Predictive Factors and the Role of Traumatic Brain Injury in Stroke

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Abstract

Background: Traumatic brain injury (TBI) is the leading cause of mortality and invalidity worldwide.

Objective: To explore whether traumatic brain injury may be a risk factor for subsequent stroke and to evaluate the role of other risk factors correlated with TBI and stroke.

Methods: We analysed 643 patients presented in the emergency department of Trauma UHC, from 1st of June 2011 - 1st of December 2011. We evaluated the following factors: age, gender, and severity of head trauma, type of head trauma, systemic hypertension, atrial fibrillation, and diabetes mellitus.

Results: During 1-year of follow upperiod 32 (4.97%) strokes occurred in TBI patients. The evaluation was done in correlation with the other risk factors taken into account in the study.

Conclusions: The role of TBI is underestimated in the evaluation of stroke. This study demonstrated that during the first year after TBI, 13.53 % of patients experienced stroke. After careful statistical correlations with the selected co-morbidities, we found that the diagnosis of stroke was strongly related with TBI.

Key words: *Stroke, traumatic brain injury, risk factors*

Background

Traumatic brain injuries (TBIs) are the leading cause of mortality and invalidity in developing and non-developing countries. The incidence rates of TBI have been reported as 234, 532, 322 per 100.000 respectively in Europe, America and Australia. (1, 2, 3)

Rates of TBIs are highest in the very young population (age group zero to four years old), in adolescents, and in young adults (15-24 years old). There is another peak of incidence in the elderly (age ≥ 65 years old). As with most traumatic injuries, the incidence of TBI is significant higher in men compared to women with a ratio that has been reported to vary between 2.0 to 1 and 2.8 to 1. (4-6)

People who have had a traumatic brain injury may have an increased risk of stroke. Controversy data support the role of traumatic brain injury in stroke. Any damage to the brain causes impairment to the vascular system, which supplies blood and nutrients to the cells of the brain. A stroke resulting from disturbance in the blood supply to the brain is a cerebrovascular event involving loss of brain functions. It is thus rational to speculate that cerebrovascular damage in the head caused by TBI may be a trigger for stroke. (7)

Objective

To evaluate the role of traumatic brain injury and other predictive factors in stroke.

Methods

This study used data of patients presented inthe Emergency Department (ED) of Trauma UHC of Tirana from 1st of June to 1st of December 2011. A total number of 643 patients were presented in the ED. A prospective cohort study was done and the patients were evaluated in 3, 6 and 12 months. Maximum likelihood estimates odds ratios (OR) and confidence intervals (CI) 95% were computed using both conditional and— to minimize the problem of missing data—unconditional logistic regression. Unconditional logistic regression correlates with the variables included age and gender.

Results

Out of a total of 643 patients presented in the ED with the diagnosis of traumatic brain injury, 167 (25.98%) were females and 476 (74.02%) were males. After matching for age and gender, the patients with TBI and stroke were more likely to have hypertension (P< 0.01), diabetes (P<0.01), atrial fibrillation (P<0.01).

Out of 643 patients, 32 (4.97%) patients had a stroke event within the 1st year after the traumatic brain injury, 104 patients suffered from hypertension, 36 from atrial fibrillation and 43 from diabetes.

Gender	male	female
	476 (74.02)	167(25.98)
Stroke	24 (10.73)	8(2.79)

Table1. Percentage of stroke in males and females 1-year post traumatic brain injury.

We summarized the distribution of the types of traumatic brain injury and stroke in table 2.

Out of 324 (50,38%) patients withmild traumatic brain injury (13-15 points GCS), 6 (1.85 %) of them had stroke during the first year followinghead trauma; out of 222 (34.52%) patients with moderate traumatic brain injury (9-12 points GCS), 16 (7.20%) of them had stroke, while out of 97(15.08%) with severe traumatic brain injury, 10 (10.30) of them had stroke.

	MTBI	MoTBI	STBI
GCS	324(50.38)	222(34.52)	97(15.08)
Stroke	6(1.85)	16(7.20)	10(10.30)

Table2. Percentage of patients secondary to the grade of severity of traumatic brain injury.

We summarized the distribution of stroke, hypertension, atrial fibrillation and diabetes mellitus secondary to the patients' age group in table 3. We estimated that the highest number of patients who had stroke werein the 50-80 years old age group. In this age group, we see that the number of patients with risk factors for stroke is higher.

Age group	- No. of pts	Stroke	Hypertension	AF	DM
0-9	58(9.02)	0	0	0	0
10-19	72(11.19)	0	0	0	0
20-29	116(18.04)	0	0	0	0
30-39	83(12.90)	0	0	0	0
40-49	100(15.55)	3(0.46)	18(2.79)	3(0.46)	2(0.31)
50-59	72(11.19)	8(1.24)	25(3.88)	6(0.93)	8(1.24)
60-69	69(10.73)	9(1.39)	22(3.42)	5(0.77)	18(2.79)
70-79	57(8.86)	10(1.55)	32(4.97)	12(1.86)	10(1.55)
80-90	16(2.48)	2(0.31)	7(1.08)	10(1.55)	5(0.77)
Total	643	32(4,97)	104(16,17)	36(5,59)	43(6,68)

Table3. Percentage and correlation of stroke and other risk factors: systemic hypertension, atrial fibrillation (AF) and diabetes mellitus (DM).

Discussion

This study demonstrated that traumatic brain injury is a risk factor for stroke. During the first year after TBI, 32 (4.97%) of patients were experienced stroke.

Conclusions

The risk of stroke increased from TBI and from other comorbidities, such as systemic hypertension, atrial fibrillation, diabetes, thesejustify the high percentage of stroke after TBI.

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