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STA – MCA bypass surgery

Dr. Venkatesan*

Consultant, Neurosurgeon, MIOT Hospitals, Chennai, India

***Correspondence:**
Dr. Venkatesan,
drvenkatesan@gmail.com

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Restoring blood flow to parts of the brain devoid of oxygen requires cerebral bypass surgery, such as the STA-MCA (superficial temporal artery to middle cerebral artery) bypass. In this procedure, blood from a coronary artery is rerouted. Usually, the superficial temporal artery travels around obstructions or damaged arteries to reach a recipient vessel inside the brain. Moyamoya discase, aneurysms, skull base lumors, and artery stenosis are among the conditions that warrant this procedure. Pre-operative imaging aids in surgical planning, and post-operative treatment includes keeping an eye out for problems such as graft occlusion and stroke. Even so, a bypass procedure increases blood flow. Underlying vascular problems remain uncured. As a result, patients are counseled to follow their prescription schedules and embrace a healthy lifestyle for the best possible results.

Keywords: bypass, stroke, cerebrovascular, neurosurgery

Overview

In order to effectively manage cerebrovascular diseases, bypass surgery is a crucial intervention that highlights the value of interdisciplinary treatment and patient education. This particular kind of cerebral bypass surgery is done to "revascularize," or restore, blood flow to the brain. In order to redirect blood flow around a damaged or clogged artery, surgery involves joining a blood vessel from outside the brain to a vessel inside the brain. Restoring blood supply to the brain and preventing strokes are my two main objectives with bypass surgery.

How does cerebral bypass surgery work?

By using a cerebral artery bypass, a surgeon can increase or restore blood flow to an oxygen-depleted ischemic area or membrane by rerouting blood flow around a blocked or damaged artery.

A cerebral bypass: the extent of the cranial region that needs to be revascularized and the underlying ailment being treated.

Two kinds of bypasses exist

1. High flow bypass surgery - This kind makes use of a vascular transplant, which is a segment of vein or artery taken from another part of the body. In order to redirect blood flow and avoid passing through the plaque, the graft is attached both above and below the clogged artery. The radial or ulnar arteries in the arm, or the saphenous vein in the leg, are frequently used as graft veins. Harvesting the transplant requires another incision. Subsequently, the graft's one end is attached to the external carotid artery (ECA) in the neck before being tunneled to the scalp through the skin in front of the ear. The graft is inserted through a hole made in the skull and attached to a cerebral artery. This technique is usually applied when a tumor or aneurysm requires the sacrifice of a big, high-flow artery.
2. Low flow bypass surgery: This kind uses a healthy donor artery that passes through the face or scalp instead of a vascular graft. On one end, the donor artery is separated from its typical position. attached to an artery on the brain's surface and guided to the inside of the skull.

Blood is now supplied to the brain through the scalp artery, which avoids the clogged or damaged channel. This technique is usually applied when there is insufficient blood supply to the brain due to narrowing of a smaller (low-flow) artery.

VIDEO 1 | https://youtu.be/Er_YU-__ezM

STA - MCA bypass surgery

1. The STA-MCA superficial temporal artery to middle cerebral artery bypass is the most popular kind of bypass. Normal blood flow to the face and scalp is provided by the superficia temporal artery (STA).
2. The frontal, temporal, and parietal lobes typically receive blood flow from the middle cerebral artery (MCA). A common consequence of internal carotid artery constriction is decreased blood flow across the MCA.
3. To restore blood flow to the brain, through a hole in the skull, and attached to the MCA (receiving vessel) above the blockage. In order to transfer a vascular graft or scalp donor artery from outside the skull to the cerebral artery inside the skull, a hole must be made in the skull. Consequently, another name for this procedure is an extracranial-intracranial bypass (EC-IC bypass).

STA - MCA bypass surgery indications

A constriction of the internal carotid arteries at the base of the brain known as Movamova disease can result in numerous hemorrhages or strokes. In an effort to supply oxygen-rich blood to parts of the brain that are lacking in oxygen, the brain forms collateral blood channels to make up for the constricted arteries. Future strokes can be avoided and blood supply to the brain can be restored via a bypass.

An arterial wall bulging or ballooning is called an aneurysm. Endovascular coiling or surgical clipping are not effective treatments for some big, fusiform, or dissecting aneurysms. In these situations, the aneurysm must be successfully cured or the parent artery must be sacrificed in order to bypass the blood flow.

Skull base tumor: A tumor may develop where the major blood arteries encircle or encroach onto an artery in the skull. It could be necessary to sacrifice the encased artery and stop the blood supply in order to remove the tumor.

Atherosclerotic plaque buildup in the arterial wall causes carotid artery stenosis, a narrowing or blockage of the carotid artery in the neck.

An artery inside the skull that provides blood to particular parts of the brain might narrow or become blocked, a condition known as intracranial arterial stenosis.

Preop imaging

1. Angiography or ultrasound evaluation of potential graft sites in the legs and arms.
2. Angiography of the brain vessels (CT, MRA) to evaluate the blockage and choose the best places to connect the graft
3. Gerebral blood flow studies (CT perfusion, PET, SPECT) that show arterial stenosis
4. Balloon test occlusion is used to evaluate whether one artery can be temporarily or permanently blocked without significantly affecting the level of blood in your brain.

STA - MCA bypass surgical procedure (8 steps)

Patient should take 325mg of aspirin to thin the blood at the morning of surgery with sips of water.

Step 1. Prepare the patient

Head is placed in a 3-pin, skull-fixation device, which attaches to the table and holds your head in position during the procedure. The hair near the incision area is shaved and the scalp is prepped with an antiseptics.

Step 2. Make a skin incision

The surgeon uses Doppler ultrasound to locate and mark the course of the superficial temporal artery (STA) on the scalp with a pen.

Step 3. Prepare the donor artery

A branch of the STA is carefully dissected from the underlying muscle. After the STA is freed, the muscle is cut and folded back to expose the bone.

Step 4. Perform a craniotomy

Next, bur holes are made in the skull with a drill. The surgeon cuts an oultine of a bone window. The bone flap is lifted and removed to expose the protective covering of the brain, called the dura. The dura is opened and folded back to expose the brain.

Step 5. Prepare the recipient artery

Working under an operating microscope, the surgeon carefully locates a branch of the middle cerebral artery (MCA) suitable for bypass. The size of the recipient vessel must be a good match for the diameter of the donor vessel.

Step 6. Attach donor and recipient arteries,

Temporary clips are placed across the donor and recipient vessels to stop the blood flow. The distal STA is cut and the end prepared for anastomosis. The surgeon then makes an

opening in the side of the MCA vessel and sutures the two blood vessels together.

Step 7. Verify blood flow through the bypass

After the vessels are attached, the surgeon releases the temporary clips and verifies there are no leaks. Using a Doppler ultrasound or special fluorescent dye, good blood flow through the bypass is verified.

Step 8. Close the craniotomy

The dura is closed with sutures. The bone flap is replaced, but the hole is enlarged to allow passage of the bypass vessel without kinking or pressure. The bone flap is secured to the skull with titanium plates and screws. The muscles and skin are sutured back together. A dressing is placed over the incision.

Postop-care

1. Doppler ultrasonography is utilized to monitor your incision site pulse to make sure the new artery connection is functioning properly.
2. An ACT scan will be carried out at some point following surgery to ensure that there have been no issues, particularly with regard to postoperative bleeding.
3. acetaminophen-treated post-operative headache additionally, seizure medications. Daily anti-platelet medicine, such as aspirin. Anti-platelets thin the blood, facilitating easier blood flow and averting the formation of clots in the bypass graft.

Complication

1. Manipulation and temporary clipping of the arteries can result in strokes. It may also result from inadequate blood flow via the recently joined arteries, or from graft failure.
2. Any brain operation carries the risk of seizures. As a precaution, you will be prescribed anti-seizure medicine for several days following your treatment. Another possible, while uncommon, consequence that may result in seizures is a hyper-perfusion damage.

   Swelling and/or bleeding in the brain can happen as a result of increased blood supply to parts of the brain that were previously receiving very little of it. Neurological impairments such as headaches and facial/eve discomfort are indicative of hyper-perfusion damage.
3. Blood clots that grow inside the donor vessel and stop the blood flow are known as graft occlusion. This is uncommon as graft patency is guaranteed by blood flow measurements taken at the time of surgery.

Conclusion

While bypass surgery increases the flow of blood to the brain, it does not treat the underlying cerebrovascular or carotid artery illness. A healthy lifestyle that includes quitting smoking, eating well, lowering cholesterol, maintaining a healthy weight, controlling blood pressure, managing diabetes, and exercising will have an impact on the short- and long-term results.