood vessel. The needle is then withdrawn, allowing a fine plastic tube (the catheter) to be placed over the guide wire into the blood vessel.
3. The X-ray equipment will then be used to navigate the catheter into the neck region and special dye (contrast medium) will be injected through the catheter and X-rays taken.
4. The procedure can be done via arterial or venous routes. The embolic material can be coils, glue or particles.
5. All the catheters will be removed at the end of the procedure. Pressure will be applied to the groin region to stop any bleeding. The opening in the skin is then covered with a dressing.
6. The duration of this procedure is different for every patient, it depends on the complexity of the condition.
7. Vital signs (e.g. blood pressure, pulse) and neurological condition will be monitored during and after the procedure. Attention should be paid on the skin puncture site to make sure there is no bleeding from it.

### Before the Operation / Procedure

1. A written consent is required.
2. Inform doctor on history of allergy to food and drugs, history of asthma, urticaria, eczema and allergy to contrast medium.
3. Check any bleeding tendency and correct if possible.
4. Fast for 6 hours before the examination.
5. Empty the bladder before the procedure.
6. Skin preparation of the puncture site.
7. For diabetic patient on drug - consult clinician concerned for the adjustment of insulin dosage if necessary.
8. During the examination, patient is advised to listen carefully to the instructions given by our staff.

### After the Operation / Procedure

1. After the catheter was removed, the puncture site has to be compressed for at least 10mins.
2. Continue to watch for evidence of secondary bleeding and swelling at the puncture site.
3. Continue to check blood pressure and pulse, or neuro-observation.
4. Patient may need to have bed rest.
5. Patient may need to continue to fast or take diet as tolerated depending on the condition.
6. For diabetic patient on drug - consult clinician concerned for the adjustment of insulin dosage if necessary.



### Risk and Complication

1. Overall procedure related mortality is rare (less than 2 %).
2. The total incidence of complications associated with procedure is low and most complications are transient morbidities.
3. Reported permanent morbidity is rare (about 2%).
4. Major complications includes:
  - 4.1 Hemorrhage.
  - 4.2 Damage to orbital structures.
  - 4.3 Infections.
  - 4.4 Cranial nerve palsies which are usually transient.
  - 4.5 Venous perforation.
  - 4.6 Venous congestion with or without neurological deficit including blindness.
  - 4.7 Dural dissection or penetration.
  - 4.8 Stroke with permanent neurological deficit (permanent limb weakness, numbness, visual loss).
  - 4.9 Groin or retroperitoneal hematoma requiring transfusion or surgery.
  - 4.10 Arterial occlusion requiring surgical thrombectomy or thrombolysis.
  - 4.11 Arteriovenous fistula or pseudoaneurysm at the puncture site.
  - 4.12 Contrast media associated nephrotoxicity.
  - 4.13 The overall adverse reactions related to iodine-base non-ionic contrast medium is below 0.7%. The mortality due to reaction to non-ionic contrast medium is below 1 in 250,000.
  - 4.14 Breakage and knot forming of catheter or guidewire is very rare, this may require surgical removal.
5. Minor complications includes:
  - 5.1 Groin bruise and pain.
  - 5.2 Complications related to contrast medium injected – rash, urticaria.
  - 5.3 Transient neurological deficit which is reversible within 24 hours (limb weakness, numbness).
  - 5.4 Transient visual loss.
  - 5.5 Arrhythmia.

### Disclaimer

This leaflet only provides general information pertaining to this operation / procedure. While common risks and complications are described, the list is not exhaustive, and the degree of risk could also vary between patients. Please contact your doctor for detailed information and specific enquiry.

### Reference

Smart Patient Website by Hospital Authority: Carotid-Cavernous Fistula Embolization (2010)