Case Report

Extracranial-Intracranial Bypass (EC/IC) for Symptomatic Occlusive Cerebrovascular Disease Not Amenable to Carotid Endarterectomy
A Case of Report

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Abstract

Extracranial-Intracranial (EC/IC) by pass surgery was expected to solve all types of cerebral ischemia with angiographic demonstration of any degree of stenosis or occlusion where end arterectomy was not applicable. The purpose of extracranial to intracranial (EC-IC) bypass is to augment cerebral blood flow. A 35 years old right handed young shoulder underwent EC/IC bypass surgery for atherosclerotic occlusion of left ICA and MCA. It was carried out successfully with significant improvement of motor power and dysphasia.

Introduction

EC-IC bypass has been carried out as a treatment for stroke for past 30 years1. The purpose of extracranial to intracranial (EC-IC) bypass is to augment cerebral blood flow2,3,4. This procedure entails connection of the superficial temporal artery (STA), or a venous conduit, to a branch of the middle cerebral artery (MCA). Carotid endarterectomy is an alternative established and effective procedure for stroke prevention in severe stenotic lesions of the carotid artery in the neck. This procedure is not feasible for 20-30 percent of occlusive disease. These includes total occlusion of carotid above the level of the mandible and occlusion of the middle cerebral artery. The first EC-IC bypass was performed by Yasargil, in Zurich, Switzerland, in 19671. Following in his footsteps, other talented cerebrovascular surgeons in the United States adopted the procedure during the 1970's, and its use expanded to most major neurosurgical centers around the world1,2. Yasargil showed that anastomosis of the superficial temporal artery to a small cortical branch of the middle cerebral artery was feasible1. The indications for EC-IC bypass are severe stenosis or occlusion of intracranial arteries (fig-1) with focal neurological symptoms, such as weakness or speech difficulties. This procedure is also used when an artery must be surgically occluded for the treatment of unclippable giant aneurysms3,4. In children, this procedure is used to treat Moyamoya disease (a progressive).

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Fig 1: Diagramatic view occlusion ov ICA and ECIC bypass.

His nervous system examination revealed-Higher psychic function-Normal except short term and long term memory loss. Speech was slurred Gait was normal. Muscle power of right sided upper and lower limbs grade 4, Sensory intact, Jerks normal. All the cranial nerves functionally intact. There were no bowel and bladder incontinence.

Routine blood investigations were within normal limit. X-ray of the skull showed normal. CT scan of brain showed ischemic infarct of fronto-parietal region (fig-2). CT angiogram of the brain showed complete occlusion of left internal carotid artery above the neck (fig-3) and left MCA is partially visualized from contralateral flow (fig-3). Transcranial color doppler study showed reduced perfusion to the left hemisphere than right (fig-4) & (Table-1).
Preoperative data

Fig. 3: CT Angiogram shows the total occlusion of left ICA and stenosis and partial visualization of left MCA by contralateral flow.

Table 1: Data analysis of all the major intracranial vessels shows reduced flow over left MCA, reversed flow over left ACA, NO FLOW OVER the left ICA.

Postoperative data

Fig. 5: Postoperative Doppler shows the peak flow wave following EC/IC Bypass.

Technique

Left sided pterional craniotomy was performed to expose the intracranial vessels. The donor artery was exposed from scalp. This was performed under the operating microscope. First we identified and dissected the superficial temporal artery. Then we select parietal branch of STA. Transylvanian approach was performed by pterional craniotomy. After gentle dissection of sylvian fissure, MCA and its bifurcation were identified. Two temporary aneurysm clips were applied in the trunk of M2 before its division. A small hole was made along its long axis. After that we mobilize the donor artery near the M2. Then end to side anastomosis was performed by 7/0 prolene. Temporary clips were removed. A key hole was maintained in the dural flap and bone to prevent the collapsing of the donor artery. Finally haemostasis was secured and closed in layers. Postoperative recovery was uneventful. After 2 weeks of bypass, we did transcranial color doppler and it shows increased blood flow to the MCA and hence to left cerebral hemisphere (table-2) & (fig. 5). Patient has improved his motor power and speech was also came to normal (fig. 6).

Discussion

A brain bypass is equivalent with heart bypass. It reinitiates blood flow in a blocked or damaged or an abnormal blood vessel. As a result corresponding brain region will get adequate blood supply. As it is formed from most side to inside head it is known as Extracranial to Intracranial (EC-IC) Bypass. In patients with ICA occlusion and reduced cerebrovascular reserve capacity (CVR), revealed by different technical modalities such as MRA, PET, the EC-IC bypass can apparently prevent recurrent ischemic attacks.

There are several studies available which suggest hemodynamic failure can be predicted in patients with exclusive cerebrovascular disease, or those prior to therapeutic carotid occlusion, using SPECT scanning, Xenon CT scanning or positron emission tomography (PET). More importantly, it has been shown that EC-IC bypass has the potential to reverse the hemodynamic failure and normalize cerebral blood flow (CBF) 7, 8.
The EC-IC bypass is well planned methodologically sound surgery. STA-MCA bypass has a definitive role in the treatment of ischemic stroke.

References


Fig. 6: postoperative picture of the patient shows almost equal motor power in both hands.