

## Illustrated Correlation of Brain C.T. Scan Findings in Clinical Assessment of Spontaneous Intracerebral Haematoma in Patients with Positive Risk Factors

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### ABSTRACT:

#### BACKGROUND:

Spontaneous intracerebral hemorrhage (SICH) is defined as non-traumatic bleeding into the parenchyma of the brain that may extend into the . head computed tomography scan is the standard diagnostic tool

#### OBJECTIVE:

Find out the most important risk factor for SICH.and Illustrate the correlation between the sites of hemorrhage detected by CT scan images and patients presentations.

#### PATIENTS AND METHODS:

A prospective study between May 2010 and May 2012; this study was done in the CT unit in AL-Imamain Kadhimmain medical city, Baghdad, The study included 224 consecutive patients with the diagnosis of primary SICH.All the patients had primary spontaneous intracerebral hemorrhage clinically diagnosed plus CT findings that showed evidence of intra-cerebral hemorrhage. Statistical analysis was done using SPSS 15.

#### RESULTS:

This study included 224 patients, 128males and 96 females. Forty two patients lie in the age group of 50-59 years, 66 between 60-69 years, 48 between 70-79 years, 52 patients are seventy years old and older and only 16 are below fifty years of age. Regarding the site of bleeding 160 patients (71.4%) had bleeding in deep seated areas of the brain and 64 patients (28.6%) had bleeding in a superficial location. Regarding the deep seated hemorrhage basal ganglia was in 96 (42.8%) of the patients, followed by Thalamus in 48 (21.4%), and cerebellum in 16 (7.2%) of the patients. In the superficial sites of hemorrhage parietal lobe was in 40 patients (17.8%), then parieto-occipital hemorrhage was in 16 (7.2%) patients and 8 patients (3.6%) had temporal lobe hemorrhage. Hypertension was the most common risk factors, found in 75% of patients, followed by anticoagulant use in 57.2% of patients. A history of diabetes mellitus was positive in 39.3% of the patients, 39.3% of them were smokers, and 25% patients had no history of any risk factors. A statistically significant difference between deep & superficial bleeding is seen in correlation with hypertension and smoking (P value is 0.00001 and 0.002 respectively) The focal neurological signs, found in 66 patients, facial palsy in 48 patients, loss of consciousness in 40 patients, 32 patients had both focal neurological signs and loss of consciousness as a presentation, 22 of them presented with speech difficulty, 8patients presented with ataxia and 8 with dementia. Significant relationship was found between the site of hemorrhage and patients' presentation (P value 0.001). 120patients had intra-ventricular extension of hemorrhage in their CT films, 120 patients had pressure effect of the hemorrhage, and 104 were complicated by edema.

#### CONCLUSION:

Males are more affected than females by spontaneous intra-cerebral hemorrhage which tends to occur more commonly in a deep seated area of the brain.Hypertension is the most important risk factor. There is great correlation between patients' presentations and the site of hemorrhage. Patients 50 years and older are more liable for spontaneous intra-cerebral hemorrhage.

**KEYWORDS:** spontaneous intracerebral hemorrhage, CT.

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#### INTRODUCTION:

Spontaneous intracerebral hemorrhage (ICH) is a serious disease despite progressing medical knowledge, ICH appears suddenly without warning, unlike ischemic strokes that are often preceded by a transient ischemic

attack<sup>(1)</sup>. Spontaneous intracerebral hemorrhage (SICH) is defined as non-traumatic<sup>(2,3)</sup> bleeding into the parenchyma of the brain that may extend into the ventricles and, in rare cases, the subarachnoid space<sup>(4)</sup>. It occurs twice as commonly as subarachnoid hemorrhage, but is equally as deadly<sup>(5)</sup>. Spontaneous cerebral hemorrhage or intracranial hemorrhage accounts for 10-15% of total cerebral vascular accidents<sup>(2,4,6,7,8)</sup>. The mortality of hemorrhagic stroke is 40% to 50%<sup>(9)</sup>, with only 38 percent of affected patients surviving the first year. Depending on the underlying cause of bleeding, intracerebral hemorrhage is classified as either primary or secondary. Primary intracerebral hemorrhage, accounting for 78 to 88 percent of cases, originates from the spontaneous rupture of small vessels damaged by chronic hypertension or amyloid angiopathy. Secondary intracerebral hemorrhage occurs in a minority of patients in association with vascular abnormalities (such as arterio-venous malformations and aneurysms), tumors, or impaired coagulation<sup>(4)</sup>.

The classic presentation of SICH is sudden onset of focal neurological deficit progressing over hours with accompanying headache, nausea, vomiting, altered consciousness, and elevated blood pressure. Supratentorial hemorrhage is commonly accompanied by vomiting and altered consciousness but is rarely seen in ischemic stroke<sup>(10)</sup>. The type of focal neurological deficit depends on hematoma location. Patients with supratentorial hemorrhage often present with contralateral sensory or motor deficits, aphasia, gaze deviation, and hemianopia. Infratentorial hemorrhages manifest with signs of brainstem dysfunction, cranial nerve abnormalities, ataxia, nystagmus, and dysmetria<sup>(11)</sup>.

When a patient is clinically suspected of having SICH, head computed tomography scan is the standard diagnostic tool<sup>(5)</sup>. Hematomas, even just a few millimeters in diameter, are rapidly and accurately identified on CT scans. Not only does CT scanning demonstrate the size and location of the SICH, but it can also suggest potential causes such as tumor, vascular malformation, or aneurysm. Related complications such as hydrocephalus, edema, herniation, and intraventricular extension are easily identified<sup>(12)</sup>. As mentioned previously, hemorrhage volume is one of the strongest predictors of outcome from SICH<sup>(13)</sup>.

### **AIMS OF THE STUDY:**

1. Find out the most important risk factor for SICH.

2. Illustrate the correlation between the sites of hemorrhage detected by CT scan images and patients presentations.

### **PATIENTS AND METHODS:**

A prospective study was done between May 2010 and May 2012; this study was done in the CT unit in AL-Imamain Kadhimain medical city, Baghdad, Iraq. The study included 224 consecutive patients (128 males and 96 females) with the diagnosis of primary spontaneous intracerebral hemorrhage. The age range of our patients was 18-72 with a mean of  $63.46 \pm 14.7$  years. All the patients were examined in the CT unit using CT scan device (Somatom definition AS 64 slice; Siemens medical system, Germany). All the patients had primary spontaneous intracerebral hemorrhage and the diagnosis was made by the appropriate clinical history and examination plus CT findings that showed evidence of intra-cerebral hemorrhage. All the patients included in this study had no previous history of brain lesion predisposing to hemorrhage (i.e. arteriovenous malformation, tumor, aneurysm), and no previous history of stroke. Our criteria were supported by primary analysis of a CT scan showing no evidence for an underlying lesion, so those patients with evidence of arteriovenous malformation, tumor, and aneurysm were excluded from our study.

The following parameters were included in our study: age, presentation, past medical history (hypertension, bleeding disorders, and Diabetes mellitus), social history (smoking, alcohol). The assessment of CT images include (size, density, edema, pressure effect, location of the hematoma, presence of intra-ventricular extension of the hemorrhage), the assessment is done by 2 independent radiologists to decrease inter-observer error.

Hypertension status was assigned based on current use of antihypertensive medications or diastolic blood pressure greater than 90 mm Hg. We measure the B.P. 3 times and the mean of the second and third measurements were used for the analysis. Diabetes status was assessed using blood glucose measures and medication status. Patients with a fasting glucose  $\geq 126$  mg/dl (7 m. mol/L) or non-fasting glucose  $\geq 200$  mg/dl (11.1 m. mol/L) or use of diabetes medications or self-report of diagnosed diabetes were categorized as having diabetes.

Statistical analysis using the program SPSS (version 15 for Microsoft Windows). The P value of less than 0.05 was considered to be significant.

### **RESULTS:**

This study included 224 patients, 128 (57.14%) males and 96 (42.86) females, with male to female ratio of 1.3:1. Forty two patients lie in the

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age group of 50-59 years, 66 between 60-69 years, 48 between 70-79 years, 52 patients are seventy years old and older and only 16 are below fifty years of age, as shown in figure (1) Regarding the site of bleeding 160 patients (71.4%) had bleeding in deep seated areas of the brain and 64 patients (28.6%) had bleeding in a superficial location. Regarding the deep seated hemorrhage basal ganglia was the commonest site of hemorrhage in 96 (42.8%) of the patients, followed by Thalamus in 48 (21.4%), and cerebellum in 16 (7.2%) of the patients. In the superficial sites of hemorrhage parietal lobe was seen in 40 patients (17.8%), then parieto-occipital hemorrhage was found in 16 (7.2%) patients and 8 patients (3.6%) had temporal lobe hemorrhage as shown in table 1. Hypertension was the most common risk factors, found in 168 (75%) patients, followed by anticoagulant use in 128 (57.2%) patients. A history of diabetes mellitus was positive in 88 (39.3%) of the patients, 88 (39.3%) of patients smoking was observed, and 56 (25%) patients had no history of any risk factors. A statistically

significant difference between deep and superficial bleeding is seen in correlation with hypertension and smoking (P value is 0.00001 and 0.002 respectively) while no significant difference was noticed in correlation with anti-coagulant and DM (P value is 0.055 and 0.79 respectively) as shown in table 2. The most common presentation was focal neurological signs (FNS), found in 66 (29.4%) of the patients, facial palsy (FP) in 48 (21.4%) of the patients, loss of consciousness (LOC) in 40 (18%) of the patients, 32 (14.2%) patients had both focal neurological signs and loss of consciousness (FNS+LOC) as a presentation, 22 (9.8%) of them presented with speech difficulty (SD), 8 (3.6%) patients presented with ataxia and 8 (3.6%) with dementia. Significant relationship was found between the site of hemorrhage and patients' presentation (P value 0.001). One hundred and twenty patients (53.57%) had intra-ventricular extension of hemorrhage in their CT films, 120 (53.57%) of them had pressure effect of the hemorrhage, and 104 (46.42%) were complicated by edema.

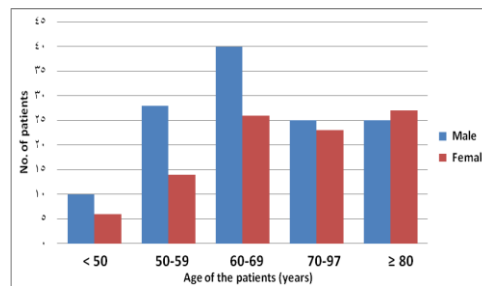


Figure 1: Age and sex distribution of the 224 patients with spontaneous intra-cerebral hemorrhage

Table 1: Distribution of the site of bleeding in patients with intra-cerebral hemorrhage.

Deep seated bleeding			Superficial bleeding		
Site of bleeding	No.	%	Site of bleeding	No.	%
Basal ganglia	96	42.8	Parietal lobe	40	17.8
Thalamus	48	21.4	Parieto-occipital	16	7.2
Cerebellar	16	7.2	Temporal	8	3.6
Total	160	71.4	Total	64	28.6

Table 2: Correlation between site of bleeding & risk factors in patients with intra-cerebral hemorrhage.

	Deep seated bleeding		Superficial bleeding		Total	%	P value
	(+ve)	(-ve)	(+ve)	(-ve)			
Hypertension	(+ve)	140	(+ve)	28	168	57	0.00001
	(-ve)	20	(-ve)	36	56	43	
Anti-coagulant	(+ve)	85	(+ve)	43	128	57.2	0.055
	(-ve)	75	(-ve)	21	96	42.8	
DM	(+ve)	62	(+ve)	26	88	39.3	0.79
	(-ve)	98	(-ve)	38	136	60.7	
Smoking	(+ve)	73	(+ve)	15	88	39.3	0.002
	(-ve)	87	(-ve)	49	136	60.7	

### DISCUSSION:

Among the subtypes of stroke, cerebral hemorrhage is the one most likely to require neurosurgical services and carries the highest mortality rate<sup>(15)</sup>. Timely and accurate identification of patients with SICH is important because therapeutic options and rates of re-hemorrhage are substantially different from secondary ICH<sup>(2,14-17)</sup>. Determining the underlying structural vascular abnormality is critical for instituting the appropriate treatment<sup>(18)</sup>. Most ICH bleeds are subcortical and over 50% of spontaneous intra-cerebral hemorrhages occur in the basal ganglia<sup>(19)</sup>.

Intracerebral hemorrhage is more common in men than women, particularly those older than 55 years of age<sup>(4)</sup>, in this study, males are more affected than females, these results were comparable with previously reported studies<sup>(4, 20-22)</sup>, however a study done by Ayala et al<sup>(23)</sup> showed that case fatality rates for hemorrhagic strokes and ischemic strokes were equal in both men and women, however, overall stroke mortality is greater in men. Only 16 of our patients are below fifty years of age, suggesting that SICH occur in increasing order in patients older than 50 years, these results were also comparable with the previously reported studies<sup>(1, 5, 9, 22, 24-26)</sup>.

Although in most cases the ICH is caused by hypertension, amyloid angiopathy, or impaired coagulation<sup>(2, 5, 9, 14, 24-28)</sup>, Hypertension is the most common cause of SICH<sup>(1, 4, 6, 8, 18, 29-33)</sup>. Hypertension was found in 168 (75%) in our patients, followed by anticoagulant use in 128 (57.14%) patients. Risk factors that have been variably related to ICH include prior ischemic stroke, diabetes, and smoking<sup>(32, 34, 35,36)</sup>, history of diabetes mellitus was positive in 88 (39.28%) of our patients, & 88 (39.28%) of them were smokers.

Basal ganglia was the commonest site of hemorrhage seen in 96 patients in our study followed by Thalamus in 48 patients and these results are comparable to that seen in previous;y reported studies<sup>(6,19,29)</sup>. The most frequent location is in the basal ganglia and its predominant etiology is poorly-controlled arterial hypertension<sup>(6)</sup>. In our study A statistically significant difference between deep and superficial bleeding is seen in correlation with hypertension and smoking. Hypertension is the most common cause of spontaneous ICH in the deep regions such as the basal ganglia, thalamus, pons, and cerebellum<sup>(29)</sup>. Cerebral hemorrhage is not a monophasic

phenomenon which abates immediately, because the hematoma continues to increase in the first 24 hours<sup>(6)</sup>.

Edema was found in 104 (46.42%) of our patients. The presence of hematoma initiates edema and neuronal damage in surrounding parenchyma. Fluid begins to collect immediately in the region around the hematoma, and edema usually persists for up to five days. Vasogenic edema and cytotoxic edema subsequently follow owing to the disruption of the blood-brain barrier, the failure of the sodium pump, and the death of neurons<sup>(4)</sup>. One hundred and twenty of our patients (53.57%) had intra-ventricular extension of hemorrhage in their CT films and 120 (53.57%) of them had pressure effect of the hemorrhage. Blood may escape into the ventricles and cause hydrocephalus. Rarely, blood finds its way into the subarachnoid space. A large hemorrhage can raise ICP to the level of the blood pressure until bleeding is tamponaded. Depending on clot location, this can result in brain herniation, compression of the brainstem, and death. Cerebellar clots greater than 3 cm in diameter have a poor prognosis if left untreated<sup>(11)</sup>. Seizures occur in approximately 10% of patients<sup>(30)</sup>.

The location of the hemorrhage was found to be significantly related to the patients' presentation (P value 0.001), as was concluded by Fewel et al<sup>(11)</sup> who stated that the type of focal neurological deficit depends on hematoma location. Patients with supratentorial hemorrhage often present with contra-lateral sensory or motor deficits, aphasia, gaze deviation, and hemianopia. Intra-tentorial hemorrhages manifest with signs of brainstem dysfunction, cranial nerve abnormalities, ataxia, nystagmus, and dysmetria.

### CONCLUSION:

Males are more affected than females by spontaneous intra-cerebral hemorrhage, spontaneous intra-cerebral hemorrhage tends to occur more commonly in a deep seated area of the brain, Hypertension is the most important risk factor for spontaneous intra-cerebral hemorrhage. There is great correlation between patients' presentations and the site of hemorrhage. Patients 50 years and older are more liable for spontaneous intra-cerebral hemorrhage.

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