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Investigation of Oxidative Stress Index in Radial Angio Patients

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ABSTRACT

Background: The study aims to determine the oxidative stress index in blood plasma in radial coronary angiography patients and compare it with a control group of healthy individuals.

Methods: In our study, which lasted approximately six months, 79 adult samples were collected. The patient group comprised 35 adults, and the control group included 44 healthy adults. As an oxidative stress marker, total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) were accepted. Patient blood samples were taken into tubes with lithium heparin, and plasmas were obtained after centrifugation. Subsequently, the biochemistry laboratory analyzed TAS and TOS in a fully automatic autoanalyzer. The OSI index is; Calculated according to the formula [(TOS/TAS) ×100]. Rel Assay Diagnostics brand kits were used in the study. The statistical significance level was accepted as $p<0.05$.

Results: As a result of descriptive statistics, the mean and standard deviation values of TAS (mmol/L) values in the patient and control groups were calculated as 1.59 (mmol/L) and 1.59 (mmol/L), respectively. TOS values were calculated as 8.95 (mmol/L) and 8.97 (µmol/L), respectively, while OSI values were calculated as 5.81 (Arbitrary Units, AU) and 5.69 (AU). A positive, weak, statistically significant correlation was found between TAS and TOS values ($p=0.029$). There was a negative, strong, and meaningful relationship between TAS and OSI values ($p<0.001$). Found a positive, moderate, significant relationship between TOS and OSI values ($p<0.001$). There was no significant difference between the TAS and TOS values in the patient and control groups. The OSI values of the patient group were higher than the control group, but this was not significant ($p=0.65$).

Conclusion: OSI values in the angiography patient group were higher than in the control group; although it is statistically insignificant, this result is subject to further studies.

Keywords: Total Antioxidant Status; Total Oxidant Status; Oxidative Stress Index; Reactive Nitrogen Species; Hospital Information Management System

Abbreviations: TAS: Total Antioxidant Status; TOS: Total Oxidant Status; OSI: Oxidative Stress Index; RNS: Reactive Nitrogen Species; HIMS: Hospital Information Management System

Introduction

Various metabolic pathways produce reactive oxygen and nitrogen species (ROS and RNS) in normal cells. However, When the oxidant/anti-oxidant balance is disturbed in human metabolism, this situation is associated with various physio-pathological formations. If the balance is disturbed in favour of oxidants, it is possible to detect this situation with OSI (Oxidative Stress Index) as a biochemical parameter. The OSI index was first defined by Erel et al. and is calculated according to the formula [(TOS/TAS) ×100]. In the studies, mmol/L was used as a unit for TAS and TOS. OSI value was calculated according to the Formula method. OSI (Arbitrary Unit)=TOS (mmol H2O2 Equiv./L)/TAS (µmol/L Trolox Equiv./L). Results are expressed as Arbitrary Units (AU).Today, Healthy Individuals is safely performed in a widespread disease group [1-6]. Oxidative stress, on the other hand, is evaluated in a wide range, and its relationship with many diseases is revealed with new research every day. Them; infertility, pre-eclampsia and coronary artery diseases are only a few of them [7-9]. In addition, recent oxidative stress studies have focused on thiol-disulfide balance [10-12]. Despite all these scientific studies, we have yet to conduct a comparative study on oxidative stress in radial angiography patients with OSI index with healthy individuals. Our determined subject has been made as a master's thesis due to its originality. We aim to transfer new information to the literature by comparing the results of the control group with the results of the angiography patient group.

Materials and Methods

Study Population

Research; It was performed in the cardiology radial angiography unit of Sakarya Training and Research Hospital. The patient group consisted of 35 people who underwent radial angiography. The control group consisted of 44 healthy individuals, most of whom were hospital workers (laboratory technicians, nurses, and doctors). In the study, which lasted approximately 6 (six) months, oxidative stress parameters were studied in the plasma of all individuals.

Protocol Study Procedures

It was determined the control group according to the exclusion criteria. These criteria are; documented history of coronary artery disease, presence of disease (liver, kidney), and cerebrovascular attack in the last year, documented severe peripheral artery disease, uncontrolled diabetes and hypertension, clinical hyperthyroidism, erectile dysfunction, and pulmonary hypertension [13]. Since all the individuals in the control group were hospital personnel, their compliance with the criteria was determined by anamnesis and the hospital information management system (HIS).

Biochemical and Hormonal Assays

A sheath was attached to the radial artery during the radial angiography procedure performed on the patient group. Then five cc of intra-arterial blood was taken to be studied. Samples arriving at the laboratory were immediately centrifuged (refrigerated, 1500 g for 10 minutes). Patient plasmas were numbered and stored at 80 in capped Eppendorf tubes (isolab centrifuge tubes 2.0 ml). Control group blood was collected in the laboratory and stored after centrifugation. The samples were re-centrifuged as written in the kit insert. On the study day, blood plasma analyzes were performed in a fully automatic Beckman Coulter brand AU 680 (serial no: 2016024580, Koutou-Ku, Tokyo, Made In Japan) fully automatic autoanalyzer, with pre-application and control sera studied. Afterwards, TAS and TOS values in plasmas will be checked in the AU 680 device. The OSI index was calculated according to the formula [(TOS/TAS) ×100]. Rel Assay Diagnostics brand kit was used in the study. The obtained data were evaluated statistically.

Statistical Analysis

Statistical analysis of the data was done with SPSS 23 package program. Evaluated significance at the $p<0.05$ level. The SAU BAP unit supported this study as a rapid support project (no: 12017-08-06-003), and SAU Medical Faculty approved the ethics committee. They were received from the Ethics Committee (Date: 14.3.2018, No: 71522473/050.01.04/63).

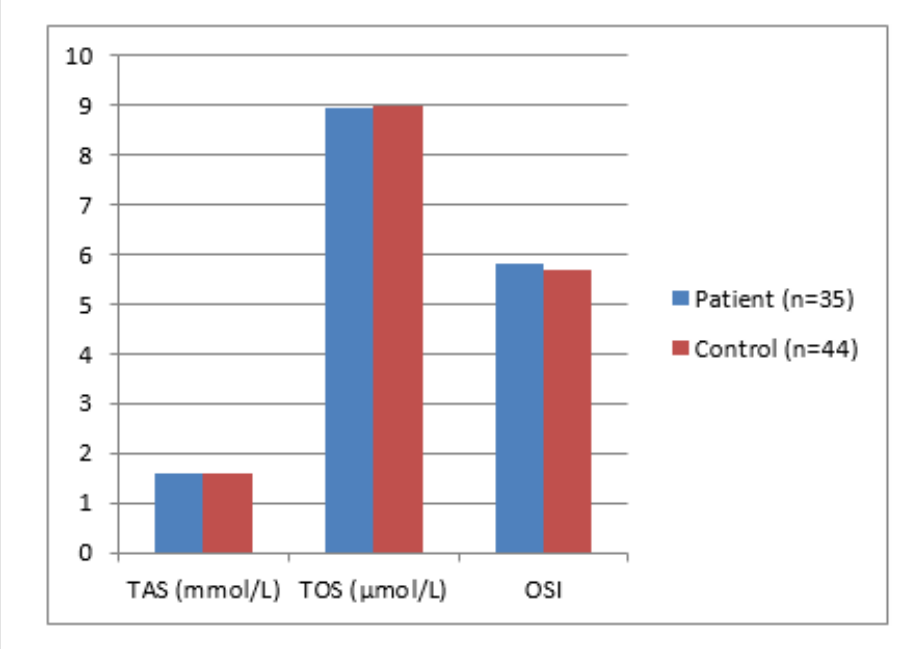
Results

Table 1: Comparison of the values obtained from the patient and control groups.

	Patient (n=35)	Control (n=44)	p
TAS (mmol/L)	1,59 ± 0,30	1,59 ± 0,20	0,93
TOS (µmol/L)	8,95 ± 1,25	8,97 ± 1,18	0,92
OSI (AU)	5,81 ± 1,23	5,69 ± 0,92	0,65

As a result of descriptive statistics, the arithmetic mean and standard deviation values of TAS (mmol/L) values in the patient (n=35) and control groups (n=44) were 1.59 ± 0.30 (mmol/L) and 1.59 ± 0, respectively. It was calculated as 20 (mmol/L). The arithmetic mean and standard deviation of TOS values in the patient and control groups were calculated as 8.95 ± 1.25 (µmol/L) and 8.97 ± 1.18 (µmol/L), respectively. The arithmetic mean and standard deviation of the OSI values in the patient and control groups were calculated as 5.81 ± 1.23 (Arbutrary Units, AU) and 5.69 ± 0.92 (AU), respectively (Table 1, Graph 1). TAS, TOS and OSI values showed normal distribution according to the One-Sample Kolmogorov Smirnov test, which tests normal distribution. In the Pearson correlation analysis, which was used to measure the bilateral relations between TAS, TOS and OSI values, a positive, weak, a statistically significant relationship was found between TAS and TOS values (n=79, r=0.245, p=0.029). A negative, strong, and statistically significant relationship was found

between TAS and OSI values (n=79, r=-0.678, p<0.001). A positive, moderate, statistically significant correlation was found between TOS and OSI values (n=79, r=0.499, p<0.001). According to the T-Test performed between the mean TAS and TOS values of the patient and control groups, no significant difference was found between the TAS values in the patient and control groups. According to the T-Test for OSI values, the OSI values in the patient group (Mean ± Standard Deviation = 5.80 ± 1.23) were higher than the control group values (Mean ± Standard Deviation = 5.69 ± 0.92), but this the difference was not significant.



Graph 1: Arithmetic mean of TAS, TOS and OSI values obtained from patient and control groups.

Discussion

Ateş I et al. were similar to ours in terms of the biochemical parameters they used in their study. They stated that the Osi index might be associated with asymptomatic organ damage. In our study, although the Osi index was higher in the patient group than in the control group, it was not statistically significant [14]. Mai AS, et al. [15] investigated cardiac oxidative stress. In his works, he examined the levels of increased oxidative stress in the cell and proteins in extracellular fluids that have proinflammatory roles. This experimental study showed that moderate exercise induces the cardiac operating system. In addition, also shown in this study that high-intensity training supports the anti-inflammatory profile [15].In our study, oxidative stress was high in the patient group, as expected, but the antioxidant and oxidant levels of the control group were not as predicted. This can be explained by the relationship between exercise and oxidative stress revealed by Mia AS et al. Again, in another study conducted by Kayacan Y, et al. [16] the relationship between physical activity and oxidative stress was shown [16].

In our study, it was decided to conduct a retrospective study of nutrition and smoking, as it was found remarkable that the stone value was not high and the TOS value was not low in the control group. As shown in a study by Hong JY, et al. [17] smoking, which affects lung functions, has a relationship between antioxidant vitamins and nutrition [17]. In our study, oxidative stress was high in the patient group, as expected, but the antioxidant and oxidant levels of the control group were not as predicted. This can be explained by the relationship between exercise and oxidative stress revealed by Mia AS, et al. [15] Again, in another study conducted by Kayacan, Y et al. [16] the relationship between physical activity and oxidative stress was shown [16]. Our study decided to conduct a retrospective study of nutrition and smoking, as it was found remarkable that the stone value was not high and the TOS value was not low in the control group. As shown in a study by Hong JY, et al. [17] smoking, which affects lung functions, has a relationship between antioxidant vitamins and nutrition [17].

Considering the relationship between oxidative stress and body weight, the fact that weight measurements were not made in our study is a negative factor. In their study, Matsumoto M, et al. [18] concluded that «the dermal structure in the thighs of overweight young individuals can be improved to the level of structure in individuals with normal body weight following weight loss» [19]. Chandrasekhar T, et al. showed that inhibiting reactive oxygen species has a protective effect on atherosclerosis and coronary heart disease [20]. In our study, renal angiography patients, all of whom were treated with the suspicion of coronary heart disease, show similarities in patient diversity. The main difference in our study is the determination of the number of oxidative stress markers in the patient's plasma compared to the control group.High oxidative stress is remarkable in patients undergoing angiography due to symptoms of coronary artery disease. On the other hand, Although this result is statistically insignificant, further studies with larger patient populations are needed.

Financial Disclosure

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Conflict of Interest

All authors declare having no conflicts of interest.

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