Acute Renal Failure Secondary to Rhabdomyolysis Following Near-Drowning in Sea Water

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Abstract
We report here a rare case of acute renal failure following near-drowning in sea water. A 21-year old college student presented in acute renal failure 48 hours after a near-drowning event. Investigations revealed rhabdomyolysis to be the cause of renal failure.

INTRODUCTION
Near-drowning is a common medical emergency in our country. Most of the emphasis in treating such patients is paid to the management of cardiorespiratory complications that occur immediately. It is often not realized that these patients can have delayed complications; rhabdomyolysis is one such delayed complication. Here, we report a case of acute renal failure secondary to rhabdomyolysis following near-drowning in sea water.

CASE REPORT
A 21-year old college student presented to the emergency medical ward in August 1999 with acute renal failure. 2 days previously, he had nearly drowned in the Arabian sea, while swimming on a holiday. He had received first-aid in a nearby health centre and thereafter had experienced severe myalgia. He had also noticed that he had passed small quantities of reddish urine for one day, after which he had complete anuria. Clinical examination was unremarkable except for tenderness of all his limb muscles. There were no bite mark, cellulitis or neurological signs suggestive of sea snake bite with systemic envenomation.

Investigations showed blood urea of 185 mg% and serum creatinine of 8.0 mg%. Serum sodium was 136 mg%, potassium 6.5 mEq/l, and serum uric acid and 18.5 mg%. There was neutrophilic leucocytosis. Serum creatinine phosphokinase was markedly elevated to 15500 units/l. ABG was not done. Patient was subjected to haemodialysis along with forced alkaline diuresis. He gradually improved and diuresis commenced on the second day. Urine examination showed albuminuria and presence of muddy casts. It also tested positive for myoglobin. Muscle biopsy showed presence of fragmented myocytes with absence of cellular infiltrates. Patient had an uneventful clinical recovery. Blood urea and serum creatinine was 160 mg% and 6.5 mg% by day 4 and 87 mg% and 1.8 mg% by day 10 of hospital stay respectively. Serum creatinine phosphokinase level estimated on day 4 was 2960 u/l and was 950 u/l by day 6. At follow up fifteen days after discharge, serum creatinine was 1.2 mg%.

DISCUSSION
Rhabdomyolysis is a common clinical entity which occurs due to a variety of physical and nonphysical causes. Some of the most common physical causes are trauma as in accidents or torture, strainful exercise of muscles, status epilepticus, delirium tremens, high voltage electrical injury and hyperthermia. Various myopathies, myositis, electrolyte imbalances and systemic infections like toxic shock syndrome, falciparum malaria, leptospirosis and legionellosis are among the nonphysical causes which contribute to rhabdomyolysis.

Strenuous muscular exercise causes myolysis especially in untrained individuals and in individuals exercising in hot and humid conditions. It is particularly documented in athletes taking part in marathon races. It is also very well known that heat stress as in malignant hyperthermia causes myolysis. However, its occurrence secondary to cold stress as in near-drowning is not a very well described entity. It is postulated that cold induces peripheral vasoconstriction and reduces muscle perfusion in order to preserve perfusion of vital organs. In a patient who is nearly drowning, the frantic muscular activity promotes myolysis, further compounded by the muscular hypoperfusion. In addition, alveolar hypoperfusion from water inhalation induces lactic acidosis which promotes muscle cell lysis leading to myoglobinuria, hyperkalaemia and hyperuricaemia. Another possible mechanism refers to the use of tight wet pants during surfing, which possibly acts as a constricting band over limb muscles causing myolysis. Myoglobin released from damaged muscles is directly toxic to the renal tubular epithelial cells.
It also induces intratubular cast formation which is enhanced in the presence of hypovolaemia and acidosis.

However rhabdomyolysis is not the only cause of acute renal failure in near drowning. In a study of 30 patients of near drowning, Spicer et al identified nearly 50% patients with acute renal insufficiency, the causes being hypovolemia, shock and multisystem failure, rhabdomyolysis, and ‘isolated acute renal insufficiency’. While the majority had mild reversible elevation in serum creatinine, 7% had severe ARF requiring dialysis. In patients with near-drowning who required prolonged cardiopulmonary resuscitation, ARF developed as a part of multisystem failure and carried a substantial morbidity. Another subgroup of patients who did not require CPR developed ARF several days after immersion, which they called ‘isolated ARF’. It is possibly related to widespread tissue hypoxia and reperfusion injury. Renin angiotensin surge while returning to dry land after whole body immersion may be contributory to the predominant renal injury in such patients. The predictors of possible renal insufficiency in this study was the severity of presenting acidemia as measured by a low base excess and reduced serum bicarbonate and pH.

Sea-snake bite with systemic envenomation is a well documented cause of rhabdomyolysis. Sea-snake bites are often painless and difficult to detect with small puncture wounds. Symptoms commonly occur 6-8 hours after the bite and are usually related to the nervous system; diplopia, weakness of limbs and respiratory distress are commonly seen. Later, rhabdomyolysis and renal failure may follow. Although sea-snake bites with envenomation have been reported from Arabian coast, such cases are not seen or reported from the area where this event of near-drowning occurred. This patient had no history or neuromuscular signs suggestive of sea snake bite with envenomation.

This cases serves to highlights the occurrence of rhabdomyolysis and acute renal failure in near drowning. Vigorous correction of hypovolemia, acidosis in survivors of near drowning and testing for renal parameters and CPK levels should be done to prevent this late complication of near-drowning.

**References**