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# A prospective study on predictors of poor outcome in patients with spontaneous non -traumatic intracerebral hemorrhage

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## Abstract

**Background:**Intracerebral hemorrhage (ICH) is spontaneous extravasation of blood into the brain parenchyma. Intra cerebral haemorrhage is the most devastating form of stroke, with high mortality and severe disability among survivors. Approximately half of the deaths occur within the first 24 hours, highlighting the importance of early and influential treatment. An emergent NECT scan is generally the first-line imaging procedure of choice in patients with spontaneous intracerebral hemorrhage

**Aims and objectives**

- Toassess the location, volume of intracerebral hemorrhage,& subarachnoid/intraventricular extension.
- To localise various types of brain herniations, midline shift, and their relation to the patient's management and outcome.
- Toassess the relationship between the extent of damage and outcome

**Materials and methods:**This study is conducted on 50 patients using WIPRO GE, CTmachine in department of radio-diagnosis in Alluri Sitarama Raju Academy of Medical Sciences referred with symptoms of cerebral hemorrhage over a period of 12 months (1st October 2020 to 30th September 2021).

**Results:** Results showed that Spontaneous ICH (SICH)was higher among males with a maximum number of patients older than 41years with hypertension as the most critical risk factor. Many of the patients showed a volume of bleed less than 30mL. The intraventricular extension was seen in 19 patients out of 50 patients (38%). The supratentorial location of haemorrhage (86%) was more common compared with the infratentorial location (14%) with the most common site being basal ganglia (26%).

**Conclusion:**CT provides an excellent imaging modality for detecting intracerebral haemorrhage, quantifying the bleed, and managing further. Various factors influence clinical outcome in SICH, including volume of ICH, intraventricular extension, and supratentorial versus infra-tentorial location.

**Keywords:** Hypertensive Intracerebral Haemorrhage, IntraparenchymalHaemorrhage, IntraventricularHaemorrhage, Non-Traumatic Spontaneous Intracranial Haemorrhage, Subarachnoid Haemorrhage

**Introduction**

Intracerebral hemorrhage (ICH) is spontaneous extravasation of blood into the brain parenchyma[1]. Intra cerebral haemorrhage is the most devastating form of stroke, with high mortality and severe disability among survivors. It accounts for 4 to 14 % of all strokes, with a higher reported incidence in Asian countries than the west and is associated with increased mortality and morbidity[2,3]. Approximately half of the deaths occur within the first 24 hours, highlighting the importance of early and influential treatment. Between 32% and 50% of patients die within the first month, and only 20% are independent at six months.

An emergent NECT scan is generally the first-line imaging procedure of choice in patients with spontaneous intracerebral hemorrhage because of its widespread availability and speed. The main aim of imaging is to identify the type of bleed and thus categorize the patients under either surgical or medical management. Imaging plays a crucial role in the management of SICH, both in establishing the diagnosis and satisfying the patients for subsequent treatment.

CT scans can image soft tissues and cranial bones with a significant degree of accuracy and speed. It also has a high sensitivity of detection of intracranial hemorrhage. Besides providing the definitive diagnosis, computed tomography also shows essential characteristics of the hematoma, such as location, volume, age, the extension to subarachnoid spaces and ventricular system, presence, and extent of surrounding edema and brain herniation.

The purpose of the study is to evaluate the role of non-enhanced CT in spontaneous intracerebral hemorrhage (SICH) to determine the volume and location of the hemorrhage. Associated complications will be studied, and their impact on patient management

**Aims and objectives**

- Toassess the location, volume of intracerebral hemorrhage,& subarachnoid/intraventricular extension.
- To localise various types of brain herniations, midline shift, and their relation to the patient's management and outcome.
- Toassess the relationship between the extent of damage and outcome

## Materials & Methods

This study conducted on 50 patients using WIPRO GE, CT machine in department of radio-diagnosis in Alluri Sitarama Raju Academy of Medical Sciences referred with symptoms suggestive of cerebral hemorrhage over a period of 12 months (1st October 2020 to 30th September 2021).

### Source of data

Patients referred from outpatient department of tertiary care Centre with symptoms of intracerebral hemorrhage.

### Selection criteria

### Inclusion criteria

- Patients above 18 years of age belonging to both sexes
- Patients with clinical symptoms suggestive of intracerebral hemorrhage

### Exclusion criteria

- Patients of age below 18.
- Patients with a trauma history.
- Patients who were suffering from a coagulation disorder / on thrombolytic therapy

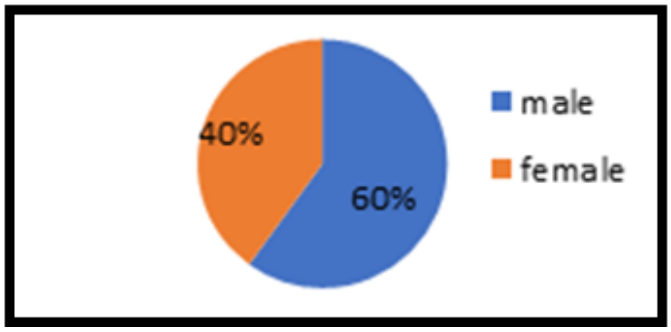
## Results

A total of 50 patients were included in the study. The CT scans were analyzed concerning the location of bleed, the volume of bleed and associated changes. Patients were followed up with respect to the management and outcome.There were a total of 50 patients with spontaneous intracerebral haemorrhage, of which 60% were males

Table 1: Gender Distribution of Spontaneous Intracerebral Hemorrhage.

| Sex | No. of Patients | Percentage |
|---|---|---|
| Male | 30 | 60% |
| Female | 20 | 40% |
| Total | 50 | 100% |

Figure 1: Gender Distribution of Spontaneous Intracerebral Hemorrhage




A higher incidence is in patients with age group 41-60 years and 43 patients (86%) were in the age group of 41-80 years.

Table 2: Age-group distribution of Spontaneous ICH

| Age | Number of patients |
|---|---|
| 0-20 | 0 |
| 21-40 | 6 |
| 41-60 | 23 |
| 61-80 | 20 |
| >80 | 1 |
| Total | 50 |

Basal ganglia are the commonest site for SICH and were seen in 13 cases (26%). Pontine and midbrain SICH were the least common.

Table 3: Sites of Intracerebral Hemorrhage

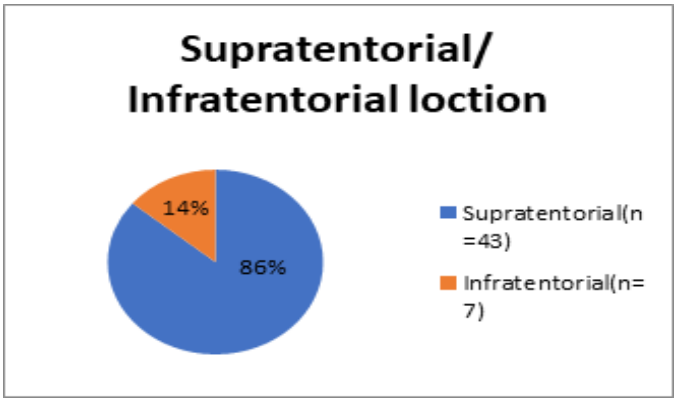
| Sites | No. of Patients | Percentage |
|---|---|---|
| Basal Ganglia | 13 | 26% |
| Thalamus | 12 | 24% |
| Thalamo Ganglia | 04 | 08% |
| Lobar | 14 | 28% |
| Cerebellum | 06 | 12% |
| Midbrain and Pons | 01 | 02% |
| Total | 50 | 100% |

SICH was supratentorial in 43 patients (86%) and infratentorial in 7 patients (14%).

Table 4: Location of spontaneous intracerebral hemorrhage.

| Location | No. of Patients | Percentage |
|---|---|---|
| Supratentorial | 43 | 86% |
| Infratentorial | 07 | 14% |

Figure 2: Location of spontaneous intracerebral hemorrhage.

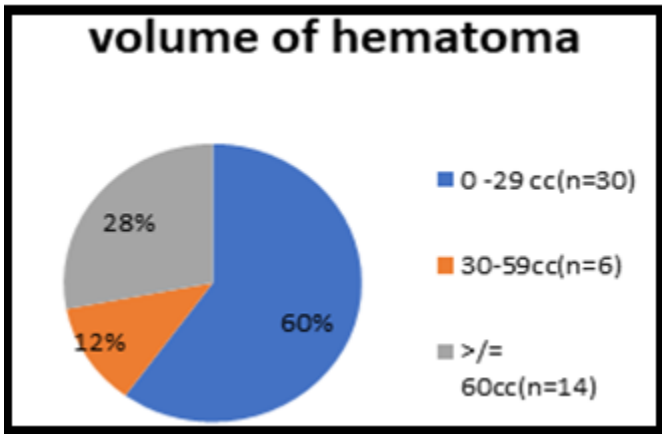



Intracerebral haemorrhage with the volume of bleed in the range of 0-29 mL was seen in 30 patients (60%), 30-59 mL was seen in six patients (12%) and greater than 60mL was seen in 14 patients (28%)

Table 5: The volume of haemorrhage.

| Volume (ml) | No. of Patients | Percentage |
|---|---|---|
| 0-29 | 30 | 60% |
| 30-59 | 6 | 12% |
| ≥60 | 14 | 28% |
| Total | 50 | 100% |

Figure 3: The volume of haemorrhage




Midline shift was seen in 27 patients (54%), while the rest did not have significant midline shift.

Table 6: Presence of Midline Shift

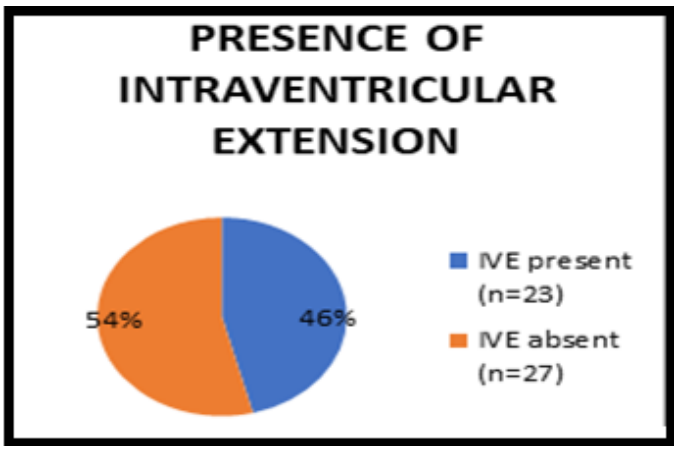
| Intraparenchymal Hemorrhage | No. of Patients | Percentage |
|---|---|---|
| With midline shift | 27 | 54% |
| Without midline shift | 23 | 46% |
| Total | 50 | 100% |

Out of 50 patients studied, 23 patients (46%) had an intraventricular extension of the bleed.

Table 7: Intraventricular Extension of Hemorrhage

| Intraventricular Extension | No. of Patients | Percentage |
|---|---|---|
| Present | 23 | 46% |
| Absent | 27 | 54% |
| Total | 50 | 100% |

Figure 4: Intraventricular Extension of Hemorrhage




Most typical cause for Spontaneous ICH was hypertension seen in 41cases (82%), and there were 2 cases of aneurysmal bleed and only one case of AV Malformation.

Table 8: Causes for Spontaneous Intracerebral Hemorrhage

| Cause | No. of Patients | Percentage |
|---|---|---|
| Hypertension | 41 | 82% |

| | | |
|---|---|---|
| Infarct | 04 | 08% |
| Aneurysm | 02 | 04% |
| Tumour bleed | 02 | 04% |
| AV malformation | 01 | 02% |
| Total | 50 | 100% |

A total of eleven patients underwent surgery, and 39 were managed.

Table 9: Mode of Treatment

| Mode of treatment | No. of Patients | Percentage |
|---|---|---|
| Medical | 39 | 78% |
| Surgical | 11 | 22% |
| Total | 50 | 100% |

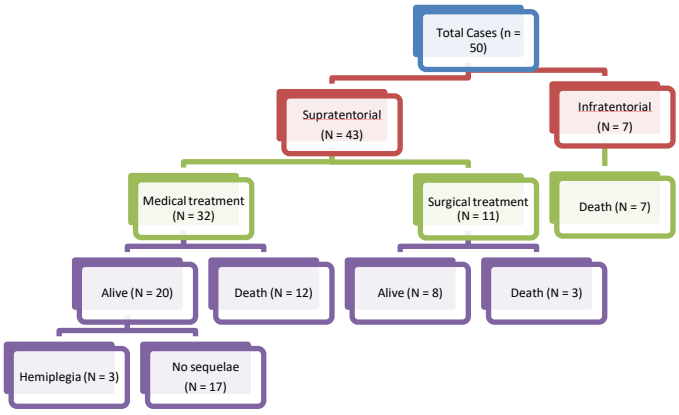



Figure 5: Details of treatment provided and outcome.

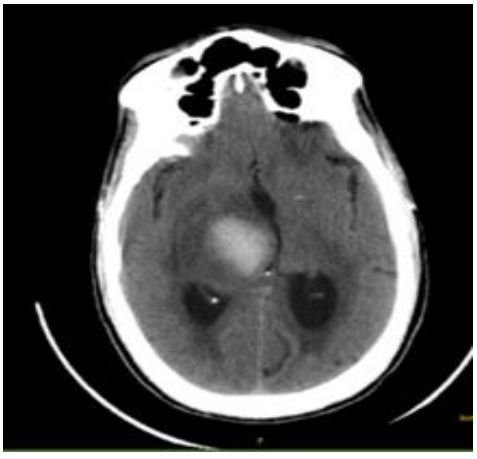


Figure 6: Haemorrhage in right thalamus with a volume of 40cc and midline shift of 5mm to the left, operated by evacuation of hematoma

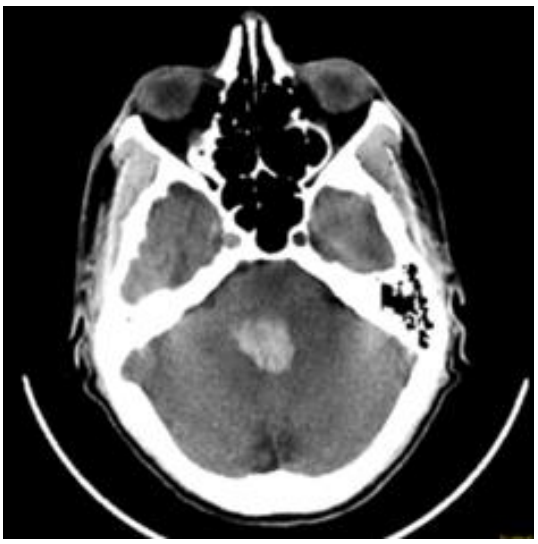
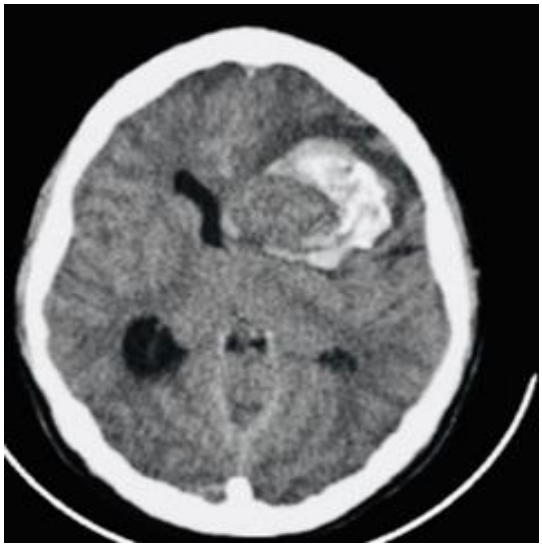


Figure 7 (a, b): haemorrhage in the pons & right cerebral peduncle with a volume of 12cc, treated medically, following which he died.

Figure 8: left frontal haemorrhage with calcification and oedema s/o intratumoral bleed.

At surgery, an anaplastic oligodendroglioma was resected, and there was bleed associated with it, which was also evacuated



**Discussion**

YS.Choi et al. [5] In 2015, a retrospective study on 110 patients with acute intracerebral hemorrhage divided them into two groups, i.e., tumorous and nontumorous origin.

Among tumorous and non-tumorous intracerebral hemorrhage, the histogram parameters of hematoma attenuation on NECT were compared. On histogram analysis, the 5$^{th}$ and 25$^{th}$ percentile values showed the highest diagnostic performance for discriminating tumorous and non-tumorous intracranial hemorrhages with cut-offs of 34 and 44HU. The study concluded that CT densitometry of intracerebral hemorrhage on NCCT is useful for discriminating tumorous and non-tumorous causes of ICH.

JMK. Murthy et al[6]. In 2005 conducted a study on 12 patients with hypertensive intracerebral hemorrhage who were treated with decompressive hemicraniectomy.

The data collected included the Glasgow coma score, intracerebral hemorrhage volume, intracerebral hemorrhage score. The outcome was assessed as immediate mortality and modified Rankin score.

Of 12 patients who underwent surgery,11 (92%) survived to discharge, and 6 (54.5%) of those had a good functional outcome. Of the ten patients with an intracerebral hemorrhage score of 3, 9(90%) survived to discharge, and 4(44%) had a good functional outcome. Of 12 patients included in the study, hematoma volume was >60cm$^3$ in 8 patients, and 50% had a good functional outcome. Hence, the study concluded that decompressive craniectomy proved to be life-saving and improved unfavorable outcomes.

Joseph P.Broderick et al.in 2005conducted a surgical trial on patients with intracerebral hemorrhage (STICH) intending to investigate the effectiveness of early surgery (<24 hrs) as compared with initial conservative management with later evacuation if deemed necessary by treating neurosurgeon.This trial concluded that patients with spontaneous supratentorial intracerebral hemorrhage show no overall benefit for early surgery than initial conservative management

C S Kase et al. [7] studied 22 cases of lobar hematomas among 93 consecutive patients with intracerebral hemorrhage. Arterial hypertension was the leading cause,andtheoverall mortality rate was 32%. Hematoma size on CT correlated with the outcome: Patients with small hematomas did well on medical treatment, and those with medium size and large hematomas had mortalities of 14 and 60%, respectively. Surgery was done in one-half of the survivors of the latter groups. It is proposed that large and medium-size hematomas might benefit from surgical treatment, especially when the level of consciousness progressively deteriorates or a CT scan shows a prominent midline shift.

The study also showed that the location of hypertensive intraparenchymalhaemorrhage was in the putamen (33%), lobar (23%), thalamic (20%), cerebellar (8%), pontine (7%), and miscellaneous in 9% of cases.

TakafumiNishizaki et al., in 2012, analyzed the outcome and clinical features of 19 patients with pontine hemorrhage without surgical intervention.

They classified the CT features of the hematoma into four types: massive, tegmen to-basilar, transverse oval, and small unilateral. Used the Glasgow Outcome Scale (GOS) to assess patient outcomes (G, good recovery; MD, moderate disability; SD, severe disability, V, vegetative state, D, death) at discharge.

The outcome was MD in 7 cases, SD in 3, and D in 9. Eight of 9 patients with acute hydrocephalus died, whereas only one of 10 patients without hydrocephalus died ($p < 0.01$). Four of 5 patients with CT evidence of massive hemorrhage died, and another patient became vegetative. The outcome in 6 patients with tegmen to-basilar type hematoma included D in 3, V in 2, and MD in 1, and that in 7 patients with transverse oval hematoma included D in 2, V in 1, SD in 1, and MD in 3. Five (65%) of the eight patients with transverse, oval or small unilateral hematomas were ambulatory at discharge. In contrast, only 2 (18%) of 11 patients with tegmen to-basilar type and massive hematoma were ambulatory at discharge ($p < 0.05$). This study concluded that transverse oval pontine hemorrhage's functional prognosis is as favorable as that of the small unilateral type.

**Conclusion**

CT provides an excellent imaging modality for detecting intracerebral haemorrhage, quantifying the bleed, and managing further. Various factors influence clinical outcome in SICH, including volume of ICH, intraventricular extension, and supratentorial versus infra-tentorial location. Based on our findings, we conclude that:

- Sex incidence of intracerebral haemorrhage is high in males.
- The peak age group of intraparenchymalhaemorrhage was 41-60years.
- Hypertension is the major causative factor for non-traumatic spontaneous intracerebralhaemorrhage.
- Thalamus and basal ganglia are the most typical sites of hypertensive intraparenchymalhaemorrhage.
- SICH volume involving more than 60 mL, infratentorial location, and intraventricular extension are independent predictors for poor outcome.
- Patients with ICH volume of less than 30 mL have a good prognosis, and patients with ICH volume more than 30 mL may be considered suitable for surgery.
- The management options in these patients depend on various clinical and CT findings. Further studies will help to develop a management algorithm for better patient outcomes.

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