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Clinical and Radiological Profile of Acute Cerebrovascular Accident With Special Emphasis On Neurosurgical and Medical Methods in Management of ICH

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Abstract

Introduction: Cerebrovascular accident is a potentially lethal neurological disease of adult life. Intracerebral hemorrhage is the second most common subtype of stroke after ischemic stroke and accounts for approximately 10 % to 20 % of all strokes. Hypertension has been identified as the single most important risk factor causing intracerebral hemorrhage. Other risk factors include alcohol, smoking, diabetes, anticoagulant use and other genetic risk factors. The incidence of intracerebral hemorrhage increases with age and it is more among men and in Asians. In acute stroke, CT scan readily distinguishes hemorrhage from infarct guiding anticoagulant therapy and site, size of lesion provide prognostic value. Other stroke mimicking conditions can also be identified .TheICH score is a simple clinical grading scale that allows risk stratification on presentation with ICH. The role of surgery remains controversial in the management of acute intracranial hemorrhage. **Material &Methods**: The present study was carried out in the Department of Medicine, Sanjay Gandhi Memorial Hospital, Rewa between April 2019 to June 2020 (15months). A total of 200 patients diagnosed with stroke were selected for the study. **Observations and Results**: CVA is most commonly found among elderly patients. The most common clinical features was found to be weakness(47%) .In the present study most common type of stroke was ischemic stroke(63%) followed by hemorrhagic(23%).In the present study most common site of Ishemic stroke was internal capsule region (40.47%), followed by parietal lobe(20.63%) . The radiographic findings were favoring the middle cerebral artery territory involvement. In the present study, mortality for patients with an ICH score of 1,2,3,4 and 5 were 27.27%, 44.4%, 66.6%, 100%, 100% respectively. In the present study there was no significant difference between outcome of patients who were managed by neurosurgery and medical management.

Keywords: stroke, hemorrhage, Hypertension.

Introduction

Stroke is the second leading cause of death worldwide, and one of the leading causes of disability. Intracerebral hemorrhage is the second most common subtype of stroke after ischemic stroke and accounts for approximately 10 % to 20 % of all strokes. Hypertension has been identified as the single most important risk factor causing intracerebral hemorrhage.

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In acute stroke, CT scan readily distinguishes hemorrhage from infarct guiding anticoagulant therapy and site, size of lesion provides prognostic value. Other stroke mimicking conditions can also be identified [1,2].The use of a scale such as the ICH Score could improve standardization of clinical treatment protocols and clinical research studies in ICH. The ICH score is a good predictor of 30 day-mortality and functional outcome in different socioeconomic population.The role of neurosurgery in intracranial hemorrhage patients are controversial. The study conducted by Juvela et al[3] who found no significant differences in the mortality rates or in the survival times and morbidity between the two treatment groups. The

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largest trial so far has been the International Surgical Trial in Intracerebral Hemorrhage (STICH) which has been published in 2005[4]. In the intention-to treat analysis, no significant difference regarding favourable outcome between the surgical (26% favourable outcome) and conservative (24% favourable outcome) group was found.

Materials and Methods
In the present study carried out in Department of Medicine, SGMH, Rewa, 200 cases of Cerebrovascular accident primarily diagnosed by clinical examination and further evaluated by available Brain imaging modality viz. Computerized Tomography Scan (CT SCAN, MRI) were taken for study.

Inclusion criteria
➢   Age >18 yrs
➢   All patients having clinical and radiologically confirmed diagnosis of stroke.

Exclusion criteria
➢   Age <18 years
➢   Patients having stroke due to trauma.
➢   Pregnant women
➢   Critically ill patients on ventilator.

➢   Patients not giving consent .
➢   Those Patients getting LAMA within 24 hours.
➢   Already known cases of bleeding diathesis.

Data Collection and Methods
Thorough history & examination were taken. History of risk factors including modifiable & non modifiable risk factors and family history was taken.
Investigations included complete hemogram, coagulation profile, Kidney Function Tests, and NCCT/MRI head. Patients were observed for a period of 72 hours in the hospital. In the present study, 15 patients with CT /MRI confirmed supratentorialICH were operated within 48 hours by craniotomy with evacuation of hematoma. Another set of 15 patients were managed by medical methods The two groups were compared in terms of methods used for management. Death or disability at 3 months was assessed by MRS scale.

Statistical Analysis
Data were collected and managed on an excel work sheet. Paired student's *t*-test was used to compare the mean of continuous variables. p values < 0.05 were considered significant.

Observations and Results

Table 1: Distribution of cases According to Age and Sex

Age (in Yrs.)	Male Mean age=57.28±11.8		Female Mean age=55.5±11.9		Total Mean age=56.3±11.9	
	No	%	No	%	No	%
<=30	0	0	4	9.30	4	2.0
31-40	12	10.52	6	6.97	18	9.0
41-50	20	17.54	15	17.44	35	17.5
51-60	35	30.70	26	30.23	61	30.5
61-70	29	25.43	29	33.72	58	29.0
>70	18	15.78	6	6.97	24	12.0
Total	**114**	**100.0**	**86**	**100.0**	**200**	**100.0%**

P value is > 0.06

Above table shows that out of 200 patients, 114 were males and 86 were females the males to female ratio 1.32:1 the mean age group is 56.3 ±11.9 years. In males the mean age was 57.28 ±11.84 years and in females it was 55.55±11.98 years. The distribution of stroke is maximum in the age group of 51- 60 years which comprises 30.5% of total patients.

Table 2:Comparison of different types of strokes with gender

Gender	Ischemic Stroke		Hemorrhagic Stroke		Total	
	No	%	No	%	No	%
Male	72	57.1	42	56.2	114	57.0
Female	54	42.9	32	43.48	86	43.0
Total	126	63.0	74	37.0	200	100.0

P value is > 0.95

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Above table shows thatthe number of ischemic stroke patients was 126 (63%) and hemorrhagic stroke cases were 74(37%).

Table 3: Distribution of cases According to clinical features in stroke patients

Clinical Features	No. of patients	Percentage
Weakness	94	47.0%
Speech involvement	34	17.0%
Giddiness	24	12.0%
Convulsions	10	5.0%
Altered sensorium	28	14.0%
Headache & Vomiting	10	5.0%
Total	200	100.0

From the table shown above, most common clinical presentation was weakness which was 47% followed by speech involvement (17%), altered sensorium (14%) giddiness (12%), convulsions (5%) and headache and vomiting (5%).

Table 4: Distribution of cases According to Risk Factors in Stroke

Risk Factors	No. of patients	Percentage
Hypertension	104	57.0%
Diabetes	91	45.5%
Past history of CAD	61	30.5%
Dyslipidemia	84	42.0%
Alcohol	100	50.0%
Smoking	133	66.50%
Past history of CVA	38	19.0%

$p \leq 0.00635$

The table above shows that the most common risk factor was smoking (66.5%) followed by hypertension (57%), alcoholism (50%), diabetes (45.5%), dyslipedimia (42%), CAD(30.5%).This observation was found to be statistically significant.

Table 5: Distribution of cases According to Associated risk factors in both the types of stroke

Risk Factor	Hemorrhagic stroke		Ischemic stroke		Total	
	No	%	No	%	No.	%
DM	37	40.65	54	59.35	91	100.0
HTN	44	42.30	60	57.70	104	100.0
Smoking	42	16.66	91	83.34	133	100.0
Alcohol	33	33.0	67	67.0	100	100.0
Hyperlipidemia	32	38.0	52	62.0	84	100.0

$P = < 0.006357$

The most common risk factor found in hemorrhagic stroke was hypertension (42.3%) whereas in case of ischemic stroke, the most common risk factor found smoking (83.34%).This was found to be statistically significant .

Table 6: Radiological distribution of infarct and Hemorrhage

Area Affected	Hemorrhagic stroke		Ischemic stroke		Total	
	No	%	No	%	No	%
Brain stem	9	12.16	7	05.55	16	8.5%
Thalamus	4	05.05	2	01.58	6	3.0%
Basal ganglia	13	17.56	14	11.11	27	13.5%
Ventricular	10	13.51	4	03.17	14	2.0%
Internal capsule	16	21.62	51	40.47	67	41.5%
Cerebellar	4	05.40	8	06.34	12	8.0%
Frontal lobe	4	05.40	8	06.34	12	5.0%

Parietal lobe	10	13.51	26	20.63	36	22.0%
Occipital lobe	4	05.40	6	04.76	10	6.0%
Total	74	37.0	126	63.0	200	100.0

P value is < 0.0238

The above table shows that the most common site of hemorrhage was in internal capsule(21.62%) followed by basal ganglia(17.56%)followed by parietal lobe(13.51%).The least common site of hemorrhagic stroke was in thalamus (5.05%) .The most common site of hemorrhage was in internal capsule region(40.47%) followed by parietal region(20.63%).The least common site of ischemic stroke was in the thalamic region(1.58%). These findings were found to be statistically significant .

Table 7:Assessment of ICH Score (n=74)

ICH Score	No. of patients	Percentage
0	8	10.81%
1	22	29.72%
2	18	24.32%
3	15	20.27%
4	6	8.10%
5	5	6.75%
Total	74	100.0%

The above table shows that, most of the patients had an ICH score of 1(29.72%), followed by 2(24.32%), 3(20.27%),4(8.10%),5(6.75).

Table 8: Assessment of Mortality according to ICH Score(n=74)

ICH Score	Mortality	Percentage
0 (n=8)	0	0%
1 (n=22)	6	27.27%
2 (n=18)	8	44.44%
3 (n=15)	10	66.66%
4 (n=6)	6	100.0%
5 (n=5)	5	100.0%

$p \leq 0.05$ The above table shows the range of ICH scores was from 0 to 5,each increase in the ICH score was associated with a progressive increase in mortality .the mortality rates for patients with an ICH score of 1,2,3,4 and 5 were 27.27%, 44.4%,66.6%,100%,100% respectively.

Table 9: Comparison of outcome in ICH patients undergoing surgery and those who are managed by conventional medical method

Methods	Good outcome	Mortality
Neurosurgical intervention	26%	50%
Medical Management	20%	53%

From the above table ,good outcome was found in 26% of patients managed neurosurgically while 50% patients died. Good outcome was found in 20% of patients who were medically managed with a mortality of 53% after 3 months.

Discussion
Age and Stroke
In the present study, in males the mean age was 57.28 years ±11.84 years and in females it was 55.55±11.98 years . The overall mean age of patients in our study was 56.3 ±11.9 years which correlated with the study conducted by Maskey et al (mean age 63)[5]. The distribution of stroke is maximum in the age group of 51- 60 years which comprised 30.5 % of total patients which closely correlates   with the study done by Ukoha Ob et al[6] and Maskey et al[5]

Similar observation was found in studies conducted by Aiyer et al [7] where it was shown that 64% belonged to more than 50 yrs.

The increase in the distribution of stroke among patients more than 50 yrs can be due to atherosclerosis.

Among young age group, ,it can be due to changing life styles, sedentary habits ,rising stress levels, etc[8].

Gender and Stroke

- In the present study, the males to female ratio was 1.32:1 which correlates with the study done by Aiyaret et al(1.9:1) [7].
- The number of ischemic stroke patients was 126 (63%) and hemorrhagic stroke cases were 74(37%). This is in very close correlation to the study done by Aiyer et al[7] who found 30% patients with hemorrhagic stroke and Sotaniemi et al [9] who found 33.8% hemorrhagic stroke .Also, the incidence of stroke was more common among males than in females in hemorrhagic as well as ischemic strokes. This finding also correlates with the study done by Aiyer et al[7] who found the distribution of stroke is more common in males than in females. So most common type of stroke was ischemic stroke.
- In both the gender,ischemic stroke presentation is more in comparison to hemorrhagic stroke. So it is obvious that distribution of stroke is more common in females than males.

Clinical Features in Stroke

In the present study, the most common clinical presentation was weakness which was 47% followed by speech involvement (17%), altered sensorium (14%), giddiness (12%), convulsions (5%) and headache and vomiting (5%). This observation is in close correlation with the study done by P. Chitrambalam et al[10]and Naik M et al[11]. This result correlates with Davidson and Framinghamstudy and study in the department of Neurology, Nizams institute of medical science, Hyderabad where hemiplegia was also found to be the commonest presentation [12,13]. Headache in most cases preceded the onset of strokeand sometimes followed the incident. It was apparent from this study that headache and vomiting has got an association stroke. This study correlates well with that of Scott and Miller,showing marked association of headache and vomiting with stroke [14]. The various clinical features depend on the area of involvement.

Risk Factors and Stroke

- In the present study, the most common risk factor was smoking (66.5%) followed by hypertension (57%) alcoholism (50%), diabetes mellitus (45.5%), dyslipidemia (42%), history of CAD (30.5%). The most common risk factor is hypertension in various studies[15,16].
- In the present study,a total of 57% patients had hypertension which correlates with the study done by Naik et al.(40.66%)[11].

- 42% of the hypertensive patients had hemorrhagic stroke whereas 57% had ischemic stroke. Kaur et al [17] in their study showed hypertension in 48.84% of hemorrhagic strokes and in 32.69% in ischemic strokes.
- Kaul et al in their study found smoking as a risk factor for stroke in 28% of cases. In our study, the percentage of smoking and alcohol are more as compared to other studies[18].
- In our study dyslipidemia was 42% which was more compared with study done by Eapen et al. (17%)[15] , Abdu-AlrhamanSallam et al. (13.9%) [16]
- In present study diabetes patients were 45.5% which is drastically more compared with the study done by Maskey et al[5] (9.3%), Gauri et al[19] (9%) and Eapen et al.(8%)[15]
- In the present study patients with previous H/o coronary artery disease were 30 .5% which is also more when compared with study done by Kaur et al. (6%)[17] and Eapen et al. (9%)[15] This brings to a conclusion that coronary artery disease is a significant risk factor for stroke .

Types of Stroke

In the present study most common type of stroke was ischemic stroke (63%) which correlated with studies done by Aiyar et al[7] in which ischemic stroke was 70%, in Eapen et al[15] it was 68% and in Devichand et al.it was (75%)[20]

- Second most common type of stroke was hemorrhagic (23%) which correlated with study done by Eapen et al[15] (32%), Aiyar et al[7] (26%), Devichand et al[20] (25%).
- A study conducted in Canada showed that majority of stroke cases were ischemic (84%),rather than hemorrhagic (26%) which was also consistent with their national data [21]
- Ischemic strokes are the most common type of stroke in both men and women and has been linked to many underlying influences and known risk factors.

Radiographic Sites of Stroke

- In the present study most common site of hemorrhage was in internal capsule (21.62%) followed by basal ganglia (17.56%) followed by parietal (13.5%).

This findings correlates with the study d one by Eapenetal[15] and Aiyeret al[7] where it has been concluded that in multiple hematoma sites most common was thalamic ganglionic region.

- In the present study most common site of Ischemic stroke was internal capsule region (40.47%), followed by parietal (20.63%) .

- R.P Eapen et al[15] in their study showed intracranial hemorrhage to be thalamic bleed (18.75%),basal ganglia bleed(46.88%),internal capsule bleed (3.25%). The same study showed ischemic stroke to be parietal(56%),internal capsule(16%), thalamus(16%).

- These findings were favoring middle cerebral artery territory; this was also confirmed in study done by Devichand et al[20]

- There is no optimal time to image stroke patients with CT and expect to show a definite infarct. Seeing the infarct is not necessary to diagnose ischemic stroke.

- MRI often helps to distinguish difficult strokes such as suspected venous infarction or carotid or vertebral dissections ,as it may show vascular anatomy also[22]

- Although clinical methods are useful in differentiating the probable cause of stroke, radiological investigations are superior to the age old methods.It not only confirms the diagnosis but also gives clear vision for deciding the treatment protocol and also other causes are ruled out.

ICH Score and Stroke

- In the present study, most of the patients had ICH score of 1(29.72%).

- The range of ICH scores was from 0 to 5, each increase in the ICH score was associated with a progressive increase in mortality which was found to be statistically significant .No patient with ICH score 0 died whereas all patients with ICH score 5 died. In the present study ,mortality for patients with an ich score of 1,2,3,4 and 5 were 27.27%, 44.4%, 66.6%, 100%, 100% respectively. This correlates with the studies done by Hemphill et al[23]

- The main outcome predictors of ICH are considered to be initial volume and haematoma expansion. Other predictors of poor outcome include age, low GCS score at admission, location and volume of the hematoma, location and amount of IVH, increased blood pressure, and increased blood glucose at admission

- Many models have been proposed to predict outcome (including death). Among these, ICH score is the most commonly used. ICH score is a simple, reliable grading scale for ICH[23]

Surgery Versus Medical Therapy For ICH

In the present study, 15 patients with CT /MRI confirmed supratentorial ICH were operated within 48 hours by craniotomy with evacuation of hematoma. Another set of 15 patients were managed by medical methods The two groups were compared in terms of methods used for management. Death or disability at 3 months was assessed by MRS scale. Good outcome was found in 26% of patients managed neurosurgically while 50% patients died. Good outcome was found in 20% of patients who were medically managed with a mortality of 53% after 3 months.

In the present study there is no significant difference between outcome of patients who were managed by neurosurgery and medical management.

Table 10:Randomized Controlled Trials

Author	Year	Location	Inclusion criteria	Total cases	Mean haematoma size	Mean GCS score at admission	Dependent at 6 month(%)	Death at 6 month (%)	Time(hr) from onset to surgery (mean)	comments
Ckissock et al.	1961	all	Not clear	S89M91	N/A	Equal groups	S13(15) M14(15)	S58(65) M46(51)	72	Pre CT era
Juvela et al.	1989	all	Unconscious /hemiparesis/dysphasia	S26M26	S 56.2 cc M 66.7cc	S9M12	S13(50) M11(42)	S12(46) M10(39)	48(14.5)	Surgical group with overall lower pretreament GCS score
Auer et al.	1989	all	>10cc,<48 hr from onset,age 30-80	S50M50	S 44% >50cc,56%		S7(14) M2(4)	S21(42) M35(7	48	Positive benefits limited to

			yr,neurological deficit		<50cc.M 48%>50 cc, 52%<50 cc			0)		patients with lobar haemorrhage
Batjer et al.	1990	putamen	>3cm diameter ICH with neurological deficit	S8 M9 ICPM 4	>3cm	N/A	S2(25) M0(0)	S4(50) M7(78) ICPM 4(100)	24	Included only putaminal haemorrhages,small sample size
Morgenstern	1998	Lobe,putamen	GCS5-15,ICH>10 cm^3	S17M17	S 49 cc M 43.8cc	S10M11	S8(47) M6(35)	S3(18) M4(24)	12(8.3)	Single centre, small sample size
Mendelow et al.	2005	all	GCS>4, >2cm diameter ICH,with in 72 hr	S503M530	S 40 cc M 37 cc	equal	S312(67) M351(72)	S173(36) M189(37)	30	Supercial hematoma might benefit from surgery

- McKissock reported the first randomized study of surgical removal of ICH.Almost no patients underwent surgery before 24 hours after onset; most underwent surgery within 3 days. The proportion of surgically treated patients who were dead or totally disabled (71 of 89 cases [80%]) at 6 months after discharge was higher than with medically treated patients (60 of 91 cases [66%]) (level of evidence II)[24]

- This is in correlation with the study conducted by Juvela et al[3] who found no significant differences in the mortality rates or in the survival times and morbidity between the two treatment groups. Thus it can be concluded that the role of surgery remains controversial.

- The largest trial so far has been the International Surgical Trial in Intracerebral Hemorrhage (STICH) which has been published in 2005[4]. Patients were eligible for inclusion if they had spontaneous supratentorialICH with onset within 72 hours and the responsible neurosurgeon was uncertain about the benefit of either medical or surgical treatment (the _uncertainty-principle'). This trial included 1033 patients from 83 centres, 503 were randomized to early surgery and 530 to initial best conservative treatment. In the intention-to treat analysis, no significant difference regarding favourable outcome between the surgical (26% favourable outcome) and conservative (24% favourable outcome) group was found. Surgery within 96 hours was associated with a statistically insignificant absolute benefit of 2.3% in 6 month outcome. The same statistically insignificant trend in favour for surgery was found for the other outcome parameters mortality, MRS score and Barthel Index. Thus, patients had no benefit from early surgery when compared with initial conservative treatment. However, a subgroup analysis identified patients with superficial, lobar haematomas (<1 cm from cortical surface) and those with GCS score of 9–12 that were more likely to benefit from surgery; however, this did not reach statistical significance. In contrast, patients presenting in coma with initial GCS score of 8 or lower, nearly all had unfavourable outcomes; early surgery even raised the relative risk of poor outcome by 8%, suggesting that surgery is probably harmful in this subgroup of patients[4].

- A meta analysis published by Prasad et al after the STITCH 1 trial concluded that surgery added to medical management reduces the odds of being dead or dependent compared with medical management alone.

Conclusion

The distribution of stroke was found to be more among patients aged more than 50 and was more common in males than females .Among clinical features weakness and speech involvement were prominent. Smoking and alcohol consumption were important acquired risk factors .Hypertension and Diabetes mellitus were modifiable risk factors commonly seen.. Dyslipidemia was also a very important risk factor. Other risk factors like tobacco chewing, CAD, prior stroke/TIA, family history of Diabetes,hypertension were also present .From the radiological investigations, it can be concluded that the most common artery involved was

the middle cerebral artery. In hospital mortality rate was higher among hemorrhagic stroke than Ishemic stroke. In the end, by comparing outcomes of patients who were managed by neurosurgical methods and medical methods, it was found to be equivocal.

Limitations

- The study was carried out in a limited population.
- Follow-up of patients in the current study is short and further follow-up is required to analyse the long term outcome in patients with spontaneous ICH.

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