

Outcome Following Decompressive Surgery for Malignant Middle Cerebral Artery Infarction.

Pankaj Raj Nepal¹, Suman Rijal²

¹ Department of Neurosurgery, B and C Medical College Teaching Hospital and Research Center, Birtamode, Jhapa, Nepal

² Department of Neurosurgery, Upendra Devkota Memorial National Institute of Neurological and Allied Sciences, Bansbari, Kathmandu, Nepal.

Correspondence:

Dr. Pankaj Raj Nepal

Deputy Medical Director, Head of Department, Department of Neurosurgery

B & C Medical College and Teaching Hospital & Research Center, Birtamode, Jhapa, Nepal.

Email: pankajrajnepal@gmail.com

Background and purpose: When >50% of the brain supplied by middle cerebral artery (MCA) gets infarcted they are often termed as malignant MCA infarction. Decompressive hemicraniectomy has become the standard treatment option in carefully selected cases with higher survival benefit (78% Vs 29%) in a pooled analysis of one year follow up; however, there was no promising outcome noted in terms of disability rating. To see the outcome following decompressive hemicraniectomy and lax duroplasty for malignant middle cerebral artery (MCA) infarction this study was performed. **Materials and Methods:** This is a retrospective analytical study, with non-probability consecutive sampling of decompressive hemicraniectomy with lax duroplasty for malignant MCA territory infarction over the last 4 years were collected and Glasgow outcome scale (GOS) at one and six month were measured. The significance was analyzed using chi square or Fisher exact test wherever applicable using SPSS-20. **Results:** Total 31 cases, with male predominance (74.2%), and mean age of presentation was 51.9 years. Most commonly operated side was on the left (58.1%). Overall favorable outcome at 6 month was 35.5%. When operated for the preoperative GCS of >8, favorable outcome was observed in 30.8% at one month and 76.9% at six months which was statistically significant. **Conclusion:** Decompressive hemicraniectomy with lax duroplasty has a significant survival benefit. The outcome is significantly better when the preoperative GCS is >8.

Key words: malignant MCA infarction, decompressive surgery, Glasgow outcome scale

When >50% of the brain supplied by middle cerebral artery (MCA) gets infarcted, they are often termed as malignant MCA infarction. The ischemic brain causing edema can broadly be divided in to two types: the early cytotoxic edema and the late vasogenic edema.¹ On the later phase there is degradation of basal lamina, breakdown of blood-brain barrier,² and is followed by leakage of serum proteins in to the interstitial tissue which initiates a vasogenic edema, and further increases the water content of the tissue.³ Thus it causes peripheral edema and once they start to swell up it raises the intracranial pressure, predictably over the initial 5 days of presentation.⁴ When these patients are managed conservatively,

mortality is as high as 78% due to the temporal lobe herniation against the brain stem.⁵

Decompressive hemicraniectomy has become the standard treatment option in carefully selected cases with higher survival benefit (78% Vs 29%) in a pooled analysis of one year follow up; however, there was no promising outcome noted in terms of disability rating.⁵

With the objective to see the influence of preoperative Glasgow Coma Scale (GCS) in the outcome following decompressive hemicraniectomy and lax duroplasty for malignant MCA infarction, this study was designed in a tertiary care center in Nepal.

Materials and Methods

Study design: Retrospective analytical study
 Sample size: 31 patients
 Sampling technique: Non- probability consecutive sampling
 Duration of study: Four years

Inclusion criteria

Infarct volume >50% of MCA territory
 Patient aged 65 years and below
 Patient GCS >5

Exclusion criteria

Terminal illness
 Significant co-morbidities (cardiac, pulmonary, renal, hematological etc.)

Operative methods

All the patients who were subjected for the surgery, underwent a large 10cm x 14 cm sized craniectomy and an autologous duroplasty using the pericranium. Durotomy is done in a cruciate fashion and the harvested pericranium is sutured loosely in an interrupted fashion. After the closure of galea and the skin, a loose dressing is consistently applied so as not to interrupt when the brain swells up. The harvested bone flap is always preserved in the anterior abdominal wall with a separate abdominal incision.

Data collection and analysis

All the consecutive patients of last four years, who underwent decompressive hemicraniectomy for malignant MCA territory infarction, were included in the study. The quantitative variables like age,

timing of surgery from the time of ictus, preoperative GCS and qualitative variables like gender, and side of the infarct were collected. Outcome of patient was measured in Glasgow Outcome Scale (GOS), where data at one month were collected from the hospital records and those of six months were obtained through telephonic conversation.

Analysis was done using SPSS- 20, where variables were cross tabulated with GOS and test of significance was done using chi square test or Fisher exact test, wherever applicable. P- value <0.05 was considered significant.

Results

There were total 31 cases, with male predominance (23,74.2% Vs 8, 25.8%). Mean age of presentation was 51.9 (Std. deviation 12.27) years. Most commonly operated side was on the left (18, 58.1% Vs 13, 41.9%).

Overall initial mortality was 38.7% at one month, and at the time of six months was 58.8%. Although, only 12.9% had favorable outcome (GOS 4) at one month, 35.5% had GOS 4 at six months. (Table 1)

Age and gender of the patients doesn't have any significant association with the GOS at one month and at 6 months. Favorable outcome was more when operated for right sided infarction (23.1% Vs 5.6% at one month and 46.2% Vs 27.8% at six months), however, this association was not statistically significant. (Table 2)

Table 1: GOS at one month and at 6months

	GOS 1	GOS 2	GOS3	GOS 4
GOS at one month	12 (38.7%)	3(9.7%)	12(38.7%)	4(12.9)
GOS at six months	17(58.8%)	0(0%)	3(9.7%)	11(35.5%)

Table 2: Comparison of GOS at one month and at six months with other variables

Variables	GOS at one month				P value	GOS at six months			P value	
	GOS 1	GOS 2	GOS 3	GOS 4		GOS 1	GOS 3	GOS 4		
Age	≤50	5	2	6	2	.88	8	2	5	.79
	>50	7	1	6	2		9	1	6	
sex	F	2	0	3	3	.08	3	0	5	.15
	M	10	3	9	19		14	3	6	
Side	Left	8	2	7	1	.52	11	2	5	.57
	Right	4	1	5	3		6	1	6	
Surgery time	<24h	5	2	5	4	.04*	7	1	8	.26
	24-48h	7	0	3	0		8	1	1	
	>48h	0	1	4	0		2	1	2	
Pre op GCS	≤8	11	2	5	0	.00*	15	2	1	.00*
	>8	1	1	7	4		2	1	10	

Outcome was significantly favorable at one month, when operated within 24 hours of the ictus. This was not statistically significant at six months. (Table 2)

Preoperative GCS had significant association with GOS at one month and at six months, better the preoperative GCS better was the GOS when dichotomized at GCS 8. (Table 2)

Discussion:

Malignant MCA territory infarction has always been a challenging disease. Despite a lot of researches have been done, it still carries a poor outcome in terms of both survival and quality of life. Mortality figures have been quoted as high as 78% when managed conservatively,⁵ however, with decompressive hemicraniectomy, overall mortality was around 8-50%.⁵ In DECIMAL Trial, there was 52.8% absolute reduction of mortality with decompressive surgery.⁶ Also, in DESTINY Trial, 30 day survival was 80% in surgical group compared to 47% in conservative group.⁷ In this series, at one month mortality was 38.7% and 58.8% at six months, which was comparable to the figures quoted in the literatures.

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Age

There is no clear cut-off guideline of age for decompressive hemicraniectomy in the literatures. Carter BS et al showed good functional outcome when operated below 50 years.⁸ Similarly, DECIMAL Trial also showed great benefit on survival and outcome at 6 and 12 months when operated below 50 years.⁶ However, HAMLET study showed better outcome between 51 to 61 years of age.⁹ In another study where patients younger or elder to 65 years were compared, no significant difference in the outcome was seen.¹⁰ In this study, where 50 years of age was used as cut-off, no statistical difference in Glasgow Outcome Score was found.

Dominant hemispheric infarction

Dominant hemispheric malignant MCA territory infarction has often been a topic of controversy for decompressive hemicraniectomy because of poor functional outcome in patients who survived. However, a systemic review of 2004 showed similar outcome with either side of infarction.¹¹ Kastrau F et al had showed 13(93%) out of 14 patients had significant improvement in different

aspect of aphasia in cases of dominant hemispheric infarction.¹² Similarly, this study also has shown no significant difference with left or right sided infarction in terms of GOS.

Timing of surgery since event

Timing of surgery has shown significant impact on the outcome of patients undergoing decompressive hemicraniectomy for malignant MCA territory infarction. Surgery done within 24 hours of event or before radiological evidence of herniation has shown good clinical outcome in previous studies.¹³ Also, aggressive treatment in single episode of herniation had shown good long term outcome.¹⁴ The HAMLET study showed no benefit of surgery after 48 hours of the event. In this study, GOS at one month was significantly better when operated within 24 hours of the event. However, this relationship was not statistically significant at 6 months. This may probably be explained by recovery of patients from the herniation which usually takes long course.¹⁴

Pre operative GCS

In a recent retrospective study from Korea, where GCS of 7 to 15 were included for surgical decompression, no statistical benefit in terms of outcome was seen.¹⁰ This study showed significantly better GOS in patients when operated for better GCS >8 than those with the patients having GCS≤8.

Conclusion

Decompressive hemicraniectomy with lax duroplasty has a significant survival benefit, though is not still a promising for the favorable outcome. The outcome is significantly better when the preoperative GCS is >8. The early benefit is better obtained if the surgery is performed within 24 hours of the event.

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