CASE REPORT

Decompressive Hemicraniectomy and Duroplasty with Refractory Intracranial Hypertension after Unilateral Hemispheric Stroke

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Introduction:

Stroke is rare in children, however, a common cause of neurological disease, and it is a major cause of death ranks in the top ten in pediatric period[1,2]. Documented incidence has been reported as 2.5-8/100000 children/year[3,4].

Medical treatment includes maintaining cerebral perfusion pressure with hyperventilation and osmotherapy, barbiturate and in case of thrombotic ischemia, thrombolytic procedure and anticoagulant therapy. However, if medical treatment failed and there is raise of intracranial pressure (ICP) and deterioration of patient conscious level, alternative treatments such as surgical decompression can be mandatory.

The common rationale of decompressive craniectomy with or without duroplasty is to let the volume expansion of the swelled up brain to extracranial space via removed skull flap and prevent cerebral herniation and secondary damage of brain parenchyme.

In case of traumatic brain injury, decompressive craniectomy for young adult patient has been reported[5]. However, there has not been a definite evidence or standard guideline for decompressive craniectomy for patient with non-traumatic acute stroke with uncontrolled refractory high intracranial pressure.

Two young adult patient were treated with decompressive hemicraniectomy with duroplasty for non-traumatic and refractory intracranial hypertension after unilateral hemispheric stroke.

Our cases was caused by ischemic stroke in Left MCA territory. Conventional laboratory results were within normal range. At the time of operation, The patients had a GCS score <8 and both the patients had unilateral mydriasis. Surgical decompressive hemicraniectomy were performed in 14 hour & 18 hours respectively and the ICP of our patients were improved following surgery (clinical monitoring).

There were no surgical complications, such as cerebrospinal fluid leakage, intracranial haematoma or wound infection even after cranioplasty.

The mean follow-up period was 36 months. GCS and Nurologic deficit had been measured to evaluate postoperative neurological outcome. Based on the regular follow up GCS scores, 2 patients had shown satisfactory recoveries.

Both of them showed good recoveries with some neurological deficits. And none of them revealed severe disability or death.

Case report:

A 28 yrs young adult male and 38 yrs young adult female were brought to emergency department with decreased level of consciousness. Neurological examination revealed stuporous condition without spontaneous eye opening with vocal command and painful stimuli. Both of them having left pupils of 6 mm in size and were not reacting to light. And in both of them right pupils were 3 mm size and were sluggishly reactive to

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light. Hemiplegia, hyper-reflexia, and Babinski's sign were observed on the right side. Preoperative GCS score were 5 & 6 respectively.

Initial brain CT scan were suggestive of acute infarction and emergency MRI study performed with MR angiography and diffusion-weighted image. Findings were appropriate for acute cerebral infarction with significant mid-line shift. Both of them were infused with high doses of mannitol, frusemide and hypertonic saline. However there were no neurologic improvement. In March 2015 & March 2017 decompressive-hemicraniectomy and duroplasty was performed in two patients with non-traumatic malignant refractory high ICP. These two patients had no history of trauma and refractory high ICP was diagnosed as clinical evidence of acute stroke, massive infarction with midline shift, compression of basal cisterns in conventional radiologic examination such as computed tomography (CT) and magnetic resonance image (MRI) and neurological deterioration consisting of decreased level of consciousness or increasing levels of unconsciousness compared with baseline status on admission. And we regarded sustained refractory high ICP as a failure of intensified standard medical therapy. Patient received treatment initially in general ward and subsequently in intensive care unit (ICU)

Decompressive surgery were performed 15 hours & 18 hours respectively following the attack. After surgery, they were treated in intensive care unit with intubated for 7 days and trachoestomy performed.

CT scan of brain at the time of 7th post-operative days revealed sustained brain swelling but midline shift did not noted anymore. The ICP reduced gradually within one day after surgery (by monitoring clinically). After one month of surgery both of them returned for elective cranioplasty. The bone flaps were preserved in anterior abdominal wall of both of them without any complications.

After 36 months of surgeries follow-up were done. GCS level were 12 & 13 respectively and their conditions were satisfactory. Both of them revealed some behavioral abnormalities and referred to phychiatrist.

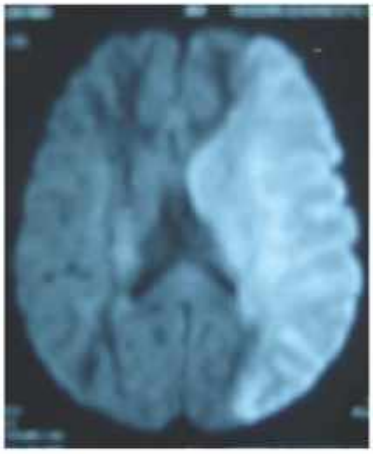

Fig. 1

A : Non enhanced brain MRI revealed an acute left -sided middle cerebral artery territory infarct with mass effect manifested as left lateral ventricular compression and left convexity sulci effacement.

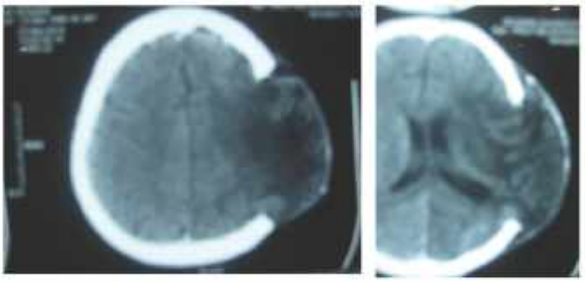

Fig. 2

Brain CT on 7th post-operative day revealed sustained brain swelling with decompressive craniectomy. No midline shift was noted any more.

Fig. 3

Bone flap preserved in anterior abdominal wall

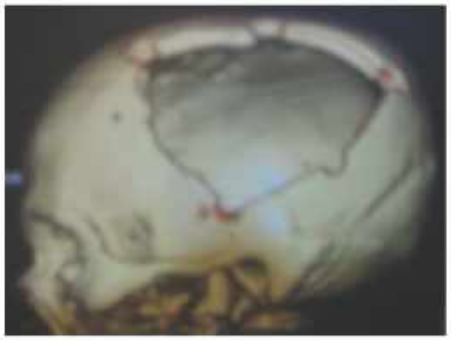

Fig. 4
Post craniectomy 3-D picture of skull

Fig. 5
Duroplasty done by fascialata from thigh

Fig. 6
Patient post operatively

Fig. 7
Gradual improvement observed after surgery.

Discussion:

In stroke patient, most common cause of death is due to uncontrolled ICP associated with large hemispheric infarctions[5,7]. When it is present, it is associated with increased mortality. In addition, early ICP elevation in patients with large hemispheric infarctions is highly concluded with high mortality[8]. It means that the one of most important goal of acute phase stroke treatment is control the ICP and prevent a secondary damage due to brain swelling.

In spite of many clinical and experimental trials on medical therapeutic method, most of them have not been shown to benefit stroke patient. There has been a widely accepted definite guideline for oxygen saturation, temperature, serum glucose level, blood pressure for adult stroke patient[1]. However, for pediatric stroke patient, even in many of mostly basic and elementary medical guideline has not been established yet[9].

To prevent and control ICP, thrombolytic therapy such as clot lysis has an accepted role in acute stroke treatment. In adult stroke patient group, there are antithrombotic management of adult ischemic stroke protocol and guideline published by the American Heart Association[10], such as intravenous tissue plasminogen activator, intra-arterial thrombolysis and oral administration of aspirin. But, for pediatric stroke patient, there is no guideline of this useful treatment method either[9].

To the best of our knowledge, the first report about the benefits of decompressive hemicraniectomy in pediatric patient was described by Carter et al. in 1997[2]. However, from this time, only a few report deals with decompressive craniectomy for pediatric patient were published.

In adult acute stroke patient group, the effect of decompressive craniectomy also has been established. Vahedi et al.[11] reported that in a meta-analysis combining the data of 93 subjects

from three small, randomized, controlled trials, mortality for conservative management in adult ischemic stroke patients with early brain edema was 71% as compared with 22% for decompressive surgical intervention.

In point of fact, there is some debate indications and optimal timing of decompressive craniectomy[7,12]. Widely accepted proper operation timing is immediately after signs of herniation and a midline shift which was defined as a more than equals 5-mm contralateral shift of the midline structures on the preoperative cranial CT scan on septum pellucidum level, compressed basal cisterns, or uncal herniation--had to be present on cranial CT had been noted. Recent studies in adult stroke group have shown that this procedure not only reduces mortality but also improves neurological functional outcome. Especially when operation is performed in the early hour[3,7]. This procedure may be life-saving if done early in cases of impending herniation, is associated with good outcomes in pediatric stroke patients[4,6]. Maybe if operation was performed earlier, it may minimize the vicious circle of brain swelling, increased ICP, ischemia, and infarction[7].

In our series, one male adult and one female adult with refractory high ICP due to non-traumatic, ischemic stroke were treated with decompressive craniectomy. All had GCS scores <8 at operation. All of them were survived and have a relatively satisfied recovery. These results showed that decompressive craniectomy can not only play a rescuer therapeutic role but also guaranty acceptable clinical outcome in the treatment regimen in non-traumatic, refractory high ICP in young adult patients field.

So decompressive craniectomy could be considered as life-saving-treatment options.

Conclusion:

Two young adult patients have undergone decompressive hemicraniectomy for a non-traumatic acute hemispheric stroke. It also showed that decompressive hemicraniectomy can be life saving and safely performed in young adult patients. Decompressive hemicraniectomy should be considered as an alternative therapy for patients with life-threatening brain swelling refractory to medical management.

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