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Hemorrhagic Stroke: A Special Emphasis on Risk Factors & Location of Bleed

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Abstract: ***Background: Intracerebral haemorrhage is the second most common subtype of stroke world-wide, and is a leading cause of morbidity and mortality. The present study was undertaken with the aim of recognizing the various risk factors of haemorrhagic stroke and understanding their relation to the location of bleed on Non- contrast CT scan of the brain in a single study and to compare them with the existing studies. Methods and Findings: A prospective study was done in 108 patients presenting with hemorrhagic stroke, to identify the common risk factors and to correlate them with the location of hemorrhage. The results were analyzed using the chi-square test to find significant correlation between them. Conclusions: Hypertension and smoking were identified as the most important risk factors for hemorrhagic stroke. Non-lobar intracerebral hemorrhage was more common in patients with both hypertension and smoking, especially in the putamen.***

Keywords: Hemorrhagic stroke, risk factors, location of hemorrhage

1. Introduction

Haemorrhagic stroke is defined as bleeding within the brain parenchyma, which result of ruptured blood vessels [3]. It is the second most common type of stroke, comprising 7.5 – 30 % of all strokes [1, 2]. Intracerebral haemorrhage occurs when a blood vessel within the brain parenchyma ruptures. It may be primary or secondary.

Primary intracerebral haemorrhage is spontaneous bleeding within the brain without a clear-cut lesion. It is the most common type of intracerebral haemorrhage, which accounts for nearly 78 - 88 % of non-traumatic intracerebral haemorrhage [4]. Secondary intracerebral haemorrhage occurs as a complication of a pre-existing lesion within the brain, such as a vascular malformation or tumour etc.

Epidemiology: Haemorrhagic stroke has an overall mortality of 40 – 50 % causing the second highest number of deaths and is responsible for causing the third highest number of Disability-Adjusted Life Years (DALYs) world-wide [2, 3]. Its incidence ranges from 10 to 30 cases per 1 lakh population per year and is most common in old age, especially in patients aged > 55 years. [2, 4]

Haemorrhagic stroke is a devastating disease that affects the life of the patient and also his family. It has poorer prognosis as compared to ischemic stroke with a 30-day mortality rate of 35 – 51 % [8] and only 38 % of patients surviving the first year after onset [9]. The morbidity associated with haemorrhagic stroke is very high, with only 12 - 39 % of the survivors achieving functional independence at 6 months [10, 11].

Among the modifiable risk factors associated with primary intracerebral bleeding, hypertension and old age are the most important [5], with risk of hemorrhagic stroke doubling with each increase in age of 10 years after the age of 50 years [6, 7].

Due to the significant morbidity and extensive care required in the management of hemorrhagic stroke, the early identification of the nature and location of hemorrhage is important so as to reduce morbidity in survivors and to avoid mortality as far as possible.

The current article focuses on the pre-clinical and imaging characteristics of haemorrhagic stroke with special emphasis on the risk factors as the early identification of modifiable risk factors and their prevention can effectively reduce the incidence of haemorrhagic stroke.

2. Materials and Methods

Study Setting: The present study was done in the Department of General Medicine, GSL Medical College and General Hospital, Rajahmundry, Andhra Pradesh, India, from OCTOBER 1st, 2016 to MARCH 31st, 2018. A total of 108 patients admitted with clinical symptoms and signs of haemorrhagic stroke were included in the study.

Exclusion Criteria: Patients with non-spontaneous intracerebral hemorrhage, like patients with known history of head trauma, known patients with intracranial pathology (such as vascular malformations, tumors, cerebral amyloid angiopathy etc.,) and patients on anticoagulant therapy, were excluded from the study.

Ethical Issues: Approval from the institutional ethics review committee was obtained before commencing the study. Informed consent was obtained either from the study subjects or from their attendants if the patient is uncooperative or unconscious.

Data Collection: A pre-designed and pre-tested questionnaire was used to collect relevant history, including symptoms and signs at presentation. Past history and personal history were carefully elicited to recognise the various risk factors or other comorbidities. Clinical examination findings were clearly documented, including the blood pressure at the time of admission.

Imaging Studies: Non-contrast CT Scan of the brain was done in all the patients using a Toshiba Alexion 16 slice modified 3rd generation CT scanner using 120 Kv and 30 mAmp. The CT scan images were evaluated and reported by a qualified radiologist and the description of the pathology was documented.

Study Variables Considered: Age and sex of the patient, Risk factors, and CT findings.

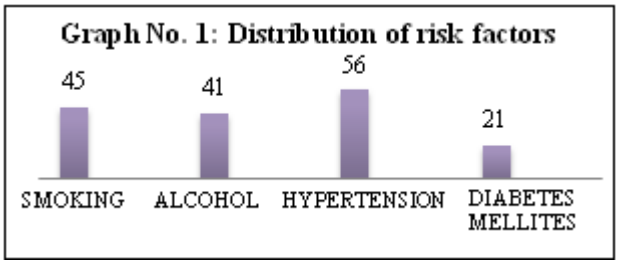
Statistical Analysis: Data was entered in MS Excel 2010 and statistical analysis was carried out using SPSS 20.0 version. Chi-square test was used to assess the association among various categorical variables. 'p' value < 0.05 was considered as significant association.

3. Results and Discussion

Out of the 108 patients included in the study, 73.1 % (n = 79) were males and 26.9 % (n = 29) were females, consistent with the literature evidence that haemorrhagic stroke is more common in males than in females.

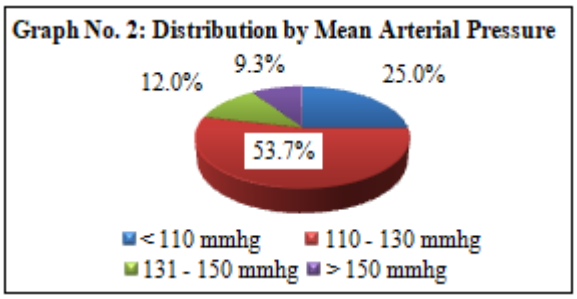
Majority of the patients were in the 41 – 60 years age group, constituting 49.1 % of the patients, (n = 53), followed by the 61 – 80 years age group with n = 41 (38.0 %), and the < 40 years age group with n = 11 (10.2 %). The least common frequency was in the > 80 years age group with n = 3 (2.8 %). The mean age of occurrence of spontaneous intracerebral haemorrhage in the current study was 57.07 +/- 12.89 years.

Risk factors: The most common risk factor found was known history of hypertension seen in 56 patients (51.9 %), followed by smoking - n = 45 (41.7 %), consumption of alcohol - n = 41 (38.0 %), and diabetes mellitus - n = 21 (19.4 %). The other risk factors found were, history of coronary artery disease, obesity, sudden extreme weight loss etc.



As hypertension was the most frequent modifiable risk factor identified, a detailed analysis was done. Majority of the patients with hemorrhagic stroke in the present study had systolic blood pressure >/= 140 mm of Hg, with n = 83, i.e., 76.9 % of the patients. The Mean Systolic Blood Pressure (SBP) was 161.57 ± 34.37 mm of Hg.

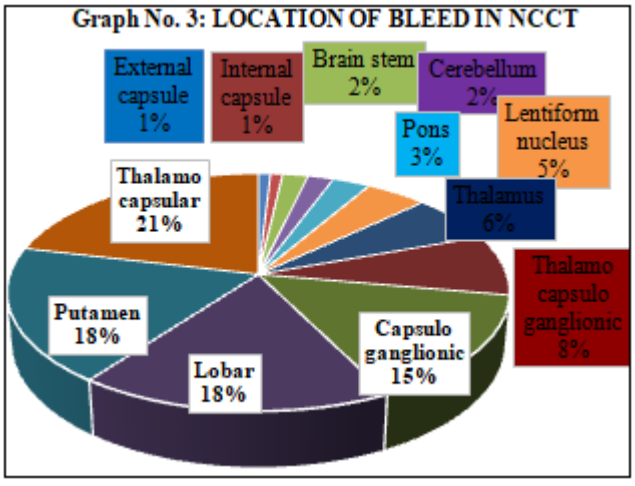
The mean arterial pressure of patients at the time of admission was calculated, and was divided into groups of < 110, 110 – 130, 130 – 150, and > 150 mm of Hg. The most frequent Mean Arterial Pressure was 110 – 130 mm of Hg, seen in 58 patients, constituting 53.7 % of the cases. The mean of the mean arterial pressure in the present study was 121.37 +/- 23.99 mm of Hg.



Non-contrast CT scan findings: The location of bleed on Non-Contrast CT scan of the brain was divided grossly into lobar and non-lobar intracerebral haemorrhage, and into supratentorial and infratentorial haemorrhage in relation to the tentorium cerebelli.

Lobar intracerebral haemorrhage was seen in only 19 patients, constituting the minority with 17.6 % of cases. Majority of the patients had non-lobar intracerebral haemorrhage with n = 89, (82.4 % of cases). Of these, 82 patients i.e., 75.9 % of patients had involvement of the thalamo capsulo ganglionic region. Of these, isolated involvement of the putamen was seen in 20 patients (18.5 %), constituting the majority of patients showing isolated involvement of a brain region. Supratentorial location was more common, seen in 101 patients, constituting 93.5 % of the cases. Of the 7 patients showing infratentorial haemorrhage, the brain stem was the most common location, involved in 5 patients, constituting 4.6 % of the cases. (Graph No. 3)

The associated findings evaluated were perilesional edema (n = 79, 73.1 %), mass effect (n = 59, 54.6 %), midline shift (n = 45, 41.7 %), intraventricular extension of haematoma (n = 42, 38.9 %), obstructive hydrocephalus (n = 16, 14.8 %), and presence or absence of active bleed within the intracerebral haematoma (n = 12, 11.1 %).



Location of haemorrhage in hypertensive patients: A total of 91 patients were identified as hypertensives in the current study, which included known hypertensives (n = 56, 61.5 %) and also those who were newly diagnosed with hypertension at the time of admission (n = 35, 38.5 %). The location of bleed among these patients was evaluated to identify the most common location for hypertensive intracerebral haemorrhage.

It was found that supratentorial and non-lobar locations were more common in hypertensives, seen in 84 patients, i.e., 92.3 % of the cases, and 81 patients, i.e., 89.0 % of the cases, respectively. Of these, the capsuloganglionic region was most commonly involved, (n = 46, 50.5 % of cases), especially the putamen (n = 18, 19.7 % of cases).

Also, 18 cases (90.0 %) out of the total 20 cases of putaminal haemorrhage seen in the present study were hypertensives. This shows the importance of hypertension as a risk factor for haemorrhagic stroke, and also shows that the putamen is the most common site of bleeding in hypertensive intracerebral haemorrhage.

Table 1: Statistical correlation between Mean Arterial Pressure & Location of bleed

Mean Arterial Pressure	Type of hemorrhage		Chi square value; p value
	Non-Lobar	Lobar	
<110	25 (69.4%)	11 (30.6%)	9.66; 0.02 (p<0.05)
110-130	43 (86.0%)	7 (14.0%)	
131-150	12 (100%)	0 (0.0%)	
>150	10 (100%)	0 (0.0%)	
Total	90 (83.3%)	18 (16.7%)	

A Chi square test was done to determine the statistical significance of increased systolic blood pressure and mean arterial pressure with respect to the site of bleeding, which revealed a p value of 0.000, and 0.010 respectively (< 0.05, i.e., significant. Thus, it was confirmed that non-lobar location of intracerebral haemorrhage is more common in patients with hypertension, as compared to lobar hemorrhage. This was true both in known hypertensives on treatment and those who were diagnosed at admission.

4. Conclusion

Haemorrhagic stroke is the second most common type of stroke and is a common cause of morbidity and mortality. Patients with intracerebral haemorrhage suffer significant residual disability even with treatment. Hence the recent focus of management of haemorrhagic stroke has been towards identification and understanding the significance of the various risk factors.

In the present study, it was observed that hypertension and smoking were the most important modifiable risk factors in the development of spontaneous intracerebral haemorrhage. Non-lobar intracerebral hemorrhage is more common in hypertensives. The most common location of bleed in hypertensive patients in the present study, whether known or newly diagnosed, was found to be capsulo-ganglionic region, especially the putamen. Also, 90.0 % of all the patients who had putaminal bleed on CT scans were hypertensives.

Hence adequate control of blood pressure in hypertensives and life style modification to quit smoking and alcohol intake should be advised in all patients over the age of 40 years to prevent the haemorrhagic stroke. A known hypertensive patient presenting with stroke should be immediately evaluated with CT scan of the brain to identify serious complications due to the development of hydrocephalus.

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