



Cerebral Computed Tomography CT angiography findings in Iraqi patients presenting with stroke

Fizel Abbas Himyari¹, Wisam Saeed Taj-Aldeen^{*1}, Zaid Hadi Al Kfaji¹

¹Associate Professor of Neurology and Interventional Neuroradiology, University of Babylon-College of Medicine, Babylon city –Iraq

Abstract : Background: Variance in the distribution of cerebral atherosclerosis in different races is thought to be a result of differences in vascular risk factor profiles, lifestyles, and genetic susceptibility.

Aim of study: Aimed to investigate the risk factor stratification of intra and extra cranial vascular stenoses in Iraqi patients with different distributions of cervicocerebral lesions.

Patients and Methods: A prospective study enrolled 54 patients with acute stroke ,they were in Babylon-Iraq during a period between December 2014 and Oct. 2016.They were divided in to two groups according to the type of stroke (ischemic and non ischemic or haemorrhagic) then the ischemic group divided in to two groups according to the site of stenosis of cervicocerebral arteries (extracranial and intracranial) ,then comparison of age , gender, risk factors and severity with site of lesions was done between the extracranial and intracranial groups. All the Patients underwent multi-slice CT angiography of carotid and cerebral arteries using a 64-slice helical CT, lesions $\geq 50\%$ stenosis were considered significant. Patients with clear embolic source has been excluded from the study. P-value < 0.05 had statistical significance.

Results: This study had enrolled 54 patients with acute stroke the mean of their ages is 49.1 ± 16 years 34 patients(62.9%) were male, 20 patients(37.1%) were female ,47 patients(87%) were diabetics, 42 patients(77.7%) were hypertensive, and 37 patients(68.5%) were smokers . Forty four patients(81.5%) with ischemic stroke and 10 patients(18.5%) with non ischemic stroke. DM, hypertension and smoking are proved statistically as risk factors in Iraqi patients with ischemic stroke. Thirty eight patient(86%) of ischemic group have cervicocerebral lesions from which 26 patients(59%) extracranial and 12 patients(27%) intracranial p value < 0.05 , from those(ischemic group) 10 patients(22.7%) with extracranial significant stenosis and 4 patients (9%) with intracranial significant stenosis T value 1.5667, p value 0.04. There is no difference in risk factors between intracranial and extracranial lesions.

Discussion and conclusion: This study proves that Iraqi peoples are susceptible to develop stroke whether ischemic or hemorrhagic at ages younger than other Asian peoples and European peoples which may be related to racial cause or related to Iraqi dietary habit which is high salt and high fat in addition to Iraqi sedentary lifestyle , also this study prove that diabetes mellitus, hypertension and smoking are risk factors to ischemic stroke, and extracranial cervicocerebral arterial stenosis are more common than intracranial lesions. So we recommend Iraqi people to give special attention to low salt low fat diet with regular sport and smoking cessation with good control of DM and hypertension.

Key words: Cerebral Computed Tomography, CT angiography, stroke, Iraqi patients.

Introduction :

Racial differences in location of lesions in cerebrovascular occlusive disease have been reported between white, black, Japanese, and Chinese persons⁽¹⁻⁸⁾. Variance in the distribution of cerebral atherosclerosis

in different races is thought to be a result of differences in vascular risk factor profiles, lifestyles, and genetic susceptibility⁽⁹⁻¹¹⁾. Improving our understanding of the risk factors contributing to cervicocerebral lesions in Asians with ischemic stroke is critical for the development and implementation of appropriate treatment strategies. While several vascular risk factors have been identified in cervicocerebral stenosis^(9,12-14), these risk factors have varied among studies, possibly due to differences in study populations and methodologies.

Aim of the study:

We aimed to investigate the risk factor stratification of intra and extra cranial vascular stenoses in Iraqi patients with different distributions of cervicocerebral lesions.

Patients and method :

This is a prospective study enrolled 54 patients with acute stroke they were selected from those who underwent carotid and cerebral CT angiography at the radiology unit of Shaheed Al-Mehrab cardiac center in Babylon-Iraq during a period between December 2014 and Oct. 2016. They were divided into two groups according to the type of stroke (ischemic and non ischemic or haemorrhagic) then the ischemic group divided into two groups according to the site of stenosis of cervicocerebral arteries (extracranial and intracranial). Comparison of age, gender, risk factors and severity with site of lesions was done between the extracranial and intracranial groups. Detailed history and thorough physical examination had been performed for each patient included in this study, and all patients underwent multi-slice CT angiography of carotid and cerebral arteries using a 64-slice helical CT, lesions $\geq 50\%$ stenosis were considered significant⁽¹⁵⁻²⁰⁾. Patients with clear embolic source has been excluded from the study.

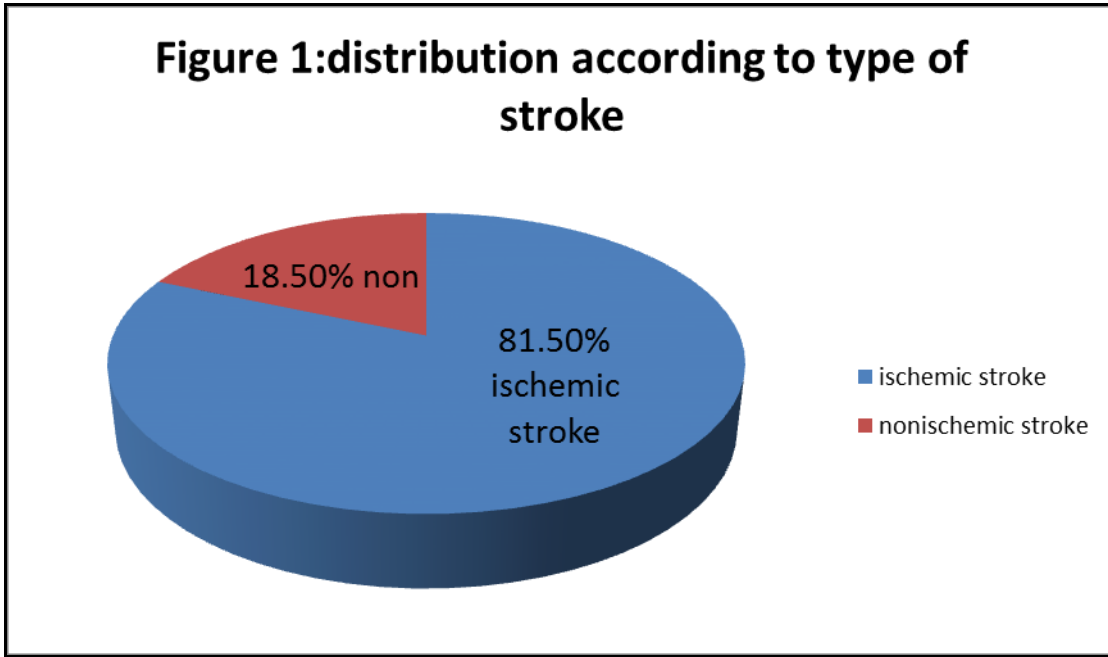
Statistical analysis had been done using student's t-test. P-value less than 0.05 had statistical significance.

Results:

This study had enrolled 54 patients with acute stroke the mean of their ages is 49.1 ± 16 years 34 patients (62.9%) were male, 20 patients (37.1%) were female, 47 patients (87%) were diabetics, 42 patients (77.7%) were hypertensive, and 37 patients (68.5%) were smokers. As shown in table 1. Forty four patients (81.5%) with ischemic stroke and 10 patients (18.5%) with non ischemic stroke as in figure 1.

Table 1: Characteristics of total number of stroke patients involved in the study.

Character	Total number	Age, mean \pm SD (year)	gender		Risk factors		
			male	female	DM	Hypertension	smokers
Number	54	49.1 \pm 16	34	20	47	42	37
Percent %	100 %		62.9%	37.1 %	87 %	77.7 %	68.5 %



And by comparing the ages, gender, and risk factors(DM , hypertension and smoking) of ischemic and non ischemic group the statistical analysis shows that there is significant difference as shown in table 2.

Table 2:comparison of characteristics of ischemic and non ischemic group.

Type of stroke	Age (y) mean± SD	Gender		DM	Hypertension	smokers
		male	female			
ischemic	52.8±13	29(66%)	15 (34%)	39 (88%)	37(84%)	33(75%)
Non ischemic	32.8±18	5(50%)	5(50%)	8(80%)	4(40%)	5(50%)
P value	P value < 0.05					

Thirty eight patient(86%) of ischemic group have cervicocerebral lesions from which 26 patients(59%) extracranial and 12 patients(27%) intracranial p value <0.05(significant) as shown in table3, from those(ischemic group) 10 patients(22.7%) with extracranial significant stenosis and 4 patients (9%) with intracranial significant stenosis T value 1.5667, p value 0.04 (statistically significant)as shown in table 4.

Table 3: Distribution of cervicocerebral arterial lesions according to site and significance in ischemic stroke patients:

location	Left significant	Left non significant	Right significant	Right non significant	Bilateral significant	Bilateral non sig.	Total
Extra-cranial	4	4	4	7	2	5	26(59%)
Intra-cranial	0	0	2	3	2	5	12(27%)
Total	4	4	6	10	2	5	38(86%)
							P value <0.05

Table 4: Distribution of cervicocerebral arterial significant lesions* in ischemic stroke patients:

location	Left cervicocerebral	Right cervicocerebral	Bilateral	total
extracranial	4	4	2	10 (22.7%)
intracranial	0	2	2	4(9 %)
				T value 1.5667 p value 0.04

*Significant lesion $\geq 50\%$ stenosis⁽¹⁵⁻²⁰⁾

By comparing the characteristics of stroke patients with extracranial and intracranial lesions there are no statistically significant differences between the two groups regarding their ages, gender, hypertension, diabetes or smoking as shown in table 5.

Table 5: Comparison between the characteristics of patients with extracranial and intracranial significant lesions:

Character	Age (y) mean \pm SD	Gender		DM	Hypertension	smokers
		male	female			
Extra-cranial	58.9 \pm 4.9	6(60%)	4(40%)	9(90%)	9 (90%)	8(80%)
Intra-cranial	59.7 \pm 5.5	3(75%)	1(25%)	4(100%)	3(75%)	3(75%)
P value is non significant to all risk factors						

Discussion:

The spatial resolution of CT is continuously improving, resulting in a current 64-slice multi-detector CT. Recently, the dual-source multi-detector CT (DSCT) was released, further improving the temporal resolution. Studies evaluating the accuracy of DSCT in the detection of significant stenosis shows high sensitivity and specificity on a per segment, vessel, or patient level.⁽²¹⁾ Many studies shows the CT angiography results are comparable to MR angiography results⁽²²⁾. So we depended on the results of CT angiography in our study to determine the type of stroke and the distribution of cervicocerebral arterial stenosis in Iraqi patients presented with acute focal neurological deficit.

This study enrolled 54 Iraqi patients with acute stroke, the results of cerebral CT angiography shows 81.5% ischemic and 18.5% is hemorrhagic and these percentages are nearly comparable to results of Andersen et al study⁽²³⁾ but by comparing the ages of ischemic and non ischemic group there is significant difference i.e. non ischemic group younger and generally the Iraqi patients are younger than Denmark's patients who were studied by Andersen et al⁽²³⁾, and Taiwanese patients who were studied by Sung et al⁽²⁴⁾ and this difference in age may be related to racial origin or dietary habit of Iraqi people who tend to take high salt and high fat diet in addition to sedentary life style. This study shows that diabetes mellitus, hypertension and smoking are proved risk factors to ischemic stroke patients and these results are comparable to Sung et al study⁽²⁴⁾, and we had proved in another study done in the same center to Iraqi patients that coronary artery disease and hyperlipidemia are also risk factors to ischemic stroke⁽²⁵⁾. By studying the distribution of stenoses of cervicocerebral arterial system in ischemic group we found 22.7% of patients has extracranial significant stenosis in either carotid, vertebral or basilar artery and this result is nearly comparable to results of Hon-Man et al study⁽²⁶⁾ in which the extracranial stenosis was 24% In Iraqi patients total (significant and non significant) extracranial stenosis is 59% which is not comparable to Horowitz et al study in which total extracranial stenosis is 39%⁽²⁷⁾. The intracranial total abnormalities in our study is 27% which is comparable to Hon-Man et al study which is 25.9%. Concerning the risk factors comparison in extracranial and intracranial group, our study shows that diabetes mellitus, hypertension and smoking all are risk factors to both group as the results of sung et al study⁽²⁴⁾. So in Iraqi patients the extracranial lesions more common than intracranial lesions and this might lead us to do cerebral angiography as intervention and stenting of extracranial lesions is easier than intracranial

lesions because extracranial lesions are large caliber arteries , easily reachable and usually are not preceded by high tortuous vessels .

Conclusions:

1. Iraqi people at risk of stroke at age younger than other Asian or European people.
2. Diabetes mellitus, hypertension and smoking are proved risk factors to ischemic type of stroke in Iraqi patients as in other Asian and European patients.
3. Extracranial cervicocerebral arterial stenosis is more common than intracranial lesions with same risk factors in different distributions.

Recommendations:

We recommend and advice the smokers of Iraqi patients to complete abstinence of smoking .Special attention should be given to control the blood pressure and blood sugar in hypertensive and diabetic patients .Also we recommend cerebral angiography and intervention to people with undisabling stroke .

References :

1. Inzitari D, Hachinski VC, Taylor W, Barnett HJM. Racial differences in the anterior circulation in cerebrovascular diseases: how much can be explained by risk factors? *Arch Neurol.* 1990;47:1080-1084.
2. Caplan LR, Gorelick PB, Hier DB. Race, sex, and occlusive cerebrovascular disease: a review. *Stroke.* 1986;17:648-655.
3. Russo LS Jr. Carotid system transient ischemic attacks: clinical, racial and angiographical correlations. *Stroke.* 1981;12:470-473.
4. Kieffer SA, Takeya Y, Resch JA, Amplatz K. Racial differences in cerebrovascular disease. *Am J Roentgen Rad Ther Nucl Med.* 1967;101:94-99.
5. Tomita T, Mihara H. Cerebral angiographic study on C.V.D. in Japan. *Angiology.* 1972;23:228-239.
6. Brust RW. Patterns of cerebrovascular disease in Japanese and other population groups in Hawaii: an angiographical study. *Stroke.* 1975;6:539-542.
7. Nishimaru K, McHenry LC, Toole JF. Cerebral angiographic and clinical differences in carotid system transient ischemic attacks between American Caucasian and Japanese patients. *Stroke.* 1984;15:56-59.
8. Feldmann E, Daneault N, Kwan E, Ho KJ, Pessin MS, Lanenberg P, Caplan LR. Chinese-white differences in the distribution of occlusive cerebrovascular disease. *Neurology.* 1990;40:1541-1545.
9. Sacco RL, Kargman DE, Gu Q, Zamanillo MC. Race-ethnicity and determinants of intracranial atherosclerotic cerebral infarction. The Northern Manhattan Stroke Study. *Stroke.* 1995; 26:14-20.
10. Nishimaru K, McHenry LC Jr., Toole JF. Cerebral angiographic and clinical differences in carotid system transient ischemic attacks between American Caucasian and Japanese patients. *Stroke.* 1984; 15:56-59.
11. Feldmann E, Daneault N, Kwan E, Ho KJ, Pessin MS, Langenberg P, Caplan LR. Chinese-White differences in the distribution of occlusive cerebrovascular disease. *Neurology.* 1990; 40:1541-1545.
12. Park KY, Chung CS, Lee KH, Kim GM, Kim YB, Oh K. Prevalence and risk factors of intracranial atherosclerosis in an asymptomatic Korean population. *J Clin Neurol.* 2006; 2:29-33.
13. Suwanwela NC, Chutinetr A. Risk factors for atherosclerosis of cervicocerebral arteries: intracranial versus extracranial. *Neuroepidemiology.* 2003; 22:37-40.
14. Leung SY, Ng TH, Yuen ST, Lauder IJ, Ho FC. Pattern of cerebral atherosclerosis in Hong Kong Chinese. Severity in intracranial and extracranial vessels. *Stroke.* 1993; 24:779-786.
15. Chambers BR, Norris JW. Outcome in patients with asymptomatic neck bruits. *N Engl J Med.* 1986;315:860-865.
16. Hennerici M, Hosbolmer HB, Hefter H, Lamberts D, Rautenberg W. Natural history of asymptomatic extracranial arterial disease. *Brain.* 1987;110:777-791.
17. Zhu CZ, Norris JW. Role of carotid stenosis in ischemic stroke. *Stroke.* 1990;21:1131-1134.
18. Admani AK, Mangion DM, Naik DR. Extracranial carotid artery stenosis: prevalence and associated risk factors in elderly stroke patients. *Atherosclerosis.* 1991;86:31-37.

19. Autret A, Sandeau D, Bertrand P, Pourcelot L, Marchal C, DeBois-Villiers S. Stroke risk in patients with carotid stenosis. *Lancet*. 1987;1:888-890.
20. Norris JW, Zhu CZ, Bornstein NM, Chambers BR. Vascular risks of asymptomatic carotid stenosis. *Stroke*. 1991;22:1485-1490.
21. Lieuwe H. Piers^{1*}, Riksta Dijkers², Tineke P. Willems², Bart J.G.L. de Smet¹, Matthijs Oudkerk², Felix Zijlstra¹, and René A. Tio¹Computed tomographic angiography or conventional coronary angiography in therapeutic decision-making *European Heart Journal* (2008) 29, 2902–2907.
22. D A Shrier, H Tanaka, Y Numaguchi S Konno, U Patel, and D Shibata CT angiography in the evaluation of acute stroke. *AJNR Am J Neuroradiol* 1997 18: 1011-20
23. Klaus Kaae Andersen, Tom Skyhøj Olsen, Christian Dehlendorff and Lars Peter Kammersgaard, Hemorrhagic and Ischemic Strokes Compared Stroke Severity, Mortality, and Risk Factors. *STROKE* AHA, June 1, 2009.108.540112
24. Yueh-Feng Sung, MD^{1,2}; Jiunn-Tay Lee, MD²; Chia-Lin Tsai, MD^{1,2}; Chun-Chieh Lin, MD²; et al, Risk Factor Stratification for Intracranial Stenosis in Taiwanese Patients With Cervicocerebral Stenosis, *J Am Heart Assoc*. 2015; 4: e002692 originally published December 15, 2015 doi: 10.1161/JAHA.115.002692.
25. Fizel Abbas Himyari, Wisam Saeed Taj-Aldeen, Sokry Faaz Al Saad, Performing Cerebral angiogram with Coronary angiogram in Pts presenting with ischemic heart disease : Stroke risk prediction in Iraq by evaluating the extracranial vascular system, *Journal of university of Babylon* ,No.7, volume 24, 2016;1995-2002.
26. Hon-Man Liu, MD; Yong-Kwang Tu, MD, PhD; Ping-Keung Yip, MD; Cheng-Tau Su, MD, Evaluation of Intracranial and Extracranial Carotid Steno-Occlusive Diseases in Taiwan Chinese Patients With MR Angiography, *Stroke*. 1996; 27: 650-653 doi: 10.1161/01.STR.27.4.650.
27. S.H. Horowitz, MD; J.L. Zito, MD; R. Donnarumma, RN, MA; M. Patel, MD; and J. Alvir, DrPH, Computed Tomographic-Angiographic Findings Within the First Five Hours of Cerebral Infarction, *Stroke*, volum 22,no.10, October 1991;1245-1253

Extra page :

نتائج المفراس الحلزوني للعنق والدماغ للمرضى العراقيين الذين يعانون من الطارئة الوعائية الدماغية (الجلطة الدماغية)
دراسة بواسطة:

د. فاضل عباس الحميري أخصائي أمراض الجهاز العصبي , بورد أمراض عصبية

د. وسام سعيد عباس تاج الدين أخصائي أمراض القلب , بورد أمراض باطنية , بورد أمراض قلبية

د. زيد هادي الخفاجي أخصائي الأشعة التشخيصية والعلاجية بورد أشعة

الخلاصة:

خلفية الموضوع: التضيقات الموجودة في شرايين العنق والدماغ تتوزع داخل وخارج القحف قد يكون على أساس عرقي وقد يرتبط بعوامل خطيرة مثل داء السكري , ارتفاع ضغط الدم , التدخين او نمط الحياة

الغرض من الدراسة: لدراسة عوامل الخطورة ومدى تأثيرها علي توزيع تضيقات شرايين العنق والدماغ داخل وخارج القحف للمرضى العراقيين الذين يعانون من الطارئة الوعائية الدماغية (الجلطة الدماغية).

طرق الدراسة: دراسة استباقية تضمنت 54 مريض عراقي يعانون من جلطة دماغية حادة للفترة من كانون اول 2014 إلى كانون أول 2015 تم تقسيمهم إلى مجموعتين حسب نوع الجلطة إلى تصلبية ونزفية وتمت المقارنة بينهما و تم تقسيم المجموعة التصلبية حسب مكان تصلب الشرايين في العنق والدماغ إلى مجموعة داخل القحف وخارج القحف حسب نتائج المفراس الحلزوني الملون وتم المقارنة بينهما وتم اعتبار 50% وأكثر تضييقاً مهماً

49 سنة وكان 62,9% رجال و 37,1% نساء وكان ± 16 النتائج: تضمنت الدراسة 54 مريضاً ممن يعانون من جلطة دماغية وكان معدل أعمارهم 87% يعانون من داء السكري و 77,7% لديهم ارتفاع ضغط الدم 68,5% مدخنون. هناك 81,5% لديهم جلطة تصلبية 18,5% لديهم جلطة نزفية وأثبتت الدراسة إن داء السكري وارتفاع ضغط الدم والتدخين هي عوامل لخطورة الإصابة بالجلطة الدماغية التصلبية، ومنهم (مجموعة الجلطة التصلبية) 59% لديهم شرايين غير طبيعية خارج القحف و 27% لديهم شرايين غير طبيعية داخل القحف ومن مجموعة خارج القحف هناك 22,7% لديهم تضيقات مهمة (50% أو أكثر) ومن مجموعة داخل القحف 9% لديهم تضيقات مهمة والفرق بينهما مهم إحصائياً وفيما يخص عوامل الخطورة لا يوجد فرق إحصائي مهم بين مجموعة خارج وداخل القحف.

المناقشة والاستنتاجات: لقد أثبتت هذه الدراسة أن العراقيين معرضون للإصابة بالجلطة الدماغية سواء كانت تصلبية أو نزفية في أعمار أصغر مقارنة مع بقية المواطنين الآسيويين والمواطنين الأوربيين وهذا قد يعزى إلى عوامل عرقية أو يكون بسبب النمط الغذائي العرقي والذي يحتوي على نسب عالية من الدهون والأملاح بالإضافة إلى إن معدلات العراقيين الذين يمارسون الرياضة بشكل منتظم قليلة. وكذلك أثبتت الدراسة أن هناك دور مهم لأمراض السكري وارتفاع ضغط الدم بالإضافة إلى التدخين في حصول الجلطة الدماغية لدى العراقيين. وإن تصلبات شرايين العنق والدماغ خارج القحف أكثر منها من داخل القحف.
