CASE REPORT

Bariatric surgery, a risk factor for rhabdomyolysis


Servicio de Cirugía General, Hospital General Universitario Morales Meseguer, Murcia, España

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KEYWORDS
Bariatric surgery; Rhabdomyolisis; Acute kidney injury; Obesity

Abstract  Rhabdomyolysis has been increasingly recognized as a complication of bariatric surgery. We report a case of this complication and its consequences, in a patient who had undergone bariatric surgery, with a very high creatine kinase (CK) concentration, and whose renal function failed. Obesity causes a range of effects on all major organ systems. Knowledge of these effects and issues specific to the intensive care unit care of bariatric patients can help to predict and manage this underestimated complication in this population in which early diagnosis can alter the outcome.
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PALABRAS CLAVE
Cirugía bariátrica; Rabdomiolisis; Insuficiencia renal aguda; Obesidad

Cirugía bariátrica, factor de riesgo para rabdomiolisis

Resumen  La rabdomiolisis tras cirugía bariátrica es una complicación rara pero posible. Presentamos un caso de rabdomiolisis y fallo renal agudo tras by-pass gástrico laparoscópico en paciente con obesidad mórbida. Su conocimiento puede ayudar a predecir y manejar esta complicación infradiagnosticada cuyo diagnóstico precoz mejora el tratamiento de estos pacientes y previene las complicaciones posteriores.
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Introduction

Rhabdomyolysis (RML) is a clinical and biochemical syndrome due to acute skeletal muscle damage. Destruction of the muscle leads to the release of the breakdown products of damaged muscle cells into the bloodstream and produces systemic complications. There are many possible causes of rhabdomyolysis; we report one case of acute renal failure and RML soon after laparoscopic gastric bypass for morbid obesity.

Case report

A 41-year-old superobese (height: 159 cm, weight: 160 kg and BMI 64 kg/m²) male was admitted to the hospital for...
a laparoscopic distal Roux-en-Y gastric bypass. Past medical history included moderate smoking, dyslipidemia and severe sleep apnea. His preoperative physical examination, laboratory work-up, chest X-ray and ECG were normal. The procedure was performed using the supine position with the surgeon standing between the legs of the patient and in the reversed Trendelenburg position. The patient was placed on a Split-leg operating table on a pillow (30–45° of elevation), so his upper body, neck and head were elevated. Egg crate padding was placed below the heels and under his knees in order to create a gentle degree of knee flexion and all other pressure points were padded with foam or pillows.

Awake endotracheal intubation was assisted by fibrescopy. Anesthesia was induced with intravenous remifentanil and propofol. Cisatracurium facilitated the maintenance of neuromuscular block during surgery. Ventilation was controlled to an end tidal carbon dioxide of 35–40 mmHg, with a tidal volume of 13–15 ml/kg ideal body weight, and PEEP 6 cmH2O. General anesthesia was maintained with sevoflurane and remifentanil infusion.

Intraoperatively, noninvasive and invasive blood pressure, heart rate, central venous pressure (CVP), mean arterial pressure, ECG, EEG (BIS) and SatO2, urinary output hourly, doses of drugs and type and quantity of fluids administered were recorded.

During surgery there was retropertoneum bleeding, which was difficult to manage. This increased the surgical time to 240 min, the total anesthesia time being 360 min. Throughout the procedure, 4000 ml of saline solution and 1 U of packed red blood cells were administered, and a noradrenaline infusion was needed. Furosemide in bolus and a 4 mg/h infusion was injected to maintain a urine output >80 ml/h. Soon in the postoperative care unit, the patient started with pain in the gluteal zone and lumbar muscles, and oliguric acute renal failure was observed. Laboratory test showed serum creatinine 5.2 mg/dl, CK (creatinine-kinase) 11,000 UI/L; and CPK Mb 400UI/L. Rhabdomyolysis was diagnosed. The patient has a peak CK of 16,600 UI/L, CPK MB 700 UI/L and LDH 1128 UI/dL at 24 h. He was treated with intravenous fluid administration, alkalinization of the urine with sodium bicarbonate, and hemodialysis. CK decreased progressively and reached baseline on the 11th postoperative day. The patient was discharged from the hospital with normal renal function.

Discussion

Surgical treatment of morbid obesity has been shown to be effective at reducing weight. After the introduction of the laparoscopic approaches, more patients are operated of bariatric surgery because there is reduced operative mortality and recovery times were shorter. Different surgical complications have been associated, but there is little knowledge about neuromuscular complications like RML. The actual incidence of RML after bariatric surgery is unknown, but is probably more common than previously realized, 7–22%. In this type of surgery, the operating room has been considered as a favorable environment for RML occurrence because of the unusual patient position and skin areas with increased pressure in patients under general anesthesia. The areas of muscle pain in our patient as well as those reported in other case reports suggest the possibility of a compartment syndrome in these body regions, especially in gluteus and lumbar muscles. One can speculate that the sustained high muscle pressure induces muscle ischemia, direct injury to sarcolemma, disruption of sodium–potassium pump, electrolyte imbalance, and failure of energy supply to the muscle fiber. Severe RML triggers a cascade that includes hypovolemia, hyperaluminaemia, anemia, disseminated intravascular coagulation, hyperkalemia, hypocalcemia, hyperphosphatemia and acute tubular necrosis.

Once suspected, diagnosis of RML can be confirmed by blood CK increase. CK is always released when muscle injury occurs and is present in 100% of cases. A serum CK level >1000 IU/L or 5-fold elevation of CK levels is the easiest and most sensitive way to make a biochemical diagnosis of RML. Its increase, even the absence of clinical signs and symptoms can alert the clinician. CK maximum peak occurs between the second and the third postoperative day, with a subsequent decrease of approximately 40% per day. Myoglobinuria (change in urine color with myoglobin levels of more than 250–300 g/ml) can be documented in most patients with RML. However, normal levels of urinary myoglobin can be found in up to 50% of patients with clinically significant RML. Other biochemical abnormalities are LDH and GOT level increase.

The major risk factors associated with RML following bariatric surgery include protracted operative time, super-obesity, peripheral vascular disease, hypertension, diabetes, and treatment with statins. BMI has been shown to be an independent factor of perioperative onset of acute renal failure. Its importance lies in the prevention and early recognition to avoid potentially irreversible renal failure. Prevention may be enhanced by careful padding on the operating table, and perhaps more importantly, limiting the duration of surgery in high risk patients. This is not only because the surgical procedure takes longer, but also because placement of central or arterial line or difficult intubation is more likely to be difficult and time-consuming in these patients.

Mortality from RML can be as high as 5%. The aim of the treatment consists of avoiding complications like acute renal failure and electrolyte imbalance. Acute renal failure has an incidence of 20–50% in patients with RML, and is the most important cause of death. Recommended treatment includes intensive intravenous fluid administration, the use of diuretics, and urine alkalinization with sodium bicarbonate. Some patients require temporary hemodialysis. Thus it seems recommendable to force a urinary output > 1.5 ml/kg/h. Although, Wool et al. reported that, regardless of the amount of intraoperative fluids administered (15 ml/kg vs 40 ml/kg), the incidence of RML was similar. In their work, there were no statistical differences in serum CK levels and these levels decreased without intensive therapy and no patient experienced oliguria, cardiac dysrhythmia, compartment syndrome, or clinically apparent myalgia.

There are no evidence-based guidelines available for intraoperative fluid management in the morbidly obese. On the one hand, fluid restriction may result in acute tubular necrosis and organ dysfunction, while on the other, excessive
fluid may lead to pulmonary edema, hypertension and requirement and duration of ventilatory support.\textsuperscript{10} Surgeons and anesthesiologists attempt to maintain renal blood flow by a variety of strategies such as intravenous hydration, CVP control and administration of vasoactive substances. Recent studies show that urine output as a guide of volume status has its limitations, perhaps due to the prolonged increase in intra-abdominal pressure during the neumoperitoneum in laparoscopic gastric bypass surgery, and morbidly obese patients have low urine output intra-operatively. Thus intraoperative oliguria occurs, and this is not associated with postoperative renal dysfunction and is unresponsive to fluid administration.\textsuperscript{8,10} Recently, Jain and Dutta\textsuperscript{10} suggested the predictive ability of the stroke volume variation (SVV) variable – derived from arterial pressure waveform analysis – for fluid charge responsiveness. This could underline the importance of its continuous measurement and might minimize unwarranted and detrimental volume loading in obese patients. By convention, fluid infusion is guided by CVP during perioperative period. There is evidence that suggest CVP-guide fluid therapy may be misleading, mainly because of low sensitivity and specificity.\textsuperscript{10}

In conclusion, RML after bariatric surgery is a rare complication. Although many times RML is asymptomatic, higher CK levels may be life-threatening, leading to acute renal failure, electrolyte imbalance, blood dyscrasia, and even death. The combination of super-obesity and prolonged operative time are risk factors for postoperative RML and muscle pain suggests its occurrence. The potential for postoperative RML should be considered in all bariatric surgical patients. CK levels are the most sensitive means of screening for RML even in the absence of clinical symptoms. CK rise above 5000 IU/L should alert one to this complication. Postoperative CK levels should be routinely obtained in patients at special risk. Early diagnosis of RML is the cornerstone of successful outcome of this increasingly recognized complication. Although large volumes of intraoperative intravenous fluids are used to treat RML, further studies suggest that similar operative fluid management did not decrease the incidence of postoperative RML.

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Conflict of interest

Authors declare there no conflict of interest.

References