REMARK ON SOME RISK FACTORS AND ACCOMPANIED INJURIES IN VICTIMS SUBARACHNOID HEMORRHAGE THROUGH THE FORENSIC EXAMINATION OF REMAINS

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ABSTRACT: ***Objectives****: Remark on some risk factors and accompanying injuries in patients with subarachnoid hemorrhage.* ***Subjects and methods:*** *A retrospective descriptive study on 93 forensic examination records of victims who died caused by subarachnoid hemorrhagic injuries at the Department of Pathological anatomy-Forensic Medicine, Viet Duc Friendship Hospital, and some Centers of Forensic medicine from January 2007 to December 2017.* ***Results****: The risk factors: men (81.7%) suffered from subarachnoid hemorrhage more than women (18.3%). The average age of the victims was 37 years, of which the most common victims were 15-29 years old (43.0%). The majority of victims with subarachnoid hemorrhage were due to traffic accidents (66.7%). 33/46 of victims (71.7%) tested with alcohol concentration in blood. The subarachnoid hemorrhage and accompanied injuries: the most common scalp injury was subcutaneous hematoma (91.4%). The rate of victims with skull fractures was high (75.3%). The most common intracranial injury was cerebral contusion (54.8%). Histopathology: the most common injury was cerebral edema (69.8%), followed by atherosclerosis (23.3%) and aneurysm malformation (9.35%).*

Keywords: Subarachnoid hemorrhage, forensic examination, skull fracture, traumatic brain injury.

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1. INTRODUCTION.

A subarachnoid hemorrhage (SAH) is bleeding in the subarachnoid space-a space surrounding the brain parenchyma-located between the two layers of the meninges (subarachnoid space and soft membranes). The causes of subarachnoid hemorrhage are divided into 2 types, including traumatic subarachnoid hemorrhage and non-traumatic subarachnoid hemorrhage [6]. Subarachnoid hemorrhage has a high mortality rate, survivors often with heavy sequels, affecting their daily lives, becoming a burden on families and society in care, treatment, and rehabilitation.

Forensic examination of cases with subarachnoid hemorrhage is important, to identify accompanied injuries, mechanism of injuries formation, and cause of death. Thereby, helping the authorities resolve legal issues; on the other hand, providing morphological characteristics of injuries, which are useful for prevention, health promotion, early detection, timely and effective treatment. Stemming from the above fact, we carried out this study to review some risk factors and accompanied injuries in victims with subarachnoid hemorrhage.

2. SUBJECTS, METHODS OF THE STUDY.

2.1. Subjects of the study:

93 cases of forensic examination were victims of death caused by subarachnoid hemorrhage. The file was kept at the Department of Pathological anatomy - Forensic Medicine, Viet Duc Friendship Hospital, and some Forensic Centers, from January to December, 2017. Select files with enough research information.

2.2. Methods of the study:

- Study design: A retrospective descriptive study. A retrospective study on forensic examination records from January 1, 2007 to December 31, 2017.

- Study criteria: age, sex, situation of subarachnoid hemorrhage, blood alcohol concentration, subarachnoid hemorrhage and

accompanied injuries (such as scalp injuries, skull bones, other intracranial injuries).

- Data processing: by SPSS 20.0 software.

3. RESULTS OF THE STUDY.

3.1. The risk factors:

- Distribution of study subjects by age and sex:

Table 1. Distribution of study subjects by age and sex.

Age	Male	Female	Total
1-14 years old	0	0	0
15-29 years old	33	7	40 (43.0%)
30-44 years old	23	1	24 (25.8%)
45-59 years old	12	3	15 (16.1%)
Over 60 years old	8	6	14 (15.1%)
Total	76	17	93 (100%)

Most of the victims with subarachnoid hemorrhage were males (81.7%). The average age of victims was 37 years, of which, the majority of victims were between the ages of 15-29 years old (43.0%), no cases were from 1-14 years old.

- Situation of subarachnoid hemorrhage (n = 93):

+ Traffic accidents: 62 cases (66.7%).

+ Be beaten: 19 cases (20.3%).

+ Falls from a height: 6 cases (6.5%).

+ Sudden death or unknown situation: 6 cases (6.5%).

The most common victims of subarachnoid hemorrhage were traffic accidents (66.7%), followed by being beaten (20.3%), the least common victims were Falling from a height and sudden death, unknown situation (accounted for 6.5%).

- Blood alcohol concentration (n = 46):

+ Yes: 33 cases (71.7%).

+ No: 13 cases (28.3%).

There were 46/93 cases of victims with subarachnoid hemorrhage tested for blood alcohol concentration; of which, 33 cases were detected blood alcohol concentration.

3.2. Subarachnoid hemorrhage and accompanied injuries:

- Scalp injury and subcutaneous tissue:

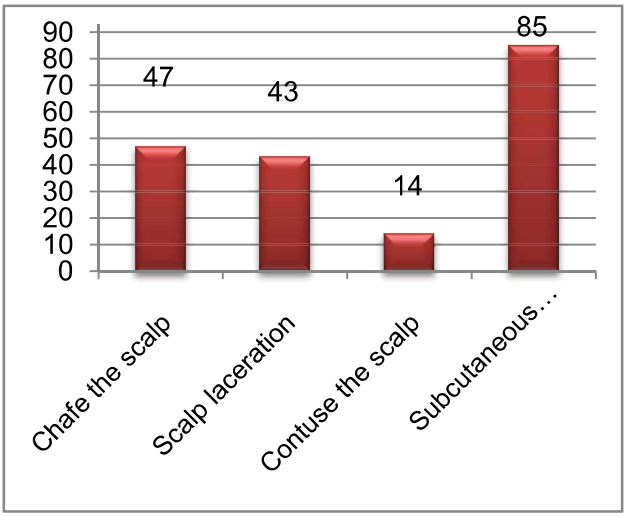

Chart 1. Scalp and subcutaneous tissue injuries.

The most common injuries were hematoma under the scalp (85 cases, accounted for 91.4%), the least common was Contuse the scalp (14 cases, accounting for 15.1%).

- Injury of skull fracture:

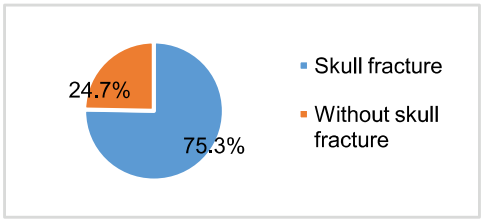

Figure 2. Rate of skull fracture injury.

The rate of victims with skull fractures (75.3%) was much higher than that of victims without skull fractures (24.7%).

- Morphology of accompanied intracranial injuries:

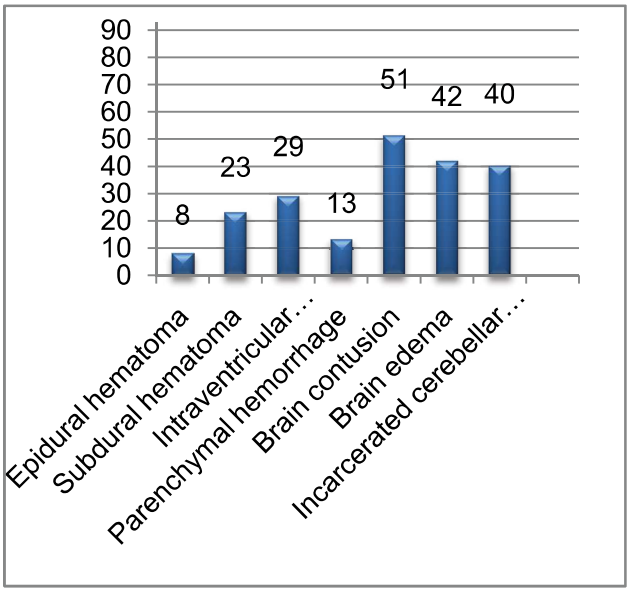

Chart 3. Accompanied intracranial injuries.

The most common intracranial injury was brain contusion (51 cases, accounted for 54.8%).

- Histopathological ịnuries (n = 43):

+ Brain contusion - cerebral parenchymal hemorrhage: 23 cases (53.5%).

+ Brain edema: 30 cases (69.8%).

+ Atherosclerosis: 10 cases (23.3%).

+ Aneurysm - vascular malformations: 4 cases (9.3%).

There were 43/93 cases that had histopathological tests. Of which, the most common was cerebral edematous injuries (30/43 cases, accounted for 69.8%), the least common was aneurysm - vascular malformations (4/43 cases, accounted for 9.3%).

4. DISCUSSION.

4.1. The risk factors:

- Age: the victim's age was from 15-85 years old, the average age was 37 years old, of which, victims aged 15-29 accounted for the highest proportion (43.0%). This result was consistent with the study results of Edirisinghe P.A.S at the University of Edinburg [7], Slobodan [3] and Inagawa Tetsuji [4], the most common age was middle-aged around 45-60 years old. The study by Nguyen Van Lieu showed that the most common age was 41-60 years old (57.4%), the average age of victims was 52 ± 6.19 years.

- Gender: the victims were males (81.7%) who suffered from subarachnoid hemorrhage more than females (18.3%). This result was similar to the study of Wong B, Ong B.B (mainly were male victims) [5]; but different from the study results of Nguyen Van Lieu (male victims accounted for 60.18%, female victims accounted for 39.82%, male/female victim ratio was 3/2 [1]).

- Situation of subarachnoid hemorrhage: in the study 93 cases, the group of victims with subarachnoid hemorrhage caused by traffic accidents accounted for the highest percentage (66.7%), followed by the group of victims with subarachnoid hemorrhage caused by being beaten (20.3%) and the group of victims with subarachnoid hemorrhage caused by fall from a heigh or sudden death, unknown cause (accounted for 6.5%). This result was similar to the study results of Muataz A.Al-Qazzaz, Mohammad Abdul-MohsinJabor in victims with subarachnoid hemorrhage caused by trauma (the main cause of death was due to traffic accidents [8]).

- Determination of blood alcohol concentration: among 93 study cases, there were only 46 cases (49.5%) tested for blood alcohol concentration. Of which, 13/46 victims (28.3%) did not detect alcohol in the blood, 33/46 cases (71.7%) detected alcohol concentration in the blood. Among the victims whose blood alcohol concentration was detected, the highest concentration was 544 mg/dl, the lowest concentration was 16 mg/dl; 27 cases had blood alcohol concentrations over 50 mg/dl.

4.2. The subarachnoid hemorrhage and accompanied injuries:

- Scalp and subcutaneous tissue injuries:

Among 93 study cases, there was only one victim who did not have scalp and subcutaneous tissue injury; 91.4% of victims had bruises and hematomas under the scalp; 50.5% of victims had chafe the scalp; 46.2% of victims had scalp laceration. This result showed that most of the victims were hit on the head no matter how big or small. The scalp injuries accompanied with the subarachnoid hemorrhage were very diverse, from the lightest level was chafe the scalp to contuse the scalp, subcutaneous hematoma and the most severe was scalp laceration. Chafe the scalp was an easy-to-observe lesion, accounting for 50.5% of cases.

- Skull Injuries: the number of victims with a skull fracture was 70 cases (75.3%), without skull fracture was 23 cases (24.7%). This result was consistent with the study results of Muataz A.Al-Qazzaz et al (skull fracture was a common injury (32.77%) [8]). In the forensic examination, the identification of skull fractures and broken bone locations can help orient the mechanism of injury, the object causing the injury, and at the same time, skull fracture was considered valuable forensic evidence to determine the victim had been hit to the head or suffered severe trauma.

- The morphology of intracranial injuries:

+ Epidural hematoma: Among 70 cases with a skull fracture, 8 cases (8.6%) had an epidural hematoma. This result was consistent with the study of Osborn A.G. (epidural hematomas were estimated to be about 90% originating from arterial lesions and 10% from venous lesions. The most common injury was caused by the middle meningeal artery running in the middle meningeal artery fissure in the temporal bone) [9].

+ Subdural hematoma: Among 93 study cases, 23 cases (24.7%) had a subdural hematoma. This result was consistent with the study of Muataz A.Al-Qazzaz (the percentage of subdural hematoma accounted for 34.45% [8]).

+ Intraventricular hemorrhage and brain parenchymal hemorrhage: 29/93 cases (31.2%) of patients had an intraventricular hemorrhage, 13/93 cases (14.0%) of patients had a cerebral parenchymal hemorrhage. This result was similar to the study of Nguyen Thi Kim Lien (43.0% of patients with subarachnoid hemorrhage with

bleeding into the ventricles, 23.3% of patients with subarachnoid hemorrhage with bleeding into the brain parenchyma [2]). Hijdra A et al (1988) studied 176 patients with subarachnoid hemorrhage, the results showed that 82.39% of patients had blood in the subarachnoid space, 55.11% of patients had bleeding into the ventricles and 19.32% of patients with ventricular dilation. According to Babchin I.C., intraventricular hemorrhage was caused by bleeding in the subarachnoid space and backflow into the ventricles. Albrecht H suggested that intraventricular hemorrhage could be caused by bleeding in the brain parenchyma bursting into the ventricles [9].

+ Brain contusion: 51/93 cases (54.8%) had brain contusion, of which, 45 cases of skull fracture. Brain contusion can occur at the site of impact or on the opposite side, the degree of injuries of the brain parenchyma may not be commensurate with the extent of injuries outside the scalp and skull.

+ Cerebral edema: we encountered 42 cases (45.2%) of cerebral edema, the second-highest rate after cerebral contusion. This was explained by the fact that cerebral edema was a secondary lesion that can appear after any intracranial lesion.

+ Incarcerated cerebellar amygdala: 40/93 cases (43.0%) had incarcerated cerebellar amygdala injuries. This was a secondary consequence of increased intracranial pressure due to cerebral edema or compressive hematomas [10]. This result was consistent with the viewpoint of Graham DI, Lantos PL (there was no case of isolated incarceration of the cerebellar amygdala which was always accompanied by other lesions, such as cerebral edema (55.0%), subdural hematoma (32.5%), epidural hematoma (12.5%) [10].

- Histopathological injuries: 43/93 study cases were tested for histopathology. The results showed that the most common histopathological injury was cerebral edema (69.8%), followed by cerebral contusion - cerebral parenchymal hemorrhage (53.5%), atherosclerosis (23.3%). Cerebrovascular aneurysms accounted for the lowest rate (9.3%). The microscopic lesions of brain parenchyma, cerebral blood vessels help provide valuable information, play a role in supplementing and evaluating the correctness of the conclusions reached through macroscopic examination.

5. CONCLUSION.

A study on 93 forensic examination cases of victims who died due to subarachnoid hemorrhage at the Department of Pathologic anatomy - Forensic Medicine, Viet Duc Friendship Hospital and some Forensic Centers, from January to December 2017, concluded:

- Risk factors: males (81.7%) suffered from subarachnoid hemorrhage more than females (18.3%). The victim's age was from 15-85 years old, the most common victims were from 15-29 years old (43.0%). The majority of victims with subarachnoid hemorrhage were caused by traffic accidents (66.7%). Among 46 victims who had blood alcohol concentration tests, 33 victims (71.7%) detected alcohol concentration in their blood.

- Accompanied injuries with subarachnoid hemorrhage: the most common scalp injury was subcutaneous hematoma (91.4%). The rate of victims with skull fractures was high (75.3%). The most common intracranial injury was cerebral contusion (54.8%).

- Histopathology: the most common injury was cerebral edema (69.8%), followed by atherosclerosis (23.3%) and aneurysm-vascular malformations (9.35%).

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