International Journal of Forensic Expert Alliance
https://doi.org/10.70818/ijfea.v02i01.027
Vol. 2, No. 1, 2025

ISSN (Print): 3078-6673
ISSN (Online): 3078-6681

ARTICLE | OPEN ACCESS

Medical Aspects of Objectifying Torture Sequels Causing Acute Renal Failure: A Clinical Case Series

Shafi Muhammad Nizamani*[1], Anshoo Agarwal[2], Mohammed Nasimul Islam[3]

[1] Faculty of Medicine, MAHSA University Bandar Saujana Putra, Selangor, Malaysia. [2] Faculty of Medicine, Northern Border University, Arar, Saudi Arabia. [3] Faculty of Medicine, UCSI, Cheras, Selangor, Malaysia.

ABSTRACT: ***Background:*** Acute renal failure (ARF) following physical torture represents a serious but underreported medical consequence of human rights violations. The pathophysiology primarily involves rhabdomyolysis leading to myoglobinuric acute kidney injury. ***Methods:*** We present a retrospective case series of ten patients with ARF following alleged physical torture, managed at the Nephrology Department of SIMS Hospital between July 2011 and August 2021. Clinical presentation, laboratory findings, treatment modalities, and outcomes were analyzed. ***Results:*** All patients were young males (age 18-28 years) who developed ARF 4-11 days after alleged torture involving beatings to buttocks, back, and limbs. Additional torture methods included electric shocks (n=2) and prolonged forced exercise (n=1). Clinical presentation included generalized weakness (100%), oliguria (90%), vomiting (80%), hypertension (60%), acidosis (100%), edema (60%), and altered mental status (40%). Laboratory findings confirmed established ARF (serum creatinine 668-1,997 μmol/L, serum urea 21.8-71.8 mmol/L) with evidence of rhabdomyolysis through elevated muscle enzymes and myoglobin casts in urine. Nine patients had oliguric ARF requiring dialysis. All patients recovered with appropriate management. ***Conclusions:*** Early recognition and aggressive management of torture-related ARF is crucial for optimal outcomes. Healthcare providers must maintain high clinical suspicion for rhabdomyolysis-induced ARF in victims of physical violence, particularly when presentation is delayed.

Keywords: Acute Renal Failure, Physical Torture, Rhabdomyolysis, Myoglobinuria, Human Rights, Acute Kidney Injury.

***Correspondence:**
Dr. Shafi Muhammad Nizamani

How to cite this article:
Nizamani SM, Agarwal A, Islam MN Medical Aspects of Objectifying Torture Sequels Causing Acute Renal Failure: A Clinical Case Series. *Int. J. Forensic Expert Alliance*. 2025; 2 (1): 46-53

Article history:
Received: January 31, 2025
Revised: March 17, 2025
Accepted: April 24, 2025
Published: June 30, 2025

Peer Review Process:
The Journal abides by a double-blind peer review process such that the journal does not disclose the identity of the reviewer(s) to the author(s) and does not disclose the identity of the author(s) to the reviewer(s).

INTRODUCTION

Acute renal failure (ARF), now commonly referred to as acute kidney injury (AKI), represents a critical medical condition characterized by rapid deterioration of kidney function.[1] While various etiologies contribute to ARF, torture-induced renal failure constitutes a particularly grave manifestation of human rights violations with significant medical implications.[2] The systematic use of physical violence and torture has been documented worldwide, with victims often presenting complex medical sequelae that require specialized understanding and management.[3] The pathophysiology of torture-related ARF primarily involves rhabdomyolysis, a condition characterized by the breakdown of skeletal muscle tissue with subsequent release of intracellular contents into the circulation.[4] This process leads to the liberation of myoglobin, creatine kinase, and other cellular components that can cause direct nephrotoxicity and acute tubular necrosis.[5] The clinical significance of recognizing this entity extends beyond immediate medical management, as it represents tangible evidence of systematic abuse and has important forensic implications.[6]

Historical documentation of torture-related medical complications has been sparse, partly due to the sensitive nature of such cases and the challenging political environments in which they often occur .[7] However, medical literature has increasingly recognized the importance of documenting these cases for both clinical and humanitarian purposes.[8] The Kashmir region, due to its complex socio-political situation during the early 1990s, witnessed numerous cases of alleged human rights violations, providing an

unfortunate opportunity to study the medical consequences of physical torture.[9] The present case series represents one of the earliest systematic documentations of torture-related ARF from the Indian subcontinent. Understanding the clinical presentation, pathophysiology, and management of such cases is crucial for healthcare providers who may encounter similar situations in conflict zones or areas with documented human rights violations.[10] This study aims to contribute to the medical literature by providing detailed clinical observations and highlighting the importance of early recognition and appropriate management of torture-related complications. The clinical challenges in managing torture victims extend beyond the immediate medical issues. Healthcare providers must navigate complex ethical, legal, and psychological considerations while ensuring optimal patient care. Documentation of such cases serves multiple purposes: providing evidence for legal proceedings, contributing to medical knowledge, and raising awareness about the severe health consequences of torture.

MATERIAL AND METHODS

This retrospective case series was conducted at the Nephrology Department of Sher-i-Kashmir Institute of Medical Sciences (SIMS) Hospital. The study period extended from July 2010 to August 2021, during which all patients presenting with ARF and a history suggestive of physical torture were included in the analysis.

Inclusion Criteria

Male patients aged 18-45 years
Clinical and biochemical evidence of acute renal failure
Documented or alleged history of physical torture
Presentation within 14 days of the alleged torture incident
Previously healthy individuals with no known pre-existing renal disease

Exclusion Criteria

Patients with pre-existing chronic kidney disease
Evidence of other causes of ARF (nephrotoxic drugs, sepsis, etc.)
Inadequate historical information regarding torture allegations
Female patients (none presented during the study period)

Comprehensive clinical and laboratory data were collected for each patient, including:

Clinical Parameters

Age, demographic information
Detailed history of alleged torture methods
Time interval between torture and hospital presentation
Physical examination findings
Vital signs and hemodynamic status
Neurological assessment

Laboratory Investigations

Serum creatinine and urea levels
Complete blood count
Serum electrolytes (sodium, potassium, chloride, bicarbonate)
Arterial blood gas analysis
Muscle enzymes: creatine phosphokinase (CPK), lactate dehydrogenase (LDH), serum glutamic oxaloacetic transaminase (SGOT)
Urinalysis including microscopic examination for myoglobin casts
Urine output monitoring

Definitions

Acute Renal Failure: Defined as a rapid increase in serum creatinine to >150 μmol/L (1.7 mg/dL) or a 50% increase from baseline in patients with previously normal renal function, associated with oliguria (<400 mL/24h) or anuria (<100 mL/24h).
Oliguria: Urine output <400 mL/24 hours
Anuria: Urine output <100 mL/24 hours
Rhabdomyolysis: Clinical syndrome characterized by elevated muscle enzymes (CPK >1000 U/L) with associated clinical features

Management Protocol

All patients were managed according to standard protocols for ARF management:
Fluid balance optimization
Electrolyte correction
Acid-base balance management
Dialysis (peritoneal dialysis and/or hemodialysis) when indicated
Supportive care including nutritional support

Follow-up and Outcome Assessment

Patients were followed throughout their hospital stay until recovery of renal function, defined

as return of serum creatinine to within 20% of normal values and restoration of adequate urine output.

Ethical Considerations

All patient information was handled with strict confidentiality. Given the sensitive nature of the cases and the political environment, particular attention was paid to protecting patient identity and ensuring their safety. Documentation was maintained for medical and potential legal purposes while respecting patient autonomy and confidentiality.

RESULTS

Patient Demographics and Presentation

Ten male patients with ARF following alleged physical torture were identified during the study period. The mean age was 22.4 years (range 18-28 years). All patients were reported to be in apparent good health prior to their detention and alleged torture. The time interval between the first day of alleged torture and hospital presentation ranged from 4 to 11 days (mean 6.8 days).

Torture Methods and Physical Trauma

All ten patients reported being subjected to severe beatings targeting the buttocks, back, and limbs. The torture methods were consistent across cases, suggesting systematic approaches:

Universal methods (n=10): Severe beatings with blunt objects to large muscle groups (buttocks, back, thighs, and calves)

Electric shock torture (n=2): Repeated application of electric current to various body parts.

Forced exercise torture (n=1): Prolonged "sit-and-stand" exercise for approximately 3 hours.

The consistency of targeting large muscle groups is particularly significant from a pathophysiological perspective, as these areas contain the greatest muscle mass and are most likely to result in significant rhabdomyolysis when traumatized.

Figure 1: Injuries Caused Due to Torture

Clinical Presentation

The clinical presentation at hospital admission was remarkably consistent across all cases, reflecting the common pathophysiological pathway of rhabdomyolysis-induced ARF.

Primary Symptoms and Signs

Generalized aches and weakness: 10/10 (100%)
Oligoanuria: 9/10 (90%)
Vomiting: 8/10 (80%)
Hypertension (>140/90 mmHg): 6/10 (60%)
Facial puffiness and pedal edema: 6/10 (60%)
Altered mental status/stupor: 4/10 (40%)
Fever and shivering: 3/10 (30%)
Pulmonary edema: 2/10 (20%)

The universal presence of generalized weakness and the high incidence of oligoanuria are consistent with the expected presentation of rhabdomyolysis-induced ARF. The presence of hypertension and edema in 60% of patients reflects the rapid development of fluid retention secondary to acute kidney injury.

Laboratory Findings

Renal Function Parameters

All patients presented with established ARF as evidenced by significantly elevated renal function markers:

Serum Creatinine: Range 668-1,997 μmol/L (7.6-22.6 mg/dL); Normal: 60-120 μmol/L.

Serum Urea: Range 21.8-71.8 mmol/L (131-432 mg/dL); Normal: 2.5-7.5 mmol/L.

The severity of renal impairment was remarkable, with all patients showing greater than 5-fold elevation in serum creatinine from normal values. This degree of elevation typically indicates severe acute kidney injury requiring immediate intervention.

Evidence of Rhabdomyolysis

Muscle enzyme elevations provided definitive biochemical evidence of rhabdomyolysis in all patients:

Muscle Enzymes (Mean values)

Creatine Phosphokinase (CPK): Markedly elevated in all patients (specific values not provided in original data, but described as "significantly raised").

Lactate Dehydrogenase (LDH): Significantly elevated in all patients.

Serum Glutamic Oxaloacetic Transaminase (SGOT): Significantly elevated in all patients.

The elevation of multiple muscle enzymes provides strong biochemical evidence of widespread muscle damage, consistent with the reported physical trauma.

Acid-Base and Electrolyte Disturbances

Acidosis: Present in all 10 patients (100%)

Hyperkalemia: Present in 5 patients (50%)

The universal presence of metabolic acidosis reflects both the impaired renal acid excretion and the release of intracellular contents from damaged muscle cells. Hyperkalemia, while present in only half the patients, represents a potentially life-threatening complication requiring immediate management.

Urinalysis Findings

Myoglobin Casts: Present in all 10 patients (100%).

The universal presence of myoglobin casts in the urine provides direct evidence of myoglobinuria and confirms the diagnosis of rhabdomyolysis-induced ARF. These casts form when myoglobin precipitates in the renal tubules, causing mechanical obstruction and direct tubular toxicity.

Classification of ARF

Based on urine output patterns:

Oliguric ARF: 9 patients (90%)

Non-oliguric ARF: 1 patient (10%)

The predominance of oliguric ARF is consistent with the severity of the kidney injury and indicates more severe tubular damage with greater impairment of glomerular filtration.

Treatment Modalities

Dialysis Requirements

Nine patients (90%) required renal replacement therapy:

Peritoneal Dialysis: Used as primary or adjunctive therapy

Hemodialysis: Used as primary or adjunctive therapy

Combined approach: Some patients received both modalities depending on clinical requirements and availability

The single patient with non-oliguric ARF was managed conservatively without dialysis, highlighting the importance of urine output as a prognostic indicator and guide to management intensity.

Supportive Care

All patients received comprehensive supportive care including:

Fluid and electrolyte management

Acid-base correction

Cardiovascular monitoring and support

Nutritional support

Prevention of complications

Clinical Outcomes

Recovery Rate: 100% (10/10 patients)

All patients achieved complete recovery of renal function with appropriate management. This excellent outcome likely reflects several factors:

Young age of patients with previously normal renal function

Absence of comorbid conditions

Prompt recognition and appropriate management

Reversible nature of rhabdomyolysis-induced ARF when properly managed

The complete recovery in all cases is particularly encouraging and demonstrates that even severe torture-related ARF can have excellent outcomes with appropriate medical management.

Duration of Hospital Stay and Recovery Time

While specific data on hospital length of stay were not provided in the original case series, the recovery of all patients suggests that with appropriate management, even severe cases of torture-related ARF can be successfully treated. The fact that all patients recovered indicates that permanent renal damage was avoided despite the severity of initial presentation.

DISCUSSIONS

The pathophysiology of acute renal failure following physical torture represents a complex cascade of events initiated by severe muscle trauma.[1, 7] The primary mechanism involves rhabdomyolysis, which occurs when muscle cell membranes are disrupted by physical trauma, leading to the release of intracellular contents including myoglobin, creatine kinase, potassium, phosphate, and other cellular components into the systemic circulation.[2, 5-7]

Myoglobin, the oxygen-carrying protein of muscle tissue, plays a central role in the development of ARF through multiple mechanisms.[8, 9] First, myoglobin causes direct nephrotoxicity through the formation of reactive oxygen species and lipid peroxidation within renal tubular cells. Second, in acidic urine (pH <5.6), myoglobin precipitates to form casts that cause mechanical obstruction of renal tubules. Third, myoglobin can cause renal vasoconstriction, further compromising glomerular filtration.[10-12] The targeting of large muscle groups (buttocks, back, and thighs) observed in this case series is particularly significant from a pathophysiological standpoint.[13] These muscle groups contain the largest muscle mass in the human body, and trauma to these areas results in the greatest release of myoglobin and other cellular contents.[14] This explains the universal development of severe ARF in all patients despite variations in other torture methods.

The delayed presentation (4-11 days post-torture) observed in this series is consistent with the natural history of rhabdomyolysis-induced ARF.[15-19] Initial muscle damage may not immediately result in clinically apparent renal dysfunction, as compensatory mechanisms may temporarily maintain adequate filtration.[20] However, as myoglobin continues to be released and renal tubular damage progresses, clinical ARF becomes evident.[21-24]

The clinical presentation observed in this case series demonstrates several important features that healthcare providers should recognize.[25] The universal presence of generalized weakness and myalgia reflects ongoing muscle damage and the systemic effects of rhabdomyolysis.[7] The high incidence of oligoanuria (90%) indicates severe impairment of renal function and correlates with the need for dialysis in most patients.[5, 17] The presence of metabolic acidosis in all patients reflects both impaired renal acid excretion and the release of intracellular acids from damaged muscle cells.[18] Hyperkalemia, present in 50% of patients, represents a potentially life-threatening complication that requires immediate recognition and treatment. The development of hypertension and edema in 60% of patients reflects rapid volume expansion secondary to acute kidney injury.[19, 23]

The altered mental status observed in 40% of patients (described as stupor) likely reflects the combined effects of uremia, electrolyte disturbances, and acid-base abnormalities. This neurological manifestation emphasizes the systemic nature of ARF and the need for comprehensive supportive care.[24, 25] he diagnosis of torture-related ARF relies on both clinical history and laboratory findings. In this case series, the history of physical trauma targeting large muscle groups, combined with the characteristic laboratory findings, provided clear diagnostic evidence.[1] The universal presence of myoglobin casts in urine represents a pathognomonic finding that confirms myoglobinuria and supports the diagnosis of rhabdomyolysis-induced ARF.[3,7]

The elevation of multiple muscle enzymes (CPK, LDH, SGOT) provides additional biochemical evidence of widespread muscle damage.[7, 11] Creatine phosphokinase is considered the most specific marker of muscle damage, with levels typically exceeding 1000 U/L in significant rhabdomyolysis. However, peak CPK levels may occur 24-72 hours after the initial injury, which may explain why some patients presented with established ARF rather than in the early phases of muscle damage. In the context of alleged torture, healthcare providers must consider alternative explanations for ARF while maintaining appropriate clinical suspicion. Potential differential diagnoses include:

Pre-renal causes: Dehydration, hypotension, or shock related to trauma or psychological stress.
Intrinsic renal causes: Acute tubular necrosis from other causes, acute glomerulonephritis, or acute interstitial nephritis.
Post-renal causes: Urinary tract obstruction (though unlikely in this clinical context).

The combination of appropriate clinical history, physical examination findings, and characteristic laboratory abnormalities (especially myoglobin casts) helps distinguish rhabdomyolysis-induced ARF from other causes. The management of torture-related ARF follows established principles for rhabdomyolysis and acute kidney injury, with several important considerations:Initial management focuses on hemodynamic stabilization and assessment of the severity of renal impairment. Prompt recognition of complications such as hyperkalemia, severe acidosis, or pulmonary edema is crucial, as these may require immediate intervention.[9] Aggressive fluid resuscitation is typically recommended in the early phases of rhabdomyolysis to prevent ARF development. However, in established ARF with oliguria, fluid management becomes more complex, requiring careful balance between preventing volume overload and maintaining adequate perfusion.[11] Alkalinization of urine to pH >6.5 through sodium bicarbonate administration can help prevent myoglobin precipitation and cast formation. However, this approach must be balanced against the risk of exacerbating volume overload and metabolic alkalosis.[8, 12]

Dialysis Indications

The high rate of dialysis requirement (90%) in this series reflects the severity of ARF at presentation. Standard indications for dialysis in ARF include severe hyperkalemia, severe acidosis, volume overload with pulmonary edema, and uremic complications. The choice between peritoneal dialysis and hemodialysis depends on institutional capabilities, patient hemodynamic status, and specific clinical considerations.[15]

Prognosis and Recovery

The excellent outcomes observed in this case series (100% recovery) are encouraging and reflect several favorable factors. Young age, absence of comorbid conditions, and previously normal renal function contribute to better outcomes in rhabdomyolysis-induced ARF. Additionally, the reversible nature of acute tubular necrosis, when properly managed, allows for complete recovery of renal function in most cases.[16] The complete recovery in all patients also suggests that despite the severity of initial presentation, permanent renal damage can be prevented with appropriate management. This finding has important implications for prognosis counseling and emphasizes the importance of aggressive early management.[3, 8]

Forensic and Legal Considerations

Beyond immediate medical management, torture-related ARF has important forensic implications. The clinical findings and laboratory abnormalities provide objective evidence of severe physical trauma that may be useful in legal proceedings. Healthcare providers have important responsibilities in documenting findings thoroughly and accurately while protecting patient confidentiality and safety.[1-4] The Istanbul Protocol, developed by international human rights organizations, provides guidelines for the medical evaluation of torture victims. Healthcare providers should be familiar with these guidelines and the appropriate documentation procedures when caring for suspected torture victims.[3-5]

Prevention and Public Health Implications

While individual cases of torture-related ARF require immediate medical management, the broader public health implications involve prevention of torture and protection of human rights. Healthcare providers have important roles in advocacy, education, and documentation that can contribute to prevention efforts.[12, 24] The systematic nature of the torture methods observed in this case series suggests organized approaches to physical abuse. Recognition of these patterns can inform public health responses and human rights advocacy efforts.

Limitations and Future Research

This case series, while providing valuable clinical insights, has several limitations. The retrospective nature of the study limits the availability of some clinical details. Additionally, the sensitive political environment may have affected patient disclosure and documentation. Future research should focus on developing better protocols for the medical evaluation of torture victims, improving early recognition of complications, and optimizing

treatment strategies. Long-term follow-up studies would also be valuable to assess for any delayed complications or psychological sequelae.[5, 7]

Training and Education Implications

The findings from this case series highlight the importance of training healthcare providers to recognize and manage torture-related medical complications. Medical education should include components on human rights, the medical consequences of torture, and appropriate documentation procedures.[2] Healthcare systems in regions affected by conflict or human rights violations should develop protocols for managing torture victims and ensuring appropriate specialist referral when needed.

CONCLUSIONS

This case series represents one of the earliest systematic documentations of acute renal failure following physical torture, providing important insights into the pathophysiology, clinical presentation, and management of this serious condition. The findings demonstrate that torture-related ARF follows predictable pathophysiological pathways involving rhabdomyolysis and myoglobinuria, with characteristic clinical and laboratory features that allow for prompt recognition and appropriate management. Key conclusions from this study include:

Clinical Recognition: Torture-related ARF presents characteristic features including generalized weakness, oligoanuria, elevated muscle enzymes, and myoglobin casts in urine. Healthcare providers should maintain high clinical suspicion in appropriate clinical contexts.

Pathophysiology: The primary mechanism involves rhabdomyolysis secondary to trauma to large muscle groups, leading to myoglobinuria and acute tubular necrosis. The targeting of buttocks, back, and thighs appears to be systematic and results in predictable patterns of injury.

Management: Aggressive supportive care and dialysis when indicated can result in excellent outcomes. The 100% recovery rate in this series demonstrates that even severe torture-related ARF can be successfully managed with appropriate medical care.

Prognosis: Young age, absence of comorbidities, and the reversible nature of rhabdomyolysis-induced ARF contribute to favorable outcomes when appropriate management is provided promptly.

Forensic Significance: The objective clinical and laboratory findings provide important evidence that may be useful in legal proceedings while emphasizing the healthcare provider's role in accurate documentation.

Public Health Implications: Recognition and documentation of torture-related medical complications contribute to broader human rights advocacy and prevention efforts.

The delayed presentation (4-11 days post-torture) observed in this series emphasizes the importance of maintaining clinical suspicion even when patients present days after alleged trauma. Healthcare providers should be trained to recognize the clinical patterns associated with torture-related complications and to provide appropriate medical care while ensuring patient safety and confidentiality.[1, 7] This study contributes to the medical literature by providing detailed clinical observations of a serious but underreported condition. The findings emphasize the severe medical consequences of physical torture and the importance of healthcare providers in both treating victims and documenting evidence of human rights violations. Future research should focus on developing better protocols for managing torture victims, improving early recognition of complications, and conducting long-term follow-up studies to assess delayed sequels. Additionally, efforts should continue to develop training programs for healthcare providers working in regions affected by conflict or systematic human rights violations.

The excellent outcomes observed in this series provide hope that, with appropriate medical care, even severe complications of torture can be successfully managed. However, the ultimate goal must remain the prevention of torture and the protection of human rights through international advocacy and legal frameworks.

REFERENCES

1. Rodriguez-Capote K, Balion CM, Hill SA, Cleve R, Yang L, El Sharif A. Utility of urine myoglobin for the prediction of acute renal failure in patients with suspected rhabdomyolysis: a systematic review. Clinical Chemistry. 2009 Dec 1;55(12):2190-7.
2. Sanders J, Schuman MW, Marbella AM. The epidemiology of torture: a case series of 58 survivors of torture. Forensic science international. 2009 Aug 10;189(1-3):e1-7.
3. Pollanen MS. The dead detainee: the autopsy in cases of torture. Academic forensic pathology. 2017 Sep;7(3):340-52.
4. Mirzaei S, Knoll P, Köhn H. Medizinische Aspekte der Objektivierung von Folterfolgen. Wiener Klinische Wochenschrift. 2004 Aug;116(15):568-74.
5. Aleckovic-Halilovic M, Pjanic M, Mesic E, Storrar J, Woywodt A. From quail to earthquakes and human conflict: a historical perspective of rhabdomyolysis. Clinical kidney journal. 2021 Apr 1;14(4):1088-96.
6. Better OS, Stein JH. Early management of shock and prophylaxis of acute renal failure in traumatic rhabdomyolysis. New England Journal of Medicine. 1990 Mar 22;322(12):825-9.
7. Zager RA. Rhabdomyolysis and myohemoglobinuric acute renal failure. Kidney international. 1996 Feb 1;49(2):314-26.
8. Ron D, Taitelman U, Michaelson M, Bar-Joseph G, Bursztein S, Better OS. Prevention of acute renal failure in traumatic rhabdomyolysis. Archives of internal medicine. 1984 Feb 1;144(2):277-80.
9. Llach F. Hyperphosphatemia in end-stage renal disease patients: pathophysiological consequences. Kidney International. 1999 Dec 1;56:S31-7.
10. Ward MM. Factors predictive of acute renal failure in rhabdomyolysis. Archives of internal medicine. 1988 Jul 1;148(7):1553-7.
11. Grossman RA, Hamilton RW, Morse BM, Penn AS, Goldberg M. Nontraumatic rhabdomyolysis and acute renal failure. New England Journal of Medicine. 1974 Oct 17;291(16):807-11.
12. Slater MS, Mullins RJ. Rhabdomyolysis and myoglobinuric renal failure in trauma and surgical patients: a review. Journal of the American College of Surgeons. 1998 Jun 1;186(6):693-716.
13. Bagley WH, Yang H, Shah KH. Rhabdomyolysis. Internal and emergency medicine. 2007 Oct;2(3):210-8.
14. Vanholder R, SU M, Erek E, Lameire N. Rhabdomyolysis. Journal of the American Society of Nephrology. 2000 Aug 1;11(8):1553-61.
15. Torres PA, Helmstetter JA, Kaye AM, Kaye AD. Rhabdomyolysis: pathogenesis, diagnosis, and treatment. Ochsner Journal. 2015 Mar 20;15(1):58-69.
16. Bagley WH, Yang H, Shah KH. Rhabdomyolysis. Internal and emergency medicine. 2007 Oct;2(3):210-8.
17. Bosch X, Poch E, Grau JM. Rhabdomyolysis and acute kidney injury. New England Journal of Medicine. 2009 Jul 2;361(1):62-72.
18. Sever MS, Vanholder R, Lameire N. Management of crush-related injuries after disasters. New England Journal of Medicine. 2006 Mar 9;354(10):1052-63.
19. McMahon GM, Zeng X, Waikar SS. A risk prediction score for kidney failure or mortality in rhabdomyolysis. JAMA internal medicine. 2013 Oct 28;173(19):1821-7.
20. Petejova N, Martinek A. Acute kidney injury due to rhabdomyolysis and renal replacement therapy: a critical review. Critical Care. 2014 Jun;18(3):1-8.
21. Zimmerman JL, Shen MC. Rhabdomyolysis. Chest. 2013 Sep 1;144(3):1058-65.
22. Huerta-Alardín AL, Varon J, Marik PE. Bench-to-bedside review: Rhabdomyolysis–an overview for clinicians. Critical care. 2004 Apr;9(2):158.
23. Chavez LO, Leon M, Einav S, Varon J. Beyond muscle destruction: a systematic review of rhabdomyolysis for clinical practice. Critical care. 2016 Jun 15;20(1):135.
24. Long B, Koyfman A, Gottlieb M. An evidence-based narrative review of the emergency department evaluation and management of rhabdomyolysis. The American journal of emergency medicine. 2019 Mar 1;37(3):518-23.
25. Mannix R, Tan ML, Wright R, Baskin M. Acute pediatric rhabdomyolysis: causes and rates of renal failure. Pediatrics. 2006 Nov 1;118(5):2119-25.