eISSN 2287-1683 pISSN 1738-8767
Journal of Trauma and Injury
Vol. 29, No. 4, December, 2016
http://dx.doi.org/10.20408/jti.2016.29.4.99

• Original Article •

The Significance of Clinical Examination for Brain Lesion Differentiation of Patients with Head Trauma after Alcohol Intoxication

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Purpose: There are many patients visited to ED in an alcohol intoxicated state. For these patients, it is difficult to predict by only clinical examination whether he/she would have brain lesion. The purpose of this study is to research whether it is possible to predict brain lesion by only clinical examination findings, with comparing patients with/without actual brain lesions.

Methods: A retrospective study was performed at a university hospital for the period 11 months with the medical records. As for the inclusion group, head trauma patients with objectively proved drunk, judging by their blood ethanol concentration, and performed the brain CT were selected. In terms of medical record, Glasgow coma scale (GCS), the presence of neurologic abnormalities, the presence of lesion on brain CT of the patients, were examined. From laboratory results, blood ethanol concentration, platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT) and glucose concentration were identified.

Results: For this study, there were total 80 patients of inclusion group. There was no statistically significant difference in terms of GCS score and neurological examination abnormalities, between the group with brain lesion and the group without brain lesion on brain CT.

Conclusion: Alcohol intoxicated patient with head trauma visits the ED, it is not possible to distinguish or determine whether brain lesion exists or not by only clinical findings. In order to check the lesion existence, the image examination, therefore, should be considered and performed. [J Trauma Inj 2016; 29: 99-104]

Key Words: Alcoholic intoxication, Craniocerebral trauma, Neurologic examination

I. Introduction

It is very common for the patient group visited to emergency room with alcohol intoxication for trauma. Based on the statistic system report of Korean Public Health Association related to drinking alcohol, the relevance to alcohol intoxication of fall down in 2010 was as following; 19.8% for 20–29 of age group and 15.8% for 30–39 of age group with close relevance. For elder than 70 year old patients, moreover, the death patients due to falling down consisted of 33.3% of patients related to alcohol intoxication. In addition, it reported that more than 20% of patients with trauma visited to emergency room had relevance to alcohol intoxication based on Choi et al.(1) In the case of non-alcohol intoxicated patients to emergency room,

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Submitted : August 14, 2016 **Revised** : September 2, 2016 **Accepted** : December 30, 2016

it is possible to predict weather she/he would have brain lesion or not depending on the patient's symptom statements, the presence of neurological examination abnormalities and etc. to some extent. Meanwhile, it is difficult to predict with only symptoms in the case of alcohol intoxicated patients. For instance, it is difficult to figure out whether the patient's low consciousness level was caused by deep sleeping after drinking alcohol or central nervous system depression by brain lesion. Moreover, it is difficult to distinguish whether vomiting patient was caused by meningeal irritation sign from brain lesion or drinking alcohol. There are some cases with difficulties for conducting neurological examination because there are many patients in excited condition or cases without sufficient cooperation. The reason of media's reporting about problems for patients to emergency room in alcohol intoxicated state and the late diagnosis of brain lesion is that the failure of early differentiation of brain lesion due to above mentioned.

In this study, if the patients with head trauma after drinking alcohol visited this hospital without visiting other medical clinics, excluding the patients delivered from other hospitals, it examined that whether brain lesion of the patients to be predicted or not through clinical examination such as Glasgow Coma Scale (GCS) and neurological examination abnormalities of the patients at the early stage.

II. Materials and Methods

In this study, it was including the patients with brain CT from the patients with head trauma in alcohol intoxicated state from elder than 16 year-old patients visiting a university hospital emergency center and performing retrospective review for their medical records.

1. Target patients

From March 1, 2015 to January 31, 2016, there were 34,638 patients visiting ED. 2,585 of them had the evidences of head trauma including lacerations, blunt trauma, abrasion and so on or head trauma based on patient or their accompanied people's statements. The definition of alcohol intoxicated patients is a patient with more than 10 mg/dℓ of blood ethanol concentration. To determine alcohol intoxication, Noh et al. (2) made a study result that the patient's statement and the physician's evaluation were relatively correct. For more objective evaluation, however, in this study,

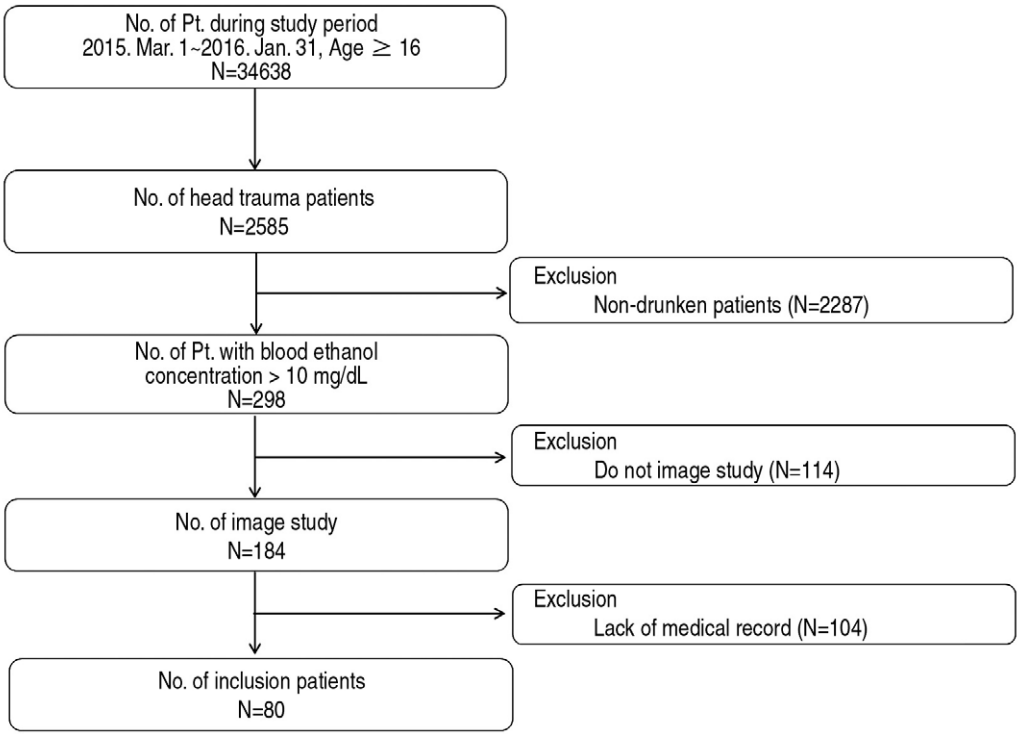

Fig. 1. The flow chart of study subjection selection.

it was determined for patient group in accordance with blood ethanol concentration. We have routinely checked blood ethanol level for patients with unknown origin mental change, alcohol odor from patients, and history of recent alcohol drinking. During study period, there were 298 of alcohol intoxicated patients with head trauma visiting emergency room and 184 of them were performed brain CT. A total of 80 of them were studied as inclusion group, excluding difficult patients for collecting data due to lack of detailed medical records regarding neurological examination (Fig. 1).

2. Data collection

The presence of abnormal findings, including consciousness state assessed by gross GCS score, lateralizing sign in terms of neurological examination, pathologic reflex, the absence of brain stem sign, age, gender and vital sign of early stage for each patient and clinician's examination findings, were collected through medical records. In addition, platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT) were checked to identifying bleeding tendency, and blood ethanol concentration and glucose concentration, that influencing consciousness state, were checked on laboratory examination.

3. Statistical methods

Collected data were analyzed with using SPSS statistics 19 (IBM Co., Armonk, NY). Continuous variables were evaluated by Kolmogorov-Smirnov test for normal distribution. If it was found to be normally distributed, the differences with respect to presence or absence of lesions of brain CT results were assessed using T-test. If variables showed non-normal distribution, then we used Mann-Whitney test. In addition, we analyze correlation between levels of blood ethanol concentration with GCS, using Pearson's correlation analysis. For neurological examination, it divided into two groups regarding with and without the presence of abnormality and the difference was assessed using chi-square test. The expected frequency for one cell (25%) was less than 5 and Fisher's exact test was also conducted. From all statistical analysis, if p-value was less than 0.05, it was regarded as statistically significant difference.

III. Results

There were total 80 of study inclusion patients consisting of 67 of male patients (83.8%) and 13 of female patients (16.2%). In the case of abnormal findings from brain CT, there were total 14 of them consisting of 13 of male patients (92.9%) and 1 female patient (7.1%). Their average age was 44.6 years old as normal from brain CT interpretation and 49.9 years old for abnormal cases creating population distribution (Table 1, 2).

With comparing the average of total GCS score, it was resulting 14.0±2.3 of and 11.8±4.3 of abnormality without statistical significance (p=0.09). From vital sign measured, moreover, there was not any statistical significance (Table 3).

There were total 11 of patients with neurological abnormality, 9 patients with neurological abnormality but without lesion from brain CT and 2 with lesion as examined (Table 4-1). On statistical analysis, negative predictive value was comparatively high (NPV=82.6%) but positive predictive value was low (PPV=18.2%) and odd ratio was 1.056 and the relevance of these 2 factors did not have statistical significance (p=0.616) (Table 4-2).

From the laboratory results, the relevance of blood ethanol concentration and findings for abnormality from brain CT also did not have statistically significant difference for both patient groups with normal

Table 1. Demographic characteristics

		Brain CT normal (N=66)	Brain CT abnormal (N=14)	Total (N=80)
Sex	Male	54 (81.8%)	13 (92.9%)	67 (83.8%)
	Female	12 (18.2%)	1 (7.1%)	13 (16.2%)
Mean age		44.6 ±14.2	49.9 ±17.9	45.5 ±14.9

findings from CT and with abnormal findings (p=0.310). And we did correlation analysis between blood ethanol concentration and total GCS. There were no statistical correlation (Pearson's correlation coefficient: −

Table 2. Brain CT abnormal group

	SDH	SAH	EDH	ICH	IVH	Contusional hemorrhage	Pneumocephalus	Skull fracture
1	√	√	√					√
2						√		
3	√	√						√
4	√	√						
5	√			√				√
6	√	√			√			√
7	√	√						√
8	√							
9			√					√
10			√				√	√
11			√			√		√
12		√				√		√
13	√							
14						√		

SDH: subdural hemorrhage, SAH: subarachnoid hemorrhage, EDH: epidural hemorrhage, ICH: intracranial hemorrhage, IVH: intraventricular hemorrhage

Table 3. Glasgow Coma Scale (GCS) & Vital sign

	Brain CT normal (Mean ± SD)	Brain CT abnormal (Mean ± SD)	p value
Total GCS score	14.0 ± 2.3	11.8 ± 4.3	0.087
Systolic blood pressure (mmHg)	127.8 ± 19.8	133.4 ± 31.3	0.534
Diastolic blood pressure (mmHg)	79.2 ± 14.3	77.3 ± 20.3	0.746
Heart rate (bpm)	88.0 ± 14.6	89.4 ± 21.9	0.822
Respiratory rate (bpm)	20.4 ± 1.8	20.9 ± 2.3	0.336
Body temperature (°C)	36.3 ± 0.6	36.1 ± 0.8	0.320

SD: standard deviation

Table 4-1. Neurologic examination

	Brain CT abnormal	Brain CT normal	Total
Neurologic exam. abnormal	2	9	11
Neurologic exam. normal	12	57	69
Total	14	66	80

Table 4-2. Statistic analysis of neurologic examination

PPV	NPV	Sensitivity	Specificity	Odd ratio	p value*
18.2%	82.6%	14.3%	86.4%	1.056	0.616

PPV: positive predictive value
NPV: negative predictive value
* Fisher's exact test

Table 5. Laboratory finding

	Brain CT normal	Brain CT abnormal	*p* value
Ethanol (mg/dl)	240.5±77.6	216.5±91.5	0.310
Platelet (103/㎕)	218.4±73.6	212±51.7	0.781
PT (sec)	11.7±1.3	12.1±1.5	0.309
aPTT (sec)	28.0±4.7	27.8±7.0	0.939
Glucose (mg/dl)	134.3±56.5	156.4±74.1	0.246

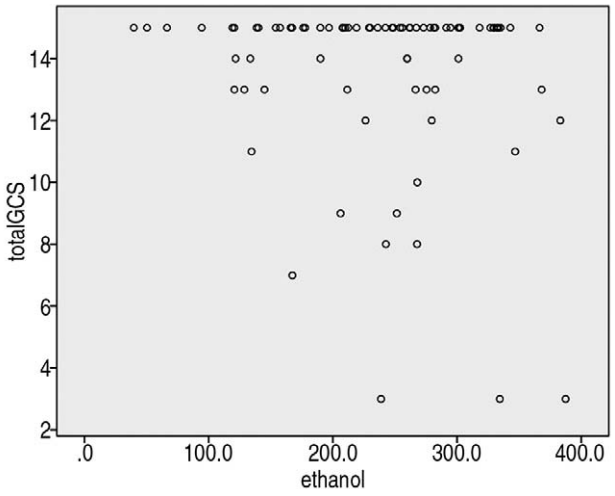

Fig. 2. Correlation analysis between blood ethanol concentration and total GCS.
Pearson's correlation coefficient: -0.17, p=0.13

0.17, p=0.13) (Fig. 2). Also as well as platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT) possible to influence bleeding tendency between two groups and glucose concentration possible to influence consciousness level did not have statistically significant difference (Table 5).

IV. Discussion

Ethanol performs to restrict central nervous system with penetrating cell membrane after its being absorbed into body through drinking alcohol. Depending on the change of blood ethanol concentration, behavior stimulus will be caused by low blood concentration and breathing restriction and consciousness change will be caused resulting coma by high concentration.(3) For other symptoms, it will cause nausea or vomiting and hypothermia by vasodilatation as well as hypoglycemia. These physiological changes from taking ethanol may cause confusion to determine the presence of disease for clinicians.

GSC score is a tool identifying consciousness level and evaluating their prognosis as commonly used for many patients with head trauma and intracranial bleeding(4-7) and so on. Kim et al.,(8) however, reported that if the patients with head trauma and 15 points of GCS as alert consciousness, 20.2% of them showed acute intracranial lesion. Also, Ashkenazi et al.(9) reported that if traumatic head injury would be caused by explosive damage, it failed to distinguish GCS score demanding neurosurgical intervention or not. Hereby, there are many preceding study results about low reliability of GCS score but this is used for the patient's consciousness state evaluation tool in current clinical examination so this study uses GCS score to analyze. As well as GCS score, neurological examination is analyzed together for the possibility of predicting brain lesion with only clinical examination. The other analyzed parameters can affect GCS score, the presence of neurological abnormalities, the presence of brain lesion and they were examined to exclude other variation of two groups.

Firstly, there was not any difference among platelet count, prothrombin time and activated partial thromboplastin time to evaluate two groups' bleeding tendency and it was not possible that any of these groups had bleeding tendency. Glucose concentration, vital sign possible to affect GCS score and neurological abnormalities, also did not have any difference between these two groups. Moreover if it assumed that the brain lesion from CT result was more severe injury and there was not any significant difference between two groups' blood ethanol concentration, then it was possible that the degree of how much they drunken would not affect the severity of damages.

From comparative analysis for two groups' GCS scores, p-value was more than 0.05 which the authors

defined as significant level and it was concluded that there was not any significant difference between both groups' GCS scores but it should be considered because it was very close to this significant level.

In this study, there was an unexpected result, which was neurological examination finding. *p*-value was high, of course, and not possible for statistical relevance between neurological examination and the presence of brain lesion. If there would be neurological examination findings for abnormalities, however, there will be brain lesion with suspected intensively.(10) In other words, the authors expected that positive predictive value (PPV) would be high but positive predictive value was remarkably low as 18.2% rather than negative predictive value was high as 82.6%.

In this study, there were some limitations as follows. Firstly, the most serious limitation was that the dead patients without being measured for blood ethanol concentration, the patients with low clinical possibility of brain lesion or the patients without brain CT because of their rejecting were excluded for this analysis and this might cause selection bias. The other limitation was that, this was a retrospective study and there were excluded cases with omitting its records. And this study was performed for short term with small cases. Also there was no consideration to trauma mechanism as another limitation. It will be needed for prospective studies by multi-institutions in the future.

V. Conclusion

If a patient to emergency room with alcohol intoxication would have head traumatic evidence or history of this, it is not possible to figure out whether actual brain lesion exists or not with only GCS score and neurological examination. Regardless of clinical examination findings, therefore, it should be considered with image examination including brain CT and so on.

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