A Survey on the Amount of Positive Result of DWI in the Patients Suffering from TIA and the Correlation of this Patients With ABCD Scoring

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ABSTRACT

Stroke is the third major reason of death in developed countries and the most prevalent disabling neurologic disorder. One of the approaches to recognize the brain damage is MRI. Presence of an acute damage in MRI of brain with DWI (diffusion weighted imaging) in patients suffering from TIA (transient ischemic attack). Therefore, cognition of the risk factors which can clinically interfere the DWI, might be helpful for making the best decision about the patients suffering from TIA. The purpose of this study is evaluation of the amount of positivity of DWI in the patients suffering from TIA and the correlation of these patients with ABCD scoring. Contributors were patients suffering from TIA hospitalized in neurology department of Sina hospital, who have been randomly selected among patients who had no problem with being studied. These patients were surveyed for one week. After the results of DWI were submitted, the study cases were divided into two groups, one the persons with positive DWI and the other one with typical DWI, and ABCD2 scorings and effecting parameters in ABCD2 scores in these two groups were compared. Raw data were entered in the SPSS software ver.17, and then the non-parametric statistic Chi-squared test was used to analysis the data and the meaningful levels were surveyed (P-Value> 0.05). In this study, 240 male took part, 73.8% of these persons had AC-TIA and 26.2% had PC-TIA. Among 177 persons with AC-TIA, 79.7% of them were normal DWI and 20.3% equal to 36 persons were positive DWI. Then continuing the study, the same score of positive DWI person (36 persons) were selected from normal DWI persons randomly. The average of the age in the normal DWI group was 65.5±10.13, and in the positive DWI group was 68.2±8.3 years old. According to the results obtained from variable statistical tests, totally the ABCD2 scores have no meaningful relationship to the results obtained from DWI (p-Value<0.05), whilst the results depict a meaningful statistical correlation between results from DWI and two other parameters of ABCD2 which are Clinical Features and Symptom Duration (p-Value>0.05). However, discoveries of this study demonstrated no meaningful relationship between results of DWI (normal/positive) and other parameters of ABCD2 scoring such as age, blood pressure, and diabetes in the patients suffering from TIA (p-Value <0.05). The results of this study demonstrates that the total score of ABCD2 have no correlation with DWI results, but some of the parts defining the ABCD2 scores, have meaningful correlation with the results obtained from DWI.

Key words: Passive ischemic attack, stroke, TIA, DWI, ABCD2 scoring, MRI.

INTRODUCTION

One of the most prevalent neurologic disabling diseases in adults and the third reason of death, is stroke (Cerebro Vascular Accident)[1]. 750000 strokes happen yearly and about 150000 persons die because of stroke[2]. 88% of the strokes are the ischemic type, which 8 to 12 percent of them leads to death in 30 days[3]. Studies shows that the risk of stroke increases after 55 years old[4]. Stroke takes place in two principal ways, one is because of the congestion of cerebral arteries (ischemic) and the other one is because of cerebral or side-cerebral bleeding . Ischemic is entitled to the reduction of blood flow to some parts of the body, which often is a result of stricture or congestion of a

blood vessel (hemorrhagic). Ischemic stroke takes place because of congestion of one of the arteries carrying oxygen and nutrition to the cerebral cells. TIA (Transient Ischemic Attack) is the passive and unstable conditions of the malfunction of the brain or a part of brain[5], or TIA is a bad neurologic period of time, caused from suffering a special part of brain , spinal cord, as well as acute retinal infarction[5, 6]. The main reason of TIA is presence of an embolus (embolus=a bulk segregated and moving in the vein) and congestion of one of the veins with the embolus. Embolus can be created because of a vascular plaque formed from atherosclerosis or a thrombosis remained from a fibrillation in the heart. This congestion happens in a short period of time and the resulted suffer is not permanent[7]. TIA is similar to a stroke. Some of the reasons of TIA are high blood pressure, smoking, high levels of cholesterol, diabetes and migraine. Symptoms of TIA are blurry vision, double vision, aphasia, problems in talking, one-sided weakness and numbness, and vertigo. These symptoms disappear after one hour[8]. In the case of observing the symptoms of stroke in the patient, some experiments are necessary to be done to measure the intensity and extension of the stroke. CT Scan is one of the methods to recognize the stroke. This approach demonstrates a 2D imaginary of the brain using X-ray whereby strokes such as ischemic and hemorrhagic strokes can be recognized. CT scan is capable to demonstrate size, the place of the brain suffered from tumor, damaged veins, and blood clots. Injecting some materials to enhance the quality of the image, and using X-ray may cause allergic reactions and are the most major dangers about using CT scan. MRI is a very more precise technique to depict more details comparing to CT scan, whereby very clear and precise images of brain and its veins are being provided employing magnetic fields, without any X-ray or colorful materials[9]. MRI is a very effective tool to recognition of damages in the brain, especially ischemic strokes. Images obtained from MRI have three axis (coronal, sagittal, axial), and the images can be taken from the inaccessible spots of brain which CT scan cannot take images from them. There are a variety of imaging in MRI, DWI (Diffusion Weighted Imaging) in which the computer orders are being designed how they react to the apparent diffusion coefficient (the sum of movement of molecules inside the cell)[10]. The most prevalent utilization of DWI MRI is the cerebral imaging immediately after infraction or the conditions after ischemic, in which the tissues lose the water absorbed from extracellular space. The suffered tissues have less capability to diffusion, consequently they have higher intensity of signals. This feature can be used to recognize healthy and damaged cells. Fast recognition of patients suffering from TIA is very essential. In addition to evaluate the condition of the patient by imaging neck and head veins and verify the heart, etc..., the ABCD2 scoring (age, blood pressure, clinical symptoms, diabetes, and the duration of symptoms) should be determined in the initial examination[11, 12]. This score can be beneficent for determining the risk factor of the next ischemic and stroke. Patients with high ABCD score should be hospitalized and healed, while patients with lower ABCD score can be healed as an outpatient treatment. The ABCD2 is the corrected initial ABCD scoring . Studies show that the ABCD2 scoring can predict the stroke with a high precision and in the case of TIA, strongly predicts stroke within 24 hour, as it was determined in the study that 76% of the patients with a relapse, had a ABCD2 score of 5 and higher than 5. Many researches has been implemented in this case, such as: Crisostomo et al, in 2003 in which they studied DWI and determination of passive ischemic TIA attack. They demonstrated in their into-past looking study that DWI was beneficent to determine the patients suffering from ischemic (DWI is also beneficent in determination of acute ischemic damages). They also showed that the capability of determination precision of DWI is higher than MRI (13). Oppenheim et al in 2000 had a research entitled a survey of false negative result of DWI in acute ischemic strokes. In this study which was implemented on 139 hospitalized patients suffering from acute ischemic stroke, the items of false negative DWI was surveyed. The results depicted that the rate of false negative DWI in the PC-tias (19%) is meaningfully higher than false negative DWI in the AC-tias (2%). Also they described that the results of DWI for PC-TIA patients have not enough accuracy[14]. A study was done by Asimos et al in 2010, they studied passive ischemic TIA attack and ABCD2 scoring. This looking-into-future study was implemented on 1667 patients. They believe that patients with lower ABCD2 scores, are less prone to ischemic attack comparing with patients

with higher ABCD2 score. Also they believe that evaluating the ABCD2 score is very essential for all the people exposed to ischemic stroke[15].

METHODS AND MATERIALS

This is a partial study and it uses random sampling. The statistic society of this study are 240 patients suffering from TIA who referred to Sina Hospital. Patients were informed about the study and the patients who had a tendency to take part in the program, started to collaborate. In this study, the patients who did not have the excluding criteria consisting of the former stroke, not to knowing the exact time of starting the symptoms, and reference to the doctor after 24 hours (of starting symptoms), were brought in the study. In this study, after the initial sampling, 26 women with a age ranging from 55-62 years old who were dismissed from the study case after evaluation of conditions and the ratio of DWI, and male patients added instead of them. The reasons of this dismissing was as below: according to former studies, researchers believe that on the one hand being a male, itself is a risk factor to be stricken by TIA[16] and on the other hand, the researches show that positive DWI is being observed in males rather than females[17] . Also the statistics show that the rate of TIA was observed in the females aging from 65 to 90, which is not compatible with the age range of the female in our study[16] (55 to 62). The rate of TIA is higher especially in the males aging from 65 to 75 comparing with females. Therefore, evaluating the symptoms and relations between them in this group is more real. In the studies in which the ABCD scoring is studied, there has been no pointing to the differences in the results of these parameters[17, 18]. Also in this study, the number of women referred to be brought in the study was by far less than men, and regarding the standards of the study (which one of the most important ones was the age between 65 to 75), dividing the participants into two groups of male and female was impossible. Therefore, the female participants were dismissed. After that, the sampling continued until the number of participants raised from 214 to 240 persons. Then, in this study patients suffering from TIA consisting of AC-TIA (anterior circulation) and PC-TIA (posterior circulation) were studied. The A and P patients were divided into groups according to symptoms written in valid science references. The division method was according to this, the patients who had at least two symptoms such as dysphagia (disorder in talking ability or losing cerebral functions), one sided disorders in vision (homonymous hemianopia), hemisensory loss, and hemiparesis, and they had lasting symptoms, were put in the AC-TIA group, and the patients with disorders in functions of brain stem and cerebellum, homonymous hemianopia, coma, vertigo, stomach sickness and vomit, were put in the group PC-TIA[19, 20]. According to reports, the indexes which effect the scoring ABCD2 (consisting of age, blood pressure, clinical features, diabetes, and time duration) were mostly observed in the AC-TIA group[20]. In the reports and researches which were done during past years, it has been proved that type amount of DWI to be positive in PC-TIA is less than AC-TIA[21, 22]. Zuo and Lian in 2015 had a study entitled looking-into-past analyzing of negative DWI results in patients with acute cerebral infarction, which was performed on 349 patients suffering from TIA. They figured out that the rate of positive AC-TIA infarction (P = 0.0122, OR: 13.858; 95%CI, 1.776–108.154) is 14 times bigger than infarction of PC-TIA[23]. According to these discoveries, in this study, in order to better cognition of the relationship between ABCD2 and the results of DWI, the researchers dismissed patients suffering from PC-TIA which a less percent of them have positive DWI, and focused on AC-TIA patients. Considering one of the purposes of this article which is the survey of the amount of positivity of DWI in the patients suffering from TIA with the ABCD2 scoring, in the following the patients with PC-TIA were dismissed and the indexes of ABCD2 were studied. DWI of the persons who were successful to pass through the next stage (AC-TIA patients) was verified. Then some patients with AC-TIA who had positive DWI were selected and the same amount of patients with negative DWI were selected and the standards of both groups were compared. The information of all the patients such as age, blood pressure, clinical features, diabetes, duration of symptoms and ABCD2 scoring were registered for all the patients with TIA. Scoring ABCD2 was done in this way: age more than 60 (1 score), high blood pressure (systolic pressure higher than 140 and diastolic pressure higher than 90)(1 score), clinical symptoms such as one sided weakness of the body (2 scores), aphasia and

dysarthria without weakness of the body (1 score), duration of the symptoms like 10 to 60 minutes (1 score), more than 60 minutes (2 score), diabetes (1 score). According to some references (17, 24), the surveyed factors for the ABCD2 scoring such as Symptom Duration and Clinical Features each one have three states (Clinical Features: talking disorder, one-sided weakness, and Motor + Speech. And about Symptom Duration (less than 10 minutes, 10-59 minutes, and more than 60 minutes). In this study, all of these cases were evaluated and analyzed. Whilst other references in order to calculate the ABCD2 scoring have considered only two states for clinical features (talking disorder, one-sided weakness) and two states for Symptom Duration (10-59 minutes, and more than 60 minutes) (25, 26). Therefore, in order to implementation of this study, to calculate the ABCD2 score and achieving the most precise state, the results of all the three standard states which were defined for Clinical Features and Symptom Duration, were evaluated. Patients were exposed to MRI with the 1.5 tesla power within less than 7 days from the start of the symptoms. These images verified and the results reported by two specialists of MRI. Features of the images are consisting of slice, ¡ field¡ size of matrix¡ gap¡ slice thickness¡ eco time¡ repetition time¡ and the B value . After collecting required data from the patients with TIA, the data were input into the SPSS software ver.17. In order to analysis of the data the Chi-squared test and T-test were used and the meaningful surfaces (P-Value<0.05) were evaluated.

RESULTS

First the variables were introduced then the raw data were analyzed by proper statistical programs. This study is performed on 240 patients suffering from TIA who referred to neurological department of Sina hospital. 26 persons of the participants are female and the rest (214 persons) are male. According to the normal and abnormal profusion (positivity) of the DWI imaging, only 3 persons equal to 11.5 percent of whole the population of females had positive DWI. Due to the limited time and standards defined for the participants and insufficient number of females comparing to males, and also the reasons mentioned in the Method section, females were

dismissed from the study. In this study patients suffering from TIA consisting of AC-TIA (anterior circulation) and PC-TIA (posterior circulation) were studied. 73.8% of the population equal to 177 persons were from AC-TIA type and 26.2% of the population equal to 63 persons were from PC-TIA type. Results obtained from former studies which were confirming no relationship between indexes of ABCD2 and features of PC-TIA patients, caused the 63 persons from the PC-TIA type to dismiss and that 177 persons from AC-TIA type were conducted for the upcoming investigations. Results of imaging DWI in the persons who conducted to the next step(AC-TIA patients), depicts that 79.7 percent of them equal to 141 persons were from the normal statistic society and type results of DWI imaging demonstrated that 20.3% equal to 36 persons were positive TIA. Then the recent group (patients with positive TIA) who were positive DWI, were selected and equal to the same number (36 persons) patients with negative DWI were selected and the standards of this two groups were compared. In this statistic society, the total average age of the patients is 68.2±8.3 years old. The smoking rate in the normal DWI was 18.1% and in positive DWI was 16.1%. In order to evaluate the relationship between the results of DWI (positive/normal), patients suffering from TIA with smoking and cholesterol variables, the non-parametric statistic Chi-squared test was used. The results demonstrate that there is not a meaningful statistic correlation between DWI (positive/normal) of the participants and the smoking and cholesterol variables (p-Value>0.05). Then in this study, the relationship between DWI (positive/normal) of the patients suffering from TIA with factors effecting the ABCD scoring using a proper statistic test. Results show a meaningful relation between DWI (positive/normal) and two indexes of clinical symptoms and the duration of the symptoms (p-Value<0.05) and also no relationship between DWI (positive/normal) and age, blood pressure, and diabetes in the patients suffering from AC-TIA (p-Value>0.05). As mentioned earlier, the studies demonstrate a meaningful statistic relationship between two parameters of ABCD2 scoring means clinical features(talking disorder, one-sided weakness, Motor + Speech) and the duration of the symptoms (less than 10 minutes, 10-59 minutes, and more than 60 minutes) with results of DWI (p-Value<0.05). Briefly,

according to the table 1, it can be declared for the Symptom Duration parameter that the longer duration of symptoms, the more probability of more positive results of DWI. Also, considering meaningful relationship between results of DWI and two indexes of talking disorder and one-sided weakness and considering table 1, this can be included that occurrence and increase of these two clinical parameters (Clinical Features and Symptom Duration) can increase the positive results of DWI.

Also in this article, the relationship between DWI (positive/normal) of the TIA patients and ABCD2 scoring was investigated. Results (table 2) show no meaningful relationship between DWI (positive/normal) and ABCD2 scoring. (p-Value>0.05). Totally, we can say that according to these statistical tests, the ABCD2 scoring has no

Table 1: The relationship between DWI (normal/positive) of the patients with each parameters of ABCD2

Value	Total Samples n=72	DWI Positive n=36	Normal DWI n=36	Variables	
753	67.1±5.2	68.2±8.3	10.13± 65.5	Age	Subnumbers ABCD2 of scores
356	42 persons (58%)	22 persons (61%)	20 persons (55%)	Blood Pressure	
0.022	32 persons (44.4%)	10 persons (27.78 %)	12 persons (33.3%)	Clinical Features	
0.011	25 persons (34.72%)	12 persons (33.33%)	13 persons (36.11%)	Talking disorder One-sided Weakness	
0.075	25 persons (34.72%)	14 persons (38.889%)	11 persons (30.56%)	Motor + Speech	
148	15 persons (20%)	7 persons (19%)	8 persons (22%)	Diabetes	
0.074	15 persons(20.83%)	6 persons (16.7%)	9 persons (25%)	<10 min	Symptoms Duration
0.314	23 persons (31.94%)	12 persons (33.3%)	11 persons (30.6%)	10-59 min	
0.042	34 persons (47.22)	18 persons (50%)	16 persons (44.4%)	>60 min	

meaningful relationship with results of DWI. While in the previous sections we realized that some sub collections of ABCD2 such as Clinical Features and Symptom Duration have relations with results of DWI.

Table 2: The relationship between DWI (normal/positive) with ABCD2 scoring of the patients

P-Value	Total Samples N=72	DWI Positive N=36	Noraml DWI N=36	Variables	
0.121				<3	Scores ABCD2
	16 persons	7 persons	9 persons		
	-22.22%	-19.40%	-25%		
	41 persons	14 persons	20 persons	5-Apr	
	-56.94%	-38.90%	-55.60%		
	15 persons	15 persons		>6	
	-20.83%	-41.70%	-19.40%	7 persons	

DISCUSSION

Presence of passive neurologic symptoms without acute infarction is called acute ischemic attack (TIA) (27). TIA is a prevalent risk factor for the stroke (28, 29). Some of the prevalent symptoms of TIA are one-sided numbness, talking disorder, and one eye blindness. These symptoms are temporary. Immediate recognition of TIA and determining it from other imitative conditions is very essential, because fast reactions can reduce the risk factor of occurrence of upcoming strokes. TIA is companied by a sudden start, neurologic defection, and talking disorders. Immediate evaluation of TIA in the patients consists these items[11, 12]: neurologic imaging, vein imaging of head and neck, heart evaluations, verifying blood pressure and other routine clinical tests. The ABCD scoring (age, blood pressure, clinical symptoms, diabetes and duration of symptoms) should be determined during initial examinations, which can be very beneficent for evaluating the risk factor of repetition of ischemic and stroke. The patients with high ABCD scores should be hospitalized, while patients with lower scores are less prone to upcoming strokes and they can be treated as outpatient. The value of ABCD scoring has been investigated in different articles regarding its ability of prediction of disorders in the brain and veins. The rate of occurrence of stroke one week after TIA in different studies shows different amounts. In high risk groups, this risk factor was 6 to 25%[30, 31]. Brazzelli et al in their review study debated the usage of DWI in recognition of TIA in 1995-2012. They reviewed 47 articles and totally surveyed 9078 patients, in 55% of the cases, the stroke was determined with a stroke professional. Studies with number of samples more than 200, reported less positive DWI rather than samples less than 50. They reported that the most prevalent discovery about the patients with TIA, is a negative DWI[32]. In a reviewing study done by Carpenter et al about the predicting ABCD scoring, they realized that three standards , ABCD, and California have almost the same prediction precision for occurrence of stroke after TIA, but the ABCD2 was the more prominent one[33]. In an article of Cucchiara et al, to evaluate the D dimer and ABCD to evaluate the risk of TIA, 167 patients were studied in a looking-into-future study. 50% venous stenosis in 25% of the patients was reported. The origin of cardio-emboli was found in 14 patients, 5 patients faced stroke and 3 patients died, from which 6 patients had high risk factor of TIA. The rate of ABCD was effective in the outcome of the patients. But D dimmer was the same in the outcome of the patients. Even D dimer companied with ABCD2 had no high value for predictions for the outcome of the patients. Adding the ABCD2 standard to DWI increases its prediction value (34). Junjun Wang et al studied the ABCD and its value to predict the

stroke in both AC-TIA and PC-TIA patients. In that study, 369 patients suffering from TIA were selected continuously in June of 2009 and December of 2012. Totally 273 patients with AC-TIA and 96 patients with PC-TIA were studied. 21 patients with AC-TIA and 7 patients with PC-TIA faced heart attack in 7 days (7.7 versus 7.3 percent, p-Value=0.8). They reported that the ABCD scoring in AC-TIA group had better predictions comparing to PC-TIA group. Age, one-sided weakness, and blood pressure were indexes in the AC-TIA patients who faced stroke. While in the PC-TIA group, the diabetes was more prominent[20]. The results of current study showed that the meaningful relationship between some parameters of ABCD2 scoring and DWI results and total score of ABCD2 can not reflect the results of DWI.

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