CLINICAL VIGNETTE

Rhabdomyolysis Following Perineal Surgery in the Exaggerated Lithotomy Position

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Introduction

Patients are placed in an exaggerated lithotomy position (ELP) to provide exposure and access to the perineum for complex surgical repairs. This position elevates the lower extremities well above the level of the heart, resulting in rare reports of lower extremity neuropathy and muscle ischemia. In severe cases, hypoperfusion to the extremities results in rhabdomyolysis and compartment syndrome. This case details the recognition and management of rhabdomyolysis following urethroplasty in prolonged exaggerated lithotomy position.

Case Report

The patient is a 33-year-old male scheduled for an elective urethral reconstruction following traumatic urethral disruption. Following the induction of general anesthesia, the patient was placed in exaggerated lithotomy position with the legs supported by stirrups and padded boots (Yellofins Stirrups, Hillrom). A pulse oximeter probe was placed on the 1st toe of the left foot to monitor perfusion in the extremity throughout the case. The surgery proceeded without any significant periods of hypotension or anemia, though the patient's heart rate rose from a baseline in the mid-90s to become mildly tachycardic during the latter half of the case. The operative time was 6 hours and 42 minutes with the legs lowered into low lithotomy for a 15-minute break at the 3-hour mark.

Following completion of the surgery and emergence from general anesthesia, the patient was brought to the recovery room, where his heart rate was noted to be 123 bpm. The patient was given 500ml of 5% albumin without improvement in heart rate. Basic metabolic panel and complete blood count revealed a significant increase in creatinine from 0.69 to 1.61 mg/dL, elevated potassium of 5.6 mmol/L, and a decrease in hemoglobin from 15 to 9.6 g/dL. Further studies showed a relatively normal arterial blood gas, but a markedly elevated creatinine kinase of 12,230 U/L. The catheterized urine appeared dark maroon.

Given the above findings concerning for rhabdomyolysis, the patient was treated for hyperkalemia with 1 g of calcium chloride, 50% dextrose, and 10 units of intravenous insulin. To protect the kidneys, the patient was started on 1 L/h of normal saline to maintain a urine output of greater than 200 ml/h. Within four hours. the repeat creatinine had decreased to 1.23 mg/dL and by postoperative day one had dropped to 0.79 mg/dL. The creatinine kinase was monitored every six hours and peaked on the first postoperative day at 30,683 U/L. The patient was discharged from the hospital on postoperative day three after the creatinine kinase had significantly improved.

Discussion

The lithotomy position is used in urologic, rectal, and gynecologic operations and is a variation of the supine position, in which the legs are abducted from the midline and the hips are flexed to varying degrees. The most extreme variation of lithotomy, ELP, requires flexing the patient's legs at the hips until the posterior surface of the thighs are 130° to 150° from the OR table surface (see Figure 1). The lower legs are nearly vertical. The elevation of the legs well above the level of the heart contributes to hypoperfusion, and severe hip flexion may reduce venous outflow. For example, an analysis of blood pressure changes at the dorsalis pedis artery in healthy volunteers demonstrate an average drop in systolic pressure from 112 mmHg in the supine position to 64 mmHg in ELP.[1] Furthermore, support devices and padding may produce compression and blood flow restriction. A retrospective review of 177 urologic patients in ELP demonstrated a 15% rate of postoperative neurapraxia, resulting in paresthesia or numbness in the foot.[2] More seriously, are numerous cases of ischemia leading to rhabdomyolysis and lower leg compartment syndrome.[3-9]

The incidence of rhabdomyolysis after a urologic procedure is extremely rare, with studies reporting 0.15% after urethroplasty to 0.03 to 0.1% after major urological surgeries.[10,11] Destruction of muscle tissue leads to the release of intracellular contents. Hyperkalemia, hyperphosphatemia, hyperuricemia and hypo or hypercalcemia can often be seen. Patients may become hypovolemic from fluid shifts into edematous muscles. Renal damage occurs through hypovolemia, intratubular cast formation, aciduria, and heme and myoglobin nephrotoxicity.[5,12,13]

The main treatment for rhabdomyolysis consists of correcting electrolyte imbalances and preventing acute renal failure with aggressive fluid resuscitation.[14] Hyperkalemia should be anticipated and can be medically managed with standard treatments, such as calcium and insulin, but may require dialysis to prevent cardiac arrythmias. Aggressive fluid resuscitation with normal saline should be initiated with a urine output goal of 200-300 ml/h. This often requires fluid administration of 1 to 2 L/h for the first several hours.[14-16] CK levels should be trended, and fluid repletion can be discontinued once CK levels are stable or decreasing. Patients with CK levels less than 5000 U/L are at low risk for developing acute kidney injury.[17]

Other treatment options include the administration of sodium bicarbonate, mannitol, and loop diuretics. Sodium bicarbonate alkalinizes the urine to prevent the precipitation of myoglobin and uric acid. Although there is some evidence that sodium bicarbonate with saline diuresis may be superior to saline alone in animal studies, there is no clear evidence in clinical studies.[18] Mannitol is believed to help minimize the formation of intratubular heme deposits and casts and acts as a free radical scavenger, but also has no clear evidence for its clinical role.[19] Loop diuretics can be administered to treat volume overload, but have no role in preventing acute kidney injury.[20] Lastly, dialysis can be considered to treat metabolic abnormalities, volume overload, and acidemia.[21]

There are no specific guidelines published regarding the prevention of rhabdomyolysis and compartment syndrome in the lithotomy position. Minimizing the degree and time of leg elevation appears to be the most effective component of prevention, as reported cases generally last longer than 3 to 4 hours in lithotomy.[5,22] In addition, avoidance of hypotension and hypoxemia, as well as careful positioning to avoid undue hip and knee flexion, tissue compression, and direct pressure, is key to improving tissue perfusion.

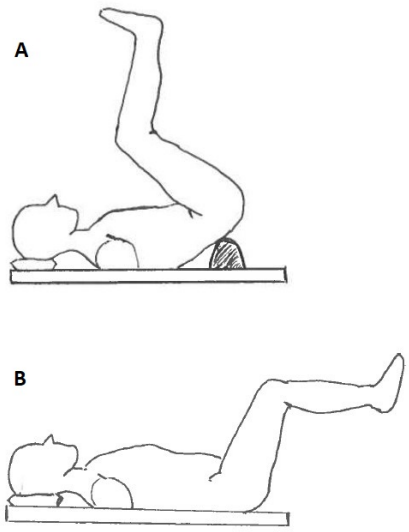

Figure 1. Example of surgical positioning in exaggerated lithotomy position (A) and in high lithotomy position (B).

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