UMURTA ARTERYSI SYNDROMIDE SOD BA GPx PHAOLLIGES: ANTIOXIDANT ENZYMAL DYNAMICS

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https://doi.org/10.5281/zenodo.22641507

ARTICLE INFO

Received: 27th August 2026
Accepted: 29th August 2026
Online: 31st August 2026

KEYWORDS

vertebral artery syndrome, oxidative stress, antioxidant defense, superoxide dismutase, SOD, glutathione peroxidase, GPx, gender characteristics, ischemia, biochemical parameters

ABSTRACT

Vertebral artery syndrome (VAS) is a complex neurological condition associated with impaired blood flow in the vertebrobasilar system and manifested by dizziness, headache, balance and coordination disorders, as well as autonomic symptoms. Mechanical compression of the vertebral arteries, degenerative changes, hemodynamic disturbances, and hypoperfusion of the brainstem and cerebellar structures play an important role in the pathogenesis of VAS [2, 6, 11]..

Introduction. Vertebral artery syndrome (VAS) is a complex neurological condition associated with impaired blood flow in the vertebrobasilar system and manifested by dizziness, headache, balance and coordination disorders, as well as autonomic symptoms. Mechanical compression of the vertebral arteries, degenerative changes, hemodynamic disturbances, and hypoperfusion of the brainstem and cerebellar structures play an important role in the pathogenesis of VAS [2, 6, 11].

In VAS, ischemic-hypoxic processes may intensify oxidative stress, leading to increased production of reactive oxygen species and damage to cell membranes and mitochondrial structures. Superoxide dismutase (SOD) and glutathione peroxidase (GPx), which are key antioxidant defense enzymes, play an important role in limiting these processes [8]. Therefore, their activity is considered an important biochemical indicator for assessing oxidative stress and the antioxidant defense status of the body. The state of the antioxidant system may differ between the functional and organic stages of VAS [7]. Prolonged disease progression and increased ischemic stress may contribute to a reduction in antioxidant defense capacity. In addition, gender-related differences in SOD and GPx activity may also exist [9, 10]. Therefore, studying the dynamics of these enzymes according to disease stage and sex is relevant for a more comprehensive assessment of VAS pathogenesis and for improving individualized pathogenetic rehabilitation approaches [1, 5, 11].

Aim of the study. To comparatively assess changes in SOD and GPx activity in patients with VAS according to disease stage and gender characteristics.

Materials and Methods. The study included 171 patients with VAS, who were divided into Group 1 (n=99) and Group 2 (n=72). The control group consisted of 30 healthy

individuals. Serum antioxidant enzyme activity, including SOD and GPx, was determined, and the results were comparatively analyzed according to sex. The reference range for SOD was 1.5–3.0 U/mL and for GPx 30–70 U/mL.

Results. SOD activity in Group 1 was 2.1±0.3 U/mL in men and 2.2±0.3 U/mL in women, which was close to the corresponding values in the control group (2.0±0.3 and 2.2±0.3 U/mL, respectively). In Group 2, SOD activity decreased to 1.3±0.2 U/mL in men and 1.5±0.1 U/mL in women. The SOD values in Group 2 were significantly lower than those in the control group ($p<0.05$). Compared with the control group, SOD activity decreased by 35.0% in men and by 31.8% in women.

GPx activity showed a similar pattern. In Group 1, GPx activity was 42±4.3 U/mL in men and 47±5.1 U/mL in women, compared with 50±4 and 55±5 U/mL, respectively, in the control group. In Group 2, GPx activity decreased to 34±3.2 U/mL in men and 41±4.1 U/mL in women. Compared with the control group, GPx activity decreased by 32.0% in men and by 25.5% in women, and the differences in Group 2 were statistically significant ($p<0.05$).

Gender analysis showed that SOD and GPx activity was slightly higher in women than in men in both groups. A pronounced decrease in antioxidant enzyme activity was observed particularly in Group 2, characterized by organic changes.

Conclusion. A statistically significant decrease in SOD and GPx activity in the organic stage of VAS indicates a reduction in antioxidant defense and increased oxidative stress ($p<0.05$). The preservation of enzyme activity close to control values in Group 1, in contrast to the pronounced decrease observed in Group 2, suggests that alterations in the antioxidant system are associated with the clinical and pathogenetic stage of VAS. The higher levels of SOD and GPx activity observed in women compared with men may indicate gender-related characteristics of antioxidant defense. These findings support the potential use of SOD and GPx as additional biochemical markers for assessing oxidative stress and antioxidant defense status in patients with VAS.

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