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Study on location of cerebral lesion among patients with hemorrhagic cerebrovascular accident

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ABSTRACT

Background: In hemorrhagic cerebrovascular accident, bleeding occurs directly into the brain parenchyma. Intracerebral hemorrhage usually occurs at certain sites in the brain, i.e., thalamus, putamen, cerebellum, and brain stem. The surrounding area of brain may be damaged by pressure produced by the mass effect of the hematoma. Increase in intracranial pressure occurs. **Aims and Objectives:** The aim and objective of the study are to compare the localization of cerebral lesions with the frequency of intraventricular hemorrhage and to study the prognosis of hemorrhagic cerebrovascular accident (CVA) as per its anatomical location in computed tomography (CT) scan. **Materials and Methods:** One-year observational cross-sectional study was conducted in 60 patients with CT scan diagnosed hemorrhagic CVA. **Results:** Regarding the site of the hemorrhagic CVA, the most commonly affected area was basal ganglia (46.7%) followed by thalamus (18.3%); other areas include pons (8.3%), paraventricular (8.3%), cerebellar (6.7%), lobar (5%), internal capsule (3.3%), and intraventricular (3.3%). **Conclusion:** This study reflects a spectrum of cerebral location of hemorrhagic stroke which may help in the management of hemorrhagic CVA patients.

Key words: Hemorrhagic stroke; Cerebral location; Intraventricular hemorrhage

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INTRODUCTION

Stroke generally refers to local interruption of blood flow to the brain and is the leading cause of long-term disability and the third leading cause of death.[1] Approximately 12% of stroke are hemorrhagic (rupture of a cerebral blood vessel) whereas the remaining 88% are ischemic and result from occlusion of cerebral artery (either thrombotic or embolic). Among all the neurological diseases of adult life, cerebrovascular accident (CVA) is the most common.[2] Acute ischemic stroke is one of the major causes of mortality.[3] The most common source of cerebral hemorrhage is one of the lateral striate branches of middle cerebral artery (MCA).[4]

Hypertension is the most common underlying cause of primary brain parenchymal hemorrhage accounting for more than 50% of causes of clinically significant hemorrhage. Conversely, brain hemorrhage accounts for roughly 15% of death among patients with chronic hypertension. Hypertensive intra-parenchymal hemorrhage may originate in the putamen (50%-60%), thalamus, pons, cerebellar hemispheres (rarely), and other region of the brain.[5]

The most common cause of arterial hemorrhage is atheromatous degeneration in an artery in a patient with high blood pressure and because of the concentration of important nerve fibers within the internal capsule, even a small hemorrhage can cause widespread effects

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on the contralateral side of the body.[6] If the intracranial hemorrhage is large enough to increase intracranial pressure, cerebral perfusion pressure will be reduced.[7]

Aims and objectives

1. To compare the localization of cerebral lesions with the frequency of intraventricular hemorrhage.
2. To study the prognosis of hemorrhagic CVA as per its anatomical location in CT scan.

MATERIALS AND METHODS

After obtaining the institutional ethical committee clearance certificate, this study was carried out on 60 patients with computed tomography (CT) scan diagnosed hemorrhagic CVA, fulfilling the inclusion and the exclusion criteria attending the emergency department and admitted in the indoor ward of medicine department for 1 year from February 2022 to January 2023 at R. G. Kar Medical College and Hospital. The study was pre-approved by the Institutional Ethical Committee on December 22, 2021, with IEC number RKC/549.

RESULTS

From Table 1, it was clearly noted that commonly affected areas in hemorrhagic CVA were basal ganglia (46.7%), followed by thalamus (18.3%) (Figure 1). Other areas include pons (8.3%) (Figure 2), paraventricular (8.3%), cerebellar (6.7%) (Figure 3), lobar (5%) (Figure 4) internal capsule (3.3%), and only intraventricular (3.3%) (Figure 5).

Males were commonly affected by intracerebral hemorrhage (ICH) than female. In the present study, among 60 persons, 44 were male and 16 were female.

Table 1: Distribution of study subjects on the basis of site of hemorrhage according to CT scan finding (n=60)

Anatomical location of hemorrhage	Frequency	Percentage
Thalamus	11	18.3
Pons	5	8.3
Basal ganglia	28	46.7
Paraventricular	5	8.3
Cerebellar	4	6.7
Internal capsule	2	3.3
Lobar	3	5
Only intraventricular	2	3.3
Total	60	100

CT: Computed tomography

From Table 2, it was shown that the most commonly affected age group was 66–75 (28.3%) and 46–55 (28.3%) followed by 56–65 (23.3%). 7 cases (11.7%) were found in the age group 76–85. Only 5 cases were present in the

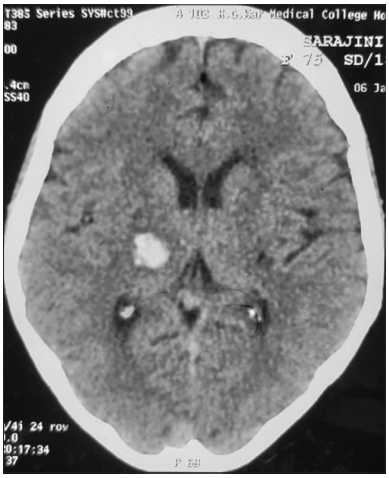

Figure 1: Thalamic hemorrhage

Figure 2: Pontine hemorrhage

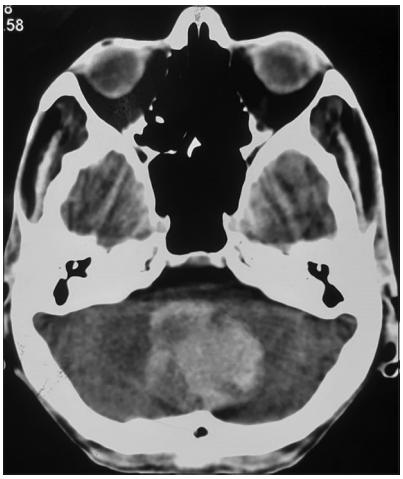

Figure 3: Cerebellar hemorrhage

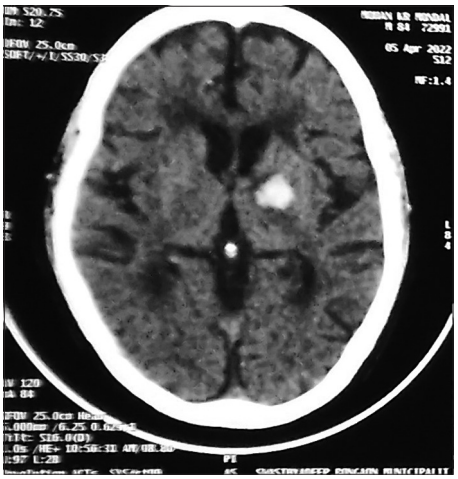

Figure 4: Bleed in the left temporoparietal region

Figure 5: Intraventricular hemorrhage

extreme age group. Among them, only 2 cases (3.3%) were found above 86 years of age whereas 3 cases (5%) lay below 45 years.

The patients of ICH came with various signs such as headache, vomiting, fever, and convulsion and symptoms such as pupillary abnormality, cranial nerve involvement, sensory system, and higher function involvement. Among these, it was noted that headache and vomiting were very common in ICH and the association was statistically significant (P<0.001). Table 4 shows the distribution of study subjects according to their presenting symptoms.

Regarding the prognosis from Table 5, it was observed that hemorrhage in pons carried grave prognosis than the other sites and the association of death in the case of pontine hemorrhage was statistically significant (P=0.001).

Table 2: Distribution of study subjects according to age group (n=60)

Age group (years)	Frequency	Percentage
≤45	3	5
46–55	17	28.3
56–65	14	23.3
66–75	17	28.3
76–85	7	11.7
86+	2	3.3
Total	60	100

Table 3: Hypertension was found to be most commonly associated with ICH

Hypertension	Frequency	Percentage
Yes	51	85
No	09	15
Total	60	100

ICH: Intracerebral hemorrhage

Table 4: Distribution of study subjects according to clinical features (n=60)

Symptoms	Frequency	Percentage	P value
Headache	27	45	<0.001
Vomiting	15	25	<0.001
Fever	19	31.70	0.875
Convulsion	6	10	0.012
Pupillary abnormality	5	8.3	0.183
Cranial nerve involvement	56	93.3	0.148
Sensory system involvement	56	93.3	0.738
Higher function involvement	3	5	1.00

Table 5: Distribution of study subjects according to prognosis

Site of hemorrhage	Discharged in stable condition	Death	Total
Cerebellum	02	02	04
Pons	02	03	05
Basal ganglia	26	02	28
Others	23	00	23

DISCUSSION

As per a novel study by Tetri[8] from the University of Oulu, ischemic heart disease and atrial fibrillation, significantly and independently of the severity of bleeding, patients' age, and other potential confounding factors, predict death within 1 month and 3 months after ICH. These are novel findings and neither of these factors has been listed as predictors for early death in recent reviews (Qureshi et al., 2001).[9] Diabetes was also found to be a predictor for early death, which confirms the findings of two previous studies (Parra et al., 2000,[10] Passero et al., 2003).[11]

Hypertension, which is the major risk factor for ICH, was not found to be a predictor for early death. This was in line with some earlier studies (Juvela, 1995a, Norhammar et al., 2002, Saloheimo et al., 2006).[12-14] However, high MABP on admission was an independent risk factor for early death whereas admission hyperglycemia was not. These findings are in line with our study results (Table 3).

According to the study carried out by Mogoanta et al.,[15] hemorrhagic stroke accounted for 15% of all strokes recorded over a period of 5 years at the Neurological Hospital of Craiova. The most frequent location of cerebral hemorrhage was intraparenchymatous followed by subcortical hemorrhage, hemorrhage of the brain stem, cerebellar hemorrhage, and intraventricular hemorrhage. Regarding gender, no significant changes were found, the percentage of men diagnosed with hemorrhagic stroke was 53% while females were affected at a rate of 47%. Decade of age most affected by the hemorrhagic stroke between was 65-74 years (37%), followed by decades 55–64 years (27%) and the decade 75–84 years of age (19%). Hemorrhagic stroke was correlated in 75% cases with hypertension, in 26.21% to ischemic cardiomyopathy, and in 8.62% with cardiac arrhythmias. This finding is also in line with our findings.

Again according to an Indian study by Eapen et al.[16] from Surat, cerebrovascular stroke was more common in males (67%) than in females (33%), the most common age group being 51–60 years. The common risk factors were hypertension (40%), smoking (28%), alcoholism (35%), and hyperlipidemia (17%). CT scan was found to detect CVA correctly in about 80% cases. The most common involved area was MCA territory (83%). Overall mortality with hemorrhagic CVA was found to be 69%. This figure is in line with our findings.

A similar study by Aiyar[17] also found a male-to-female ratio of 1.9:1, with mean age being 55.06 years and the most common risk factors to be associated with CVA, other than age and gender were found to be smoking (52%) and hypertension (44%). These are also close to our figures.

However, in another study, Kaul et al.,[18] found smoking to be associated with only 28% of CVA patients which is lower than our findings. Regarding hypertension, two studies by Kaur et al.[19] and Naik et al.,[20] found hypertension to be associated with 48% and 40% of hemorrhagic CVA patients, respectively, reaffirming our findings.

Regarding the site of the hemorrhagic CVA, a study by Devichand and Caroli[21] different sites involved in hemorrhagic CVA including basal ganglia (45%), pons (15%), internal capsule (9%), lobar (10%), thalamic (15%), and others (6%). These findings also correlate with our findings.

Limitations of the study

Small number of study population from a relatively small geographic area is limitation of our study.

CONCLUSION

The hemorrhagic CVA is more common in males than in females and the most commonly affected age group is 46–55 years and 66–75 years. Regarding the site of the hemorrhagic CVA, the most commonly affected area was basal ganglia followed by the thalamus. Our study had a relatively small number of study population from a relatively small geographic area. Further multicentric studies involving more patients from other regions of India will be required for more definitive findings.

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NC- Concept and design of the study, prepared first draft of manuscript; **BK-** Interpreted the results, reviewed the literature and manuscript preparation; **SC-** Manuscript preparation; **PKK-** Statistical analysis and interpretation.

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