Prognostic Factors in Spontaneous Intracerebral Haemorrhage

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Introduction:

World Health Organisation defines stroke or Cerebro Vascular Accident (CVA) as rapidly developed clinical sign of focal disturbance of cerebral function of presumed vascular origin and of more than 24 hours duration. This purely clinical definition includes most case of intracerbral haemorrhage, subarachniod haemorrhage and cerebral infarction (with or without demonstrable arterial occlusion) but not cases of cerebral ischaemia or diffuse cerebrovascular disease or insidious onst. This is the third commonest cause of death in developed countries being exceeded only by cardiovascular system involvement and malignant disease of all systems. The annual incidence of new stroke is 2 per 1000 people. Pathological studies indicate that 15-20% are acused by intracerebral haemorrhage.

Haemorrhage into the substance of the cerebral hemisphaere may occur from variety of causes but the most common causes are hypertensive disease or atherosclerosis.

Though adequate control of hypertension has decreased the incidence of Spontaneous Intracerebral Haemorrhage (SICH) in developed countries, it is not so in developing countries. Inadequate control and late detection of hypertension may be responsible for this.

Whereas cerebral amyloid angiopathy has emerged as and important cause of labar SICH, various other causes for secondary intracerebral haemorrhage have been recognized including ateriovenous (AV) malfomation, recreational drug abuse like cocaine and amphetamine, anti-thrombotic agents and anticoagulation treatment.

In is a common problem bearing a high morbidity and mortality. Computerized Tomography (CT) scan & M.R.I. has been very useful not only in the detection of intracerebral haemorrhage but also in the loclisation of its size and extension.

In spite of tremendous advances in the management of cerebrovascular disease, a stroke is still and immediate threat to life, especially so in case of intracerebral haemorrhage. To predict accuately the prognosis of intreacerebral haemorrhage has always-certain advantages. It helps the doctor where to allot his maximum efforts and hew best to conserve the limited intensive care resources of his hospital. It will also decrease the suffering of patient's relatives who worry more when uncertainty shrouds the outcome and who likes to take them to pashupati if prognosis is extremely poor. Accurate and early prediction of the outcome of acute stroke would also help early management and planning or rehabilitation. Clearly all clinicians would like to answer the question more precisely. Different studies have been carried out in different centers to predict the outcome of acute stroke. Some are mainly clinical whereas others are purely based on CT & MRI finding. In this study both clinical knowledge CT & MRI and studies are used to determine prognosis of intracerbral haemorrage.

Material and Methods

50 patients Admitted to Birendra Hospital with intracerebral haemorrhage above12 years of a irrespective of sex were included for the study. An intracerebral haemorrhage was defined as an ac stroke in which M.R.I. or C.T. demonstrated the origin of heomorrhage. Patients having traum intracerebral haemorrhage, haemorrhagic transformations of cerebral infract and due to ruptured aneury were excluded.

Information was collected by following Method.

The following method of study was carried out

1) Detailed clinical history as per proforma.
2) General physicial examination and other systemic examination as per proforma.
3) Review everyday to see progression of neurological signs and development of increased intrecra pressure.

In the history, each patient was asked about associated illness, risk factor for cardiovascular disease a patterns of disability within the immediate, premorbid period. If the patient was unconscious or otherw not assessable due to Aphasia etc. the information was obtained from patient's close relative. Level consciousness was graded as : (i) Fully conscious (ii) Drowsy (iii) comatose.

Coma is characterized by absence of response to even the most painful stimuli. Primitive motor respons to painful stimuli are absent. Drowsiness is a state where the person is arousable, responds to pain stimuli and verbal command and purposeful fending off movement.

Patients were classified as hypertensive if they had a clinical history of hypertension or had two or mo previously documented systolic blood pressure > 160 mm Hg, a diastolic blood pressure > 95mm Hg 3 consecutive days recording of high B.P. (Systolic > 160mm Hg Diastolic > 95 mm Hg) even witho history of hypertension.

Information was obtained about use of aspirin and anticoagulats. Consumption of alcohol was assess via a retrospective diary of drinking on each day of the week preceding the stroke' a binge was defin as $\geq$ 10 times the usal daily intake.

Each brain region that contained haemorrhage was recorded and the origin classified into one of t following : (i) Lobar (ii) Basal Ganglia (caudate, putamen and globus pallidus) (iii) Thalamus (iv) Inter capsule (v) Deep, periventricular white matter (vi) Cerebellar and (vii) Brainstem.

M.R.I. & C.T. Scan of head was taken in each case.

The volume of each haemorrhage was estimated. It was done by calculating area in each slice and multiply it by slice thickeness. If haematoma was seen in multiple cuts, the volume of the blood in each slice wa added together to get the total volume of blood. Mass effect was quantified according to whether or n there was compression of surrounding structure and midline shift of the pineal or septum pelluctidum. Th presence of intraventricular haemorrhage and hydrocephalic dilatation of cerebral ventricle was record

Result

50 patients of spontaneous intracerebral haemorrhage (SICH) were included in the Analysis. Spontaneo intracerebral haemorrhage was confirmed by M.R.I. in 47 patients (94%) and by C.T. Scan in patients (6%). The median delay between the onset of symptoms and M.R.I.G.C.T. was 14 day (range 1-25 days).

The mean age was 51.2 (Range 12-87 years). There were 33 male (66%) and 17 female (34%) as shown in Table 1

TABLE – 1

AGE. SEX & MORTALITY

Age	Mortality		Alive		Total No.
	No.	%	No.	%	
< 40	9	69%	4	31%	13
> 40	16	43%	21	57%	37
TOTAL	25		25		50

Sex	Mortality		Alive		Total No.
	No.	%	No.	%	
Male	16	48%	17	52%	33
Female	9	55%	8	45%	17
TOTAL	25		25	50	

AGE DISTRIBUTION OF SPONTANEOUS INTRACEREBRAL HAEMORRHAGE

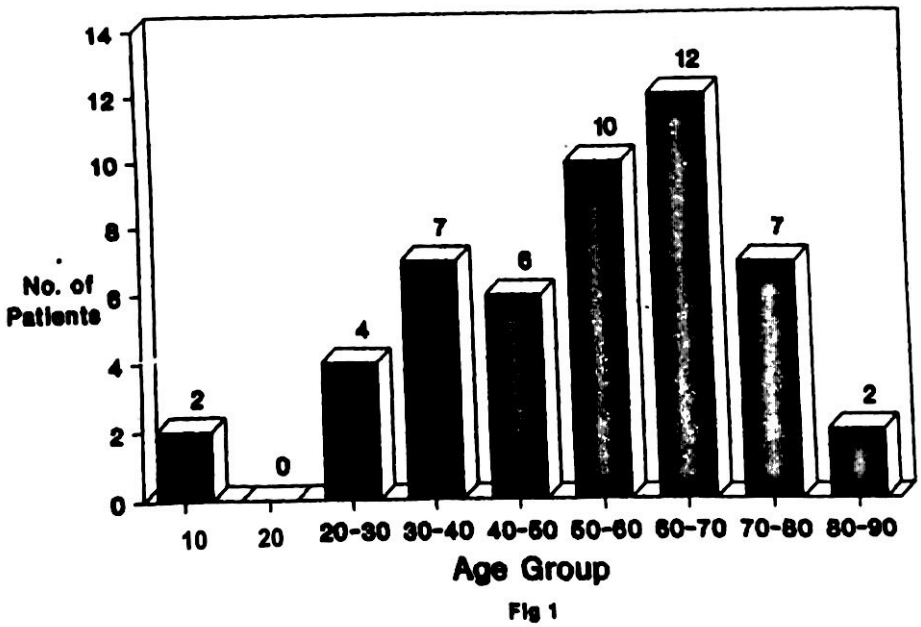

Fig 1

SICH was most common in 6th and 7th decades, comprising of 44% of all patients (Table No. 2)

TABLE – 2

DISTRIBUTION OF INTRACEREBRAL HAEMORRHAGE

Age Group	No. of Patients
10-20	2
20-30	4
30-40	7
40-50	6
50-60	10
60-70	12
70-80	7
80-90	2
Total	**50**

Hypertersion was present in 29 patients (58%), only 14 of whom were known hypertensives. Othe were diagnosed by 3 days basal BP record and detection of target organ involvement. Out of the known hypertensives, only 10 patients were on regular antihypertensive treatment at the time of strok The proportional frequency of hypertension in relation to site of hae morrhage were as follows : Labar deep (Thalamus Basal ganglia and internal capsule) 14, There were only 2 cases of cerebellar haemorrha Both of them were hypertensive.

TABLE –3

SITE OF HAEMORRHAGE

IN RELATION TO HYPERTENSION

Site	No. of Patients (With hypertension)	%
Labar	13	45
Deep (Thalamus, basal ganglia and internal capsule)	14	48
Cerebellum	2	7
Total	**29**	**100**

Only on patient was taking anticoagulant warfarin 5mg daily for prosthetic mitral valve). Prothrombin tim was Control 14 seconds and test 62 seconds.

12 patients (24%) were taking regular alcohol prior to stroke for more than 10 years. One case presente after alcoholic binge.

7 patients had hyperglycemia. 3 gave definite history of NIDDM. 4 were found to have hyperglycaemi after they had stroke. Hyperglycaemia persisted in all 4 suggesting that they were diabetic befor they ha a stroke.

2 cases of acute lymhatic lukemia presented with massive intracerebral haemorrhage. Both of them ha platelet count <20000/cmm and bleeding time> 5 min suggesting haemostatic defect. Both were fatal.

There were 3 cases of IHD on regular medication with aspirin and sorbitrate.

The prevalence of other risk factors for cerebrovascular accidents were smoking 25% including those who left smoking one year back and past history of stroke in one patient.

CLINICAL FEATURES

The onset was sudden in all the 50 patients. Headache and vomiting preceded in 30 and 13 patients respectively. 6 patients had seizures. 27 patients were comatose, 14 drowsy, 9 conscious at the time of hospital admission. Out of 27 comatose patients 20 died while 5 out of 14 drowsy patients died. (Table 4)

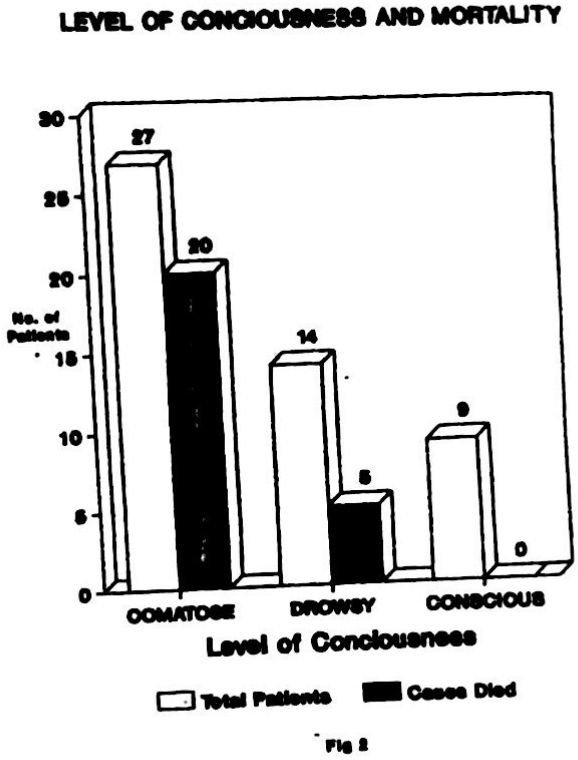

Fig 2

TABLE – 4

LEVEL OF CONSCIOUSNESS AT ONSET AND OUTCOME

Level of Consciouseness	Mortality		Alive		Total
	No.	%	No.	%	No.
Comatose	20	74%	7	26%	27
Drowsy	5	36%	9	64%	14
Conscious	0		9	100%	9
Total	**25**		**25**		**50**

Out of 50 patients, 38 had stroke in the morning. 42 patients were involved in routine daily work when the stroke occurred. 5 were at rest and 5 were doing more than accustomed work.

Other features of clinical importance were hemiparesis/quadriparesis 38, cranial nerve palsy 21, eye signs-9, ataxia 1, bilateral papilloedema with haemorrhage in 1. The eye signs were seen in 2 patients out of 5 thalamic haemorrhages and 7 atients out of 25 labar haemorrhages. In thalamic haemorrhage, the

eyes were deviated downward and inward, unequal in size and not reacting to light. In lobar haemorrhage, the eyes were deviated to the side of lesion.

Clinical features

TABLE-5

CLINICAL FEATURES

Level of Consciousness		
(a) Comatose	27	54%
(b) Drowsy	14	28%
(c) Conscious	9	18%
Headache	30	60%
Vomiting	13	26%
Seizure	6	12%
Incontinence	30	60%
Hemiparessis	38	76%
Cranial Nerves	21	42%
Eye signs	9	18%
Ataxia	1	2%
Bilateral papilloedema with haemorrhage	1	2%

Clinical signs of brain stem involvement in the form of absent corneal, pupillary and oculoephalic reflexe were seen in 18 patients and all of them died.

The smallest haematoma size was 2 cc and the largest was 128 cc. Table 6 shows mortality in relation size of haematoma.

TABLE – 6

SIZE OF HAEMATOMA

Size (cc)	OUTCOME				
	Expired	%	Improved	%	Total
< 25 cc	7	29	19	71	26
25 to 50	4	44	5	56	9
50 to 75	7	87	1	13	8
75 to 100	3	100	None		3
> 100	2	100	None		4
Total	**25**	**50**	**25**	**50**	**50**

None of the patients with haematoma size more than 75 cc survived. Mortality was fairly high even i patients with haematoma size 50 to 75cc.

The most common site of haematoma was labar haemorrhage (25 out of 50 patients) followed by intern capsule, basal ganglia, thalamus, cerebellum 12, 6, 5 and 2 respectively. Table No. 7 shows site o haematoma, level of consciousness and outcome.

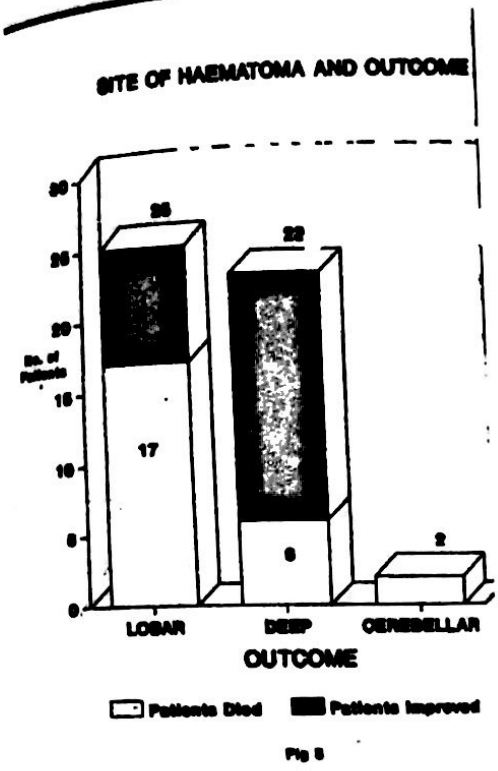

Fig 8

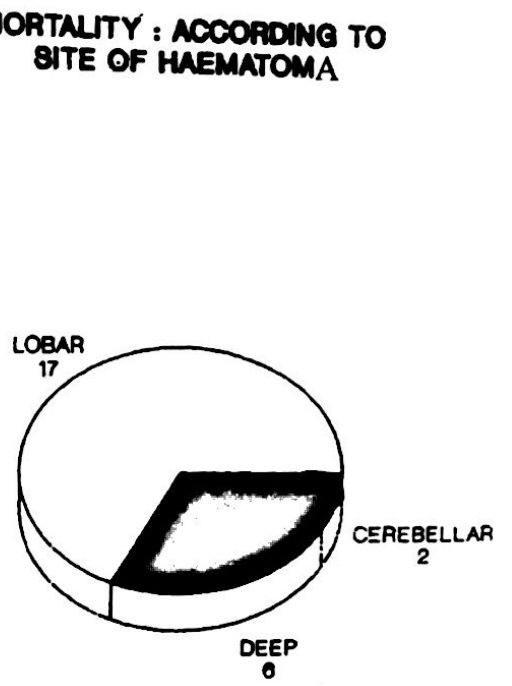

TABLE – 7
SITE OF HAEMATONA

Site of Haemorrhage	Coma Grade Conscious	Drowsy	Comatose	Outcome Dead	Improved	Total No.
1. Lobar	2	10	13	17 68%	8 32%	25
2. Thalamus	1	1	3	1 20%	4 80%	5
3. Basal Ganglia	2	1	3	2 33%	4 77%	6
4. Internal Capsule	4	2	6	3 25%	9 75%	12
5. Cerebellum			2	2 100%	None	2
6. Brain stem						0
TOTAL				25		50

There were 14 patients with intraventricular haemorrhage out of which 10 died. 9 were comatose 4 drowsy and 1 semiconscious. 5 patients had > 50 cc and 9 patients had < 50 cc haematoma.

20 patients had midline shift with compression of ventricle out of which 10 died. (Table No. 0)

TABLE – 8
INTRAVENTRICULAR HAEMORRHAGE MIDLINE SHIFT WITH COMPRESSION OF VENTRICLE AND MORTALITY

	Outcome Mortality No.	%	Alive No.	%	Total No.
Intraventricular Haemorrhage midline shift with compression of ventricle	10	71%	4	29%	14
	10	50%	10	50%	20

All 14 cases of intraventricular haemorrhage except one had also midline shift with compression o ventricle.

Table 9 shows the association between intraventricular haemorrhage (IVH) and level o consciousness.

Out of 14 patients of IVH, 9 were comatose, 4 drowsy and one conscious. All 9 comatose patient died. One out of 4 drowsy patients died where as the conscious patient survived.

TABLE – 9

LEVEL OF CONSCIOUSNESS AND OUTCOME IN I.V.H. (INTRAVENTRICULAR HAEMORRHAGE)

Level of Consciousness	Outcome				Total No.
	Dead		Alive		
	No.	%	No.	%	
1. Comatose	9	100%	0		9
2. Drowsy	1	25%	3	75%	4
3. Conscious	0		1	100%	1
TOTAL	10		4		14

Table 10 shows the relation between size of haematoma and outcome in intraventricular haemorrhage. There was 100% mortality with haematoma size > 50 cc. However, the mortality was 55% even with haematoma size < 50 cc.

TABLE - 10

SIZE OF HAEMATOMA AND OUTCOME IN I.V.H.

Size of haematoma	Outcome				Total No.
	Dead		Alive		
	No.	%	No.	%	
> 50 cc	5	100%	0		5
< 50 cc	5	55%	4	45%	9
Total	10		4		14

The aetiology could be determined only 36 patients out of 50 patients of SICH. In 14 cases the etiology was not known. Table 11 shows different etiologies observed in the study.

TABLE – 11

Etiology	No. Patients
1. Hypertension	29
2. Bleeding disorder	3
3. Cerebral tumour	2
4. Cortical venous thrombosis	1
5. Alcohol	1
6. Unknown	14

INTRA VENTRICULAR HAEMORRHAGE

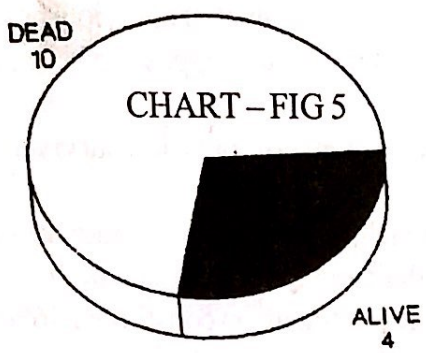

Fig 5

DISCUSSION :

It is difficult to diagnose spontaneous intracerebral haemorrhage on linical features alone. Large infarcts can mimic the classical picture of intracerebral haemorrhage. conversely lobar as well as deep haemorrhages can mimic infarction, including one of the classical lacunar syndrome. Indeed and apparent increase in incidence but fall in case fatality of spontaneous intracerebral haemorrhage is readily explained by an increased diagnosis of small non fatal haemorrhage.

In the present study 5 patients diagnosed as infarction clinically, proved to be spontaneous intracerebral haemorrhage by CT Scan.

Age is one of the most important risk factor for spontaneous intracerebral haemorrhage (S.I.C.H.) In the present study, the mean age was 51.2 years. S.I.C.H. was more common in older age group being most common between 6th and 7th decade. In another study be Gambhir et al the mean age was 58 + 014.5 years. In French prospective study mean age for men was 63.54 years and female 59.8 years.

The male female ratio was 1.9:1. This may not reflect the true incidence in the population because in this referral centre being of ARMY, we deal mostly with male patients. In French prospective study (43) the male female ratio was 1.5:1. In study by Gambhir et al the ratio was 2.3:1.

Amog risk factors for S.I.C.H. hypertension was the most common risk factor (58%) followed by smoking (25%) and alcohol (24%) respectively. In the study by Anderson CS et al 55% had history of hypertension, current smokers were 29% and ex-smokers (>12 months) 19%.

Chronic hypertension leads to infiltration of the walls of penetrating arteries with lipid and hyaline materials (lipohyalinosis) and microaneurysmal outpouchings (Charcot – Bouchard aneurysms). These arteries damaged by chronic hypertension may rupture and cause intracerebral haemorrhage.

Out of 24 patients who consumed alcohol, 23 had hypertension. It was difficult to associate any relation between stroke and alcohol consumption because alcohol certainly raises blood pressure. However, there are many mechanisms by shich heavy use of alcohol may predispose to stroke. The most important mechanisms relevant to spontaneous intracerebral haemorrhage are decrease in prostacyclin/thromboxane ratio, release of plasminogen activator and decrease in fibrinogen. It is interesting to note that modest intake of alcohol can be protective.

Although smoking is a strong risk factor for subarachnoid haemorrhage and cerebral infarction, there appears to be no association with spontaneous intracerebral haemorrhage.

Among clinical features, the level of consciousness at the onset had definite relationship with prognosis. 36% of drowsy and 74% of comatose patients were dead within 2 weeks of stroke whereas all the conscious patients survived. This is statistically hightly significant ($P < 0.001$). Though other studies have used Glasgow coma scale, higher mortalities were seen when the score was ?

Coma is due to direct involvement of the brain stem reticular activating system bilaterally in the b stem tegmentum (usually paramedian pons or thalamus) or increased intracranial pressure which shift brain contents or frank herniation. It is a very bad prognostic sign except in patients with thala haemorrhage.

Apart from coma, clinical deterioration in level of consciousness also suggest poor outcome.

Enlarged pupil on the same side of the lesion suggesting herniatino of homolateral temporal carried bad prognosis.

No patients with features of brain stem compression survived. All of them had absent corn pupillary and oculocephalic reflex.

The most common site of haemorrhage in the present study was lobar (50%) followed by inter capsule (24%) basal ganglia (12%), thalamus (10%) and cerebellum (4%). Deep haemorrhages (ba ganglia, thalamus and internal capsule put together) constituted 46% which is similar to other stud where the figures ranged from 40% to 69%.

In most of the studies, hypertensive intracerebral haemorrhages were deep seated rather than lob But in this study there was no appreciable difference in the prevalence of hypertension between differ sites of S.I.C.H. 45% of hypertensive patients had lobar haemorrhage and 48% had deep haemorrha Cerebellar haemorrhage consisted of 4%. This result is similar to Australian study.

The mortality in deep seated haemorrhage was 26% as compared to lobar haemorrhage (68% Though this study is comparable to the study by Weisberg (1979) (37), in most of the other studies, de seated haemorrhages had higher mortality. There are number of possible explanations for this. First many cases of intracerebral haemorrhage diagnosed clinically to be deep seated were not included in th study because they were dead before MRI could be done. Autopsies were also not carried out becau patient's relatives refused. Secondly most of the deep seated haematomas included in the study consist of smaller size. Cerebellar haemorrhage had 100% mortality. But it is difficult to comment because of on one patient.

In this study 3 cases of S.I.C.H. due to haematological disorders were observed. 2 cases of acu lymphatic leukemia had obvious haemostatic defects causing S.I.C.H. and both expired. They ha haemorrhages at multiple sites, both parietal regions and left temporal region. Third case was due anticoagulant treatment. He also had haemorrhages on both sides of cerebral cortex.

Apart from haemostatic defects, other causes of multiple intracerebral haemorrhage are cerebr amyloid, angiopathy, metastases, inflammatory vascular diseases, intracranial venous thrombosis, vascul diseases, intracranial venous thrombosis, vascular malformation, malignant hypertension, multipl haemorrhagic infarcts (usually embolic) and drug abuse. There were 2 patients with haemorrhages into th tumour. One patient had right frontal lobe tumour, other patient and tumour in right parietotemporal regio Both of them died.

The size of the haematoma is also very important predictor of early mortality. All patients with larg size haematomas 75 to 100cc were dead within one week of stroke. Even with haematomas of 50 to 7 cc size, mortality was 87%. It is statistically highly significant ($P < 0.001$). In other studies also larg volume of haemorrhage was associated with poor outcome. The volume of the haematoma was measure in this study as described in the method. This gives more accurate size of haematoma than the maximu diameter on MRI Scan. Though the cause of death in both supratentorial and infratentorial lesion irreversible failure of vital functions of the brain stem, the mechanism is different. Primary subtentori haemorrhages are therefore rapidly fatal as they affect the brain stem directly producing eithe disruption, necrosis or compression. Haematomas in posterior fossa are likely to cause obstructiv hydrocephalus also.

In supratentorial haemorrhages, brain stem damage is a secondary phenomenon resulting eithe from caudal expansion of pathological precess itselff or from transtentorial herniation of brain and raise

intracranial pressure.

M.R.I. showing midline shift with compression of ventricle had bad prognosis. 50% mortality was observed in this study. Middline shift was seen mostly in large size haematomas. Any large haematoma can cause brain shift. Haematoma disrupts the normal vascular autoregulation in the region of the lesion and causes oedema to which is added the space occupying character of the lesion. This results in dramatic increase in intracranial pressure. These changes cause brain shift and transtentorial herniation.

14 patients had intraventricular haemorrhage and there was 71% mortality. Intraventricular haemorrhage definitely gives additional predictive information.

Though size of haematoma and level of consciousness have definite relationship with prognosis in intraventricular haemorrhage, I.V.H. associated with even small haematoma (< 50 cc) had high mortality rate (55%) in the present study. This shows that I.V.H. may be an independent risk factor. In a study by Tuhrim S et al, 40 out of 52 patients of I.V.H. with Glasgow Coma scale less than or equal to 8 died, where as only 4 of 34 patients with I.V.H. but Glasgow coma scores greatoer than 8 died. Statistcally significant motality in in intraventricular haemorrhage was also observed in a study by Poungvarin N et al in 1990 and Broderick et al in 1993.

Intraventricular haemorrhage is due to rupture of haematoma into ventricle. Though primary ventricular haemorrhage may occur, it is rare in adults. The rupture of haematoma into ventricle can cause very rapid compression of brain stem and death. This is because sudden extravasation of blood into ventricle creates a pressure wave that immediately propagates downward to fourth ventricle, causing compression of the surrounding brain stem tissue.

Summary & Conclusion

50 patients of spontaneous intracerebral haemorrhage were studied.

The mean age was 51.2 years, most of them belonging to 6th and 7th decades. Male female ratio was 1.9:1. The significant risk factors were hypertension (58%) and alcohol (24%).

74% comatose and 38% drowsy patients expired. All conscious patients survived. No patient with clinical features of brain stem lesion survived.

The mortality depending upon the site of haematoma were as follows: (1) Cerebellum (100%), Lobar (68%) and deep (26%).

There were 3 cases of bleeding due to haematological disorders (1) 2 cases of acute lymphatic leukaemia (2) one case due to anticoagulant treatment. All of them had multiple haemorrhages and died.

Two patients ahd haemorrhage into tumour with fatal outcome.

50% of patients showing midline shift expired. 71% with intraventricular haemorrhage expired. The total mortality was 50%.

Accurate prediction of outcome not only gives a big moral support to patients and family members. But it would also help in early management, planning and rehabilitation. In certain cases it has been shown to improve the management of patients. The prognostication is never going to be perfectly accurate but the size of error can be made minimal by considering different factors instead of a single factor.

The following factors when considered together have significant prognostic value as seen in thestudy.

1) Comatose patients had bad prognosis. Conscious patients had good prognosis.
2) Large size haematoma had bad prognosis. Small size haematoma had good prognosis.
3) Cerebellar haemorrhage and lobar haemorrhage had bad prognosis. Deep seated haematomas because of smaller size had good prognosis in this study.
4) Midline shift with compression of ventricles had poor prognosis.
5) Haemorrhage into the ventricles due to rupture of haematoma had very bad prognosis.

In brief, the prognosis in a case of intracerebral haemorrhage without any complication like myocardial

infarction, pneumonia and septicaemia etc. depends upon whether brain stem is involved or not either directly or indirectly.

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