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Acute Rhabdomyolysis: A Rare Complication Subsequent to Intrathecal Dose Escalation: A Case Report

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Background: Rhabdomyolysis (RM) requires prompt recognition and treatment to prevent serious complications. This case report details RM several months after an intrathecal pump implantation.

Case Report: A 69-year-old woman with chronic pain syndrome managed by an intrathecal morphine pump presented with worsening proximal lower extremity weakness. Notably, the dose of the intrathecal pain pump was recently increased. Laboratory values revealed elevated creatine kinase (1,678), low potassium (3.2), elevated aspartate aminotransferase (48), lactic acid (2.5), low albumin (2.8), and mild troponin elevation (34). The intrathecal pump was found to be 2 hours behind and was corrected, with its infusion rate reduced by 50%. Potassium replacement improved levels from 3.2 to 3.8 mmol/L. However, mobility remained below baseline, and physical therapy was recommended to improve activity tolerance.

Conclusions: This case report highlights the importance of early recognition and intervention to prevent complications and reduce the mortality of RM.

Key words: Rhabdomyolysis, intrathecal pump, case report, morphine

BACKGROUND

Rhabdomyolysis (RM) refers to the state of skeletal muscle injury that leads to leakage of muscle cellular contents, leading to common symptoms, such as muscle weakness, pain, swelling, and dark red-colored urine (1-3). Etiologies can be classified into traumatic and nontraumatic causes. Diagnoses largely rely on elevations of creatine kinase (CK) and muscle biopsy can be considered if a genetic condition is suspected. Treatment includes early hydration and alkalization of urine to prevent kidney sequelae (1-3).

Intrathecal drug delivery involves administering the medication directly in the area surrounding the central nervous system (CNS), bypassing the blood-brain barrier (4). This allows for a greater effect at a much lower dosage of medication. Opioid medications, such as morphine, or nonopioids, such as ziconotide, are common agents utilized in intrathecal drug therapy, as they act on the opioid receptors and N-type voltage-gated calcium channels, respectively, located in the dorsal horn of the spinal cord (5).

Complications of intrathecal pump implantation include incisional pain, wound infection, seromas, catheter leakage, malfunction of the pump delivery system, and positional headaches related to cerebrospinal fluid (CSF) leakage, which may be treated with an epidural blood patch (6). Malfunction of the pump or catheter leakage requires immediate deactivation of the pump and administration of reversal agents to prevent overdose, such as naloxone for opiates and physostigmine for baclofen (6).

Intrathecal drug administration is an effective means of chronic pain control in patients who have failed

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conservative management. In this case report, we outline a rare complication of RM following a previously well-tolerated intrathecal pump implantation. The patient provided informed consent to be included in this case report.

CASE PRESENTATION

A 69-year-old woman with a history of osteoarthritis, rheumatoid arthritis, diabetes mellitus, neuropathy, chronic obstructive pulmonary disease, obstructive sleep apnea, chronic pain syndrome managed with an intrathecal morphine pump (1.0 mg/mL), class III obesity, and a history of bilateral knee surgery presented with progressively worsening proximal lower extremity weakness over the past couple of weeks. The patient's home medications included albuterol, atorvastatin, azelastine, bisoprolol, Ditropan, Eliquis, furosemide, gabapentin,isosorbide mononitrate, lamotrigine, Lidoderm, Ozempic, pantoprazole, Spiriva Respimat, and Zyrtec.

The patient had a history of multiple falls and primarily used a wheelchair for mobility due to bilateral knee arthritis. Given the patient's chronic kidney issues with low glomerular filtration rate and dependence on oral opioid medications, she underwent an intrathecal pump implantation in October 2024. The procedure was completed without complications and was tolerated well. Notably, the dose of morphine in the pump was recently increased by 50% for better pain relief.

In the past several weeks, she reported being unable to stand due to proximal bilateral leg weakness. She could previously ambulate long distances using her power wheelchair, but the last time she walked a short distance was approximately 3 months ago. The patient was admitted to the emergency room (ER) in January 2025 after she experienced a fall and reported feeling too weak and fatigued to get up for 3 days until she was found on the floor of her home by her caretaker. She denied recent trauma before the fall, use of corticosteroids, or new onset of pain symptoms compared to her baseline symptoms. Additionally, she denies bowel and bladder incontinence as well as numbness in the lower extremities.

In the ER, the patient was found to be mildly tachycardic and tachypneic, with fingerstick glucose of 91, negative Cincinnati Prehospital Stroke Scale, but afebrile, with no leukocytosis, and did not appear septic despite meeting 2 of the systemic inflammatory response syndrome criteria. Chest x-rays showed no significant change or acute cardiopulmonary processes. Laboratory results were consistent with RM with elevated serum CK at 1,678 and a low potassium level of 3.2. Other laboratory values can be found in Table 1.

The patient was afebrile and the white blood cell count remained within normal limits. Results from an electrocardiogram showed no signs of ischemia and 1 L of intravenous (IV) fluids was administered in the ER before admission to the hospital for further assessment and management of her symptoms.

Upon physical evaluation, the patient appeared alert and oriented but was unable to mobilize from the bed. Neurological examination showed bilateral proximal lower extremity weakness graded 3/5 and distal strength at 4/5. Following physician examination, the intrathecal morphine pump was interrogated, and showed that the pump was 2 hours behind the programmer time. This was corrected and the infusion rate was also decreased by 50% (0.1054 mg/d). Following these adjustments and the initiation of a potassium replacement protocol, which included administration of Effer-K at doses of 20 mEq and 40 mEq, as well as IV infusions of potassium chloride at 10 mEq/100 mL as needed, potassium levels improved to 3.8 mmol/L the following day. However, she remained below baseline for mobility. As a result, the patient was recommended physical therapy to improve activity tolerance and mobility.

DISCUSSION

This case report describes a rare case of RM several months after implantation of an intrathecal pump. RM was suspected given the patient's immobility for 3 days, elevated CK levels, recent increase in dosage, and programming error. Intrathecal administration produces more concentrated medication dosages directly into the spinal cord, producing more potent CNS effects than oral doses (4). Opioid usage is associated with adverse effects, such as sedation, dizziness, and falling, with a notable association with falls and fractures among older adults (7). The rapid increase in intrathecal dosage is supposed to have led to generalized body weakness, predisposing the patient to fall and leading to increased susceptibility to RM.

RM can present with minor elevations in CK to severe or even emergencies with disseminated intravascular coagulation, acute kidney injury, arrhythmias, and compartment syndrome (1). Diagnosis involves elevations of CK, which is the most sensitive evaluation of muscle injury, but elevations do not determine the severity of

muscle damage and kidney injury. Furthermore, there is no established diagnostic serum CK criteria, but many clinicians use 3-5 times the upper limit of normal values (100-400 U/L) (1). Additionally, RM and electrolyte disorders can occur as soon as the day of admission, making prompt recognition and treatment necessary to prevent serious complications (8). However, the classic triad of muscle pain (~50%), weakness (proximal muscle groups), and tea-colored urine (~30-40%) is not always apparent, with an estimate of < 50% of patients presenting with this triad (1). Other nonspecific symptoms, such as cramps, stiffness, swelling, malaise, abdominal pain, fever, and nausea, can also occur. Treatment includes maintenance fluid resuscitation to prevent acute kidney injury while identifying the underlying cause of RM with close monitoring of urine output, electrolyte balance, and the development of further complications (1).

Table 1. Initial laboratory values.

Test	Value	Reference Range	Interpretation
RBC	3.77	4.2-5.4 M/μL	Low
Hgb	9.8	12.0-16.0 g/dL	Low
Hct	30.6	36-48%	Low
RDW	17.3	11.5-14.5%	High
ABS Neut	7.7	1.5-7.5 x 10^3/μL	High
Potassium	3.2	3.5-5.1 mmol/L	Low
CO_2	23	24-30 mmol/L	Low
EGFRcr	69	> 90 mL/min/1.73m²	Low
Magnesium	1.4	1.7-2.2 mg/dL	Low
Albumin	2.8	3.5-5.0 g/Dl	Low
AST	48	10-40 U/L	High
Lactic Acid	2.5	0.5-2.2 mmol/L	High
B-Natriuretic Peptide	286	< 100 pg/mL	High
CK	1,678	22-198 U/L	High
Troponin I	34	< 0.04 ng/mL	High

Abbreviations: RBC, red blood cells; Hgb, hemoglobin; Hct, hematocrit; RDW, red cell distribution width; ABS Neut, absolute neutrophil count; CO_2, carbon dioxide; EGFRcr, estimated glomerular filtration rate based on creatinine level; AST, aspartate aminotransferase; CK, creatine kinase.

The patient's at-home medication consisted of albuterol and furosemide, which are both medications associated with hypokalemia (9). Potassium levels play an important role in regulating vascular tension, excitability, and contractile force of muscle tissue (10). Thus, hypokalemia leads to vasoconstriction, reduced muscle blood supply, tissue hypoxia, and resulting in muscle cell damage. Severe hypokalemia causes progressive muscle weakness, hypoventilation, paralysis, and RM (depending on the level of pre-existing hypokalemia and underlying disease states/comorbidities) (10). Although rare, hypokalemic-induced RM must not be overlooked and may have potentiated RM in this patient. While albuterol, atorvastatin, and furosemide may have contributed to weakness or falls, the clinical presentation and timing suggest that the rapid increase in intrathecal morphine dosage was the most likely cause of weakness, fall, and subsequent RM.

Opioid toxicity has been associated with RM, but the mechanism is unclear. In a cross-sectional study (8) of 354 patients with acute drug toxicity, 76 (21.5%) were found to have RM, most commonly secondary to methadone or opium usage. Similarly, Mousavi et al (11) found that among 114 patients with RM, opioid overdose (28%) was the most common reason.

Intrathecal pump complications have been well characterized, including bleeding, infection, epidural abscess, loss of CSF from the catheter, wound seromas, granulomas at the tip of the catheter, mechanical complications of the pump, and adverse effects associated with the intrathecal drug (12). Pump-related complications, such as catheter/pump issues, programming errors, and manual manipulation of the pump by the patient, can all lead to drug withdrawal (4). Severe cases of opioid withdrawal, especially with baclofen, can lead to RM, hyperthermia, disseminated intravascular coagulation, and multiorgan failure (1). Supportive treatment with oral opioid supplementation and benzodiazepines, along with close monitoring, is required (4).

Before starting an intrathecal pump for a patient, the history and physical examination, comorbidities, and psychosocial evaluation must be performed to assess the appropriateness of this procedure. This study's main limitation is that it reports only on one patient. Further research with long-term, observational, retrospective, and real-world evidence can better characterize the risks and causes of RM among patients with an intrathecal pump. These risks must be considered and recognized/addressed early to prevent further complications and mortality associated with this diagnosis.

CONCLUSIONS

In this case report, we described a rare case of RM following several months of uncomplicated intrathecal pump implantation with morphine. The importance of early recognition and treatment is essential to mitigate further complications and mortality of this condition.

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