Carotid Doppler In Stroke Patients

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الخلاصة:

لدراسة الممية تضيق الشريان السباتي الداخلي ونوع اللويحة في مرضى السكتة الدماغية الاحتشائية ، ٦٤ مريضا اعمار هم فوق الاربعين درسوا دراسة مستقبلية ومنتخبة وكانت المعايير بان احتشاء الدماغ قد حصل في فروع الشريان السباتي حيث استخدم مفراس الدماغ للتشخيص. وكان فحص الشريان بجهاز الدوبلارقد اجري لكل منهم ٢٠ مريض فوق ٥٠% تضيق مع شكل اللويحة. وكانت النتائج ان ٤٠ مريض لديهم تضيق الشريان السباتي منهم ٢٠ مريض فوق ٥٠% تضيق وكان فحص المفراس لهم يدل على حصول احتشاء من النوع الكبير وهؤلاء بتموا معايير توست في تشخيص تصلب الشرايين الكبيرة بينما ٢٠ لديهم اقل من ٥٠% تضيق وكانت نتائج المفراس تشير ان ١٠ لهم احتشاء كبير والعشرة الاخرون لهم احتشاء صغير وكلهم لا يتموا معايير توست اللازمة لاحتشاء الدماغ الفجوي وقد يعود هذا الى نوع اللويحة لديهم. من جهة اخرى اعتمادا على نوع اللويحة ونسبة تضيق الشريان ٢٠ مريض لوق ١٠ مولان الميز الكبيرة بينما ٢٠ لديهم اقل من ٥٠% تضيق وكانت نتائج المفراس تشير ان ١٠ لهم احتشاء كبير والعشرة الاخرون لهم احتشاء صغير وكلهم لا يتموا معايير توست اللازمة تضيق الشريان ٢٠ مريض لديهم نسبة تضيق <٥٠% ظهر ان ١٤ منهم لديه لويحة غير متجانسة و٢ لديه لويحة متجانسة و عليه هؤلاء ال١٤ يتموا تشخيص تصلب الشرايين الكبيرة المؤدي الى احتشاء على نوع اللويحة ونسبة متجانسة و عليه هؤلاء ال١٤ ليتموا تشخيص تصلب الشرايين الكبيرة المؤدي الى احتشاء الدماغ. الماغ الديهم متجانسة وعليه هؤلاء ال١٤ ليتموا تشخيص تصلب الشرايين الكبيرة المؤدي الى احتشاء الدماغ. المراغ نضيق الشريان ح٠٠ و وعدده ٢٠ ظهر ان ٨ منهم لديه لويحة متجانسة و٨ لديه لويحة غير متجانسة وبالتالي فان اهمية تضيق الشريان السباتي عندما يكون اكثر من ٥٠% هي كاهمية نوع اللويحة غير المتجانسة. لذا ان المرضى الفين لديهم تضيق اكثر من٠٥% هم ذو حطر عالي للاصابة بجلطة الدماغ الاحتشائية ويكون نوع المرضى المير الميجانسة كاهمية نسبة التضيق.

Abstract:

64 patients over 40years old had been studied with ischemic infarction, carotid Doppler was done for them .My study revealed 24 patients with normal Doppler findings and 40 patients showed carotid stenosis and from the later 20 patients had \geq 50% stenosis with large infarction by CT-scan findings and accomplished the TOAST criteria for large artery atherosclerosis, while those 20 patients with <50% stenosis did not accomplish this criteria for lacunar infarction.

On the other hand ,depending on the relation between plaque with the degree of stenosis ,14 patients with <50% stenosis showed heterogenous plaque ,while those with $\geq50\%$ stenosis showed equal proportion of the types of the plaques.

So patients with more stenosis are at high risk of ischemic stroke and the importance of the heterogenous plaque is same as degree of stenosis, so those with less stenosis and heterogenous plaque are also at risk of ischemic stroke

Introduction:

Stroke is a syndrome characterized by the acute onset of a neurologic deficit that persist for at least 24 hours(1).

Is 3rd most common cause of death in U.S ,ischemia &infarction constitute 85-90% hemorrhage(2),and while 10-15% intracranial ICA(internal are carotid artery)responsible for about fifth of ischemic stroke(3).In most cases atherosclerosis of the large extra-cranial arteries is the underlining causes of focal cerebral ischemia, and most risk factors hypertension, age(4,5), diabetes ,cigarette, are and hyperlipidemia(6,7).

Atherosclerosis in the proximal ICA is most sever in the 1st 2cm(8) and two mechanisms to explain cerebral ischemia in this setting: local cerebral embolization

from thrombus and reduced cerebral perfusion secondary to stenosis. The degree of stenosis divided to mild(under 30%), moderate(30-60%), or sever(70-90%)(9).

Embolization may result when intra-plaque hemorrhage leads to intimal tears then initiation of thrombus formation over the tear, the resulting thrombus can then incorporated into the vessel wall resulting in increase stenosis or break-off and emboli the distal vessels leading to stroke. With high quality sonar it is now possible to evaluate the structure of plaque and vessel wall and intra-plaque hemorrhage with an accuracy of 90%(10).Intra-plaque hemorrhage and ulceration are found as heterogeneous pattern, while homogenous pattern contain no pathologic evidence of intra-plaque hemorrhage or ulceration.

Calculation of Doppler shift frequency made possible to detect the flow velocity and infarction, used to assess luminal narrowing and the degree of flow restriction(11), it is accurate ,safe and non-invasive method of assessing arterial caliber and monitor the progression in carotid stenosis(12).

Patients & Methods:

Sixty four patients were studied prospectively with ischemic stroke ,age above 40years,36were male and 28 were female.

The inclusion criteria depends on undoubtful evidence of carotid-ischemic infarction proved by CT-scan and absence of any pointing to cardio-embolism or an etiology other than atherosclerosis, and lacunar infarction depending on TOAST criteria.

All patients were investigated with CBP&ESR, blood biochemistry, blood sugar, CXR, ECG, echocardiography, CT-scan and then carotid Doppler. CT-scan was the most important determinant of the final diagnosis of the stroke types, in this study the ischemia was included and the hemorrhage excluded. Echocardiography was 2D mode and M-mode types for all my patients, this was to exclude the possible source of cardioembolism.

Carotid Doppler was carried out using color Doppler image (Kertz 7.5 MHz by linear probe) to perform the percentage degree of stenosis together with plaque morphology whether hetero. or homo.or indeterminate. Depending on Doppler criteria for plaque; homo- plaque was classified sonographically as a uniform echo-pattern most commonly consisting of low-level echoes the surface margin of plaque is always smooth ,in contrast the echo pattern of hetero-plaque was complex in nature and contain focal anechoic areas.

Statistical analysis was carried out using Chi-Square test.

Results:

The total no. of patients was 64, 56.25% was males and 43.75% was females, the mean±SD of the age was 61.23 ± 11.20 and range 40-80 years; table-1.

Age	Male	Female	Total
40-49	4	10	14
50-59	2	2	4
60-69	20	8	28
70-79	6	8	14
≥80	4	-	4
Total	36	28	64

Table (1) : Age distribution by Gender

The peak incidence of age were 60-69(28 patients 43.75%).

The clinical findings:

-Rt.sided deficits were seen in 30 patients (46.87%) and lt.sided deficit in 34 patients(53.12%).

-The carotid bruit was present in 16 patients (37.5%) 10patients out of those 16 were left side and 6 were right side contra lateral to the side of deficit.

-Risk factors were taken in my study as follows:table-2

Hypertension is the commonest risk factor in my study

Table (2) : Risk factors

H.T	16
Smoking	14
H.T & Smoking	10
D.M., H.T & Smoking	10
D.M. & H.T	2
D.M. & Smoking	6

CT-scan findings:

-44scans (68.7%) were large infarctions 50% on the left and 50% on the right. -20 scans(31.3%) were small infarctions ,40% on the left and 60% on the right.

Carotid Doppler study results –table-3:

-24 patients (37.5%) had normal Doppler findings ,while 40 patients (62.5%) had carotid stenosis; 30 (75%) of them had ipsilateral stenosis to the brain lesion , and 10(25%) had bilateral stenosis and there were no contralateral stenosis alone.

Result	Number	%
Normal Doppler	24	37.5 %
Carotid Stenosis	40	62.5 %
Ipsilateral Stenosis	30	75%
Bilat. Stenosis	10	25%

Table (3) : Doppler Results

Types of plaques_table-4:

-Total no. of plaques were 44(68.7%) from them 22(50%) were heterogeneous and all were ipsilateral to brain lesions where as homo.plaques were22(50%) patients in which 10(45.4%) were ipsilateral and 12(54.6%) contra lateral. The contralateral stenosis of < 50% & associated with contralateral homo. Plaque were not enrolled in my study and ipsilateral side with clinical deficit had been taken only.

Plaque	Plaque Total number (percentage)		Contralat.	
Hetero	22 (50%)	100%	Zero	
Homo	22 (50%)	45.4%	54.6%	

Table (4) : Types of Plaques

Relation of ipsilateral stenosis with CT-scan findings- table-5:

From those 40 patients with abnormal Doppler study,20 patients were with \geq 50% carotid stnosis had 100% large infarction ,while those with less than 50% stenosis, 50% of them had large infarction and 50% small infarction ,which is statistically significant for large artery atherosclerosis(P-value <0.05).

24(37.5%) patients with normal Doppler findings had CT-scan of large infarction in 16 patients and small infarction in the other 8 patients so this findings goes with unknown sources of ischemic stroke, the term of cerebral atherothrombo-embolism of unknown source is used.

Table (5) : Size of CT-scan infarction with ipsilateral CA-stenosis

		infarction			
			Large	Small	Total
Ipsilateral stenosis ≥500	~5004	Count % within insisten	10	10	20
	<30%	Count % within ips.sten	50%	50%	100%
	≥50%	Count % within ips.sten	20		20
			100%		100%
Total			30	10	40
			75%	25%	100%

Relation of the ipsilateral stenosis with plague-table_6:

20 patients with \geq 50% stenosis 16 of them had ipsilateral plaque in which 8 were homo. And 8 were hetero. And number of indeterminate plaque were 4. The other 20 patients with< 50% stenosis the number of ipsilateral plaque 16 in which 14 were hetero. And 2were homo. Plaque, and indeterminate plaque were 4 ;table_6.

So patients with <50% carotid stenosis as compared with those of $\ge50\%$ stenosis had more hetero. plaques which is statistically significant (P=0.022).

		Ipsilateral Plaque				
		Hetero	homo	Indeter minate plaque	Total	
		Count	14	2	4	20
<5 Ipsilateral stenosis ≥5	<50%	% within ips. Sten.	70%	10%	20%	100%
		% within ips. plaque	63.3%	20%	50%	50%
	≥50%	Count	8	8	4	20
		% within ips. Sten.	40%	40%	20%	100%
		% within ips. plaque	36.4%	80%	50%	50%
Total		Count	22	10	8	40
		% within ips. Sten.	55%	25%	20%	100%
		% within ips. plaque	100%	100%	100%	100%

 Table (6) : Relation between the degree of ipsilateral CA-stenosis & the nature of plaque

Carotid bruit testing with ipsilateral carotid stenosis also was carried out in both <50% stenosis and $\ge50\%$ carotid stenosis, there was a significant difference between carotid bruit and the ipsilateral carotid stenosis in more than 50% stenosis (P-value =0.047) as shown in table 7

Table (7) : Association between	n carotid bruit	& ipsilateral	stenosis
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			Carotid bruit		
			+ve	-ve	Total
	<50%	Count	4	16	20
Ipsilateral stenosis		% within	20%	80%	1000/
		ips.sten			100%
	≥50%	Count	10	10	20
		% within	50%	50%	100%
		ips.sten	30%		10070
Total		Count	14	26	40
		% within	250/	65%	1000/
		ips.sten	55%		100%

Discussion:

Carotid disease as a cause of stroke comprise an important proportion(13,14),the Doppler image provides a non-invasive method analyzing diseases of extra-cranial circulation

In my study ,20 patients with \geq 50% stenosis(comprises 31.25% total of my patients) had CT-scan findings of large infarction and so they accomplish the TOAST criteria for the diagnosis of large artery atherosclerosis and goes with other studies (15,16), the other less than 50% stenosis 10 of them had CT-scan finding of small infarction, but they did not have the clinical picture of lacunar syndrome according to TOAST criteria (15) so the deficit seen in my patients may be either due to the type of plaque or unknown sources.

In patients with carotid atherosclerosis, hetero-plaques have a higher risk of ischemic stroke irrespective of the degree of stenosis of vessel lumen(17). In my study 20 patients with <50% stenosis total plaque were 16(80%), 70% of them had hetero-plaque and 10% had homo-plaque, so the deficit in 14 patients(21.8%) out of the total of my patients (64) had the diagnosis of large artery atherosclerosis and goes with Lubsy etal(18), & Bluth etal(10).

Twenty patients with \geq 50% stenosis ,total plaque were16 from these 50% were hetero. & 50% were homo. plaques and all have large infarction by CT-scan ,so in this category, degree of stenosis is as important as shape of plague in ischemic stroke.

24 patients(37.5%) had normal Doppler findings and CT-scan revealed infarction ,the term cerebral atherothromboembolism of unknown source is used, those may require trans-cranial Doppler for intracranial arterial diseases this goes with Donald etal(2) were find 40% of stroke fall into this category.

Carotid bruit carries a variable risk of vascular events, Machy et al (19) suggested that severity of carotid stenosis is the main risk factor predicting occurrence of neurological events.

In my study 35% with carotid stenosis had carotid bruit ,while 65% had no ,on the other hand patients with carotid bruit in< 50% carotid stenosis were 4 out of 20 patients , and in \geq 50% stenosis were 10 out of 20 patients this means carotid bruit increase with the degree of stenosis and this goes with other studies(6,19).

Conclusion

1-Patients with \geq 50% CA-stenosis are at high risk of ischemic stroke.

2-Patients with <50% stenosis with the presence of hetero. Plaques are at risk of ischemic stroke.

3-Patients with \geq 50% stenosis, increase the degree of stenosis is as important as shape of plaque in ischemic stroke.

4-The presence of carotid bruit is a variable risk factor and its significant rises with increase in the degree of stenosis.

Recommendations

1-Transcranial Doppler preferred to be performed to evaluate intracranial circulation abnormalities, especially in patients with normal cervical carotid Doppler study.

2-Concentration should be done on differentiation the different forms of plaque together with the degree of stenosis in performing carotid Doppler ultrasonography.

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