The objective of this project is to evaluate total antioxidant status (TAS) and oxidative damage assayed as the amount of malondialdehyde (MDA) in patients with cerebral aneurysm (CA) and the influence that frequent consumption of fruit and vegetables, drinking tea, coffee and smoking of cigarettes have on it. The concentrations of TAS and MDA in serum of patients with CA were not different than in the control group. Frequent consumption of food products with antioxidants evoked the higher content of TAS but lower concentration of MDA in serum of patients with cerebral aneurysm.

A natural antioxidants contained in foods and beverages such as vegetables, fruits, tea, and wine have been studied extensively. There is now increasing evidence from basic, clinical, and epidemiologic studies showing the involvement of oxidative stress in a variety of diseases, cancer, and aging.

The prognosis for a patient with a ruptured cerebral aneurysm (CA) may be fatal or could lead to hemorrhagic stroke, vasospasm, hydrocephalus, coma, or short-term and/or permanent brain damage. There are no reliable predictive markers for identifying at-risk individuals. The most frequently occurring aneurysms are saccular and considered to be the combined result of a multifactorial pathogenic complex. Both genetic and acquired factors have been investigated. Hemodynamic stress at arterial bifurcations and congenital medial defects are also believed to contribute to aneurysm development. Other factors, such as hypertension, smoking, atherosclerosis, and alcohol intake, are commonly related to the pathogenesis and eventual rupture of cerebral aneurysms. Measured of TAS has shown improved survival of patients with high TAS and poorer outcomes for those with lower values (1).
PATIENTS AND METHODS

76 patients with CA were admitted to the Department of Neurosurgery of Medical University, Bialystok, for surgical procedure and 19 healthy, age and sex matched subjects served as controls. Patients data are shown in tab. I.

Table I. The characteristic of patients with cerebral aneurysm (CA) and control group

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CA PATIENTS (N = 76)</th>
<th>CONTROL (N = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (M/F)</td>
<td>30/46</td>
<td>6/13</td>
</tr>
<tr>
<td>Age (years) – Mean (range)</td>
<td>51.28 ± 11.87 (16–73)</td>
<td>52.63 ± 10.51 (36–69)</td>
</tr>
<tr>
<td>Body Mass Index (BMI)</td>
<td>26.05 ± 4.68 (16.1–42.0)</td>
<td>26.03 ± 5.78 (18.1–36.8)</td>
</tr>
<tr>
<td>Live/Dead</td>
<td>55/21</td>
<td>–</td>
</tr>
</tbody>
</table>

Serum samples collection

Blood samples were collected in the VACUTAINER Systems test tubes containing clot activator, Becton Dickinson, France. The samples were allowed to clot within 30 minutes, then centrifuged within 10 minutes at approximately 1000 × g. Serum was removed and kept frozen at –70°C. Protocol of the study was approved by the Local Ethical Committee.

Food-frequency questionnaires (n = 40) were implemented to collect the dietary data. The data from other patients, relating to frequent consumption of food products, the alcohol consumption, cigarette smoking and obesity, were not available.

Plasma total antioxidant status (TAS, n = 65) was measured using the Randox total antioxidant status assay kit (Randox Laboratories Ltd., United Kingdom) according to the manufacturer’s instructions. The assay relies on the ability of antioxidants in the plasma to inhibit oxidation of 2,2’ azino-bis-[3-ethylbenz-thiazoline-6-sulfonic acid] (ABTS) to ABTS⁺ by metmyoglobin. The amount of ABTS⁺ produced is monitored by reading the absorbance at 600 nm. Under these reaction conditions, the antioxidants in the plasma cause suppression of the absorbance at 600 nm to a degree that is proportional to their concentration. The final plasma antioxidant concentration was obtained using the following formula: antioxidant concentration (mmol/L) = [factor x( absorbance of blank- absorbance of sample)]; factor = [concentration of standard/( absorbance of blank- absorbance of standard)].

MDA contain of the serum (n = 76) samples was measured as thiobarbituric acid activity in the following manner. 0.5 ml of sample serum was added to a 1:1:1 (vol/vol/vol) solution of trichloroacetic acid (15%, wt/vol), thiobarbituric acid (0.375%). wt/vol), and hydrochloric acid, 0.25 N. The mixture was heated at 100°C for 25 min. then the supernatant was obtained by centrifugation (1,500 g for 5 min), and the absorbance at 535 nm was determined. Immediately before the addition of sample, butylated hydroxytoluene was added in final concentration of 0.01% (wt/vol) in order to block further lipid peroxidation (2). Statistical analyses
were performed using Statistica v.6.0 software. Differences between independent groups were tested by the Mann-Whitney U-test. Correlation was calculated and tested by the Spearman rank test.

RESULTS AND DISCUSSION

The concentrations of TAS (2.294 ± 0.22 mmol/l) and MDA (2.04 ± 1.5 μmol/l) in serum of patients with CA were similar to the mean contents of TAS (2.201 ± 0.07 mmol/l) and MDA (2.22 ± 0.7 μmol/l) in the control groups (tab. II, III). Significantly higher values of TAS were found in 73% of patients with CA who survived surgery.

The influence of frequency consumption of antioxidant food products or smoking on content of MDA and TAS in serum in patients with CA are shown in tab. III. Frequent consumption of vegetables, fruit, honey, drinking tea and coffee has increasing influence on the content of TAS (2.343 ± 0.21 mmol/l) but decreased MDA (1.60 ± 0.9 μmol/l) in serum concentration in patients with CA. Serum TAS and MDA concentrations in patients with CA were not independent from smoking of cigarettes and drinking of alcohol.

We did not find significant correlation between MDA and TAS in patients with CA.

The prognosis for persons whose aneurysm has burst is largely dependent on the age and general health of the individual and location of the aneurysm; about 27 percent of patients whose aneurysm has ruptured do not survive the first 24 hours in our study.
Earlier data (3) suggested that enhancement of the antioxidant defense system such as much intake of soy products may be important in preventing an aneurysmal rupture subarachnoid hemorrhage rather than the reduction of such oxidants as smoking. Flavonoids and carotenoids, the major antioxidants, are ubiquitous in fruit and vegetables. The most abundant flavonoids in the diet are flavanols (catechins plus proanthocyanidins), anthocyanins and their oxidation products. The main polyphenol dietary sources are fruit and beverages (fruit juice, wine, tea, coffee, chocolate and beer) and, to a lesser extent vegetables, dry legumes and cereals. Epidemiological studies have repeatedly shown an inverse association between the risk of myocardial infarction and the consumption of tea and wine or the intake level of some particular flavonoids, but no clear associations have been found between cancer risk and polyphenol consumption (4). More human studies are needed to provide clear evidence of their health protective effects and to better evaluate the risks possibly resulting from too high a polyphenol consumption.

Zimmermann et al. (5) investigated the differences of antioxidant capacity in acute stroke and stroke risk patients to elucidate whether the differences are a result of chronic low availability in arteriosclerosis and stroke risk or due to changes during acute infarction. MDA levels showed a trend for elevation in the first 6 h after the acute stroke. We observed also the elevated of MDA in patients serum with CA, and frequent consumption of the antioxidant from boiled and fresh vegetable, fruits, may be, decreased these concentrations.

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activity in the acute phase of the illness. Level of TAS biochemical marker was associated with the degree of organ function and with higher antioxidant. Cowley et al. (6) reported that survivors in the intensive care unit, with severe sepsis, rapidly attained normal or supra-normal values of TAS, and that non-survivors had initially lower levels that subsequently increased. While they had no clear evidence to prove that this reduction had a causal relationship, failure to achieve a normal plasma antioxidant potential was strongly associated with an unfavourable outcome.

Antioxidant enzymes like copper/zinc superoxide dismutase (SOD), catalase and glutathione peroxidase (GSHPx) are part of intracellular protection mechanisms to overcome oxidative stress and are known to be activated in vascular diseases and acute stroke.

CONCLUSION

Patients with CA before surgical procedure have similar concentrations of TAS and MDA than in control group. Significantly higher values of TAS were found in 73% of patients with CA who survived surgery. We suppose, that these are not crucial elements for burst aneurysm, but the diet influence on. There are no known ways to prevent a cerebral aneurysm from forming.

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STAN OKSYDACYJNY PACJENTÓW Z TĘTNIAKAMI MÓZGU
A PRZECIWUTLENIACZE W DIECIE

Streszczenie

W pracy oznaczono całkowity status antyoksydacyjny (TAS) i malondialdehyd (MDA) jako jeden z końcowych produktów utleniania lipidów błon komórkowych i wpływ częstego spożycia warzyw, owoców, miodu, herbaty i kawy oraz palenia papierosów na te parametry u pacjentów z tętniakami mózgu. Zawartość TAS i MDA w surowicy badanych pacjentów nie różniła się istotnie w odniesieniu do kontroli, ale wykazano, że częste spożycie produktów o działaniu antyoksydacyjnym podwyższało TAS, a obniżało MDA. Istotnie wyższe wartości TAS stwierdzono u 73% pacjentów CA, którzy przeżyli zabieg operacyjny.

REFERENCES
