



EVALUATION OF ETIOLOGY, RISK FACTORS AND SURGICAL TREATMENT OUTCOME IN STROKE PATIENTS

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Article Info

Received 09/01/2016

Revised 16/02/2016

Accepted 22/02/2016

Keywords :-

Ischaemic stroke;
Intracerebral
hemorrhage; Glasgow
Coma Scale; Middle
cerebral artery
infarction; Cerebellar
infarction.

ABSTRACT

The present was undertaken to evaluate the outcome of stroke patients who have been subjected to surgery after all the conservative measures. The outcome has been analyzed with respect to the type of stroke, age of the patient, sex of the patient, hypertension, and interval from onset of ictus to treatment. A total of 48 patients of stroke both hemorrhagic and ischemic which were included as per the inclusion criteria. The results of the present study showed, 6 cases out of 48 were ischemic stroke and 42 cases were hemorrhagic where majority of the cases were in the age group of 41 to 50 with a male of female ratio 2.5:1. In the present study, the mortality was above 50% in patients with history of Hypertension, smoking and alcoholism. The present study, also shows that patients were taken up for surgery within 24 hours of onset of ictus showed lesser mortality rate when compare with other time intervals. In the present study, where 6 cases of ischemic stroke were subjected to decompressive craniectomy, there was 75% mortality with Middle cerebral artery infarction infarcts and 50% mortality with cerebellar infarcts. In the present study, there was 82% mortality in patients with Glasgow Coma Scale (GCS) <8 compared to 42% in patients with GCS>10. To conclude, younger the age of the patient, better was the outcome. Early surgical intervention was associated with better outcome.

INTRODUCTION

Stroke is one of the leading causes of mortality and morbidity worldwide. Approximately 20 million people each year suffer from stroke and of these 5 million do not survive [1]. Developing countries account for 85% of global deaths from stroke [2]. Stroke is also a leading cause of functional impairments; with 20% of survivors requiring institutional care after 3 months and 15% - 30% being permanently disabled (American heart association, AHA 2009). Stroke is a life changing event that affects not only the person who may be disabled, but their family and caregivers. Utility analysis shows that a major stroke is viewed by more than screening, evaluation and

management strategies for stroke are well established in high income countries [3], but these strategies have not been fully implemented in India [4].

The aim of treatment in stroke patients is to prevent further neurological deterioration and to prevent recurrence. Strokes can have minor consequences especially lacunar and small cortical strokes or they can be lethal if they involve major arterial distribution such as whole middle cerebral artery (MCA) territory infarction. Despite all advances in medical treatment, mortality in such large infarcts is estimated to be between 50% and 78% [5]. The other alternative is surgical treatment, which still lacks class 1 evidence. However, there is recent reconsideration of this form of treatment and ongoing trails are showing some promising results.

To deal with the lethal complications of malignant edema and raised intracranial pressure (ICP), medical

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Research Article



treatment offers mannitol, hypertonic saline, barbiturate coma hypothermia and hyperventilation. However, no medical therapy has proven effective in preventing brain herniation and improving patient outcome.

Decompressive Craniectomy: As an alternative therapy, surgical decompression techniques have been proposed to relieve the high ICP. This involves removal of large bone flap ipsilateral to the side of infarction (hemicraniectomy) followed by dural reconstruction with the help of the flap taken from temporal fascia or any other available graft (duroplasty) [6]. The rationale of this therapy is to create compensatory space to accommodate the swollen brain, thereby normalizing intracranial pressure, reverting brain shifts and preventing secondary neuronal insult.

Recently three multicentre randomized controlled trials have been conducted with favourable outcome in patients who underwent decompressive craniectomies for the treatment of large MCA ischemic strokes. These are DESTINY (Decompressive Surgery for the Treatment of Malignant Infarction of the Middle Cerebral Artery) from Germany, DECIMAL (Decompressive Craniectomy in middle Cerebral Artery Infarcts) from France and HAMLET (Hemicraniectomy after Middle Cerebral Artery Infarction with Life Threatening Edema Trial) from Netherland [7].

The other surgical options for ischaemic stroke are embolectomy, carotid endarterectomy, stenting and emergency revascularization [8, 9]. Spontaneous intracerebral hemorrhage is the most disabling and least treatable form of stroke, with a continuing high mortality rate despite advances in medical knowledge. Studies of surgical evacuation of hematoma using a variety of methods have yielded wither negative or inconclusive results. Likewise, no medical treatment has been shown conclusively to benefit patients with intracerebral hemorrhage. The international STICH trial was a timely study to assess whether a policy of early surgical evacuation of hematoma in patients with spontaneous supratentorial intracerebral hemorrhage would improve outcome, in terms of death and disability, compared with a policy of initial conservative treatment. Additionally, it aimed to improve the definitions of indications of early surgery. The STICH investigators concluded that patients with spontaneous supratentorial intracerebral hemorrhage in neurosurgical units show no benefit with early surgery when compared with initial conservative management, except in superficial lobar hematoma. There has been widespread criticism of this study, as the patients included in the study were only those in whom there was a doubt regarding the benefit from surgery or conservative management. Hence, it would not be prudent to generalize the results for all patients with intracerebral hemorrhage. It has been suggested that further studies with uniform entry criteria and outcome assessment may determine which patients will do well with medical or surgical treatment.

This study has been undertaken to evaluate the outcome of surgical treatment in stroke patients after all the conservative modalities of treatment are exhausted.

MATERIALS AND METHODS

The present study was conducted in the department of neurosurgery, The study was conducted on 48 patient of stroke who has been referred to neurosurgery after the conservative management has failed to improve the condition. All the cases referred were first examined as per the inclusion and exclusion criteria and those who met with the inclusion criteria were shifted to NSICU and were subjected to necessary after failed conservative management.

Inclusive criteria:

- Age <60 years
- Progressive deterioration of neurological status in spite of conservative treatment
- Hypodensity of <50% of MCA territory on the scan
- Edema causing significant midline shift.
- Hypodensity >2/3rd of cerebellar hemispheres
- Compression or displacement of fourth ventricle
- Compression of basal cisterns
- Displacement of brainstem
- Obstructive hydrocephalus
- Hemorrhagic transformation

Exclusion criteria (managed conservatively)

- Patient in coma with bilateral non reacting pupils
- Age >60 years
- GCS<6
- Other comorbid conditions like myocardial infarction, cardiac failure incurable malignancy
- Clinical or radiological signs of irreversible brain stem ischemia.
- Refusal by the patient attendants to surgical treatment after explaining the poor prognosis

MATERIALS AND METHODS

All the patients considered for surgery were initially evaluated clinically and every case was recorded according to the standard protocol. All patients initially managed conservatively in the medical wards were transferred to NSICU and patients were prepared for surgery. In the meanwhile the conservative management was continued which included control of hypertension with continuation of same medication advised by physician or with injectable antihypertensive like labetalol. Antiedema measures with IV mannitol 1 gm/kg tid. Close monitoring of serum electrolytes. Maintenance of fluid and electrolyte balance, respiratory care, chest physiotherapy, and diabetic control. All patients were given antacids as prophylactic against gastric hemorrhages. Once the patient was ready surgery was undertaken as an emergency. Post operatively, all the patients were given the best critical care facility



with antibiotics, antiedema measures, antiepileptics, fluid electrolyte balance, nutrition through IV for first 3 days followed by RT feeds, chest physiotherapy, anti DVT measures like stockings, antihypertensives, antidiabetic drugs, regular neurologic assessment, ventilator support if needed. EVD was removed after 3 days on the basis of repeat CT and in case of further need was converted to VP shunt. All patients were subjected to scan on the third post operative day.

RESULTS

There were a total of 48 patients of stroke both hemorrhagic and ischemic which were included as per the inclusion criteria after they have been tried of all the conservative measures and there was no improvement. The outcome has been analyzed with respect to the type of stroke, age of the patient, sex of the patient, hypertension, and interval from onset of ictus to treatment.

In the present study, 6 cases (13%) out of 48 were ischemic stroke and 42 cases (87%) were hemorrhagic (Table 1).

Analysis revealed that, there were 3 patients under 30 years of age, 8 patients in the 31-40 age group, 19 patients in the 41-50 age group, 10 patients in the 51-60 age group, 6 patients in the 61-70 age group and 2 patients above 71. Majority of the cases were in the age group of 41 to 50 and constituted about 39.5% and the next common age group was 51 to 60 and accounted for 20.8% (Table 2).

In the present study, after surgery the maximum mortality was seen in the age group of above 70 and favourable results with increases survival were observed in age group less than 50 (Table 3).

In the present study, 73% (35) of 48 patients were male and 27% (13) were females. The male of female ratio is 2.5:1 (Table 4).

In the present study, 23 patients were known Hypertension, 28 patients with history of smoking, 21 were habituated to consume alcohol, and 6 had history of diabetes mellitus and family history of stroke (Table 5).

In the present study, the mortality was above 50% in patients with history of Hypertension, smoking and alcoholism (Table 6).

In the present study, there were 23 patients who have were known hypertensive among the total 48. Of the 23 patients, 9 patients had history for 5 years, 8 patients had history of 6-10 years and 6 patients had history for greater than 10 years (Table 7).

Among the 23 patients, 11 patients were on regular antihypertensives and had a mortality rate of 64%. 8 patients were on irregular treatment and the mortality rate in this group was 63%. 4 patients were not taking any treatment and the mortality rate in this group was 75% (Table 8).

In the present study, 24 patients were taken up for surgery within 24 hours of onset of ictus with a mortality rate of 46%, 13 patients after 24 hours but within 4 days with mortality rate of 62%, 11 patients after 4 days of ictus with mortality rate of 82% (Table 9).

In the present study, there was 82% mortality in patients with GCS<8 compared to 42% in patients with GCS>10. In the present study, where 6 cases of ischemic stroke were subjected to decompressive craniectomy, there was 75% mortality with MCA infarcts and 50% mortality with cerebellar infarcts.

Table 1. Stratification Based On Type Of Stroke

Type of stroke	Number of cases
Ischemic	6
Hemorrhagic	42

Table 2. Stratification based on age group

S. No	Age group in years	Number of cases	Percentage
1	<30	3	6.25%
2	31-40	8	16.68%
3	41-50	19	39.58%
4	51-60	10	20.83%
5	61-70	6	12.5%
6	>70	2	4.16%
Total		48	100%

Table 3. Outcome of surgery with respect to age of the patient

S.No	Age group	Number of patients	Alive	Dead
1	<30	3	2(66%)	1(34%)
2	31-40	8	5(63%)	3(33%)
3	41-50	19	10(52%)	9(48%)
4	51-60	10	2(20%)	8(80%)
5	61-70	6	1(16%)	5(84%)
6	>70	4	0	2(100%)
Total		48	20	28



Table 4. Stratification based on sex

Sex	Number of patients	Percentage
Male	35	73%
Female	13	27%

Table 5. Risk factors

Risk factor	Number of patients	Percentage
Hypertension	23	48%
Smokers	28	58.3%
Alcoholism	21	43.7%
Diabetes mellitus	6	12.5%
Family history	9	18.7%

Table 6. Outcome with respect to risk factors

Risk factors	Number of patients	Alive	Dead
Hypertension	23	8(34%)	15(66%)
Smokers	28	10(35%)	18(65%)
Alcoholism	21	9(42%)	12(58%)
Diabetes mellitus	6	4(66%)	2(44%)
Family history	9	5(55%)	4(45%)

Table 7. Duration of hypertension and outcome

Duration	Number	Alive	Dead
1-5 years	9	4(44%)	5(56%)
6-10 years	8	3(37.5%)	5(62.5%)
>10 years	6	1(16.6%)	5(83.3%)

Table 8. Prior treatment and outcome

Treatment	Number	Alive	Dead
Regular	11	4(36.3%)	7(63.6%)
Irregular	8	2(37.5%)	5(62.5%)
No treatment	4	1(25%)	3(75%)

Table 9. Interval between the onset of ictus and surgery

Interval	Total	Live	Dead
<24 hours	24	13(54%)	11(46%)
1-4 days	13	5(38%)	8(62%)
>4 days	11	2(18%)	9(82%)

Table 10. Neurological State at the time of surgery and Outcome

GCS (Glasgow Coma Scale)	Number	Alive	Dead
<8	16	3(18%)	13(82%)
8-10	15	7(46%)	8(54%)
10-12	17	10(58%)	7(42%)

Table 11. Outcome after decompressive crainectomy in ischemic stroke

Site	Total	Alive	Dead
Middle cerebral artery infarction (MCA)	4	1(25%)	3(75%)
Cerebellar infarction	2	1(50%)	1 (50%)

DISCUSSION

The present study was aimed to evaluate the outcome of stroke patients and to analyze the results with

respect to various factors like etiology, risk factors after the onset of stroke and the outcome. This study was conducted on 48 patient of stroke who has been referred to



neurosurgery after the conservative management has failed to improve the condition. In the present study, majority of the cases were in the age group of 41 to 50 and constituted about 39.5% and the next common age group was 51 to 60 and accounted for 20.8%. In the present study, after surgery the maximum mortality was seen in the age group above 70 and favourable results with increased survival was observed in age group less than 50. Similar observations were seen in earlier studies done by Harscher and co-workers, the mean age of all patients was 59 ± 11 years (range 24-77). In survivors, mean age was 54 ± 11 years, significantly younger than in the non-surviving patients (mean age, 65 ± 7 years) [10].

In the present study, 73% (35) of 48 patients were male and 27% (13) were females. The male to female ratio is 2.5:1. Several studies have shown similar observations; Men are more likely to have a stroke than women. This may be due to differences in risk factors such as smoking and drinking which are more prevalent among men in India compared with women. The mean onset of stroke for men in India ranges from 63-65 years and 57-68 years for women [11-13].

In the present study, patients on regular antihypertensives and irregular treatment showed lesser in mortality rate when compared with the patients taking no antihypertensives treatment. But experimental work by Goldberg and Larjani had shown that regular treatment of hypertension could reverse, many hemodynamic changes induced by hypertension which are important pathogenic mechanisms in stroke.

In the present study, 24 patients were taken up for surgery within 24 hours of onset of ictus with a mortality rate of 46%, 13 patients after 24 hours but within 4 days with mortality rate of 62%, 11 patients after 4 days of ictus with mortality rate of 82%. According to the pooled analysis of randomized trials from DECIMAL, DESTINY and HAMLET studies regarding the timing of surgical intervention, the argument for early intervention is the notion that might in itself limit damage caused by progressive swelling and mass effect. The counter argument is that surgery may be over utilized, exposing patients who will not ultimately require it to the morbidity of major surgery.

Our observations are in accordance with earlier authors where, Bagley in 1932 study advocated that proper time for evacuation was second week so that the hematoma would be liquefied. But Penfield showed in 1933 that solid clot can remain even after 18 days and suggested that mortality might be less if surgical intervention is done earlier. Lazorthes in 1959 advocated early surgery and favoured surgery on 3rd or 4th day.

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Mitsuo proposed that 24 to 48 hours after onset is the ideal time. They suggest that surgery within 24 hours is risky "because patient is in a shock like state". Lucassenhop operated within 24 hours in 62 out of 64 cases with a mortality of 32%, out of 6 patients of Van der ark 3 died and 2 were severely disabled. Pia in 1983 has written "operations on hypertensive hematomas during first 24 hours" has no effect and should be abandoned. The ideal time would be late half of 1st week or early 2nd week. Suzuki has advocated that surgery within 24 hours improves both mortality and morbidity. Kitamura says the best results are obtained by surgery within 7 hours and favorable results within 24 hours.

In the present study, where 6 cases of ischemic stroke were subjected to decompressive craniectomy with 4 cases of massive middle cerebral artery infarction and 2 cases of cerebellar infarction, the survival rate was 25% with supratentorial infarction and 50% with infratentorial infarction.

The pooled analysis of randomized trials from DECIMAL, DESTINY and HAMLET studies suggest that decompressive surgery undertaken within 48 hours of onset of stroke reduces the mortality and increases the number of patients with favorable functional outcome after malignant hemispheric infarction. Gupta and Sanders in their study of 129 patients in 2004 showed that after a follow up of 4 months, 7% of patients were functionally independent, 35% were mildly to moderately disabled, and 58% died or were severely disabled. Of the 75 patients who were > 50 years of age, 80% were dead or severely disabled compared with 32% of 63 patients <50 years of age. They concluded that although the mortality rates may fall after decompressive surgery, it is unclear which groups of patients benefit most from the procedure. Younger patients may have better functional outcome after surgery [15].

CONCLUSION

Present study concludes that, younger the age of the patient, better was the outcome. Early surgical intervention was associated with better outcome. Outcome was good in patients with better GCS at the time of surgery compared to worse outcome in patients with poor GCS at the time of surgery.

ACKNOWLEDGEMENT: None

CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.



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