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Case Report

Compartment Syndrome Caused by a Hyperextension Position after Open Radical Cystectomy with Hautmann Ileal Neobladder Construction: A Rare Case of Rhabdomyolysis

Virginie Georgia Comte[1]*, Fabio Henrique de Carvalho Pavao[2], Emmanuelle Bovard[1], Tarek Laswad[3]

[1]*Department of Anesthesiology, Hospital Riviera Chablais, Rennaz, Switzerland.*

[2]*Department of Anesthesiology, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne, Switzerland.*

[3]*Department of Radiology, Hospital Riviera Chablais, Rennaz, Switzerland.*

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ABSTRACT

Compartment syndrome (CS) is caused by an excessive increase in compartment intramuscular pressure, which measurement is the reference diagnostic tool. We examine the case of a 44yearold man with invasive bladder cancer who underwent an open radical cystectomy. After extubation, the patient is transferred from the operating room to the Intermediate Care Unit, where he complains of severe lumbar pain on a visual analog scale of 10 that is unresponsive to opioids and is diagnosed with rhabdomyolysis due to compartment syndrome. Multidisciplinary care and multimodal analgesia approaches were used; no fasciotomy was performed; and a favourable outcome was achieved.

Compartment syndrome is a serious pathology that develops when there is an increase in pressure within one of the body's anatomical compartments, resulting in insufficient blood supply to the tissue in that space. Although acute compartment syndrome is commonly attributed to trauma, it can have numerous causes. Positioning related compartment syndrome of the lower leg following long duration gynecologic and urologic procedures is a rare complication. Rhabdomyolysis, limb loss, or even death may result from ineffective treatment [1].

Acute rhabdomyolysis is a syndrome characterized by a skeletal muscle lesion and subsequent release of contents into the circulatory system, which can cause potentially lethal complications such as myoglobinuria, electrolyte abnormalities, and acute kidney injury.

We examined the case of a 44yearold male patient who underwent a radical cystectomy for high grade urothelial carcinoma. This was complicated by massive rhabdomyolysis, which led to lumbar para spinal compartment syndrome and acute kidney damage.

Case Report

A 44yearold man was scheduled for an elective radical cystectomy with orthotopic neo-bladder reconstruction by a Hautmann ileal neobladder for high-grade urothelial carcinoma "lymphoepithelioma like" pT2 cN0 M0. His preoperative anesthesia consultation revealed an American Society of Anesthesiologists (ASA) physical status 2 with a body mass index (BMI) of 33,3 kg/m2. His medical history included former tobacco use (forty five packs per year) and spinal anesthesia for a transurethral bladder resection two months earlier. At the time of surgery, he received standard care and underwent four cycles of cisplatin and gemcitabine neoadjuvant chemotherapy. The surgery was performed under general anesthesia. Antibiotic prophylaxis with cefuroxime 1.5 g and metronidazole 500 mg proved beneficial for the

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*Corresponding author.
E-mail address: comte.virginie@yahoo.com

patient. We used lidocaine 1% 50 mg, propofol 1% 300 mg, sufentanil 20 mg, and rocuronium 50 mg to induce anesthesia. Desflurane 7% (MAC 1.0) and continuous infusions of lidocaine (2 mg/kg/h), ketamine (0.15 mg/kg/h), and dexmedetomidine (0.4 mcg/kg/h) were used for anesthesia maintenance. The surgical procedure lasted six hours. The enhanced recovery after surgery (ERAS) protocol was utilized for perioperative care. A pain relieving device containing ropivacaine 0.2% (7 ml/h) was placed in the abdominal compartment for postoperative analgesia.

The surgery was uncomplicated, and the patient was transferred to intermediate care for post-surgery monitoring. Immediately after the extubation, he described severe lumbar pain. Laboratory results (Table 1) revealed an increase in creatine kinase (15351 UI/L) in the absence of lactate and a 32% increase in basal creatinine (117 mmol/L) in the presence of hyperkalemia (5.8 mmol/L).

Table 1- Laboratory results J0- J11

Laboratory results	**J0**	**J1**	**J4**	**J7**	**J11**
Hemoglobin (g/l)	114	107	77	76	77
K+ (mmol/L)	5.8	5.9	4.1	3.9	4.7
Créatinine (mmol/L)	117	123	237	123	87
Créatine-Kinase (CK)- UI/L	15351	33400	14712	6787	1643
ASAT UI/L	89	754	487	166	121
ALAT UI/L	65	251	355	220	157
C-réactive protein (PCR) mg/L		10,6	260	93	26.1

There were no indications of ischemia or a herniated disk on the abdominopelvic CT scan. Intravenous patientcontrolled analgesia (IVPCA) was used to titrate morphine, but the results were insufficient. Then, we administered an infusion of fentanyl 50 µg /h and ketamine 20 mg/h, tizanidine 6 mg daily (3 mg twice a day orally), clonidine 90 µg twice daily intravenously, magnesium 3 g once daily intravenously, hypnosis, physiotherapy, and lorazepam 1 mg once daily orally.

Four days later (J4), the pain was uncontrollable and persistent despite these treatments. We performed abdominal and lumbar magnetic resonance imaging (MRI), which revealed muscular edema that affected the para spinal muscles down to the dermis and roots of the gluteal muscles (Figure 1 and 2).

Figure 1-Thoracolumbar magnetic resonance imaging with sequence T2 STIR with fat saturation showing marked diffuse hypersignal "edema"of paraspinal muscles (Parasagital view)-- white arrows: edema of paraspinal muscles

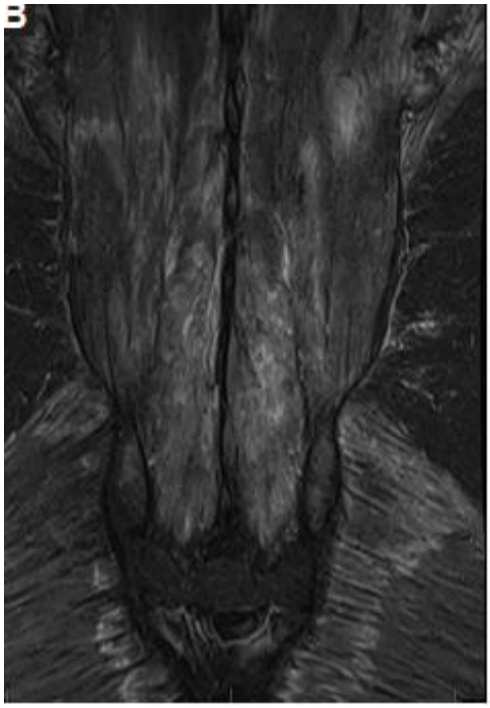

Figure 2- Anterior View

Imaging and an increase in compartment pressure (measured at 27 mmHg and a delta pressure of of 43 mmhm at J5 by a handheld manometer device) resulting from prolonged hyperextension under general anesthesia confirmed the presence of compartment syndrome with rhabdomyolysis. Due to the delayed diagnosis and the

risk of infection, a fasciotomy was not performed. References values are showed on (Table 2) [4].

Table 2- References values for Compartment pressure

Compartment Pressure	Pression (mmHg)
Normal	0-10
Elevated	20-30
Emergency	>30

The implementation of an insulin glucose protocol and hyper hydration resulted in the normalization of serum potassium and kidney function. Additionally, the evolution of creatine kinase was positive, and the patient was pain free after multimodal analgesia at J4.

Discussion

Lower limb compartment syndrome is caused by abnormal increases in intracompartmental pressures within a nonexpandable fascial space. It has been recognized after the prolonged elevation of the lower limbs during surgical procedures in the lithotomy position and many other positions, such as the hyperextended position used during open cystectomy. The incidence of compartment syndrome after major pelvic surgery in the lithotomy position has been estimated to be 1 in 3500 cases, but it may be higher in urological surgery. The incidence of cystectomy surgery in a nonlithotomy position has not, however, been documented in the literature. Compartment syndrome is caused by a prolonged decrease in lower limb perfusion as a result of an increase in compartment pressure [2-3]. Reduced perfusion pressure results in tissue ischemia. Ischemia can be followed by reperfusion, causing subsequent capillary leakage and tissue edema. The result is a vicious cycle of tissue edema and further impairment of perfusion. When compartment pressure exceeds 50 mmHg for more than four hours, irreversible neuromuscular damage occurs.

In 2004, 520 consultant urologists with more than twenty years of experience in the United Kingdom responded to an anonymous postal survey; only 9 percent of respondents were positive for CS after performing urologic surgery. Risk factors for the development of CS included intraoperative hypotension, blood loss/hypovolemia, peripheral vascular disease, prolonged operation (more than four hours in 94 percent of all cases), muscular calves, and high body mass index (> 25 kg/m2) [4]. Our patient had two risk factors at the time of surgery: a prolonged operation and a high body mass (33.3 kg/m2). Anesthetists should be aware that any degree of head down Trendelenburg tilt may also increase compartment pressures, although no consistent data are indicating which inclination should be considered harmful. A diagnostic delay may be associated with a worse prognosis. Lack of staff awareness may have contributed to this delay, and all staff involved in the perioperative and postoperative care of such patients must have a low index of suspicion for the development of CS.

In our case report, magnetic resonance imaging provided a definitive diagnosis only five days after extubation and measurement of compartment pressure due to uncontrolled pain. A previous negative CT for compartment syndrome should not be considered the gold standard for diagnosis.

The patient also developed acute kidney injury (Kidney Disease: Improving Global Outcomes (KDIGO) II classification) due to rhabdomyolysis. Possible post renal acute kidney failure may also be responsible for kidney injury. A temporary nephrostomy that was difficult to flush was reported by paramedical staff. After correcting all of these factors, the patient's renal function returned to normal ten days after being discharged from intermediate care. This patient was sent for rehabilitation and discharged days later without any lasting effects.

Conclusion

Compartment syndrome requires a high level of clinical suspicion and, if untreated, can result in permanent injury or death. Our case is exceptional due to a position that is poorly described in the literature, and its outcome was positive. The use of hydraulic stirrups may allow for simple and minimally disruptive position changes during procedures, such as changing position during a cystectomy and then lowering the patient at the end of the procedure. Medical staff must be aware of the clinical presentation, treatment, and outcome.

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