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Short Communication

The correlation of nitrite concentration with lesion size in initial phase of stroke; It is not correlated with National Institute Health Stroke Scale

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Abstract

BACKGROUND: The role of Nitric Oxide (NO) and its metabolites in stroke has been examined clinically and experimentally. The relationship between plasma NO level and Lesion Size (LS) or clinical severity of stroke is still under investigation. In this clinical study, the serum level of Nitrite (NI); the last metabolite of NO was measured in first and fifth days of onset of the stroke, and its correlation with LS was determined.

METHOD: 37 Cerebrovascular Attack (CVA) patients were considered. The National Institute Health Stroke Scale (NIHSS) was assessed to determined neurological impairment within 24 hours of onset. On the basis of NIHSS, the patients were divided into mild, moderate and severe groups. CT Scan for all patients were obtained in the first day, and based on CT Scan results, the patients were also divided into hemorrhagic, ischemic and normal groups. The serum level of NI and the LS were determined.

RESULTS: The mean serum levels of NI in 37 patients in the first and fifth days of stroke were 8.43± 1.23 and 7.46±0.72 µmole/liter with no significance difference. The analyses of data indicated no significant correlation between NI concentration and NIHSS, but in patients with abnormal CT Scan, statistical correlation was existed between NI concentration and LS ($r=0.521$, $p=0.022$).

CONCLUSION: The NI concentration is not correlated with NIHSS, but it is correlated with LS. The sources of NO metabolite sources are different; neuronal, endothelial or inducible. Therefore the concentration of NO or NI is not exactly the endothelial NO reprehensive which is beneficial in stroke, and it seems that the relationship between NO precursor subtypes and NIHSS or LS is needed to investigate.

KEYWORDS: Nitric Oxide, Stroke

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Stroke is the third cause of death in the world after cadiovascular event and cancer. Nitric oxide (NO) is a substance that greatly increases in vascular events. [1] The therapeutic benefit of NO in stroke is suggested. [2-5] It is also reported that NO reduces stroke lesion size, [6] and significant negative correlation was observed between blood NO concentration and erythrocyte aggregability index in stroke patients. [7] On the other hand, the NO synthase inhibitors reduce the infarct volume in experimental ischemic stroke, but they may have negative effect on cerebral blood flow. [8] There are two main questions. First, does nitrite (NI) level, the last metabolite of NO, change in a day to day base during stroke period; and the second, is there any cor

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relation between NO level and lesion size (LS) or National Institute Health Stroke Scale (NIHSS)?

Methods

Accordingly, 37 patients with cerebrovascular attack (CVA), older than 50 years, either male or female who referred to Al-Zahra hospital were studied. They never had any past history of CVA. The NIHSS was assessed to determine neurological impairment within 24 hours of onset of stroke. Based on NIHSS, the patients were divided into mild (score 1-6; group IA), moderate (score 7-21; group IIA) and severe (score 22-33; group IIIA) groups. The blood samples were taken to measure serum NI concentration by Griess method (G2930, Promega Corporation, USA). The serum level of NI and NIHSS were also determined on the fifth day of onset. Based on CT scan results, the same patients were also divided into hemorrhagic (group IB), ischemic (group IIB) and normal (group IIIB) groups. LS was determined by the following formula:

LS=[maximum length x maximum width x (number of lesion slice -1)]/2

The data were analysized statistically using ANOVA and Pearson correlation. The p value less than 0.05 was considered as significant.

Results

The mean serum levels of NI in 37 patients in the first and fifth days of stroke were 8.43 ± 1.23 and 7.46 ± 0.72 micromole/liter, respectively, with no significant difference (table 1). It is obvious that NIHSS varies from the first to the fifth days of onset. Therefore, the number of patients of three groups was different in the fifth day compared to the first day of onset.

The analyses of data indicated no significant correlation between NI concentration and NIHSS score neither in the first nor in the fifth day of onset. First day CT scans of 18 patients were within normal range. The other 19 patients with abnormal CT scans were divided into two groups: ischemic and hemorrhagic strokes. The data for LS and serum level of NI are shown in table 2. There were significant correlation in group IB (P = 0.038) and considerable correlation in group IIB (P = 0.11) between NI concentration and LS. In general, in abnormal CT scan group (ischemic and hemorrhagic, n = 19) a statistical correlation was existed between NI and LS (r = 0.521, P = 0.022).

Table 1. NI concentration (mean ± SE; µmol/L) in three groups of stroke patients.

Group	First day	Fifth day
IA (NIHSS = 1-6)	6.59 ± 1.14 (n = 14)	7.48 ± 0.91 (n = 25)
IIA (NIHSS = 7-21)	10.10 ± 2.16 (n = 19)	7.50 ± 0.99 (n = 7)
IIIA (NIHSS = 22-33)	6.59 ± 2.73 (n = 4)	7.28 ± 2.66 (n = 5)
Total	8.43 ± 1.23 (n = 37)	7.46 ± 0.72 (n = 37)

Table 2. LS and NI concentrations (mean ± SE; µmol/L) in ischemic (IB), hemorrhagic (IIB) and normal (IIIB) groups.

Group	First day LS	First day NI	Correlation
IB (n = 10)	33.20 ± 13.19	7.47 ± 2.56	r = 0.66, P = 0.038
IIB (n = 9)	17.19 ± 5.31	9.73 ± 2.57	r = 0.54, P = 0.11
IIIB (n = 18)	0.0	8.32 ± 1.76	--

Discussion

Our findings are interesting in light of some previous studies. Castillo et al reported no significant difference in NO metabolite concentration between stroke subtypes, and a positive correlation between NO metabolite and infarct volume. [9] Beridze also reported a negative significant correlation between NO initial levels and ischemic lesion size in ischemic stroke condition. [7] Our results indicated a positive correlation between NI and LS, and these results verify the Castillo findings. [9] Some other investigators found significant relationship between NO and clinical severity of stroke. [10,11] Total concentration of NO or NI is not exactly the endothelial NO reprehensive, which is beneficial in stroke, and it may be the result of neuronal or inducible NO that are neurotoxin. [12,13] It seems the relationship between NO precursor subtypes and NIHSS or LS is strongly anticipatable, and it warrants further investigation.

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