

Original Article

## Distribution By Location of CT-Diagnosed Primary Intracerebral Hemorrhage In Isfahan

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**ABSTRACT**

**Background:** Intracerebral hemorrhage (ICH) is the third most frequent cause of stroke and accounts for 10 to 15 percent of all strokes in whites and 30 percent of them in blacks and Asian Population. The commoner sites of hemorrhages are different among populations and complications of them are different too.

**Methods:** In the present descriptive observational study, we studied 226 ICH patients admitted in Al-Zahra Hospital in Isfahan, Iran, from November 2001 to November 2003 and evaluated them for their symptoms and signs according to size and location of their hemorrhages recognized by CT-scan at the time of admission.

**Results :** From our 226 patients (126 men and 100 women) , 38.5% of them had thalamic hemorrhage , 24% had lobar hemorrhage , 22.5% had putaminal hemorrhage , 8% had pontine hemorrhage , 6% had cerebellar hemorrhage, and 1.3% had internal capsular hemorrhage . Seizure was commoner in lobar and putaminal hemorrhages. Vomiting was present in 100% of cerebellar hemorrhage cases. Headache was present in 100% of cerebellar hemorrhage cases and between 66-83% of cases with hemorrhage cases in other sites. Coma was common in pontine hemorrhage .

**Conclusion:** ICH accounts for 28.5% of our all stroke admissions. The incidence of intracerebral hemorrhage increases with age , reaching a maximum between the ages of 60 and 80 years old, and is higher in men than women and right side than the left side . We found that thalamic hemorrhage was the commonest site of hemorrhage among our patients second by lobar hemorrhage and more than half of our patients had headache or vomiting on the day of admission. Overall acute mortality rate depends mainly on the position and size of hemorrhage, which we can estimate them by the CT- scan. Diabetes mellitus is not considered as a risk factor, in contrast to hypertension.

**Keywords:** ICH, hypertension, CT-scan

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**I**ntracerebral hemorrhage (ICH) is more than twice as common as subarachnoid hemorrhage, and is much more likely to result in death or major disability than cerebral infarction <sup>1</sup>. ICH is the third most frequent cause of stroke <sup>2</sup>. More than one-third of such hemorrhages, now occur in normotensive individuals and the hemorrhages, more often than previously, arise in locations that are not typical for hypertension <sup>2</sup>. Intracerebral hemorrhage is characterized by bleeding into the substance of the brain, usually from a small

penetrating artery <sup>3</sup>. Hypertension (HTN) has been implicated as the cause of weakening of the arterioles walls and the formation of microaneurysms <sup>3</sup>. Commoner sites for ICH are different in reports. According to National Institute of Neurological Disorder and stroke (NINDS ) Data Bank , by studying 203 patients, the commoner sites are lobar 32% , putaminal 25% , thalamic 23% , cerebellar 11%, and pontine 4% hemorrhages <sup>4</sup>. But according to Weisberg et al, commoner sites are putamen 50%,

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central white matter of temporal, parietal or frontal lobes (lobar hemorrhages), thalamus, cerebellar hemisphere, and pons in descending order 5. There is another different report by Kase et al in 1998, in which commoner sites are; putaminal (35%), lobar (25%), thalamic (10-15%), cerebellar (5-10%), pontine (5%), and caudate (5%) hemorrhages<sup>6, 7, 8</sup>. The classic presentation of ICH is sudden onset of a focal neurological deficit that progresses with accompanying headache, vomiting, decreased level of consciousness, and elevated blood pressure<sup>1, 9</sup>. An early decreased level of consciousness is seen in about 50% of patients with ICH<sup>1</sup>. Headache occurs in about 40% of patients with ICH. Vomiting is an important diagnostic sign especially if the hematoma lies within the cerebral hemispheres. Elevation in blood pressure, often to very high levels, occurs in as many as 90% of patients. Seizure at the time of presentation occurs in only about 6-7% of patients with ICH but is commoner with lobar than deep hemorrhages<sup>1,9,10</sup>. In lobar hemorrhages it occurs in as many as 28% of patients<sup>6</sup>.

The diagnosis and localization of hemorrhage can be established easily with CT-scan, which shows the high density of acute blood<sup>3</sup>.

### Subjects and Methods

In this descriptive observational survey, we studied 226 CT-diagnosed primary intracerebral hemorrhage cases from patients referred to Al-Zahra Hospital in Isfahan, Iran, from November 2001 to November 2003. Patients were selected according to history and physical examination which were confirmed by CT-scan of the Brain. Those whose intracerebral hemorrhages were secondary to trauma, consumption of anticoagulants, AVM, or tumors were excluded from study. The patients (126 men, 100 women) aged 21 to 92 years old (mean age = 64 years old). CT-scan, as a key initial diagnostic evaluation, was done on the day of admission to demonstrate size and location of hemorrhages. The location of hemorrhages, which means the origin of the ICH regardless

of its extension, divided into 6 regions: putamen, cerebral lobes, cerebellum, thalamus, pontine, and internal capsule. Lobar hemorrhages consist of frontal, parietal, temporal, and occipital lobes. Except for pontine hemorrhages, the size (hemorrhage volume) of any other area was estimated by this formula:

$$\frac{Length + Width + Height}{2}$$

In which we estimated the length, width, and height of hemorrhage by the scale of CT. In any region, except for pontine and internal capsular hemorrhages, we divided the size of hemorrhages to small (less than 20cc), Moderate (between 20-50cc), and large (more than 50cc) size. Pontine and internal capsular hemorrhages, because of their small area in brain, don't follow this rule. The symptoms and signs of seizure, vomiting, headache, and coma were obtained by physical examination or asking from patients or their relatives, and evidences of diabetes mellitus (DM) and hypertension (HTN) were obtained by past medical history. Then, according to size of hemorrhage and other findings, we matched every patient and followed them for 5 days to see if the loss of consciousness or death occurred or not.

### Results

From a total number of 226 patients with intracerebral hemorrhages, 87 of them had thalamic hemorrhages (38.49%), 54 of them had lobar hemorrhages (23.39%), 51 of them had putaminal hemorrhages (22.56%), 18 of them had pontine hemorrhages (7.96%), 13 of them had cerebellar hemorrhages (5.75%), and 3 of them had internal capsular hemorrhages (1.32%). Seizure was seen in 24.07% of lobar and in 11.76% of putaminal hemorrhages, but it was seen only in 2.29% of thalamic hemorrhages. There was not any seizure in pontine, cerebellar, and internal capsular hemorrhages. Vomiting was present in 100% of cerebellar, 66.66% of internal capsular, 62.74% of putaminal, 59.77% in thalamic, 59.25% of lobar, and 55.55% of pontine hemorrhages.

**Table 1.** Results of studying 226 ICH patients and frequency of their complications by location

Location/Number	Mortality Rate	Volume of hemorrhage	Number	Seizure	Vomiting	Headache	Coma	DM	HTN
Thalamus 87 = 38.49%	12 (13.79%)	< 20cc 20-50cc >50cc	60 18 9		31 12 9	43 14 9	4 6 8	8 2 1	44 15 8
Lobar 54 = 23.89%	10 (18.51%)	<20cc 20-50cc >50cc	22 19 13	5 4 4	10 11 12	17 16 12	1 5 10	3 7 2	13 14 8
Putamen 51=22.56%	8 (15.68%)	<20cc 20-50cc >50cc	24 16 11	3 2 1	10 12 10	17 14 10	2 12 8	6 2 2	18 11 10
Pontine 18 = 7.96%	7(38.88%)	-----	18	----	10	11	15	1	16
Cerebellom 13 = 5.75%	5 (38.46%)	<20cc 20-50cc >50cc	7 5 1	---- ---- ----	7 5 1	7 5 1	1 5 1	1 2 ---	6 5 1
Internal Capsule 3 = 1.32%	-----	<20cc	3	----	2	2	----	----	3
Total	42 (18.58%)	-----	226	21 (9.24%)	142 (62.83%)	178 (78.75%)	78 (34.51%)	37 (16.37%)	172 (76.1%)

Headache was seen in 100% of cerebellar, 83.92% of putaminal, 83.33% lobar, 75.86% of thalamic, 66.66% of internal, and 61.11% of pontine hemorrhages. Coma was seen in 83.33% of pontin, 53.84% of cerebellar, 43.13% of putaminal, 29.62% of lobar, and 20.68% of thalamic hemorrhages and there was not any comatous patient in internal capsular hemorrhages. In general, headache (78.75%), vomiting (62.83%), coma (34.51%), and seizure (9.24%) occurred in our 226 patients. Diabetes mellitus was not found in patients with internal capsular hemorrhages but it was found in only 5% of pontine hemorrhages and 12-23% of patients with ICH in other areas. Hypertension was found in 100% of patients with internal capsular, 92.30% of cerebellar, 88.88% of pontine, 77.01% of thalamic, 76.47% of putaminal, and 64.81% of lobar hemorrhages.

Our patients had an age range between 21 to 92 years old, and about 68% of them were between 60 to 80. The highest incidence of hemorrhages was in time period of December to March that consisted of about 46% of all hemorrhages, in contrast to time period of June to August which consisted of about 8.5%.

According to the site of hemorrhages recognized by CT-scan, 118 of hemorrhages had happened on the right side and 108 on the left

side. Acute mortality rate (up to 5 days) was high in cerebellar and pontine hemorrhages which were 38.46% and 38.88%, respectively and was low in lobar (18.51%), thalamic (13.79%), and putamenal (15.68%) hemorrhages. There was no acute death in internal capsular hemorrhages. Overall mortality rate was 18.58%. Diabetes mellitus consisted of about 16.5% of our patients, in contrast to hypertension which consisted of about 76.1% of them.

## Discussion

Primary ICH accounts for 28.5% of all our stroke admissions in Al-Zahra Hospital in Isfahan, Iran, which is close to the reports of ICH in the black and Asian population which that is 30%. This current study illustrates that the incidence of primary ICH increases with age, reaching a maximum between the ages of 60 and 80 years old, and is slightly higher in men than women. We also found that the maximal and minimal number of hemorrhages were during winter and summer, respectively. This study also shows that right side hemorrhages were marginally higher than the left sides. In spite of NINDS stroke Data Bank which shows the common sites of hemorrhages as lobar, Putamen, thalamus, cerebellum and pons, and Kase et al and Weisberg et al which indicate the

commoner sites of hemorrhages as putamen, lobar, thalamus, cerebellum, and pons<sup>4, 5, 6, 8</sup>. our study depicted that thalamic and lobar hemorrhages are the commoner sites of hemorrhages. Tatu et al showed that the commoner sites of primary intracerebral hemorrhages are lobar, lenticular, Cerebellar, midbrain, and pons, in descending order, and Ruiz – Sandrol et al illustrated lobar and basal ganglionic hemorrhages as the commoner ones<sup>11,12</sup>.

Seizure was common in lobar and putaminal hemorrhages which accounted for 24.07% and 11.76%, respectively, in spite of 6-7% which was reported previously. Vomiting and

headache existed in more than half of all patients. Coma on the day of admission occurred more in pontine and cerebellar hemorrhages. Headache, vomiting, coma and seizure were the more frequent symptoms and signs, in descending order. Acute mortality rate (up to 5 days) was higher in cerebellar and pontine hemorrhages than the other sites. Hypertension consist of 76.1% of all our ICH patients with highest rate in internal capsular and cerebellar hemorrhages. In Asian population high incidence of hypertension may cause high incidence of intracerebral hemorrhage.

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