A Case of Influenza Associated with Acute Renal Failure and Rhabdomyolysis

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Abstract

Clinical Scenario/Case

A 47-year-old male without prior significant medical history presented with a one-week history of diffuse myalgias, weakness, nausea, vomiting, and intermittent fever following exposure to individuals with upper respiratory symptoms. He tested positive for influenza B at another hospital prior to arrival. Laboratory evaluation showed creatine kinase (CK) level of 664,000 U/L, transaminitis, and acute kidney injury. Despite aggressive intravenous fluid resuscitation and correction of electrolytes, the patient progressed to anuria and worsening renal function, necessitating hemodialysis. A comprehensive autoimmune workup was negative. CK levels improved substantially over the nine-day hospital course, but renal function remained severely compromised requiring ongoing dialysis.

Evidence/Literature Review

Rhabdomyolysis is a rare but recognized complication of influenza supported by literature documenting direct viral invasion of muscle tissue and systemic inflammatory responses as underlying mechanisms. Several case reports highlight its potential to cause severe muscle injury and acute renal failure, underscoring the importance of early diagnosis and treatment.

Unique Aspects of Case

While there is established evidence of influenza-induced myositis, there seems to be relatively few reported cases of it causing rhabdomyolysis. Influenza-induced rhabdomyolysis is less well-known than other causes of rhabdomyolysis, but equally important to consider. Early identification of influenza-associated muscle injury and renal failure is essential to initiate appropriate management for rhabdomyolysis, such as aggressive fluid resuscitation.

Recommendations/Conclusion

This case highlights the rare but severe complication of influenza-associated rhabdomyolysis resulting in acute renal failure requiring dialysis. Clinicians should maintain vigilance for muscle involvement in patients with influenza presenting with marked weakness and elevated muscle enzymes. Early diagnosis combined with aggressive supportive care, including fluid management and timely renal replacement therapy, is critical to improving outcomes. Further research is needed to better understand the mechanisms underlying influenza-associated muscle injury and to identify patients at greatest risk for severe complications.

Introduction

Influenza Mechanism of Invasion

- Influenza **hemagglutinin binds sialic acid receptors** on host cells, enabling invasion [1]

Rhabdomyolysis

- Skeletal muscle breakdown releases **myoglobin**, **creatine kinase** (CK), and **electrolytes** into the bloodstream [2, 3, 4, 5]
- Etiologies: trauma, toxins/drugs, metabolic disorders, and infections [4, 5]
- Complications: **electrolyte disturbances, acute kidney injury (AKI), and multi-organ failure** [2]

Influenza and Systemic Complications

- Primarily **respiratory**, but can affect multiple organs
- Annual U.S. burden: ~**35,000 deaths** and **200,000 hospitalizations** [6]
- Vaccination rates: suboptimal at about **50% of eligible individuals** [7]
- Documented complications include myositis, myocarditis, encephalopathy, renal injury, and rhabdomyolysis [1, 8]

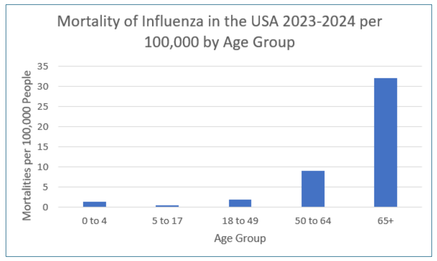

Figure 1: mortality from influenza by age group [9]

Patient Outcome and Discussion

Patient Outcome

- Survived hospital stay
- To continue hemodialysis three days per week

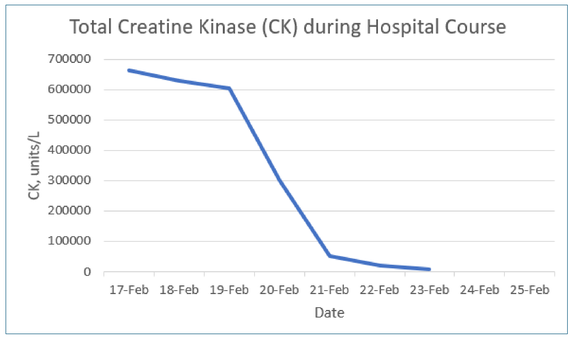

Figure 2: trends of creatine kinase for case patient

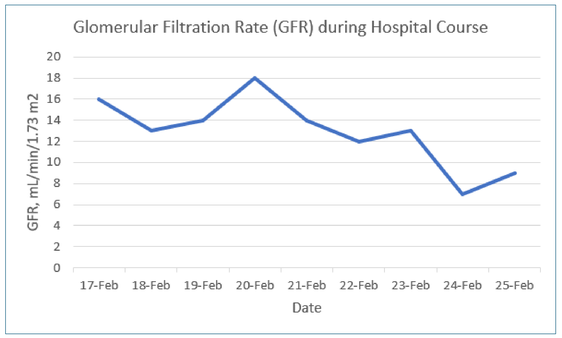

Figure 3: trends of glomerular filtration rate for case patient

Influenza and Renal Failure and Rhabdomyolysis

- Rare cause, but reported in previous cases, especially 2009 H1N1 [8]
- Acute kidney injury (AKI): approximately **10-30% who are hospitalized** for influenza [10]
- Leads to severe **acidosis, electrolyte imbalance, and uremia**. May become dependent on dialysis.
- Direct invasion of renal tissue by influenza may play a role [11]
- 2009 H1N1 Influenza A: case series reported **18 patients, 62% with elevated CK**, many with rhabdomyolysis and AKI [8]

Proposed Mechanism of Muscle Injury

- **Direct myocyte infection** in human and experimental studies. Viral RNA and antigens detected in muscle tissue [12, 13]
- **Cytokine storm** → oxidative stress, mitochondrial dysfunction, and apoptosis of muscle fibers [3]
- Severe systemic inflammation → **ischemia, myonecrosis, release of myoglobin → AKI** [2, 3, 10, 13]
- Influenza A may be more often linked to severe rhabdomyolysis and AKI compared to Influenza B

Indications for Emergent Dialysis [14]	**Risks of Dialysis**
A: refractory **Acidosis** (pH ~<7.1)	Placing dialysis access: infection, bleeding, pneumothorax
E: severe **Electrolyte** abnormalities (K >6.5)	Long term dialysis: infection, hypotension, amyloidosis, bone diseases [15]
I: Ingestion of toxins (salicylates, lithium, isopropanol, methanol, ethylene glycol)	Life expectancy for dialysis-dependent, long-term: <3 years [16]
O: refractory volume **Overload**	Life expectancy for dialysis-dependent, middle-aged: <5 years [16]
U: symptomatic **Uremia** (encephalopathy pericarditis, coagulopathy)	

Figure 4: comparing indications for emergent dialysis vs short- and long-term risks of dialysis

Management and Conclusion

Early Identification of Rhabdomyolysis

- Severe myalgias, profound weakness, or dark urine
- **Markedly elevated CK** levels (>5,000 U/L) [5]
- Electrolyte abnormalities, transaminitis not otherwise explained [5]
- Attention to previously healthy patients with disproportionate weakness or unexplained AKI during influenza infection

Early Management

- **Aggressive IV fluid resuscitation,** prevent renal injury from myoglobin [4, 5]
- Treat **hyperkalemia** and other electrolytes urgently [5]
- **Avoid nephrotoxic treatments**
- **Early nephrology involvement**; hemodialysis if indicated [5]
- Consider empiric **antiviral** [4, 6] **(oseltamivir)** early, in high-risk patients

Future Directions

- Larger studies to define **incidence and risk factors** for influenza-associated rhabdomyolysis and AKI
- Better understanding of **mechanistic pathways**
- Development of **risk prediction tools** for high-risk patients [17]
- Exploration of **preventive strategies:** vaccination [3] and hygiene

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