

Evaluation of oxidative stress tests in patients diagnosed with renal colic in the emergency department of Ankara Atatürk Training and Research Hospital, Turkey

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Abstract

Objective: To investigate oxidative stress changes in renal colic patients, and to determine its role in differential diagnosis of renal colic.

Methods: The cross-sectional study was conducted at Ankara Atatürk Training and Research Hospital, Turkey, from June 2012 to December 2012 and comprised patients with complaints suggesting of renal colic and diagnosed with urinary stone. Healthy individuals were enrolled to form the control group. The patients and the control group were evaluated in terms of oxidative stress parameters. SPSS 17 was used for statistical analysis.

Results: Of the 83 subjects, 50(60%) were patients with renal colic, while 33(40%) were healthy controls. Among the patients, 25(50%) were men and 25(50%) were women. Among the controls, there were 17(51.5%) men and 16(48.5%) women. No statistically significant difference was found between the two groups in terms of age and gender ($p>0.05$). Likewise, no statistically significant difference was found between the oxidative stress indexes of the two groups ($p>0.05$).

Conclusions: There was no significant increase in oxidative stress in patients with renal colic. The result may help in the differential diagnosis of patients with abdominal pain.

Keywords: Oxidative stress, Renal colic. (JPMA 65: 242; 2015)

Introduction

Renal colic due to urinary tract stone is one of the most common reasons for admission to emergency department (ED). The most common cause of renal colic is acute urinary obstruction.^{1,2} Renal colic causes severe pain and it should be treated immediately. Therefore differential diagnosis should be made in a short time in order to exclude other causes of pain.

Urinary tract stones usually originate in the kidneys, and then descend into ureter, bladder and urethra. Direct formation of stones in the lower urinary tract may also occur rarely. The incidence of urinary tract stone disease is reported between 12% and 15% in literature, while in a multi-centre study in Turkey it was reported to be 14.8%.^{3,4} In cases of abdominal pain, treatment modalities may be surgical or non-surgical depending on the severity of the condition. In case of a pain suggesting renal colic, several causes of abdominal pain should be excluded to make a certain diagnosis. Terminating the pain in indecisive cases is controversial and ED doctors usually experience distress, while patient comfort is negatively affected by this condition.

The symptoms induced by urinary stone may resemble the symptoms of many conditions associated with abdomen such as acute appendicitis, peptic ulcer, gallstones with or without occlusion, acute renal artery embolism, abdominal aortic aneurysm, ectopic pregnancy, ovarian cyst torsion, diverticular disease, bowel obstruction, lumbar disc herniation, abdominal tumours, inguinal hernias, epididymitis and orchitis. In such a case, an urgent and complete differential diagnosis is needed.⁵ Clinicians have to evaluate patient's history, physical examination, duration of symptoms and associated conditions, and need laboratory findings to support the differential diagnosis of abdominal pain.

Measuring total antioxidant status (TAS), total oxidant status (TOS) and oxidative stress index (OSI) would be more appropriate in evaluating oxidative stress (OS) because additive interactions of these parameters yield more accurate results than their individual effects. Thus many factors that affect the results due to unclear reasons would be excluded.⁶

There are many studies showing that OS increases in some diseases such as acute appendicitis, abscesses, cancer, polycystic ovary syndrome (PCOS) and so on. The current study was planned to investigate whether OS parameters change in renal colic. We also planned to explain the role of OS in the differential diagnosis of renal colic.

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Patients and Methods

The cross-sectional study was conducted at the ED of Ankara Atatürk Training and Research Hospital, Turkey, from June 2012 to December 2012 and comprised patients who presented themselves with complaints suggestive of renal colic and were diagnosed with urinary stone. Healthy individuals were also enrolled as the control group. Those included as the cases were patients who were admitted to ED with complaints of haematuria and renal colic, describing no decrease in urine output and whose pain completely relieved with medical treatment. The controls were compatible with the patients in terms of age and gender, who had normal blood pressure, no history of smoking and alcohol use, without a history of heart disease or invasive therapy due to heart disease, and no use of any medication within the preceding 15 days.

Patients with Diabetes Mellitus (DM), chronic infection and inflammation (tuberculosis, rheumatoid arthritis, etc.), ischaemic heart disease, congestive heart failure, acute abdominal pain and patients using antihypertensive drugs were excluded. All the subjects were informed about the scope of the study and written informed consent was

Results

Of the 83 subjects, 50(60%) were patients with renal colic, while 33(40%) were healthy controls. Among the patients, 25(50%) were men and 25(50%) were women. Among the controls, there were 17(51.5%) men and 16(48.5%) women. In the patients group, 32(64%) were in the 20-40 years age group and 18(36%) in the 40-60 bracket. The corresponding numbers among the controls were 22(66.7%) and 11(33.3%). No statistically significant difference was found between the two groups in terms of age and gender ($p>0.05$).

The mean value of TAS was $2.4300\pm 0.29847\mu\text{mol Trolox equivalent/L}$ in the patients group and $2.4606\pm 0.29889\mu\text{mol Trolox equivalent/L}$ in the control group ($p>0.05$).

The mean value of TOS was $1.2110\pm 1.5178\mu\text{mol H}_2\text{O}_2\text{ equivalent/L}$ in the patients group and $1.4573\pm 1.24177\mu\text{mol H}_2\text{O}_2\text{ equivalent/L}$ in the control group ($p>0.05$).

The mean value of OSI was 0.4818 ± 0.60870 OSI arbitrary unit in the patients group and 0.5988 ± 0.52079 arbitrary unit in the control group ($p>0.05$).

Comparison of TAS, TOS and OSI Mean Rank and Sum of

Table-1: Comparison of TAS, TOS and OSI Mean Rank and Sum of Ranks and U values between patient and control groups.

	Grups	n	MeanRank	Sum of Ranks	U	P value
TAS ($\mu\text{mol Trolox equivalent/L}$)	RenalColic	50	40.87	2043.50	768.5	0.597
	Control	33	43.71	1442.50		
TOS ($\mu\text{mol H}_2\text{O}_2\text{ equivalent/L}$)	RenalColic	50	39.98	1999.00	724.0	0.341
	Control	33	45.06	1487.00		
OSI (arbitraryunit)	RenalColic	50	39.58	1979.00	704.0	0.259
	Control	33	45.67	1507.00		

TAS: Total Antioxidant Status

TOS: Total Oxidant Status

OSI: Oxidative Stress Index.

obtained.

The patients and the controls were evaluated in terms of OS parameters. Blood samples of all the subjects were collected through antecubital veins, centrifuged at 3000rpm for 15 minutes at room temperature and transferred properly for cold chain. The centrifuged serum and erythrocytes were stored at -80°C in order to be analysed for OS parameters, and routine biochemical tests were performed at the institution's Central Laboratory.

TAS, TOS and OSI were measured using the standard protocols.⁷⁻¹⁰ Data were analysed using SPSS 17. Chi-square test was used to compare the percentages. Mann-Whitney U test was used to compare the averages of measurements of the two groups. $P<0.05$ was considered statistically significant.

Ranks and U values between the two groups were also calculated (Table).

Discussion

The study found no significant difference between the two groups in terms of mean values of TAS, TOS and OSI. The studies investigating any relationship between renal colic and OS often create ureteral stenosis experimentally in animals and measures OS parameters in certain periods of time. One study created a unilateral ureteral obstruction in rats, and reported a significant increase in concentration of malonyldialdehyde (MDA), an oxidant, when compared with the control group.¹¹

Researchers observed that when they created full renal ischaemia and left it for reperfusion, OS decreased after a

certain time. One such study created left kidney ischaemia (30, 60, 90 min) and reperfusion (2, 24, 72, 120 hours) at different times. It reported significant decrease in levels of superoxide dismutase, catalase and glutathione peroxidase and an increase in levels of lipid peroxidation in the 60min ischaemia-24h reperfusion group.¹² Given this information, a certain time is needed for the formation of OS. In our study the lack of OS may be explained to be due to lack of full obstruction and sufficient time. We think that patients with renal colic present to ED as early as possible because of the severe pain and, therefore, the time necessary for OS to occur doesn't pass. We suggest that OS parameters should be taken into account in differential diagnosis of renal colic.

In a study investigating the relation with abdominal pain and OS parameters, TAS and MDA levels were examined pre-operatively in blood samples of 51 appendectomy patients. It reported no significant difference between the groups in MDA levels, whereas plasma TAS values were significantly lower in perforated and gangrenous appendicitis group.¹³ Another study examined OS in patients with diagnosis of appendicitis and reported that TAS values were significantly decreased, and TOS and OSI values were significantly increased.¹⁴

The majority of studies reveal that OS increases in cases of acute appendicitis. In our study, the lack of increase in OS is an important indicator for differentiation of acute appendicitis and renal colic in right lower quadrant pain.

One study comprising 81 patients with colorectal cancer found that severe OS was associated with colorectal carcinogenesis, and progression of oxidative-antioxidative disorders was followed by progression of colorectal cancer.¹⁵ Another study evaluated MDA and total antioxidant levels of 128 patients with acute abdominal pain and found a correlation between the severity of abdominal pain and OS.¹⁶ Given that release of oxidants by cancer cells cause severe abdominal pain, and in the light of our findings, it may also play an important role in the differential diagnosis of acute abdominal pain.

Gynaecological diseases also lead to difficulties in differential diagnosis in emergency services. One study showed that MDA levels were higher in women with PCOS.¹⁷ In addition, it is suggested that many other known causes of infertility, such as endometriosis, unexplained infertility, hydrosalpinx and recurrent pregnancy loss, may be associated with OS.¹⁸ As can be seen, many causes of abdominal pain may increase OS. In

our study with renal colic, observation of no increase in OS tests emerges as an important factor in differentiation.

Conclusion

In patients with renal colic, OS tests within the normal range may facilitate differential diagnosis of abdominal pain. It is suggested that OS tests could be used as supplementary tests in the evaluation of renal colic patients when there is doubt about diagnosis with clinical signs.

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