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Spontaneous Intracerebral Hemorrhage; Findings of Primary CT-scan, Clinical Manifestations and Possible Risk Factors

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Spontaneous intracerebral hemorrhage is of relatively prevalent emergency cases of neural system associated with significant rate of mortality. The present study aims at determining radiological symptoms, clinical manifestations and possible risk factors of intracerebral hemorrhages. Clinical and radiological findings (primary CT-scan) of 80 patients with intracranial hemorrhage were retrospectively evaluated. The study was consisted of 300 patients. Pictorial findings considering clot age and brain scan of all patients were studied to determine location and extension of hemorrhage and. There were 160 male and 140 female patients with the mean age of 62. The most prevalent clinical manifestation including decrease of consciousness and headache were seen in 51 and 41.6% of cases and only 8.3% of the patients referred while they were in coma. Hematoma was replaced in 36 of lobar and 32.6% in basal ganglia (lenticular). It was observed in 15, 9% and 7.3% of thalamus, cerebellum and other areas, respectively. Additionally, hypertension and consumption of anticoagulation were, respectively seen in 60.3 and 9% while there was not any specific risk factor in 30.6% of the patients. Hypertension was regarded as main risk factors and hemorrhage was seen in basal ganglia in most cases of hypertensive patients. Headache and extension of hemorrhage into ventricles were often seen in cerebellum and thalamus hemorrhages, respectively. Subarachnoid hemorrhage was often associated with lobar hemorrhage. Most hypertensive patients suffering from intracerebral hemorrhage were older than 45 years. Controlling of risk factors especially hypertension is of high importance in prevention from cerebral hemorrhage.

Key words: Spontaneous intracerebral hemorrhage, risk factor, CT scan

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INTRODUCTION

Stroke is regarded as third factor of mortality (following cardiovascular diseases and cancer) in western industrialized countries. The older the patient the higher the cerebral hemorrhage rate. Prognosis of cerebral hemorrhage is bad and it has high mortality rate (Bekelis *et al*., 2012; Goldust and Rezaee, 2013; Lotti *et al*., 2013). The strokes are consisted of about 80% ischemic and 15-20% hemorrhagic ones. It results from rupture and tear of brain vessels leading to intraparenchymal hemorrhage or hemorrhage into cerebral membranes or ventricles (Goldust *et al.,* 2013a; King *et al*., 2012; Mohebbipour *et al.* 2012). It was divided into two trauma and non-trauma or spontaneous types. Non-trauma or spontaneous hemorrhages covered in this article is two times more prevalent than subarachnoid hemorrhages and results in the patients' mortality more than ischemic infarctions and subarachnoid hemorrhages (Goldust *et al.,* 2013b, c; Gross *et al.,* 2012). Prevalence rate of spontaneous intracerebral hemorrhages is about 9:100000 in America per year and 70-90% of the patients suffer from hypertension (El-Koraichi *et al*., 2012; Goldust *et al.,* 2013d; Vafaee *et al.,* 2012). Brain amyloidal vascular diseases are regarded as another common cause of cerebral hemorrhages in old patients. Also, vascular malformations, aneurysm rupture, blood coagulation disorders, consumption of anticoagulation drugs and thrombolytic drugs can be introduced as other factors affecting cerebral hemorrhages. Sometimes, hemorrhage occurs inside of brain tumors (Chiu *et al.,* 2012; Goldust *et al*., 2012; Sadighi *et al.,* 2011). Although treatment and management of intracerebral hemorrhages have been advanced, it still is regarded as one of the dangerous diseases (Golfurushan *et al.,* 2011; Lin *et al*., 2012; Milan *et al*., 2011). In this study, frequency of spontaneous intracerebral hemorrhages was analyzed considering age, gender, different seasons, radiological findings, risk factors and clinical findings.

MATERIALS AND METHODS

Out of 2324 patients with stroke referred to neurology and brain surgery wards of Imam Khomeini and Razi hospitals of Tabriz, Iran, files of 380 patients with cerebral hemorrhages confirmed by CT-scan was studied. Those patients with cerebral hemorrhage resulting from trauma or background damage such as vascular anomaly or brain tumor were excluded from the study. This study was approved by ethic committee of Tabriz university of medical sciences. Written consent was obtained from all the patients. Finally, 300 patients with intracerebral hemorrhage participated in the study. File of every patient was analyzed based on age, gender, primary clinical manifestations and radiological findings, risk factors, times of hemorrhage considering different seasons of the year. Primary scan of the patients was reevaluated by a neuroradiologist as far as possible. If primary scan was not available, the radiology report found in the patients' file was used. Radiological findings were classified based on hematoma location including lobe (hemorrhage in frontal, parietal, temporal and occipital lobes), deep (putamen, thalamus, tailed core, internal capsule), posterior fossa (medulla, brain bridge, midbrain and cerebellum) hemorrhages. Other radiological findings including decrease of density surrounding hematoma (edema), subarachnoid hemorrhage, inter-ventricle hemorrhage and mass effect of hematoma were separately recorded for every patient.

Statistical analysis: All understudy data was analyzed using SPSS16 statistical software. Descriptive statistical methods (frequency, percentage, mean, standard deviation) were used to statistically evaluate the data. Chi-square and Independent T-test were used to compare qualitative and quantitative variables, respectively. In this study, $p<0.05$ was regarded significant.

RESULTS

There were 160 (53.4%) male and 140 (46.6%) female patients in the study. The youngest and oldest patients were 26 and 78 years with the mean age of 62 years. Seasonal dispersion of intracerebral hemorrhage includes 20 in spring, 17% in summer, 30% in autumn and 33% in winter. Mean time interval between stroke and CT-scan was one day such that 42% of the patients scanned within the first 24 h. Out of these 300 patients, 181 (60.3%) cases were hypertensive, 27 (9%) cases consumed anticoagulation drugs and 92 (30.6%) patients experienced cerebral hemorrhage without any specific reason (Table 1) Lobe, lenticularis, thalamus, cerebellum

Table 1: Risk factors and hemorrhage location

Hematoma location	Lobe	Putamen	Thalamus	Cerebellum	Others	Total
Risk factors	108	98	45	27	22	300
Hypertension	48 (44.4%)	74 (75.5%)	30 (66.6%)	18 (66.7%)	11 (50%)	181 (60.3%)
Consumption of anticoagulation drugs	18 (16.6%)	3 (3.06%)	1 (2.2%)	3 (11.1%)	2 (9.09%)	27 (9%)
Without any specific reason	42 (38.8%)	21 (13.43%)	14 (31.1%)	6 (22.2%)	9 (40.9%)	92 (30.6%)
Total	108 (36%)	98 (32.6%)	45 (15%)	27 (9%)	22 (7.3%)	300 (100%)

Table 2: Hematoma location in brain

Hematoma location	No.	Percentage
Lobe	108	36
Lenticular	98	32.7
Thalamus	45	15
Cerebellum	27	9
Pons	6	2
Tailed core	5	1.7
From interaventricle origin	7	2.3
Several	4	1.3
Total	300	100

Table 3: Primary CT-scan and clinical findings

	Hematoma location					
CT and clinical findings	Lobe 108	Putamen 98	Thalamus 45	Cerebellum 27	Others 22	Total 300
Low conscious	51 (47.2%)	61 (62.2%)	26 (57.7%)	10 (37.04%)	7 (31.8%)	155 (51.6%)
Coma	15 (13.8%)	11 (11.2%)	--	2 (7.4%)	--	28 (9.3%)
Headache	41 (37.9%)	38 (38.7%)	16 (35.5%)	19 (70.3%)	11 (50%)	125 (41.6%)
Seizure	15 (13.9%)	5 (5.1%)	4 (8.8%)	--	1 (4.5%)	25 (8.3%)
Extension into ventricle	21 (19.4%)	47 (47.9%)	26 (57%)	8 (29.6%)	10 (45.4%)	112 (37.3%)
Associated with subarachnoid hemorrhage	75 (69.4%)	18 (18.3%)	2 (4.4%)	4 (14.8%)	6 (27.2%)	105 (35%)
Hypodense margin around hematoma	89 (82.4%)	26 (26.5%)	13 (28.8%)	20 (74.7%)	15 (68.1%)	163 (54.3%)

hemorrhages were seen in 36, 32.6, 15 and 9%, respectively. Hemorrhage of other parts including brain bridge, tailed core and inter-ventricle was observed in 7.3% of cases (Table 2). Also, 44% of patients without any specific risk factor experienced lobe hemorrhage. In hypertensive patients, the hemorrhage is often seen in deep structures (basal ganglia). Out of 184 hypertensive patients, 104 (73.5%) cases experienced basal ganglia hemorrhage. Low conscious level, coma, headache and seizure were seen in 155 (51.6%), 28 (9.3%), 125 (41.6%), 25 (8.3%) patients, respectively. Headache was often occurred in cerebellum hemorrhages and seizure in lobe hemorrhages such that 70.3% of cerebellum hemorrhages was associated with headache and 13.9% of lobe hemorrhages was accompanied by seizure. Inter-ventricle hemorrhage was usually seen in putamen and thalamus hemorrhages and subarachnoid hemorrhage was often seen in lobe hemorrhages. Reduction of local density of hemorrhage surrounding area (edema) was seen in 163 (54.3%) of cases. Generally, 82% of hemorrhages were of lobe, 26.5% of putamen, 28.8% of thalamus hemorrhages and 74% of cerebellum hemorrhages were associated with edema around hematoma (Table 3).

DISCUSSION

Spontaneous cerebral intraparenchymal hemorrhage results from rupture of intracerebral vessels. Aging and hypertension are regarded as the most important risk factors such that about 50% of the patients suffer from chronic hypertension. Penetrative arteries are highly exposed to being damaged in chronic hypertension. The arteries feed basal ganglia, thalamus and brain stem. In other areas, it may occur in internal capsule, deep white material, around ventricles, brain bridge and cerebellum. Hemorrhage in brain bridge is often fatal and results in deep coma (Goldust *et al.,* 2011; Romero *et al*., 2012; Sadeghpour *et al.,* 2011). Lobar hemorrhage is often seen in youths resulting from vascular anomalies, consumption of anticoagulation drugs, or intra-tumor hemorrhage. Although lobe hemorrhages of elders are mainly due to amyloidal vascular diseases, hypertensive patients may also experience lobe hemorrhages (Roessler *et al.,* 2011; Vogel *et al.,* 2011). Edema, ischemia and infarction are regarded as local complications of hemorrhage. If hemorrhage is of sufficient volume, it may result in hydrocephaly through pressing Monroe cavities and third ventricle. Cerebral intraparenchymal hemorrhage in men is more prevalent than women. It is much more common among young and middle-aged blacks in comparison with whites. The disease in Asian countries is more prevalent than European and American ones. In comparison with women, men are younger. Aging and hypertension are regarded as the most important risk factors (Dong *et al.,* 2010; Mendelow *et al.,* 2011). There is a relationship between frequency of cerebral intraparenchymal hemorrhage and different seasons of year. This study was consisted of 160 (53.4%) male and 140 (46.6%) female patients and seasonal dispersion of the hemorrhage can be stated as 20% in spring, 17% in summer, 30% in autumn and 33% in winter. Different studies introduce hypertension, consumption of alcohol and anticoagulation drugs, background damages and race. In Japan, cerebral intraparenchymal hemorrhages are more prevalent than ischemic infarctions (Kalita *et al*., 2011; Ricard *et al*., 2010). The studies demonstrated that 60.3 and 9% of the patients were hypertensive and consumed anticoagulation drugs, respectively. Also,

92 patients (30.6%) suffered from cerebral hemorrhage without any specific risk factor. Clinical symptoms of patients with cerebral intraparenchymal hemorrhage include sudden focal neural disorders (progressing within some minutes to some h), headache, nausea, vomit, low conscious level and hypertension (Gupta *et al.,* 2010; Won *et al*., 2010). In these patients 51.6 and 3.8% of the patients referred to the hospital while they respectively experienced decrease of consciousness level and were in coma. Headache was regarded as the first symptom of the disease onset in 41.6% of cases and 70.3% of headaches were seen in patients with cerebellum hemorrhages. Epilepsy was introduced as primary sign of the disease in 25 (8.3%) patients and 13.9% of patients with lobar hemorrhage seized. Inter-ventricle hemorrhage (57%) was often seen in cases where primary hemorrhage was occurred in thalamus. Lobar hemorrhages were associated with subarachnoid hemorrhages in 67% of cases. Although clinical manifestations of intracerebral hemorrhages are different from that of ischemic infarctions, they cannot be differentiated only relying on clinical symptoms. Rather, brain imaging is required (Chakraborty *et al*., 2010; Stemer *et al*., 2010). CT-scan is an alternative way to evaluate intracerebral hemorrhages, quickly differentiate hemorrhage from ischemia and determine size and location of hemorrhage. It demonstrates abnormal structures such as aneurysm, vascular malformations and brain tumors resulting in intracerebral hemorrhages and refers to hemorrhage complications such as cerebral hernia, interaventricle hemorrhage and hydrocephaly. Sometimes, intravascular administration of contrast material more exactly determines vascular anomalies (Levis *et al.,* 2010; Szeder *et al.,* 2010) Blood density varies based on time of scan. At the acute stage (the first four hours), hematoma is of high density and is seen in a white color (hyperdense). However, it should be considered that severe blood anemia may be concolorous with (isodense) or even lighter (hypodense) than adjacent brain tissue. Hypodense edge indicating to edema is seen around clot. At hyper-acute stage, liquid surface may be seen in hematoma indicating to blood sedimentation get out of vessel but not already clotted. Through time, CT findings vary depending on age of hematoma. Clot density gradually decreases from its edge after 7-10 days. Density enhancement of hematoma surrounding area is observed between 1-6 weeks after administration of contrast material. It may be seen as abscess which can be attributed to more vessels surrounding hematoma and breakage of vascular dam. Following 2-4 months of hemorrhage, decrease of density and, finally, formation of fossa-like cavity is seen at clot location resulting from absorption of necrosis materials and hematoma tissue (Hallevi *et al*., 2010; Tetri *et al.,* 2010). In this study, since most patients underwent CT-scan within the first week, hematoma was seen as hyperdense in all cases and there were isodense and hypodense in only two patients. They were suffering from severe anemia. Considering 36% of patients with lobar hemorrhage, it can be stated that hemorrhage in putamen, thalamus and cerebellum was seen in 32.6, 15 and 9%, respectively. Also, 7.3% cases of hemorrhages occurred in other parts including brain bridge, tailed core and inter ventricle. According to the findings, 44% of patients without any specific risk factor suffered from lobar hemorrhage. In hypertensive patients, hemorrhage was often seen in deep structures (basal ganglia). Out of 181 hypertensive patients, 104 (73.5%) cases experienced basal ganglia hemorrhage. There were low consciousness level, coma, headache, seizure in 155 (51.6%), 28 (9.3%), 125 (41.6%) and 25 (8.3%) patients, respectively. Headache is often seen in cerebellum hemorrhages. Lobar hemorrhages were associated with seizure in 13.9% of cases while inter-ventricle hemorrhage was often observed in putamen and thalamus hemorrhages and subarachnoid hemorrhage was more seen in lobar hemorrhages. Decrease of local density around hemorrhage is seen in 163 (54.3%) cases including 82% of lobar, 26.5% of putamen, 28.8% of thalamus and 74% of cerebellum hemorrhages.

CONCLUSION

The present study referred to hypertension and consumption of anticoagulation drugs as the most important risk factors, too. Although detection and treatment methods of the disease have significantly been progressed, cerebral intraparenchymal hemorrhages are of bad prognosis and high mortality rate. Therefore, controlling of blood pressure and observing of different aspects in consumption of anticoagulation drugs may play an effective role in prevention from cerebral intraparenchymal hemorrhages.

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