Case Report

Decompressive Craniectomy for Malignant Middle Cerebral Artery Infarction with the Postpartum Period and Ebstein Anomaly as risk factors

Farhan Fateh Jang, Muhammad Moosa, Nasir Raza Awan

ABSTRACT

An eighteen years old female presented with sudden onset of left sided weakness two weeks postpartum. Computed tomography (CT) brain revealed right malignant middle cerebral artery (MCA) infarction. The patient underwent decompressive craniectomy (DC) based on the clinical deterioration and imaging studies. This case report discusses DC with or without dural opening as a viable option for the management of pressure caused by malignant MCA infarction the postpartum period and Ebstein anomaly are the risk factors for malignant MCA infarction.

Keywords: *Decompressive craniectomy. Malignant MCA infarction. Postpartum period. Ebstein anomaly.*

INTRODUCTION

Decompressive craniectomy has been performed for many years as a surgical management of the brain tissue compression caused by infarction and other conditions such as cerebral venous thrombosis and traumatic brain injury. However, due to inherent morbidity of primary brain pathology and poor esthetic outcome, the procedure got limited attention.[1] In this case report; we share the experience of DC in a young female patient diagnosed with malignant MCA infarction two weeks postpartum. The postpartum period was considered as the main risk factor for malignant MCA infarction. However, further workup revealed that the patient had Ebstein anomaly, which may have contributed to the malignant MCA infarction.

CASE REPORT

An 18-year-old female patient was admitted in the Department of Neurosciences, Sharif Medical City Hospital, Lahore (Pakistan) with an acute onset of weakness in the left upper and lower extremities. The patient was fully conscious and oriented with Glasgow Coma Scale (GCS) score of 15/15 (Eye_4 + $Motor_6$ + $Verbal_5$) on admission. Pupils were equal in size and reactive to light bilaterally. There was no history of any previously known cardiac disease. CT scan of the brain on admission day showed an ischemic stroke in the right MCA region (Figure 1).

Sharif Medical & Dental College, Sharif Medical City. Sharif Medical City Road, Off Raiwind Road, Jati Umra, Lahore 54000, Pakistan.

Correspondence: Dr. Farhan Fateh Jang
Assistant Professor Department of Neurosciences
Sharif Medical & Dental College
E-mail: drfarhan50@hotmail.com

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All laboratory blood tests including complete blood count and coagulation profile were within normal limits. Conservative treatment such as anti-platelets, intravenous fluid and statins was started after obtaining informed consent from the patient's family. Echocardiography performed on second post-admission day suggested atrial septal defect (ASD) and transesophageal echocardiography (TEE) was planned for further evaluation.

The patient started to deteriorate clinically on third post-admission day with left hemiplegia and GCS score of 7/15 (Eye2 + Motor3 + Verbal2) before performing TEE. CT scan of the brain on third post-admission day showed persisting ischemic changes in the right MCA region with cerebral edema and significant mass effect, a condition known as malignant MCA infarction (Figure 2).

The patient underwent immediate DC following clinical deterioration (on 3rd post-admission day), and a large right frontotemporoparietal bone flap was removed temporarily. Written informed consent was obtained from the patient's family before performing surgery. The dura was not opened along with the removal of bone flap as not much pressure of the ischemic brain tissue was observed intra-operatively. The bone flap was placed in the subcutaneous abdominal tissue, and the scalp was closed over the dural membrane. CT scan of the brain on third post-operative day showed decrease in the mass effect (Figure 3), and the patient also improved clinically (GCS score of 12/15).

Two weeks after DC, the patient gained full consciousness with GCS of 15/15. The muscle power in the left upper and lower limbs improved with physiotherapy (from Grade 0 to Grade 2). CT scan of the brain two weeks after surgical decompression showed resolving infarct in the right MCA region with no mass effect (Figure 4).

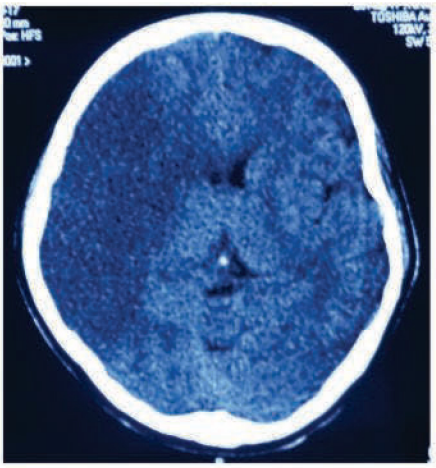

Figure 1: CT scan of the brain showing large hypodense (ischemic) area in the right MCA region with no significant mass effect

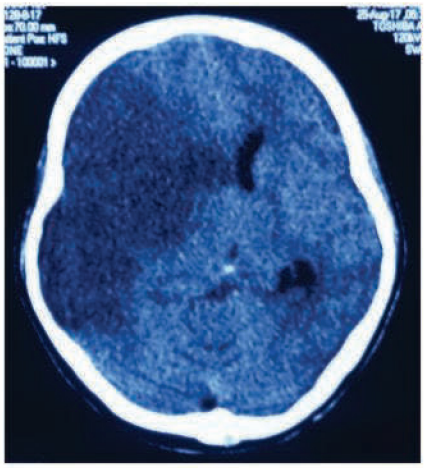

Figure 2: CT scan of the brain on third post-admission day showing hypodense (ischemic) area in the right MCA region with cerebral edema and significant mass effect

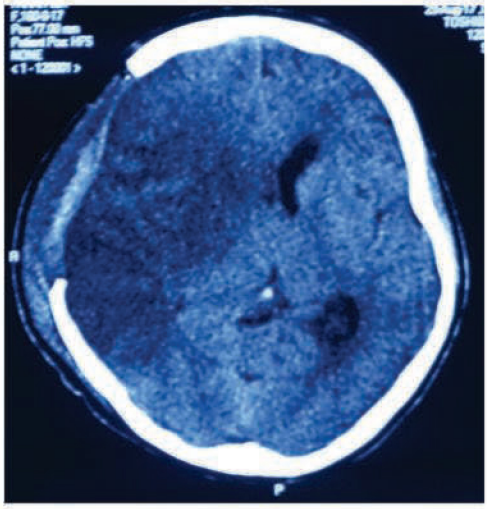

Figure 3: CT scan of the brain on third post-operative day without dural opening showed decrease in the mass effect

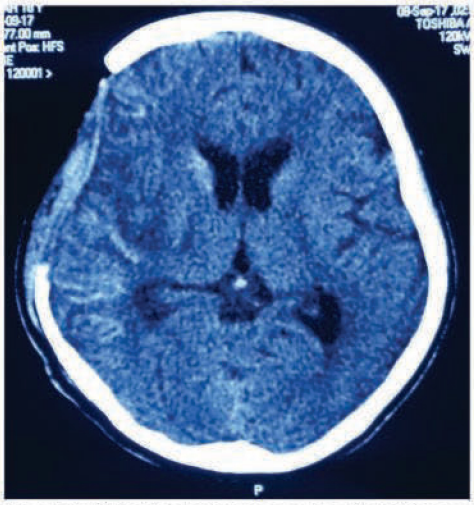

Figure 4: CT of the brain two weeks after DC shows resolving infarct in the right MCA region

Post-operative TEE showed Ebstein anomaly with large ASD. The bone flap was replaced seven weeks after DC, and the patient was referred to cardiac surgeon for the management of Ebstein anomaly.

DISCUSSION

The procedure of lobectomy has been widely replaced by DC as the better surgical option for the management of compression on the brain tissue.[2] The procedure of DC involves temporary removal of a large flap of the skull bone (frontal, temporal, and parietal bones) with or without dural opening to provide space into which the ischemic or injured brain can expand. Decompressive craniectomy can reduce the intracranial pressure (ICP) with the radiological and clinical herniation signs improvement. It can also reduce the spread of the infarcted area and salvage the hypoperfused penumbra.

Malignant MCA infarction is characterized by >50% of MCA distribution area infarction with life-threatening cerebral edema, and the mortality rate of malignant MCA infarction is about 80%.[3] Clinical worsening usually occurs 24-72 hours after the onset of ischemic lesion. Once the patient starts to deteriorate clinically, the role of conventional therapies including osmotherapy, hypothermia, and mechanical ventilation to decrease the ICP becomes limited.[4] In this case, the patient started to deteriorate on third post-admission day. Therefore, we performed immediate DC.

Various methods of DC such as, frontotemporoparietal, sub-temporal, circular and bifrontal decompression methods have been applied to lower the ICP after malignant MCA infarction or traumatic brain injury.[5-8] Frontotemporoparietal DC is a more widely used

method and it has been demonstrated that this method can provide as much as additional space of 92.6 cm^3.[6] Therefore, we performed frontotemporoparietal DC in this case to gain maximum space for decompression.

Dural opening is usually performed combined with DC in order to gain maximum brain expansion. However, not much data is available to compare the outcome of DC with and without dural opening, especially in malignant MCA infarction. In this case, we did not open the dura along with the removal of bone flap as not much pressure of the ischemic brain tissue was observed intra-operatively.

The postpartum period has been identified as the greatest risk for ischemic stroke.[9,10] This may be because the puerperium is a pro-thrombotic state.[11] Our patient had two weeks post-partum history. So, our immediate impression of the main risk factor causing malignant MCA infarction, in this case, was the postpartum period.

However, TEE showed Ebstein anomaly. Ebstein anomaly is a rare congenital heart defect accounting for <1% of all congenital heart diseases, and mainly affects the tricuspid valve. It has been reported that paradoxical embolism due to the atrial septal defect (right to left shunt) can cause cerebral ischemic insult in young patient with Ebstein anomaly.[12] Therefore, Ebstein anomaly may also be the risk factor for malignant MCA infarction in this case.

We concluded that the postpartum period and Ebstein anomaly can be risk factors for malignant MCA infarction in young patients, and DC with or without dural opening can be used as neurosurgical option for treating clinically deteriorating patients with malignant MCA infarction.

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