International Journal of Neurology and Neurosurgery
Volume 11 Number 1, January - March 2019
DOI: http://dx.doi.org/10.21088/ijnns.0975.0223.11119.10

Original Research Article

Factors Resulting in Poor Outcome Following Decompressive Craniectomy for Malignant Sylvian Stroke: Our Institute Experience

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Abstract

Introduction: Malignant MCA infarct is a common cause of morbidity and mortality. Decompressive hemicraniectomy (DC) is a well-established mode of treating malignant MCA infarct. This article shares our experience with an insight into the problems faced and the lessons learnt in the process.

Materials And Methods: Patients with Malignant MCA Infarct and subjected to decompressive hemicraniectomy at the Institute of Neurosurgery, Madras Medical College, Chennai, from January 2017 to January 2018 were included. Outcome was assessed in terms of mortality and modified Rankin scale (mRS).

Results: A total of 28 patients underwent DC for malignant MCA infarct between January 2017 and January 2018 at our institute. The mean age of the study group was 47.1±13.73yr. Seventeen patients (60.7%) had left MCA territory infarct while 11 patients (39.3%) had right MCA territory infarct. 18% of patients had an mRS of 0-3 at discharge and 7% had mRS of 4 and more. Approximately, 20% of patients operated within 24 h had mRS 0–3 at discharge while only 12.5% patients operated after 48 h had mRS 0–3 at discharge.

Conclusion: A subset of patients survives but remains in bedridden state. Mortality and functional outcome can be better with early access and prompt intervention. Interval between clinical deterioration and surgery is more relevant than early surgery in determining the outcome. Although age is an impediment to favourable outcome, deserving candidates should not be denied surgery because of age.

Keywords: Malignant Middle Cerebral Artery Infarct; Neurological Outcome; Morbidity; Decompressive Hemicraniectomy; Mrs.

How to cite this article:

R. Raghavendran, S. Balamurugan, Dhibyojyoti Bora. Factors Resulting in Poor Outcome Following Decompressive Craniectomy for Malignant Sylvian Stroke: Our Institute Experience. Int J Neurol Neurosurg. 2019;11(1): 63-66.

Introduction

Ischemic stroke is a leading cause of morbidity and mortality [1]. Malignant massive Middle cerebral artery (MCA) territory infarction is seen in over 10% of supra-tentorial strokes. Life threatening brain edema with signs of elevated intracranial pressure (ICP) and brain herniation is maximum from the second to fifth day resulting in a mortality rate of 70% to 80% despite maximal intensive care treatment. Therefore, the term "malignant MCA infarct" was introduced for these massive cerebral infarcts [2]. Conservative intensive care treatment strategies like osmotherapy with glycerol, mannitol or hydroxyl–ethyl starch, ICP lowering therapies with barbiturates, buffer solutions or hyperventilation, and neuroprotective therapies such as moderate hypothermia are widely used. None of these therapies are supported by adequate evidence from clinical trials.

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Received on 08.10.2018, **Accepted on** 28.12.2018

The benefit of decompressive hemicraniectomy (DC) in malignant MCA infarct has been demonstrated in the pooled analysis of three major randomised trials (DECIMAL, DESTINY, and HAMLET). With timely surgery the probability of survival increases from 28% to nearly 80% and the probability of survival with a mRS of ≤3, doubles.

We report our experience with DC in patients of malignant MCA infarct at our institute over a period of one year, with an insight into the problems faced at a tertiary care centre in a developing country and the lessons learnt in the process.

Aim:

To study the

1. Role of decompressive craniectomy in patients with malignant MCA infarct and assessment of outcome in terms of mRS score.
2. Factors influencing the outcome following surgery at a tertiary health care centre.

Methods

Study design

This is a prospective study, describing the results of decompressive hemicraniectomy in 28 patients with malignant MCA infarct at the Institute of Neurosurgery, Madras Medical College, Chennai, from January 2017 to January 2018.

On admission, diagnosis was confirmed by - computed tomography [CT]/magnetic resonance imaging [MRI].

Midline shift was measured as the distance of septum pellucidum that deviated from the line between anterior and posterior falx cerebri at its attachment to the inside of the calvarium.

Clinical characteristics documented were - age and gender, preoperative clinical status, timing of surgery, location and extent of infarction, time delay from the onset of symptoms to surgery, pre-operative signs of herniation and their relation to the final outcome

Outcome was assessed in terms of mortality and modified Rankin scale (mRS).

Functional Outcome was divided into two groups:

Favourable outcome (mRS score 0–3) versus

Poor outcome (mRS score 4–6).

Patient selection:

The criteria to do DC were the presence of a large MCA infarction on CT scan and clinical status of the patients. Patients with GCS >13 and no midline shift or without basal cistern effacement were managed conservatively.

Patients with an ischemic lesion volume >150 cm^3 on diffusion-weighted MRI or CT evidence of at least 50% MCA territory infarction by visual inspection, clinical or radiological evidence of herniation, decrease in level of consciousness were subjected to Decompressive craniectomy immediately.

Patients with Glasgow coma scale (GCS) <4, coma with two dilated pupils and absent brainstem reflexes and who refused surgery were excluded from the study.

Surgical technique:

A question mark-shaped skin flap was made and a wide craniotomy performed on the affected side with partial removal of the frontal, temporal, and parietal bones, so that the floor of the middle fossa could be exposed and the bone flap had a minimum of 12 cm diameter. Hitches were taken at the bony edges, sylvian based durotomy was done which was converted into a stellate shape. Temporal fascia was used for dural repair and bone flap was discarded. Titanium mesh was used for cranioplasty at a later date.

Statistical analysis:

All data are expressed as mean±standard deviation (SD). T tests and Fisher's exact test were used for analysis of statistical evidence, with $p<0.05$ considered significant. Statistical software SPSS 14.0 was used for statistical analysis.

Results

A total of 28 (22 male and 6 female) patients underwent DC for malignant MCA infarct between January 2017 and January 2018 at our institute. Age of the patients ranged between 15 and 70 years (mean age was 47.1±13.73yrs). The majority of patients were aged between 31-40years (10 patients).

Seventeen patients (60.7%) had left MCA territory infarct while 11 patients (39.3%) had right MCA territory infarct. There was no statistically significant difference in terms of favourable outcome following surgery between the two groups ($p=0.8091$). Mean GCS score at the presentation of

all patients was 8.75 while mean GCS at surgery was 6.56.

Time interval between onset of symptoms and DC was less than 24 hours in 6 (21.4%), 24-48 hours in 14 (50%), 48-72 hours in 5(17.8%) and more than 72 hours in 3 (10.7%) patients,respectively. Overall, 18% patients in this series had an mRS of 0-3 at discharge and 7% had mRS of 4 and more. Approximately, 20% patients operated within 24 h had mRS 0–3 at discharge while only 12.5% patients operated after 24 h had mRS 0–3 at discharge. However, this difference is not statistically significant (p-0.1429). In the present study 5 (17.8%) patients were above 60 years of age and none of these patients survived in the postoperative period.

A total of 21 patients (75%) died in the postoperative period secondary to the presenting brain lesion, hemodynamic failure and complications arising out of prolonged ventilation; nine patients developed ventilator associated pneumonia.

Diabetes was present in 8 (28.5%) patients. Systemic hypertension was found in 12 (42.8%) patients. Coronary artery disease was present in 3 patients and one patient had RHD. These factors did not significantly influence the mortality rates or functional outcomes in our study. We assume that this was caused by the relatively small number of patients (n = 28) in our study.

Discussion

Although, over a period of time various studies have established the superiority of DC over conservative therapy in the setting of malignant MCA infarct, its applicability is still debated in terms of quality of life, outcome in elderly patients, quality of life in dominant hemispheric infarct and the timing of surgery.

The outcome analysis is not limited to mortality alone, the clinical outcome and quality of life in the survivors are not highly beneficial. In our study, 18% patients had an mRS of 0-3 at discharge and 7% had mRS of 4 and more.

As shown by various studies (Table 1) decompressive craniectomy has survival benefit. The number of people surviving with severe disability is high. In our study, the negative outcomes are due to the delay in patients reaching a proper health care facility. In many cases, hospitalisation and conservative management at local hospitals led to critical delay in the initiation of treatment. These causes need to be corrected by creating better awareness about the disease among the public.

The timing of surgery, for good outcome, is controversial. Schwab et al. found that patients undergoing decompression within 24 hours after stroke onset, had better outcome. However, no benefits of an early surgery were seen in a review by Gupta et al. [12], which can be because of large number of patients with preoperative herniation. In a systematic review Vahedi et al.6 concluded that the outcome is not related to the timing of surgery. In our study 20% patients operated within 24 h had mRS 0–3 at discharge while 12.5% patients operated after 24 h had mRS 0–3 at discharge, however there is no statistical significance (p-0.1429). On analysing the data it is the immediate pre-operative GCS and the interval between clinical deterioration and surgery were more relevant factors in determining the outcome.

The benefit of decompressive craniectomy in patients above 60 years is controversial. Various observational trials show mortality in older patients to be 50–80% and there is no significant benefit of surgery over non-surgical management2,3 .Uhletal9 reported an independent lifestyle outcome in 12% of patients older than 50-years whereas 37% died or persisted with severe morbidity. Review by Gupta etal.12 concluded 80% patients above 50 years, died or were severely disabled. Only 1% had an independent outcome. Common Pre-existing disabilities and co morbid conditions in elderly result in poor outcomes. Kuroki et al. [8] reported a reduced deaths and better outcomes in terms of ADL, in patients undergoing decompressive surgery when compared to the outcomes of conservatively treated patients above 70 years old. In our series 5 patients were above 60 years and the mortality rate in this group was 100%; pre-existing co morbidities although present did not show statistical significance.

Outcome following DC in dominant hemisphere infarct is still controversial, mainly because of persistent dysphasia which results in patients with an unacceptable quality of life. The hemispheric location of the infarct did not have any statistical significance influence on the functional outcome in our study. Gupta et al. [12] found similar functional outcomes in patients with dominant hemisphere infarct when compared to those with non-dominant hemisphere involvement. Brainstem dysfunction is seen in large infarcts, indicating that mortality is more influenced by the size of infarct rather than the side of infarct. Therefore, we believe that the location of the infarct should not be an exclusive criterion for surgery.

Table 1: showing mortality and outcome following DC in MCA infarct in various studies:

Study	Design of study	No of patients in surgical group	Mortality	Good outcome in surgical group	Poor outcome in surgical group
Holtkamp et al .	Retrospective descriptive study	12	33%	-	67%
Kuroki et al.	Retrospective/ prospective descriptive study	8	12%	44%	44%
Uhl et al.	Multicentre retrospective descriptive study	188	37%	24%	37%
Woertgen et al.	Retrospective descriptive study	48	25%	25%	50%
Kilincer et al.	Non-randomised prospective study	32	50%	-	50%
Gupta et al.	Metanalysis ofnon-randomisedtrials and retrospectivestudy	138	24%	42%	34%
Vahedi et al.	Metanalysis of 3 randomised trials	51	22%	43%	35%
Our study	Retrospective descriptive study	28	75%	18%	7%

Conclusion

DC reduces mortality and morbidity with a subset of patients who survive but have bedridden life. Improving the quality-of-life and eventual neurological outcome is a challenge for the treating doctor. The family and care providers should be involved at each step as most of these patients need lifelong rehabilitative care. Mortality and functional outcome can be improved by improving early access to medical care and prompt intervention. In our setting, creating public awareness and education will help people to seek health care services earlier. Interval between clinical deterioration and surgery is more relevant than early surgery in determining the outcome. Although age did not show favourable outcome in our series, deserving candidates should not be denied surgery considering age as a negative factor. Size of infarct and presence of brainstem compression signs are more reliable in predicting the outcome.

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