Dysphasia and platelet count associated with diffusion-weighted images lesions in patients with a clinical diagnosis of transient ischemic attack

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Research article

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Abstract

Background Magnetic resonance imaging (MRI) including diffusion-weighted imaging (DWI) is a mandatory tool in the diagnosis of a transient ischemic attack (TIA). Many patients cannot have an MRI in time. The clinical characteristics associated with DWI positivity after TIA are of great significance for the early diagnosis and urgent intervention of TIA and cerebral infarction. This study was conducted to investigate the clinical characteristics associated with DWI lesions in TIA patients. **Methods** We retrospectively identified patients who met the criteria of symptom duration <24 hours for a clinical diagnosis of TIA, and then screened out 302 patients underwent DWI within 7 days of admission. The patients were divided into DWI positive and DWI negative group. The clinical characteristics including risk factors, clinical manifestation, the laboratory blood tests, the auxiliary examination and the TIA scores were compared between the two groups. We aimed to identify the clinical characteristics associated with DWI lesions using logistic regression analysis. Receiver operating characteristic (ROC) curves and area under the curve (AUC) were calculated to compare the predictive value of various scores such as ABCD2, ABCD3, ABCD3I, Dawson score and the Diagnosis of TIA (DOT) score for DWI lesions in TIA patients. **Results** A total of 302 patients (mean age, 62(54,70) years; 67.2 % men) were enrolled in this study. There were 89(29.5%) patients with DWI positivity. Logistic regression analysis showed that the clinical characteristics associated with DWI lesions were dysphasia ([OR] 2.129; 95%[CI] 1.215-3.729) and platelet count ([OR] 0.993; 95%[CI] 0.988-0.999). The AUCs [95%CI] for Dawson score was 0.610[0.543-0.678] and the DOT score was 0.625[0.559-0.691]. **Conclusion** DWI lesions were detected in 29.5% of patients with classically defined TIA and were associated with dysphasia and platelet count. Dawson score and DOT score seem to have the predictability of DWI lesions in TIA patients.

Introduction

A transient ischemic attack (TIA) is classically defined as an acute and focal neurologic deficit caused by temporary brain ischemia lasting less than 24 hours, irrespective of imaging findings[1]. Recent years, a new tissue-based definition of TIA was proposed[2]. It includes symptoms lasting less than 1 hour and the absence of a diffusion-weighted imaging (DWI) lesion detected by magnetic resonance imaging (MRI) [3, 4]. DWI is highly sensitive to small acute ischemic lesions[5]. DWI become a mandatory tool in the diagnosis of a TIA. The frequency of positive DWI findings in TIA patients varied from 9 to 67% between studies[6]. Several studies have shown that DWI lesions were associated with high risk of recurrent ischemic stroke after TIA[5, 7, 8]. Clinical characteristics associated with DWI lesions after TIA are of great significance for the early diagnosis and urgent intervention of TIA and cerebral infarction[9]. Various studies have reported that the presence of DWI lesions in acute TIA is associated with motor weakness, aphasia, dysarthria, left hemispheric presenting symptoms, National Institutes of Health Stroke Scale (NIHSS) score of ≥ 10 at admission, time from onset to DWI longer than 24 hours, intracranial large artery atherosclerosis and old brain infarctions on MRI[3, 10, 11]. In this study, we aimed to further identify characteristics associated with the presence of acute DWI lesions in Chinese TIA patients.

Methods

Study design

From January 2016 to February 2019, we retrospectively identified patients admitted to the neurology department of Beijing Chao-Yang Hospital, Capital Medical University, who met the criteria of symptom duration <24 hours for a clinical diagnosis of TIA. We screened out the patients underwent DWI within 7 days of admission. We used 3.0-T MRI including T1, T2 and DWI sequences to evaluate whether acute ischemic lesions were present on admission. Acute DWI lesions were defined by areas of high signal intensity on DWI. All MRI scans were read by experienced neuroradiologists. Based on the results of DWI, patients were divided into DWI positive and DWI negative group.

We collected a broad range of clinical, laboratory and radiological data from all patients based on a review of their medical records: baseline characterizations—age and gender, TIA symptoms, duration of symptoms, time from onset to MRI, vascular risk factors including hypertension, diabetes mellitus, atrial fibrillation, hyperlipidemia, smoking and alcohol drinking, history of ischemic stroke and coronary artery disease, ABCD2[12], ABCD3, ABCD3I[13], Dawson score[14], the Diagnosis of TIA (DOT) score[15] at admission, results of the laboratory blood tests recorded for platelet count(PLT), albumin(ALB), prealbumin(PAB), cholesterol(CHOL), low density lipoprotein(LDL), triglyceride(TG), blood urea nitrogen(BUN), creatinine(Cr), uremic acid(URIC), calcium(Ca), phosphonium(P), fibrinogen(Fbg), glucose, degree of intracranial artery stenosis in magnetic resonance angiography(MRA) and computed tomography angiography(CTA), maximal plaque thickness in cervical vascular ultrasound and treatment after admission. We analyzed the associations of acute DWI lesions with clinical characteristics.

Ethics Statement

The study was approved by the ethics committee of Beijing Chaoyang Hospital and performed in accordance with the Declaration of Helsinki. All subjects provided written informed consent.

Statistics analysis

Statistical analyses were performed using IBM SPSS Statistics 21. All statistics were presented as mean $\pm$ standard deviation (SD) for continuous variables with normal distribution, median and interquartile range for continuous variables with non-normal distribution, and counts and proportions for categorical variables. We performed t test, chi-square test and the nonparametric Mann–Whitney U test to compare the clinical characteristics between the two groups. A P value of less than 0.05 was considered significant. Logistic regression analysis was applied to identify independent predictors of DWI lesions in TIA patients. A enter selection procedure was performed. The results were presented as estimates of

relative risk by odds ratio (OR) with a 95% CI. Receiver operating characteristic curve analysis were used to compare the predictive values of various scores with regard to DWI lesions in TIA.

Results

We enrolled a total of 302 patients (mean age, 62(54,70) years; 67.2 % men) admitted for diagnostic TIA who met the criteria of symptom duration <24 hours and underwent DWI within 7 days of admission. DWI lesions were detected in 89 (29.5%) of the 302 patients. Table 1 shows the baseline clinical characteristics of patients with DWI lesions and those without. Results of blood pressure at admission, the laboratory blood tests, the auxiliary examination and the scores of the two groups are presented in Table 2.

There were differences in gender, dysphasia, motor weakness, Hyperlipidemia, smoking, alcohol drinking, systolic pressure, diastolic pressure, platelet count and glucose of the two groups. Logistic regression analysis (Table 3) showed that acute DWI lesions were independently correlated with dysphasia ([OR] 2.129; 95%[CI] 1.215-3.729) and platelet count ([OR] 0.993; 95%[CI] 0.988-0.999). Patients with DWI lesions had lower platelet count. There were significant differences in the severity of the stenosis in intracranial artery between the two groups. Patients with DWI lesions had more severe vascular stenosis. There were no differences in the location of vascular stenosis. Cervical vascular ultrasound showed thicker maximal plaque in patients with acute DWI lesions. In addition, treatment taken after admission was different between the two groups. The ABCD2, ABCD3, ABCD3I, Dawson score and DOT score were significantly higher with DWI lesions than those without DWI lesions. Based on receiver operating characteristic curve analysis (Figure 1), the comparison of AUCs [95%CI] (Table 4) showed superiority of Dawson score (0.610[0.543-0.678]) and DOT score (0.625[0.559-0.691]) compared to ABCD2 score (0.585[0.517-0.654]) and ABCD3 score (0.609[0.540-0.678]). The corresponding cutoff were shown in table 4.

In addition, most of the DWI lesions were located in the periventricular area, basal ganglia, cortical and subcortical region. Most lesions were diffused punctiformed lesions or lacunar infarcts. DWI lesions were more frequent in the anterior circulation.

Discussion

Our results showed that DWI lesions was detected in 29.5% of TIA patients. Characteristics associated with DWI lesions were dysphasia and platelet count. The ABCD2, ABCD3, ABCD3-I, Dawson score and DOT score were significantly higher with DWI lesions than those without DWI lesions.

According to the meta-analysis the pooled proportion of TIA patients with an acute DWI lesion was 34.3%, and there is a large variety in the prevalence of DWI lesions in acute TIA patients. The frequency of positive DWI findings varied from 9 to 67% between studies[6]. In young patients (median age 46 (40,51) years) with a clinical TIA 15% demonstrated acute DWI lesions on brain MRI[11]. In our study, the

frequency of an acute DWI lesion was 29.5% in TIA. A potential cause of heterogeneity may be the procedural TIA definition. In some studies, clinical TIA with acute lesions may be classified as stroke. Otherwise, it is not clear to what extent TIAs without DWI lesions represent TIA mimics rather than being the result of a cerebrovascular event.

In agreement with previous investigations[3], acute DWI lesions were associated with dysphasia. Patients with dysphasia need to be taken seriously. The diagnosis of TIA is mainly based on the clinical history. Neurological signs usually disappear quickly. The diagnosis of TIA can be difficult and 50–60 % of patients seen in TIA clinics turn out to be nonvascular mimics[15]. The sign of dysphasia is not easy to imitate. The diagnosis of dysphasia is more accurate. This may explain why dysphasia is a related factor. Episodes of acute atypical or nonfocal neurological symptoms, referred to as transient neurological attack (TNA), are as prevalent as TIAs. It was reported that DWI shows acute ischemia in 23% of patients clinically diagnosed as TNA by experienced stroke neurologists[16]. This raises questions about the accuracy of the clinical diagnosis of TIA.

In addition, our study showed that DWI lesions were independently correlated with platelet count. Patients with DWI lesions had lower platelet count. Platelets have an important role in the initiation of atherosclerotic lesions and subsequent complications[17]. Ischemic stroke is associated with abnormal platelet activity and thrombus formation[18]. Inflammatory molecules secreted by platelets can induce the transition from chronic to acute disease, featuring increased instability of the atherosclerotic lesion that results in plaque rupture and thrombosis[19]. In a study of ischemic heart disease, patients with acute coronary syndrome had higher platelet volume indices and lower platelet counts. Some studies have shown that decreases in platelet count may be a characteristic of the pre-thrombotic state and platelet consumption in the acute phase of clot formation and subsequent thrombosis[17]. Platelet volume indices such as mean platelet volume (MPV), platelet distribution width (PDW) and platelet large cell ratio (P-LCR) may be useful to show the association between platelet size and ischemic events. We collected some additional data including MPV, PDW and P-LCR of the two groups. There were no significant differences in MPV, PDW and P-LCR of the two groups. Results of them are presented in Table 5. Though MPV increased in unstable angina and myocardial infarction[17], we found that there were no differences between patients with acute DWI lesions and those without DWI lesions of TIA patients. With the support of further clinical studies, platelet count could be used for predicting acute DWI lesions of TIA patients.

Our result showed that ABCD2, ABCD3, ABCD3-I, Dawson score and DOT score were significantly higher with DWI lesions than those without DWI lesions. Acute DWI lesions were associated with the prognosis of TIA patients. Ay and co-workers found a higher predictive value of early risk of stroke for acute DWI lesion in TIA patients[20]. Early brain MRI examination is warranted in these patients. The use of DWI in all TIA patient assessments improved risk stratification from day 7 up to 3 months[21]. As for DWI lesions for stroke risk from 1 to 5 years, the study of Whilst Anticoli did not record any difference in stroke risk in patients with positive DWI lesions. This study showed the long-term follow-up study in TIA patients documents that both positive and negative DWI patients treated with fast-track had similar long-term

risks of stroke[21]. We found that patients with acute DWI lesions had more severe vascular stenosis and thicker maximal plaque. We still need to pay close attention to the clinical course of these patients. Based on receiver operating characteristic curve analysis, the comparison of AUCs [95%CI] showed superiority of Dawson score and DOT score compared to the ABCD2 score and the ABCD3 score. Dawson score is a clinical scoring system that assists with diagnosis of TIA[14]. DOT Score is a new clinical diagnostic tool for both brain and retinal TIA[15]. With the use of Dawson and DOT score, the diagnosis of TIA would be more accurate. It seems to be useful in predicting acute ischemic lesions on DWI with TIA.

Previous research found that most of the lesions were located in the cortical or subcortical region[11]. In our study, most of the DWI lesions were located in the periventricular area, basal ganglia, cortical and subcortical region. Most lesions were diffused punctiform lesions or lacunar infarcts. DWI lesions were more frequent in the anterior circulation. Havsteen I found that one-third of acute DWI lesions were completely reversed without persistent infarction signs, especially to the small cortical grey matter[22]. Further research is needed to analyze its characteristics.

In our study, there were no differences in the time from symptom onset to DWI examination (mean time, 5 (3,10) days) of the two groups. There was a study showed the time from symptom onset to DWI examination longer than 24 hours was independently associated with the presence of DWI lesions. In this study, 81.7% of patients underwent a DWI examination within the initial 24 hours after the symptom onset. They suggested that longer time from symptom onset to DWI examination was associated with more frequent lesions[10]. Brazzelli et al. found in a meta-analysis no evidence that the DWI-positive rate varied with time from symptom onset to DWI examination. They found that the DWI lesions were unstable. It may disappear within 24 hours or be undetectable on hyperacute imaging[6]. The study of Shono K also demonstrated that short latency (less than 2 hours) from TIA onset to initial DWI was an independent risk factor associated with false-negative findings on DWI[23]. A repeat DWI is recommended for these patients. Further research is needed to define the relationship between them.

Our study has several limitations. First, the number of patients was small. A study with a larger number of patients from multiple centers is needed to confirm the characteristics associated with DWI lesions. Second, our study only had DWI results. It was reported that perfusion-weighted imaging (PWI) is useful in defining whether or not the transient neurological symptoms in DWI-negative TIA are true vascular events. The presence of a focal perfusion abnormality is a strong predictor of new DWI lesions at follow-up in DWI-negative TIA patients[24]. We need a variety of imaging tools to determine potential mechanisms underlying such events. Finally, our study population was based on hospital patients in a single center, and there might have been selection bias.

Conclusion

Our results showed that acute DWI lesions were detected in 29.5% of patients classically defined TIA. Acute DWI lesions were associated with dysphasia and platelet count. The clinical characteristics

associated with DWI lesions need to be confirmed in further studies. The association between clinical characteristics and DWI lesions is valuable for early evaluation of TIA patients. Additionally, the comparison of AUCs showed superiority of Dawson score and DOT score compared to ABCD2 score and ABCD3 score. Dawson score and DOT score may be useful for the diagnosis and management of TIA.

Abbreviations

MRI: Magnetic resonance imaging; DWI: diffusion-weighted imaging; TIA: transient ischemic attack; DOT: the Diagnosis of TIA; TNA: transient neurological attack; PWI: perfusion-weighted imaging

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Beijing Chao-Yang Hospital, Capital Medical University and all participants gave written informed consent for participation and to publication.

Consent for publication

All patients agreed with the publication.

Availability of data and materials

The datasets used in the current study are available from the corresponding author upon reasonable request.

Competing interests

On behalf of all authors, the corresponding author states that there is no competing interest.

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Authors' contributions

WH, JY and ZJ designed the work. ZJ and YS collected the clinical data, discussed the results, and contributed to the final version of the manuscript. All authors read and approved the final manuscript; contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

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References

1. Albers GW, Caplan LR, Easton JD, Fayad PB, Mohr JP, Saver JL, Sherman DG: Transient ischemic attack—proposal for a new definition. *The New England journal of medicine* 2002, 347(21):1713-1716.
2. KL F, SE K, RJ A, GW A, RL B, SC F, JL H, SC J, I K, WN K *et al*: Guidelines for the prevention of stroke in patients with stroke or transient ischemic attack: a guideline for healthcare professionals from the american heart association/american stroke association. *Stroke* 2011, 42(1):227-276.
3. Al-Khaled M, Matthis C, Munte TF, Eggers J: The incidence and clinical predictors of acute infarction in patients with transient ischemic attack using MRI including DWI. *Neuroradiology* 2013, 55(2):157-163.
4. JD E, JL S, GW A, MJ A, S C, E F, TS H, RT H, SC J, CS K *et al*: Definition and evaluation of transient ischemic attack: a scientific statement for healthcare professionals from the American Heart Association/American Stroke Association Stroke Council; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular Nursing; and the Interdisciplinary Council on Peripheral Vascular Disease. The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists. *Stroke* 2009, 40(6):2276-2293.
5. JN R, UG S, D B, T M, PM R: Presence of acute ischaemic lesions on diffusion-weighted imaging is associated with clinical predictors of early risk of stroke after transient ischaemic attack. *Cerebrovascular diseases (Basel, Switzerland)* 2007, 24(1):86-90.
6. Brazzelli M, Chappell FM, Miranda H, Shuler K, Dennis M, Sandercock PA, Muir K, Wardlaw JM: Diffusion-weighted imaging and diagnosis of transient ischemic attack. *Annals of neurology* 2014, 75(1):67-76.

7. Kono Y, Shimoyama T, Sengoku R, Omoto S, Mitsumura H, Mochio S, Iguchi Y: Clinical characteristics associated with abnormal diffusion-weighted images in patients with transient cerebral ischemic attack. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association* 2014, 23(5):1051-1055.
8. ST E, M A, F J, F W, M K, A B, LH B, F H, SG W, F F *et al*: Optimizing the risk estimation after a transient ischaemic attack - the ABCDE $\oplus$ score. *European journal of neurology* 2012, 19(1):55-61.
9. P vW-M, SP J, G A: Low risk of vascular events following urgent treatment of transient ischaemic attack: the Aarhus TIA study. *European journal of neurology* 2011, 18(11):1285-1290.
10. Miyagi T, Uehara T, Kimura K, Okada Y, Hasegawa Y, Tanahashi N, Suzuki A, Takagi S, Nakagawara J, Aii K *et al*: Examination timing and lesion patterns in diffusion-weighted magnetic resonance imaging of patients with classically defined transient ischemic attack. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association* 2013, 22(8):e310-316.
11. Tanislav C, Grittner U, Fazekas F, Thijs V, Tatlisumak T, Huber R, von Sarnowski B, Putaala J, Schmidt R, Kropp P *et al*: Frequency and predictors of acute ischaemic lesions on brain magnetic resonance imaging in young patients with a clinical diagnosis of transient ischaemic attack. *European journal of neurology* 2016, 23(7):1174-1182.
12. SC J, PM R, MN N-H, MF G, JS E, AL B, S S: Validation and refinement of scores to predict very early stroke risk after transient ischaemic attack. *Lancet (London, England)* 2007, 369(9558):283-292.
13. A M, GW A, P A, EM A, H A, D C, SB C, BL C, AM D, KL F *et al*: Addition of brain and carotid imaging to the ABCD² score to identify patients at early risk of stroke after transient ischaemic attack: a multicentre observational study. *The Lancet Neurology* 2010, 9(11):1060-1069.
14. Dawson J, Lamb KE, Quinn TJ, Lees KR, Horvers M, Verrijth MJ, Walters MR: A recognition tool for transient ischaemic attack. *QJM : monthly journal of the Association of Physicians* 2009, 102(1):43-49.
15. Dutta D: Diagnosis of TIA (DOT) score—design and validation of a new clinical diagnostic tool for transient ischaemic attack. *BMC neurology* 2016, 16:20.
16. FG vR, SE V, BM G, PJ K, E R, FE dL, EJ vD: Diffusion-weighted imaging in transient neurological attacks. *Annals of neurology* 2015, 78(6):1005-1010.
17. MP R, R D, VK M, MG K, R K, A K: Significance of platelet volume indices and platelet count in ischaemic heart disease. *Journal of clinical pathology* 2009, 62(9):830-833.
18. ZG F, RA C, AS W, MT R: Platelet-leukocyte interactions link inflammatory and thromboembolic events in ischemic stroke. *Annals of the New York Academy of Sciences* 2010, 1207(undefined):11-17.

19. E FQ, F FQ, V A, OM P, J FdM, I PG: Role of platelets as mediators that link inflammation and thrombosis in atherosclerosis. *Platelets* 2013, 24(4):255-262.

20. H A, EM A, SC J, M V, LH S, KL F, WJ K, AG S: Clinical- and imaging-based prediction of stroke risk after transient ischemic attack: the CIP model. *Stroke* 2009, 40(1):181-186.

21. Anticoli S, Pezzella FR, Pozzessere C, Gallelli L, Bravi MC, Caso V, Siniscalchi A: Transient Ischemic Attack Fast-track and Long-Term Stroke Risk: Role of Diffusion-Weighted Magnetic Resonance Imaging. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association* 2015, 24(9):2110-2116.

22. Havsteen I, Ovesen C, Willer L, Nybing JD, K AE, Marstrand J, Meden P, Rosenbaum S, Folke MN, Christensen H *et al*: Small cortical grey matter lesions show no persistent infarction in transient ischaemic attack? A prospective cohort study. *BMJ open* 2018, 8(1):e018160.

23.Shono K, Satomi J, Tada Y, Kanematsu Y, Yamamoto N, Izumi Y, Kaji R, Harada M, Nagahiro S: Optimal Timing of Diffusion-Weighted Imaging to Avoid False-Negative Findings in Patients With Transient Ischemic Attack. *Stroke* 2017, 48(7):1990-1992.

24. Lee SH, Nah HW, Kim BJ, Ahn SH, Kim JS, Kang DW, Kwon SU: Role of Perfusion-Weighted Imaging in a Diffusion-Weighted-Imaging-Negative Transient Ischemic Attack. *Journal of Clinical Neurology* 2017, 13(2):129.

Tables

Table 1 The baseline clinical characteristics of patients with DWI lesions and those without

Variables	With DWI lesions (89)	Without DWI lesions (213)	P value
Age, years	62(53,69)	63(55.5,70.5)	0.430
Male, n (%)	71(79.8%)	132(62%)	0.003*
Risk factors, n (%)			
Hypertension	57(64%)	136(63.8%)	1.000
Diabetes mellitus	30(33.7%)	61(28.6%)	0.410
Coronary artery disease	6(6.7%)	24(11.3%)	0.294
Hyperlipidemia	72(80.9%)	146(68.5%)	0.034*
History of stroke	16(18.0%)	43(20.2%)	0.751
Atrial fibrillation	2(2.2%)	7(3.3%)	1.000
Smoking	56(62.9%)	91(42.7%)	0.002*
Alcohol drinking	35(39.3%)	49(23%)	0.005*
Clinical features, n (%)			
Motor weakness	62(69.7%)	119(55.9%)	0.029*
Dysphasia	43(48.3%)	63(29.6%)	0.002*
Sensory disturbance	29(32.6%)	72(33.8%)	0.894
Dizziness	29(32.6%)	67(31.5%)	0.892
Ataxia	2(2.2%)	13(6.1%)	0.245
Amnesia	4(4.5%)	4(1.9%)	0.241
Loss of consciousness	5(5.6%)	19(8.9%)	0.484
Diplopia	5(5.6%)	10(4.7%)	0.774
Homonymous hemianopia	3(3.4%)	5(2.3%)	0.697
Time from TIA to MRI, days	4.5(3,9.25)	6(3,11)	0.161
Symptom duration, n (%)			0.238
≤10 min	33(37.1%)	99(47.4%)	
10–59 min	39(43.8%)	73(34.9%)	
≥60min	17(19.1%)	37(17.7%)	
Treatment, n (%)			0.000*
Aspirin	24(27%)	80(44.9%)	
Clopidogrel	10(11.2%)	51(28.7%)	
Dual antiplatelet + Aspirin	12(13.5%)	9(5.1%)	
Dual antiplatelet + Clopidogrel	17(19.1%)	10(5.6%)	
Dual antiplatelet	25(28.1%)	24(13.5%)	
Anticoagulation	1(1.1%)	4(2.2%)	

Notes: * P value less than 0.05

Abbreviations: DWI diffusion-weighted imaging

Data are presented as median (interquartile range) or counts (%)

Table 2 Results of Blood pressure, Laboratory blood tests, Auxiliary examination and the scores

Variables	With DWI lesions (78)	Without DWI lesions (172)	P value
Systolic pressure, mmHg	151.78±19.119	145.06±20.457	0.008*
Diastolic pressure, mmHg	86(78.5,92.5)	80(73,89.5)	0.002*
PLT, *10 ⁹ /L	188±167,224	215(185,246)	0.000*
ALB, g/L	42.3(39.95,44.25)	41.9(39.125,44.5)	0.679
PAB, g/L	0.25(0.21,0.295)	0.25(0.2,0.29)	0.426
CHOL, mmol/L	4.57(3.78,5.095)	4.455(3.848,5.36)	0.569
LDL, mmol/L	2.8(1.95,3.2)	2.6(2,3.275)	0.873
TG, mmol/L	1.66(1.145,2.365)	1.46(1.06,2.225)	0.206
BUN, mmol/L	5.11(4.34,5.92)	4.93(4.405,5.952)	0.908
Cr, umol/L	67.7(59.8,80)	66.5(55.775,74.875)	0.127
URIC, umol/L	330.73±88.602	338.53±86.554	0.479
Ca, mmol/L	2.253±0.132	2.266±0.134	0.474
P, mmol/L	1.064±0.242	1.108±0.220	0.121
Fbg, mg/dl	256.3(229.5,309.4)	270.3(228.9,306.2)	0.428
Glucose, mmol/L	6.27(5.045,8.565)	5.55(4.7,7.055)	0.006*
Arterial stenosis, n (%)			0.017*
No stenosis	23±26.7%	101±47.4%	
Mild stenosis	23±26.7%	44±20.7%	
Moderate stenosis	11±12.8%	25±11.7%	
Severe stenosis	14±16.3%	20±9.4%	
Occlusion	15±17.4%	23±10.8%	
The location of the stenosis, n (%)			0.948
Left	13±20%	23±20.7%	
Right	13±20%	20±18%	
Both sides	39±60%	68±61.3%	
Distribution of stenosis, n (%)			0.250
Anterior circulation	28±43.1%	47±42.3%	
Posterior circulation	6±9.2%	20±18%	
Both	31±47.7%	44±39.6%	
Ultrasound findings, cm			
Maximal plaque thickness	0.28±0.240,0.368	0.255(0.180,0.370)	0.038*
ABCD2 score	4(3,5)	4(3,5)	0.018*
ABCD3 score	5(4,6)	5(3,6)	0.002*
ABCD3I score	8(6,9)	5(3,6)	0.000*
Dawson score	7.55±1.29	7.04±1.43	0.004*
DOT score	1.341(0.352,3.717)	0.842(-1.407,2.185)	0.001*

Notes: * P value less than 0.05

Abbreviations: DWI diffusion-weighted imaging, PLT platelet count, ALB albumin, PAB prealbumin, CHOL cholesterol, LDL low density lipoprotein, TG triglyceride, BUN blood urea nitrogen, Cr creatinine, URIC uremic acid, Ca calcium, P phosphonium, Fbg fibrinogen, DOT score the Diagnosis of TIA score

Data are presented as mean $\pm$ standard deviation, median (interquartile range) or counts (%)

Table 3 Factors associated with the presence of DWI lesions in logistic regression analysis

Factors	OR	95% CI	P value
Male	1.275	0.548,2.785	0.542
Dysphasia	2.129	1.215,3.729	0.008*
Motor weakness	1.364	0.767,2.425	0.291
Hyperlipidemia	1.695	0.885,3.244	0.111
Smoking	1.663	0.820,3.372	0.159
Alcohol drinking	1.278	0.667,2.448	0.460
Systolic pressure	1.011	0.993,1.029	0.230
Diastolic pressure	1.012	0.984,1.041	0.398
PLT	0.993	0.988,0.999	0.021*
Glucose	1.063	0.978,1.156	0.152

Notes: * P value less than 0.05

Abbreviations: DWI diffusion-weighted imaging, PLT platelet count

Table 4 Receiver operating characteristic curve analysis for various scores

Test Result Variable(s)	Area	95% CI	P value	Cutoff
ABCD2	0.585	0.517,0.654	0.019	3.5
ABCD3	0.609	0.540, 0.678	0.003	5.5
ABCD3I	0.830	0.779, 0.881	0.000	6.5
Dawson	0.610	0.543, 0.678	0.002	6.81
DOT	0.625	0.559, 0.691	0.001	0.079

Abbreviations: DWI diffusion-weighted imaging, DOT the Diagnosis of TIA score

Table 5 Platelet counts and Platelet volume indices of patients with DWI lesions and those without

Variables	With DWI lesions (78)	Without DWI lesions (172)	P value
PLT, *10 ⁹ /L	188 (167,224)	215 (185,246)	0.000*
PDW, fl	11.850 (10.525,13.275)	11.4 (10.3,12.9)	0.156
MPV, fl	10.3 (9.7,10.9)	10 (9.5,10.7)	0.089
P-LCR, %	27.35 (21.875,32.35)	24.8 (20.5,30.65)	0.093

Notes: * P value less than 0.05

Abbreviations: DWI diffusion-weighted imaging, PLT platelet count, MPV mean platelet volume, PDW platelet distribution width, P-LCR platelet large cell ratio

Data are presented as median (interquartile range)

Figures

Figure 1

Receiver operating characteristic curve analysis for various scores Abbreviations: DWI diffusion-weighted imaging, DOT the Diagnosis of TIA score, TIA transient ischemic attack