Vascular Cognitive Impairment in Ischemic Stroke Patients

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ABSTRACT:

BACKGROUND:
Stroke is associated with considerable physical and psychological impairment. Cognitive impairment is common sequel of stroke and small vessel ischemic disease. Potentially modifiable risk factors for vascular cognitive impairment (VCI) include hypertension, DM, hyperlipidemia and others. Because of the close association of these factors with stroke, prevention of VCI is largely tied to control of stroke risk factors.

OBJECTIVE:
The main aims of the study were to ascertain the significant determinants of cognitive impairment in stroke patients and the associated risk factors.

PATIENTS AND METHODS:
This is a case series descriptive study that enrolled 100 patients whose ages were 50 years and above with stroke attending at Al-Yarmouk Teaching Hospital in Baghdad-Iraq during the period between the 1st of January 2007 to the 31st of January 2008. All of the patients were asked about demographic and atherogenic risk factors and subjected to cognitive assessment by MMSE and executive function also the patients subjected to thorough clinical assessment, laboratory investigations and radiological studies.

RESULTS:
This study revealed that distribution of VCI in stroke patients was 27%, the patients with vascular CIND represent 19% and those with VaD represent 8%. The mean age of the patients was 65. The most common risk factors were hypertension 25%, hypercholesterolemia 20%, smoking 17%, acute myocardial infarction 10%, diabetes 10% and atrial fibrillation 5%. We observed that increasing age, low level of education and acute myocardial infarction were significant determinants of cognitive impairment in stroke patients.

CONCLUSION:
Considerable proportion of stroke patients presented with cognitive impairment which is determined by modifiable risk factors like atherogenic and demographic risk factors.

KEYWORDS: stroke, vascular cognitive impairment, dementia.

INTRODUCTION:
Vascular Cognitive Impairment encompasses vascular cognitive impairment no dementia (vascular CIND), vascular dementia (VaD) and mixed vascular dementia and other pathology (usually Alzheimer's disease [AD]). [1] VCI is common sequel of stroke and small vessel ischemic disease. Significant challenges to research in VaD are defining the importance of microvascular disease and learning how to recognize it clinically.[2] For a diagnosis of either VaD or mixed VaD/AD dementia, patient must show significant cognitive impairment in a

number of domains, such as executive functions, memory, language, or speed of information processing. The cognitive impairment must be severe enough to adversely impact functional abilities on tasks that the patient had been able to do it before, such as employment, driving, shopping, hobbies, or housework.[2] Patients should not be tested in acute phase of stroke, whether aphasic or otherwise. Although most tests for cognitive functioning rely heavily on language abilities, tests of nonverbal memory and reasoning help to support the diagnosis of dementia in aphasic patien.[3] The memory impairment in vascular dementia generally affects encoding of new material (anterograde amnesia),and non-declarative learning also may be defective. Retrograde memory tends to be spared.[4] Multiple cerebral strokes may cause increasing deficits that cumulatively qualify as a

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dementia, but at least some of the focal lesions that contribute to the cognitive worsening in the clinical syndrome can be identified, and there is a corresponding stepwise decline. The mental capacities of such patients may then appear to fail in a gradual and continuous fashion. Memory is relatively spared in the early stages. [5] Vascular cognitive impairment no dementia (CIND): show at least deficit in one cognitive area but the deficits are not severe or varied enough for the diagnosis of vascular dementia. [6] Depression is common. Occasionally, patients become aggressive, and the clinical features are made acutely worse by coexistent intercurrent illness.[7] Qualitative differences in the pattern of dementia in patients with mild vascular dementia and AD were documented: the groups were matched on levels of cognitive impairment and everyday functioning, but the patients with vascular dementia were less impaired in episodic memory, and more severely impaired on tests of attention/ executive function, semantic memory, and visuospatial skills.[8]

In VaD, neurological examination commonly shows pseudobulbar palsy with dysarthria, dysphagia, and pathological emotionality (pseudobulbar affect), focal motor and sensory deficits, ataxia, gait apraxia, hyperreflexia and extensor plantar responses.[9]

Epidemiological studies examining the relationship between blood pressure and cognitive impairment can be broadly classified into two groups. One group of studies has examined the association between hypertension in older persons and the risk of concurrent cognitive impairment or of cognitive impairment occurring in the near term future.[10] The second group of epidemiological studies examining the association between hypertension and cognitive impairment has yielded more consistent and noteworthy results. These studies have examined blood pressure during midlife and the risk of cognitive impairment in late life.[11]

In secondary prevention the target is stroke management and prevention, including (1) early diagnosis and appropriate treatment of acute stroke; (2) prevention of stroke recurrence; and (3) slowing of progression of brain changes associated with VaD by intensive management of existing risk factors.[12] Lipid lowering agents are important in the secondary prevention of stroke and may protect against dementia. [1] The aim of the study was to ascertain the significant determinants of cognitive impairment in stroke patients.

PATIENTS AND METHODS:

This is a case series descriptive study enrolled 100 randomly selected patients 50 years and above of age with stroke who attended Al-Yarmouk teaching hospital- Baghdad-Iraq, during the period between 1st of January, 2007 to the 31st of January, 2008. All of the patients have been asked about demographic and atherogenic risk factors like (age, gender, level of education, hypertension, cigarette smoking, acute myocardial infarction, atrial fibrillation, diabetes mellitus, hypercholesterolemia and alcoholism). All the patients were examined by a neurologist after they passed the acute stage; examination of patients in delirium state has been avoided to fulfill the criteria of VaD. The patients were fully investigated with (blood sugar, serum lipid, ECG, cardiac echo study and neuroimaging; CT scan of head, MRI of brain). The cognitive function assessed by MMSE a total score of <24 generally lead to possibility of dementia. The patients were classified into 3 groups as follows:

Group **I** no cognitive impairment: those whose MMSE > 24

Group **II** Vascular CIND: those whose MMSE< 24 with cognitive impairment in at least one cognitive area (memory, language….) but the deficit was not severe enough for diagnosis of VaD.

Group **III** VaD those patient whose MMSE < 24 with cognitive impairment not limited to single cognitive area (memory, language…) with cognitive impairment severe enough to interfere with daily activities & fulfill the criteria of DSM **IV** .

All the patients were assessed by the International Diagnostic Checklist for ICD-10(WHO /2005) Organic personality and behavioral disorders and Organic amnesic syndrome to exclude non organic causes of dementia. All the patients were assessed by Wechsler memory scale test. Patients with aphasia were excluded from the study.

Executive functions assessed by asking the patients to count to 10, recites the Alphabet, subtract serial 7s and Clock drawing test, the patients with VCI more impaired on tests of executive function, this help to differentiate it from AD. Demographic variables and clinical variables were tested by Chi square p-values < 0.05 were considered significant.

RESULTS:

During the period of the study, hundred Iraqi patients (57 women and 43 men) with stroke were evaluated. They had a mean age at examination of 64.98 (range 50 to 81) years.

They were divided according to their age into four groups (table 1). The total number of patients in age group (50-59) years was 28, with male to female ratio of 1.33:1. They represented 28% of the total cases. While (60-69) years age group was 36 patients, with 1:1 male to female ratio. They made 36% of the total. The third group (70-79) years consisted of 30 patients with 1.5:1 male: female ratio. They made 30% of the total. The fourth group's age was 80 years and above and consisted of 6 patients with 5:1 male: female ratio .They represented 6% of the total patients. The stroke patients were further categorized in (table 2) according to cognitive level into patients with no cognitive impairment and those with VCI. With 73 patients (73%) having no cognitive impairment, male: female ratio was 1.28:1.While those with VCI were further subdivided into those with vascular CIND 19 patients (19%) with male: female ratio of

1.37:1 and those with VaD 8 patients (8%) with 1.66:1 male to female ratio. The distribution of level of education in patients with vascular CIND is illustrated in (table 3), nine of the patients were illiterate (47.36%), five had very primary education (26.3%), 4 had primary school education (21%) and one had higher education (5.2%). The level of education in patients with VaD is illustrated in (table 3), six of the patients were illiterate (75%), one had primary school education (12.5%) and one had higher education (12.5%). The prevalence of atherogenic risk factors in VCI and in total cases is illustrated in (table 4) respectively as follows: Hypertension: 92.5%, 25%; hypercholesterolemia: 74%, 20%; cigarette smoking: 62.9%, 17%; diabetes: 37%, 10%; acute myocardial infarction: 37%, 10%; atrial fibrillation: 18.5%, 5%. Univariate analysis of the factors associated with cognitive impairment is illustrated in (table 5).

Table 1: Age and gender distribution of cases.

Age group(yrs.)	Sex			Total	
	M	F	M:F	Number	%
50-59	16	12	1.33:1	28	28
60-69	18	18	1:1	36	36
70-79	18	12	1.5:1	30	30
80-	5	1	5:1	6	6
	57	43	1.32:1	100	100

Table 2: Distribution of VCI in stroke patients.

Cognition		Male No. (%)	Female No. (%)	M:F ratio	Total No. (%)
No impairment		41(41)	32(32)	1.28:1	73(73)
VCI	Vascular CIND	11(11)	8(8)	1.37:1	19(19)
	VaD	5(5)	3(3)	1.66:1	8(8)
Total		57(57)	43(43)		100(100)

Table 3: Distribution of patients with CIND and VaD according to level of education.

	CIND	VaD
Education level	No. (%)	No. (%)
Illiterate	9 (47.37)	6 (75)
Very primary education	5 (26.31)	0 (0)
Primary school	4 (21.06)	1 (12.5)
Secondary school	0 (0)	0 (0)
Higher education	1 (5.26)	1 (12.5)
Total	19 (100)	8 (100)

Table 4: Percentage of risk factors in VCI patients and in total cases.

Risk factors	Percentage of risk factors in VCI patients	Percentage of risk factors in total cases
Hypertension	92.5%	25%
Hypercholesterolemia	74%	20%
Cigarette smoking	62.9%	17%
Diabetes	37%	10%
Acute myocardial infarction	37%	10%
Atrial fibrillation	18.5%	5%

Table 5: Analysis of risk factors associated with cognitive impairment.

Risk factors	Cognitively impaired no: 27(27%)	Normal cognition no: 73 (73%)	P	O.R.	95%C.I.
Age: <=65 66-79 80-	12 (44.4%) 12 (44.4%) 3 (11.11%)	48 (65.7%) 22 (30.13%) 3 (4.1%)	- 0.10 (NS) 0.10 (NS)	1.00 2.18 4.0	- 0.85-5.62 0.72-22.36
Gender male female	16 (59.2%) 11 (40.7%)	41 (56.1%) 32 (43.8%)	- 0.78 (NS)	1.00 1.135	- 0.46-2.78
Education £ secondary: > secondary	25 (92.55%) 2 (7.4%)	54 (73.9%) 19 (26.02%)	0.043 -	4.40 1.00	0.95-20.36 -
Hypertension: Present Absent:	25 (92.5%) 2 (7.4%)	66 (90.4%) 7 (9.5%)	0.73 (NS) -	1.33 1.00	0.26-6.82 -
Smoking: Present Absent:	17 (62.9%) 10 (37.03%)	42 (57.5%) 31 (42.4%)	0.63 (NS) -	1.26 1.00	0.51-3.1 -
Acute myocardial infarction: Present Absent:	10 (37.03%) 17 (62.9%)	11 (15.06%) 62 (84.9%)	0.017 -	3.32 1.00	1.21-9.11 -
Atrial fibrillation Present Absent:	5 (18.5%) 22 (81.4%)	8 (10.9%) 65 (89.04%)	0.32 (NS) -	1.85 1.00	0.55-6.24 -
Diabetes Present Absent:	10 (37.3%) 17 (62.9%)	29 (39.7%) 44 (60.3%)	0.81 (NS) -	0.89 1.00	0.36-2.22 -
Hypercholesterolemia Present Absent:	20 (74%) 7 (25.9%)	45 (61.1%) 28 (38.3%)	0.25 (NS) -	1.78 1.00	0.67-4.74 -

DISCUSSION:

In this study we have been able to identify group of stroke patients who showed cognitive impairment and their base line correlates. The mean age in this study is 64.98 years. Males were more affected than females may reflect increased rate of cerebrovascular disease in males. The prevalence of VCI in this study is 27% which encompasses vascular CIND 19% and VaD 8% and this is compatible to study done by Vladimir Hachinski [14] account the Vascular CIND to 17% and VaD to 8%. Prevalence rates for poststroke cognitive impairment and dementia vary greatly, dependent upon the population being studied, the manner in which VCI is classified, and the time window after stroke that is examined (Nyenhuis and Gorelich, 1998).[1] The prevalence of

hypertension in this study is 25% and this is compatible with what mentioned by Gorelick et al 1993.[15] The prevalence of hypercholesterolemia is 20% and this is lower to what mentioned in that of Gorelick et al 1997[16] who account it to 36% and this may be due to difference in dietary habit and different life style. The prevalence of smoking is 17% and this lower to what mentioned in that of Gorelick et al 1997 [16] who account it to 25% and this may be due to difference in habits and life style. The prevalence of diabetes in this study is 10% and this is similar to a study accomplished by Stolk et al 1997. [17] The prevalence of acute myocardial infarction is 10% but no comparable study. The prevalence of atrial fibrillation is 5% and this is comparable to what mentioned in that of Wolf et al 1991. [18] Regarding heavy alcohol consumption in this study we found no patients with alcohol drinking and this may be related to religious respect in our society. One of the main aims of the study was to ascertain the significant determinants of cognitive impairment in stroke patients. We observed that lesser years of education and acute myocardial infarction were significant determinants of cognitive impairment in stroke patients. Likewise consistent with previous observations we found that lower educational level to be a significant correlates of post stroke cognitive impairment. The probable reasons for this could be because with increasing age there may be a concomitant degenerative process setting in and the lower educational level may be associated with lesser mental reserve due to involvement of synapses. [19,20] A reserve hypothesis has been proposed to explain this protective effect, positing that persons with higher levels of education may have greater reserve to protect (at least initially) against neurological insult (Stern et al 2003). [21] Regarding neuroimaging in this study 52.6% of the patients with vascular CIND have left hemisphere infarction followed by white mater hyperintensities 36.8% and this is compatible with what mentioned by Pedelty et al, 2005. [22] In our study most of the patients with VaD having left hemisphere and bilateral hemisphere infarction, as have atrophic changes and higher ventricle to brain ratio and this is compatible to that mentioned by Mayer et al, 1994.[23] Considerable proportion of stroke patients present with cognitive impairment which is determined by modifiable risk factors like atherogenic and demographic risk factors. Hence by judiciously identifying these risk factors the

prevention of cognitive impairment in stroke patients can be attained. Further investigations must be completed to work toward large scale clinical randomized control trials to reduce the burden of stroke, and thereby VCI. There is a great promise to reduce the incidence of cognitive impairment by implementing life style modification.

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