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Research Article

Demographic and Clinical Characteristics of Rhabdomyolysis in Emergency Service: A Prospective Clinical Research

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Abstract

Objective: Rhabdomyolysis is a life-threatening syndrome caused by extracellular release of skeletal cell content in which various traumatic or non-traumatic causes may take part.

The aim of this study is to show the frequency of adult patients that who admitted to the emergency room for various reasons and were diagnosed with rhabdomyolysis, the etiological and demographic factors, and the risk factors related to acute renal failure in these patients.

Materials and Methods: Patients over 18 years old, who had presented to the emergency service within a period of 6 months, were included in the study. Patients with a serum level of creatine phosphokinase higher than five times than normal were regarded as individuals with rhabdomyolysis. The demographic, etiological, clinical characteristics thereof were recorded; the risk factors for acute renal failure therein were attempted.

Results: Sixty-five patients were included in the study of which 45 were men and 20 were women. The most common factor was over-exercise; the most common symptoms were fatigue and muscle pain. An acute renal failure was found in 12.3% of patients.

Conclusion: The etiological factors of rhabdomyolysis vary, such as muscle over-activity, injection, infection, dehydration, trauma, medicine. The male gender and muscle over-activity are critical factors for rhabdomyolysis. Patients with rhabdomyolysis caused by dehydration also showed ARF.

Keywords: Rhabdomyolysis; Emergency service; Creatine kinase; Acute renal failure

Abbreviations

ARF: Acute Renal Failure; CK: Creatine Kinase Levels; MOF: Multiple Organ Failure; OAD: Oral Anti-Diabetics

Introduction

Rhabdomyolysis is a clinical and laboratory syndrome in which skeletal muscle cell injuries with various reasons lead to inclusion of intracellular contents in the circulation. Alcohol, medical treatments, muscle diseases, trauma, seizures, infection and severe physical activities are generally the most frequently encountered causes in adults. In most patients, multiple factors are in effect [1,2].

Rhabdomyolysis is the common symptoms are varied; myalgia, fatigue, dark-colored urine, nausea, vomiting and abdominal paid can be seen [1-3]. The clinical course of rhabdomyolysis may exhibit a wide distribution among clinical indications such as increased levels of asymptomatic liver enzymes, Acute Renal Failure (ARF), life-threatening electrolyte imbalance and multiple organ failure. Therefore, the early diagnosis and treatment are crucial [2,3].

Publications and case reports regarding rhabdomyolysis associated with toxic causes or secondary to crush syndrome is available in the literature, but general rhabdomyolysis data about adult patients presenting to emergency room and having a rhabdomyolysis diagnosis is insufficient [4-6].

In this study, we intended to determine the demographic and clinical characteristics, ARF frequency and risk factors of adult patients who had been diagnosed with rhabdomyolysis and presented to the Emergency Room (ER) with a compliant of trauma, extreme fatigue-weakness, myalgia, infection, dehydration and/or urine volume and color change.

Materials and Methods

Study design and data collection

This study was performed prospectively, observational study in emergency service of Goztepe Training and Research Hospital (Istanbul, Turkey) tertiary referral center of the Medeniyet University within six months (July 2012 to January 2013). Number of the total population presented to the ER is approximately 190.000 in a year. The diagnosis of rhabdomyolysis in adult emergency services older than 18 years old patients were included in the study. Patients under 18 years old were not included in the study, since they are not evaluated in adult emergency services. We excluded patients with an

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acute coronary syndrome, cerebral vascular infarction, myopathy, muscle metabolic defect and patients on chronic dialysis.

The diagnosis of rhabdomyolysis was made via measurements of serum Creatine Kinase levels (CK). Patients with a 5-fold increased (above 850 IU/L) (normal range: 0-170 IU/L) serum creatine kinase level were regarded as individuals with rhabdomyolysis [2,3,7-9]. The diagnosis of Acute Renal Failure (ARF) was defined using the RIFLE criteria with a minimum of 50% increase over baseline creatinine value. The acronym RIFLE stands for the increasing severity classes, Risk (R): 1, Injury (I): 2, and Failure (F), and the two outcome classes, Loss (L) and End-stage kidney disease (E) [10].

The gender, age and presenting symptoms of patients, the etiological factors, the serum potassium, urea and creatine levels, the observation periods, the treatments, and the situations of patients after emergency room examination were recorded in a forms with emergency doctors during the first presentation. And samples were collected from patients after admission to ER. The risk factors for rhabdomyolysis as muscle over-activity, trauma, dehydration, infection, alcohol, seizures were questioned and recorded. Patients who diagnosed with rhabdomyolysis followed by emergency doctors in ER and who diagnosed with ARF admitted to internal medicine service.

Statistical analysis

For statistical analysis, SPSS (Statistical Package for Social Sciences) 17.0 for Windows was used. The descriptive statistical methods (mean, standard deviation, frequency, percentage) were used during evaluation of study data and Chi-square used for categorical data.

CK level is not normally distributed so Wilcoxon test used for analysis and Logistic regression analysis used for factors that may cause rhabdomyolysis in this study.

Results were considered to be statistically significant if p-value was less than 0.05 (95% confidence interval was used).

Ethics statement

The ethics approval for this study was gained from the Research Review Commission of Goztepe Training and Research Hospital (with no. 24/B, dated 20.07.2012).

Results

A total of 65 patients between 18 and 92 years old was included in the study, of which 20 (30.8%) were women and 45 (69.2%) were men. Rhabdomyolysis incidence was found as 0.052%.

The mean age of patients was 46.22 ± 2.09 years (Min/Max: 18/92).

The distribution of patients based on etiological causes is shown in Table 1.

There were significant associations between muscle over-activity and CK level (p: 0, 0051).

The distribution of patients based on presenting symptoms is shown in Table 2.

Log-regression analysis performed to study, DM and age were significant correlation with rhabdomyolysis (respectively; p: 0,026 and p: 0,027).

Table 1: Distribution according to etiological causes.

Etiological Causes	N (%)
Muscle over-activity	15 (23.1%)
Injection	14 (21.5%)
Infection	11 (16.9%)
Dehydration	8 (12.3%)
Trauma	6 (9.2%)
Medicine	5 (7.7%)
Seizure	3 (4.6%)
Alcohol	1 (1.5%)
Multiple organ failure	1 (1.5%)
Unknown	1 (1.5%)
Total	65 (100%)

Table 2: Distribution according to presenting symptoms.

Presenting Symptoms	N (%)
Muscle pain + weakness	31 (47.7%)
Fever	7 (10.8%)
Flank pain	4 (6.2%)
Diarrhea	4 (6.2%)
Abdominal pain	3 (4.6%)
Sore throat	3 (4.6%)
Urine color change + dysuria	3 (4.6%)
Seizure	2 (3.1%)
Headache	2 (3.1%)
Changes in consciousness	2 (3.1%)
Trauma	1 (1.5%)
Lumbar pain	1 (1.5%)
Suprapubic pain	1 (1.5%)
Poor oral intake	1 (1.5%)
Total	65 (100)

A urine color change was seen in 3 (4.6%) patients. Physical examination was normal in 46 (70.8%) patients.

An acute renal failure was found in 12.3% of patients.

The women-to-men ratio and mean age of 8 patients (12.3%) with ARF diagnosis were 1/7 and 61.87 (Min: 26, Max: 78), respectively. The etiological causes for patients with ARF secondary to rhabdomyolysis were as follows according to frequency order: dehydration (n=4), trauma (n=1), multiple organ failure (n=1), infection (n=1) and injection (n=1). There were significant correlations between CK level and ARF (Min: 850 IU/L, max: 54500IU/L, median: 1571IU/L, p: 0, 0078) when performed Wilcoxon test.

Forty-three (66.2%) of all patients were free from any additional disease. The distribution of patients based on additional disease was shown in Table 3.

Forty-nine patients (75.38%) were discharged from the emergency

Table 3: Distribution according to additional disease.

Additional Disease	N (%)
No additional disease	43 (66.2 %)
Diabetes mellitus + hypertension + congestive heart disease	8(12.3%)
Hypertension	7 (10.8 %)
Diabetes mellitus	4 (6.2%)
Epilepsy	1 (1.5%)
Familial Mediterranean fever	1 (1.5%)
Chronic kidney disease	1 (1.5%)
Total	65

service, and 16 patients (24.61%) were hospitalized for observation. One of the hospitalized patients was taken into intensive care unit due to diagnosis of Multiple Organ Failure (MOF). This patient died in intensive care unit because of severe acidosis. One patient was taken to hemodialysis. Other 14 patients were discharged after treatment.

Discussion

Rhabdomyolysis is a clinical and laboratory syndrome in which skeletal muscle cell injuries lead to inclusion of intracellular contents in the circulation. Although the classical clinical presentation of rhabdomyolysis generally include myalgia, fatigue, dark-colored urine associated with myoglobinuria, and increased serum levels of muscle enzymes such as Creatine Kinase (CK), the clinical features may vary from increased asymptomatic muscle enzyme to ARF and MOF [1,2,7].

The literature data on general rhabdomyolysis incidence (traumatic or non-traumatic) is few. In a retrospective study, the incidence of rhabdomyolysis was reported as 0.06% [5]. The observed incidence of 0.052% in our study is compatible with the previous data [5].

In a study carried out by Melli et al., of the 475 patients with rhabdomyolysis 151 were women and 475 were men and the mean age was 47 [8]. In accordance with literature our study 31% were women and 69% were men. Mean age was 46.22 ± 2.09 years [8]. According to our view, the underlying reason for the high rate of men with rhabdomyolysis compared to that of women is muscle over-activity.

Rhabdomyolysis can occur as a result of trauma, medicine and toxins, infection, electrolyte abnormalities, hypoxia, hyperthermia, alcohol, exercise and/or seizure [1-3,7,9]. In the literature data obtained from USA, the major causes of rhabdomyolysis in patients presenting to emergency services and being diagnosed with rhabdomyolysis were reported as cocaine, exercise and immobilization, and seizure [3]. In our study, the most common etiological factor was muscle over-activity, but no case related to substance-use was recorded.

The drug-related rhabdomyolysis frequency was found as 7.7% was recorded 11% in literature [8]. The rhabdomyolysis causing drugs were determined as antidepressants, statins, Oral Anti-Diabetics (OAD) and anti-hypertensive medicines in our study compatible with literature [2,3].

The classical presenting symptoms are reported as muscle pain, muscle weakness and dark-colored urine [1-3,7]. However, in over half of the patients, the presenting symptoms may not include weakness or muscle pain [2,3]. When we had looked into the presenting symptoms of patients in our study, we found that though the most common presenting symptoms were muscle pain and weakness (47.7%), only 4.6% of all patients suffered from urine color change. These data are similar to that of Chen et al. who reported urine color change as 5.6% [6].

The measurement of CK and measurement of serum myoglobin level may be useful for the diagnosis. The CK measurement is more sensitive for rhabdomyolysis diagnosis compared to the myoglobin measurement [2,7,9]. CK is a perfect marker for rhabdomyolysis, because it is an easily measurable content that can be measured in serum immediately after any muscle injury, and the half-life of 1.5 days also. is not cleared from serum as fast as myoglobin. In general, CK exhibits peak 24-36 hours after a muscle injury, and shows an approximately 39% decrease at last day compared to peak [2,7]. In an ongoing increased level of CK, an ongoing muscle injury or compartment syndrome should be taken into consideration. An increase of 5-folds or more in CK level compared to normal value is diagnostic for rhabdomyolysis [2,3,7]. In literature, the high levels of CK, especially levels over 16,000 U/L, were reported to be associated with ARF [2]. Brown et al. have stated that CK levels over 5000 U/L in trauma patients are indicative of increased risk for ARF [3]. In our study, serum or urine myoglobin levels could not be measured. In urine test, patients showing positive for hemoglobin and negative for erythrocyte were reevaluated with respect to myoglobinuria, and the diagnosis was made based on CK values. The highest CK value found in our study was 32,442 U/L. This patient had presented with symptoms of extreme weakness and decreased urinary volume, and declared a trauma history. The patient was diagnosed with ARF and rhabdomyolysis secondary to trauma, and taken to hemodialysis. The treatment was continued with hydration and bicarbonate. When a recovery in general health condition thereof was observed in terms of laboratory and clinical findings, the patient was discharged with an appointment of polyclinic check for 12 days later. CK value of 2 of 8 patients with a ARF diagnosis was over 5000 U/L (25%), and the etiology of one of these two patients was trauma. Hemodialysis was not needed except for one patient. ARF occurrence secondary to rhabdomyolysis was found as 12.3% in our study, while it had been reported with wide ranges such as 5-15% or 10-50% in previous studies [7,8,11]. Rhabdomyolysis and ARF occurrence were more common among men compared to women in our study. The most common etiological factor in patients with a rhabdomyolysis diagnosis was muscle over-activity, e.g. sports activity, carrying heavy loads etc.

A number of complications such as hypovolemia, compartment syndrome, and electrolyte abnormalities, ARF or MOF may be observed in patients with rhabdomyolysis. Therefore, the early diagnosis and treatment are crucial. The early treatment has been reported to be able to decrease the incidence of ARF [2,3,7,9]. The treatment of rhabdomyolysis includes initial stabilization, resuscitation and to prevent development of acute renal failure. At the beginning of treatment, a normal saline infusion of 1-1.5 L/hour is given so as to have an hourly urinary excretion of 200-300 ml. It is important to monitor vital findings, urinary output, electrolytes. If acute renal failure establishes, the patient requires hemodialysis [7].

In our study, hydration was administered to patients with a rhabdomyolysis diagnosis within the scope of treatment. Hemodialysis was required for only one case (1.53%). Forty-nine (75.38%) of all patients were discharged from the emergency service. The hospitalization was needed for 16 patients (24.61%) to be able to monitor them. One of these patients died due MOF, while other patients were discharged upon recovery as a result of medical treatment. The prognosis was good with early diagnosis and treatment.

Study Limitation

In this study, serum or urine myoglobin levels could not be measured; the diagnosis was made based on CK values. The sample size was limited.

Conclusion

The etiological factors of rhabdomyolysis vary, such as muscle over-activity, injection, infection, dehydration, trauma, medicine. The male gender and muscle over-activity are critical factors for rhabdomyolysis. Patients with rhabdomyolysis caused by dehydration also showed ARF.

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