Compartment Syndrome after Prolonged Lithotomy Position in Patient Receiving Combined Epidural and General Anesthesia

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The compartment syndrome is a rare, but potentially serious complication observed in patients who undergo prolonged procedures in the lithotomy position. Because of providing relief of postoperative pain, postoperative epidural analgesia may mask symptoms and signs of the compartment syndrome, delaying diagnosis and treatment[1]. The following case report describes such a patient who underwent prolonged genitourinary surgery in the lithotomy position with general and epidural anesthesia, but the compartment syndrome was suspected with measuring the compartment pressure.

Case Report

A 15-year-old woman, weight 70.5 kg, ASA physical status 2, was scheduled for surgery to repair a genitourinary fistula. She received general anesthesia (oxygen/nitrous oxide/isoflurane) and intermittent epidural anesthesia with 2% mepivacaine via the catheter inserted between L1 and L2 intervertebral space. Shortly after the induction of anesthesia, the patient was placed in the lithotomy position using adequately padded leg holders. She remained in the lithotomy position for the duration of the 11-hour procedure. No hypotension or surgical trauma to the vascular supply of the lower extremities occurred during the procedure. One hour before the end of the procedure, 5 ml of 2% mepivacaine was injected via the epidural catheter. Immediately after waking up in the recovery room, she complained of severe pain in her right calf. Tension was noted in the calf compartments. Swelling and pain of the lower extremity which were not relieved by epidural injections of lidocaine, persisted during the immediate postoperative period. On physical examination, her right lower leg was markedly edematous and painful on palpation. She had decreased sensation in the right foot, and was unable to move the toe or ankle. The posterior tibial pulses were diminished. Compartment pressures in the right lower extremity were: anterior, 114 mmHg; lateral, 63 mmHg; su-

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perficial posterior, 67 mmHg; and deep posterior, 81 mmHg[2]. The pressures in the left leg were normal: 24 mmHg. The compartment syndrome was diagnosed by consulting an orthopedic surgeon.

The patient underwent four fasciotomies of the compartments of the lower right leg 23 hours after the original surgery. Intraoperative examination revealed a small amount of necrotic tissue in the deep posterior compartment. On the first original postoperative day, laboratory studies revealed a serum creatinine phosphokinase value of 35,700 U with a 98% MM fraction. Serum blood urea nitrogen and creatinine were 15.0 $mg \cdot dl^{-1}$ and 0.89 $mg \cdot dl^{-1}$, respectively. Renal function was well maintained. Delayed primary closure was performed 15 days later. At discharge, the patient was able to walk unassisted, with a slight limp.

Discussion

The compartment syndrome is the result of elevated local pressure of tissue fluid in a closed compartment[3,4]. This increased tissue pressure can compromise the circulation and tissue function within the space. In our patient, the stirrups exerted pressure on the muscle mass of the calf, increasing the pressure in the deep compartment while the patient had been in the lithotomy position. Although the maximum duration of time that a patient can safely remain in the lithotomy position is not known, it seems prudent to limit the duration to less than 6-1/2 hours[5]. We used a standard leg brace stirrup in the present case because the planned operative time according to the surgeon was 3 hours. Because of the prolonged surgery, it would have been better to switch from the leg brace stirrup to the leg suspension system, which permits long-term suspension of the lower extremities without risk of lower extremity compression[5,6]. Other intraoperative factors that may contribute to the development of compartment syndrome include hypotension, hypothermia, vasoconstriction, hypovolemia, and compression of the pelvic vessels. Our patient experienced mild hypothermia (35.7°C) and vasoconstriction, which usually coexist during prolonged surgery, but these effects were not significant.

Typical symptoms and signs of the compartment syndrome include severe pain, plantar hypoesthesia, weakness of compartmental muscles, pain on passive stretching of those muscles, and tense swelling of the compartment. In conscious patients, the early symptom complex usually alerts the physician to the compartment syndrome. However, in patients with tracheal tube in place or receiving epidural anesthesia, early diagnosis for the syndrome would be difficult. Although the effects of regional sympathectomy associated with intraoperative anesthesia on the compartment syndrome are not known, epidural analgesia may mask the pain and hypoesthesia that are the early symptoms of compartment syndrome[1,7]. Fortunately, the early symptoms of our patient were not masked by epidural analgesia. The keys to the diagnosis of compartment syndrome are a high index of suspicion and the early measurement of compartment pressure. In the presence of a tissue pressure above 30 mmHg and one or more of the signs and symptoms of compartment syndrome, fasciotomy, which is the only reliable method of terminating the malignant ischemia-edema cycle, should be performed promptly[8]. Our patient achieved nearly complete recovery after fasciotomy without major complications, especially renal failure.

The compartment syndrome can be prevented by the following measures: 1) avoid unnecessary points of com-

pression of the lower extremity when positioning the patient; 2) use leg suspension type stirrups to avoid direct pressure on the calves; 3) reduce the length of time the patient is kept in the lithotomy position; 4) monitor all factors that predispose the compartment syndrome. Early diagnosis and prompt treatment of this syndrome can reduce complications such as permanent neuromuscular dysfunction, skin necrosis, and myoglobinuric renal failure.

In summary, our patient developed the compartment syndrome after prolonged surgery in the lithotomy position. Symptoms were not obscured by the use of epidural analgesia. Although there is no contraindication to the use of epidural infusion, careful monitoring of the patient and a high degree of suspicion are necessary in patients at risk for developing of the compartment syndrome.

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