All stroke patients admitted to Banjaluka Clinical Centre during one year were evaluated by the standard protocol during the hospitalization and three months after the stroke. It included clinical, functional and neuropsychological examination and neuroimaging. Dementia was diagnosed according to the criteria of National Institute of Neurological Disorders and Stroke-Association Internationale pour la Recherche et l’Enseignement en Neurosciences (NINDS-AIREN) [6].

Vascular changes, such as lesions of the white mass, are often present in almost all other types of dementia; therefore, they are probably the leading cause of cognitive dysfunction [4]. Vascular causes of dementia are ischemia, haemorrhage, and anoxia. The diagnostic procedure must confirm the existence of dementia, vascular factors and their causal relationship [5]. A special problem occurs later in life when a large number of people develop both dementia and vascular disorders. Hence, various diagnostic criteria have been designed in order to differentiate VaD successfully, and the most widely used today are National Institute of Neurological Disorders and Stroke-Association Internationale pour la Recherche et l’Enseignement en Neurosciences (NINDS-AIREN) criteria [6].

Material and methods

The prospective study included all patients treated for stroke during one-year-period at the Clinic of Neurology of the Clinical Centre of Banja Luka. The diagnosis of stroke was based on the rapid development of focal signs of brain damage lasting for more 24 hours and on additional diagnostic tests, including computed tomography and magnetic resonance of the head.

During the first hospitalization all patients were entered into the corresponding register in Microsoft Access; the file for each patient included demographic data, previous diseases and habits, previous cognitive status (measured by Blased Dementia Scale), clinical, functional and cognitive status on admission, which were measured by National Institute of Health National Institute of Neurological Disorders and Stroke (NIH-NINDS), score Mini Mental State Examination Score (MMSE), and Hachinski Ischemic Score (HIS), type of stroke (TOAST classification-The Trial of ORG 10172 in Acute Stroke Treatment criteria) and functional status at discharge (measured by the Barthel index). Three months later, the surviving patients were subjected to neuropsychological testing according to the protocol standardized for our population and the diagnosis of vascular dementia was made according to the NINDS-AIREN criteria. All data were statistically processed by appropriate statistical tests in Microsoft Excel.

Results

In the follow-up period, out of 463 patients, who had been treated at our Clinic with the diagnosis of stroke, 138 (29.8%) died and 325 (70.2%) survived. Out of the total number of the surviving patients, 273 (84% of survivors or 58.8% of the total number) were tested after three months. Fifty-two patients (16% of survivors, or 11.21% of the total number) were not tested either due to not responding to be tested or due to having severe aphasia after stroke (Figure 1).

Introduction

Vascular dementia (VaD) is an acquired decline in cognitive, emotional skills and/or disorder caused by vascular factors, pronounced enough to interfere with daily functioning and quality of life [1]. VaD is the second most frequent of dementias in Western Europe and the United States [2]. The prevalence in the general population over 65 years of age is estimated to be about 1.6%, a meta-analysis of European studies showed the incidence of 17.6% [3]. In Japan, Russia, Finland, Venezuela and other countries VaD is the most common dementia.

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Out of 273 patients tested, 22 (8.05%) were demented before the stroke (Blased Dementia Scale ≥ 2.5) and they were excluded from further analysis.

Analysis of the tested patients

Out of the remaining 251 patients, 49 (19.52%) patients met the criteria for vascular dementia three months after the stroke and, according to the results of neuropsychological testing, all patients were divided into two groups: group I - demented patients (n = 49; 19.52%) and group II - non-demented patients (n = 202; 80.48%) (Table 1).

Analysis of vascular risk factors

The demented patients had a statistically significant presence of both atrial fibrillation and ventricular arrhythmias (p<0.01) and previous stroke (p <0.05) compared with the non-demented patients. There were no statistically significant differences observed in other vascular risk factors (hypertension, diabetes, previous myocardial infarction, heart decompensation, hypercholesterolemia, hyperlipidemia, cigarette smoking and alcohol consumption) between the two groups of patients (Figure 2).

Type of stroke

Among the demented patients, 89.8% (n=44) had ischemic and 10.2% (n=5) hemorrhagic stroke in contrast to 88.1% (n=178) of ischemic and 11.9% (n=24) hemorrhagic stroke among the non-demented patients. There was no statistically significant difference in this parameter between the two groups of patients (p>0.05).

Subtypes of ischemic stroke

Subcortical and lacunar infarctions with leukoaraiosis were significantly more highly represented in the demented patients, whereas cortical stroke was more frequent in the non-demented patients (Figure 3).

The functional status of demented and non-demented patients on admission

The percentage, i.e. the number of multiple and individual lesions in the demented patients was 77.2% (n=32) and 27.3% (n=12), respectively; whereas these figures for the non-demented patients were 38.8% (n=69) and 61.2% (n=109), respectively. A statistically significant difference was demonstrated in the presence of multiple lesions in the demented patients (p<0.01).

A statistically significant difference was demonstrated in the presence of bilateral lesions in the demented patients (p<0.01).

The mean value of the NIH-NINDS scores in the demented patients was 16.61 with SD ± 8.33 and the confidence interval from 14.22 to 19.01.
The mean value of the NIH-NINDS scores in the non-demented patients was 11.93 with SD±6.37 and confidence interval from 11.05 to 12.81. A statistically significant difference was demonstrated in the NIH-NINDS scores between the demented and the non-demented patients (t=4.330, p<0.01).

The cognitive status on admission

The mean value of MMSE scores in the demented patients was 15.51 with SD±6.05 and the confidence interval from 13.77 to 17.25.
The mean value of MMSE scores in the non-demented patients was 25.98 with SD±7.47 and the confidence interval from 24.94 to 27.01. A statistically significant difference was demonstrated in the MMSE scores between the demented and non-demented patients (t=9.109, p<0.01).

The functional status at discharge

The mean value of the Barthel index in the demented patients was 71.63 with SD±19.67 and the confidence interval from 65.98 to 77.28.
The mean value of the Barthel index in non-demented patients was 88.66 with SD±12.65 and the confidence interval from 86.91 to 90.42. A statistically significant difference was demonstrated in the Barthel Index between the demented and non-demented patients (t=7.491, p<0.01).

Discussion

This study presented a large series of patients with non-selected stroke who had been treated at a tertiary level referent health institution located in an urban region without an alternative health centre in which such patients could be managed. The proximity of a hospital as well as the absence of economic constraints in the treatment of these patients exclude an error in the process of sampling. In order to avoid further possible errors in the analysis, all patients were prospectively registered, without excluding hemorrhagic or recurrent stroke. The NIH-NINDS-AIREN research criteria were used as the most reliable ones to find out if there had been previous dementia. The most frequent reason for not being included into the final group of patients to be tested was the fatal outcome, and a small group of patients not having been tested for other reasons did not differ significantly from the tested patients.

Our study has been the first one to be conducted not only on the territory of former Yugoslavia but also in Eastern Europe and it has shown that almost one fifth of patients develop dementia three months after stroke. This finding is in accordance with previously published data and very close to those published in the studies of Tatemichi et al (9.6%) [9], Helsinki Stroke Aging Memory Study Cohort (9.2%) [10], Intizaria et al. (11.5%) [11] and Henon et al (16.3%) [12]. In these studies, a retrospective diagnosis of previous dementia was based on the same standardized questionnaire as used in our study and we agree with the opinion of the above mentioned authors stating that previous dementia considerably increases the risk of developing dementia after stroke.

Although the high level of previous education was highlighted as a protective factor for VaD in numerous older studies [13], the absence of correlation between vascular dementia and the level of previous education has been a constant finding in the majority of recent studies [14]. Our study has shown this correlation. Alternatively, education, as an indicator of socio-economic status, may be a marker for other factors that may affect the risk for vascular dementia, for example, dietary habits [15].

As in previous studies [13,16] we have shown that there is a correlation between the age and vascular dementia of the patients. By comparing the average age of our patients with those from studies conducted in Finland (70.2±7.7 years), the United States (72±8.3 years) and Spain (69±13 years), it can be seen that the average age of the demented patients was higher in our study (73.24±8.79 years). One possible reason for this difference is that absolutely everyone, even the oldest patients, with stroke were treated at our clinic. A study performed in Hong Kong [13] showed the average age of patients suffering from dementia to be 75±8.5 years, in Canada 78.1±6.04 years [7], while the lowest average age of patients suffering from dementia of 64.4±8.4 years was observed in a study from Taiwan [17].

Our study has demonstrated a limited influence of traditional cardiovascular risk factors on the development of dementia after stroke. The Framingham study states that although none of the individual factors increases the risk of developing dementia significantly, their combination may increase the risk of developing dementia by increasing the risk of having a stroke [16].

Previous stroke was presented as an independent predictor for the development of vascular dementia more consistently [7,17,18], as shown in our study, noting that this factor has not reached any high statistical significance. Although the risk of dementia is maximally expressed in the first three months after stroke, studies have shown that 7-30% of patients who were not demented three months after stroke become demented over the next three years [19,20]. In most cases, dementia is associated with the recurrent stroke, which further emphasizes the importance of this risk factor.

In addition, cognitive and functional deficits on admission and functional status of patients at discharge were highly statistically associated with vascular dementia in our study. The results of our study indicate that an initial MMSE and NIH-NINDS score...
as well as the Barthel index at discharge can indicate the possibility of developing dementia three months after the stroke and this finding may help to simplify identification of these patients. The importance of cognitive and functional status of patients is a well known predictor of developing dementia, which has been demonstrated in studies of Lina et al [17], Tang and colleagues [13] and Raquela and associates [18].

Our study has not shown a statistically significant difference in the incidence of vascular dementia regarding the stroke type (ischemic vs. hemorrhagic), but the importance of the characteristics of ischemic stroke has been stressed. The presence of subcortical, multiple and bilateral lacunar infarctions with leukoaraiosis showed the existence of high statistical significance in patients with vascular dementia. In their study, Miya et al. [21] showed that the prevalence of dementia was higher in patients with leukoaraiosis after the first lacunar infarction. The importance of leukoaraiosis as an independent predictor of vascular dementia was demonstrated in a study of Henon et al [20]. In the Stroke Data Bank [22]

the risk for vascular dementia increased with the number and size of ischemic lesions.

Conclusion

Dementia after stroke is frequent and occurs in almost one fifth of patients (19.52%). A significant percentage (8.05%) of patients had dementia before clinically overt stroke. The predictors of vascular dementia identified in this study were age, atrial fibrillation, cognitive and functional status on admission, subcortical lacunar infarctions, leukoaraiosis, and multiple and bilateral lesions. A limited influence of vascular risk factors on the development of vascular dementia has been demonstrated. Our results show that there is no simple explanation for vascular dementia as well as that multiple factors, which include both the characteristics of stroke and of the patients themselves, contribute to dementia, each of them independently. In addition to brain damage due to stroke, the co-existent degenerative pathology may be significant.

References


Račić D, et al. Vascular dementia

Summary

Uvod
Vaskularna demencija je stečeni pad kognitivnih, emocionalnih sposobnosti i/ili poremećaj ličnosti uzrokovani vaskularnim faktorima, izražen u dovoljinoj meri da ometa svakodnevno funkcioniranje i kvalitet života.

Materijal i metode
Svi bolesnici sa moždanim udarom (n=463) lečeni tokom godinu dana na Neurološkoj klinici Kliničkog centra Banjaluka ispitani su pomoću standardizovanog protokola prilikom boravka u bolnici i ponovo nakon tri meseca. Protokol je obuhvatao klinička, funkcionalna, neuroradiološka i neuropsihološka ispitivanja. Dijagnoza vaskularne demencije je postavljena pomoću kriterijuma National Institute of Neurological Disorders and Stroke-Association Internationale pour la Recherche et l’Enseignement en Neurosciences. Pored toga, ispitane su i mnoge demografske i kliničke varijable.

Rezultati
Nakon isključenja iz studije umrlih bolesnika (n=139; 29,8%), onih koji se nisu odazvali na intervju na tromesečnom praćenju (n=52; 11,2%) i onih sa prisutnom demencijom i pre moždanog udara (n=22; 8,05%), ukupno 273 (58,8%) pristupilo je neuropsihološkom testiranju tri meseca nakon moždanog udara. Četrdeset devet (19,52%) bolesnika je ispunilo kriterijume za vaskularnu demenciju.

Diskusija
Prediktori vaskularne demencije u statističkoj analizi bili su starost, atrijalna fibrilacija, kognitivni i funkcionalni status pri prijemu, funkcionalni status pri otpustu, supkortikalni lakunarni infarkti, leukoaraioza, multiple i obostrane lezije mozga.

Zaključak
Demencija je česta nakon moždanog udara i njen razvoj nije određen samo jednim faktorom. Multipli faktori koji uključuju osobine moždanog udara i osobine samog bolesnika svaki nezavisno doprinose demenciji i na neke od njih može da se deluje preventivno. Kao dodatak oštećenju mozga usled moždanog udara, koexistenta degenerativna patologija takođe može da bude faktor.

Ključne reči: Vaskularna demencija; Kognitivni poremećaji; Poremećaji ličnosti; Kvalitet života; Moždani udar; Neuropsihološki testovi

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