CASE REPORT

The curse of relieving pain

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SUMMARY

A 39-year-old woman with a history of chronic back pain due to spinal haemangiomas, multiple malignancies and depression was brought by Emergency medical services to the emergency centre (EC) after being found unresponsive on the bathroom floor.

The patient had an exacerbation of her back pain the previous day for which she admitted to taking double her usual dose of oxycodone, in addition to alprazolam, lorazepam, diphenhydramine and a glass of wine. She reported that she lost consciousness and was down for over 8 hours. In the EC, she complained of right forearm pain which was accompanied by mild diffuse soft-tissue swelling and decreased sensation in the right hand. Radial pulse was intact. Creatine kinase was found to be at 4663 U/L. The patient was found to have acute compartment syndrome and underwent emergent forearm fasciotomy. She eventually regained full function of the right arm.

BACKGROUND

Acute compartment syndrome (ACS) is a surgical emergency that most often occurs following significant trauma. It is associated with significant morbidity if not promptly diagnosed and successfully treated.^{1,2} Severe complications are inevitable if the fasciotomy is delayed >12 hours. Irreversible muscle damage can occur within even 6–8 hours of moderately raised compartment pressure. Local complications may include infection, contractures (including Volkmann's), deformity, functional impairment, amputation or nerve damage with weakness or paralysis of affected muscles, while systemic complications include acidosis, hyperkalaemia, myoglobinuria, acute renal failure or shock.^{3–5}

Drug overdoses and deaths are increasing in the USA. In 2015, drug overdoses accounted for 52 404 deaths in the USA, from which 33 091 (63.1%) involved an opioid.⁶ The increase in opioid-related deaths has been directly linked to an increase in opioid prescriptions, with opioid prescriptions and opioid-related deaths both quadrupling since 1999.^{7,8}

In this case, we present acute compartment syndrome as a result of prolonged loss of consciousness caused by overdose with prescribed controlled substances that mainly included an opioid medication. Acute limb compartment syndrome has never been reported in association with chronic opiate treatment. It is very important for physicians to keep awareness of possible complications of prescription opiate drugs, especially when polypharmacy is needed to address multiple concomitant medical problems.

CASE PRESENTATION

A 39-year-old woman presented to the emergency centre (EC) after an episode of loss of consciousness. She was down on her bathroom floor for at least 8 hours. She eventually regained consciousness and was able to talk with her mother who called 911. On presentation, the patient appeared drowsy and lethargic. However, she was arousable by loud verbal stimuli. She admitted to taking a total of 120 mg of oxycodone, which was double her prescribed dose, in addition to a couple of diphenhydramine pills (unknown dosage), one alprazolam 1 mg, one lorazepam 0.5 mg and a glass of wine for an exacerbation of her back pain. Later in the course of the EC stay, she complained of pain in her right forearm and hand. She did not recall having this pain in her arm before.

Vital signs were within normal limits. On physical exam, the right forearm, hand and fingers were erythematous and swollen. The right hand was held in ulnar claw position. Marked tenderness to palpation was noted over the forearm, wrist and hand circumferentially. The compartment in the forearm was firm but compressible. Strength was compromised in the flexors and hand intrinsic muscles. Sensation to light touch was decreased in the median and ulnar nerves distributions. Radial pulse was palpable.

Initial laboratory results showed elevated creatine kinase levels at 4663 U/L, alanine transaminase at 78 U/L and aspartate transaminase at 259 U/L. X-ray of the entire right upper extremity did not reveal any fractures or dislocation. She was diagnosed with acute compartment syndrome and was emergently taken to the operating room where she underwent a forearm fasciotomy.

The patient had a history of renal cell carcinoma status postpartial right nephrectomy in 2010, thyroid papillary carcinoma status post-thyroidectomy in 2009, metastatic melanoma status post wide excision in 2012, hepatic haemangiomas, splenic haemangioma, chronic back pain secondary to spinal haemangiomas, depression and anxiety. She underwent multiple excisions of skin melanomas all over the body including one lesion on the right arm 3 years before this event. Her family history was only positive for thyroid cancer in maternal aunt and colon cancer in maternal grandmother. She had a history of tobacco abuse for many years and occasionally smoked marijuana.

INVESTIGATIONS

Her white cell count was elevated at $16.7 \times 10^9/L$, with $14.7 \times 10^9/L$ neutrophils and $0.04 \times 10^9/L$ immature granulocytes. Ethanol, acetaminophen

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Figure 1 Right hand in ulnar claw position 3 weeks after fasciotomy.

and salicylate levels were within normal limits. A urine drug screen was not done. Her creatinine was 0.84 mg/dL and her potassium level was 5.0 mm/L. Head CT was negative for acute bleeding and head MRI failed to show any acute intracranial process. Due to the emergent need to operate, the patient did not undergo muscle MRI or duplex ultrasound.

DIFFERENTIAL DIAGNOSIS

The acute nature of the pain and swelling after an 8-hour period of loss of consciousness raised suspicion for compartment syndrome. Her high creatine kinase levels supported this diagnosis. X-ray was done to evaluate for fractures. The patient did have leukocytosis but infectious process seemed less likely due to the very fast progression of symptoms and signs. Duplex ultrasound to rule out vascular injuries or venous thromboembolism

Figure 2 Full recovery of right arm function following occupational therapy.

was not done before fasciotomy because of the emergent nature of the surgical intervention.

TREATMENT

Patient was emergently taken to the operating room. The right arm was elevated and tourniquet was inflated to 250 mm Hg. A volar incision was made extending from the carpal tunnel all the way into the elbow flexion crease. Carpal tunnel release was performed. The deep flexor compartment had evidence of necrosis of portion of the digital flexors as well as portion of the flexor pollicis longus, which was debrided. After the volar fasciotomy and debridement, a dorsal fasciotomy was performed. The dorsal compartments were mobilised, the common digital extensors appeared benign with viable tissue and no significant elevated pressure. The volar wounds were closed loosely primarily. The arm was placed in a long bulky splint holding the digits in extension.

OUTCOME AND FOLLOW-UP

The patient remained in the hospital for few days after the fasciotomy. Creatine kinase levels were checked daily and came down significantly even after intravenous fluids were stopped. The patient was discharged home. She followed up with orthopaedic surgery for splint removal and also underwent outpatient occupational therapy (figure 1).

The patient maintained regular follow-up with her primary care physician and achieved full recovery of her right upper extremity function (figure 2).

DISCUSSION

Acute compartment syndrome has been reported in the literature as a complication of loss of consciousness from illicit drug overdose especially from heroin.^{9–11} There are no reports of acute compartment syndrome occurring in patients who lost consciousness after overdosing on their prescribed opioid medications or controlled substances. In one case report about acute compartment syndrome following heroin overdose, the patient presented to the emergency centre for complaints of severe hand pain. The patient underwent emergent fasciotomy and was discharged 1 week later. On follow-up 3 weeks after fasciotomy, the patient only regained partial function of the hand.⁹ In other cases, patients presented with gluteal compartment syndrome. One of these patients had subsequent sciatic nerve palsy which completely resolved following emergent fasciotomy.¹⁰ While another patient developed persistent lower extremity weakness and was discharged to a short-term rehabilitation centre.¹¹ Our patient was fortunate to have a complete recovery of her limb function.

Compartment syndrome has also been reported as either a presentation of metastatic malignancies¹² or a complication following surgery for cancers.^{13 14} However, the association between compartment syndrome and prescribed opioid overdose has not been reported in the patient population with cancer despite the fact that this population has opioids being prescribed fairly commonly and potentially in a more liberal fashion when compared with other patients without malignancy. We are reporting the first case of acute compartment syndrome developing as a result of prescription medication overdose. The reported patient had been taking opioids for years before this incident. However, we believe that taking double her dose in addition to small doses of other central nervous system depressants caused her to pass out and lie on her right arm for over 8 hours resulting in non-traumatic compartment syndrome.

Patient's perspective

I do not remember much about the incident, but I now have a permanent reminder of a scar that extends from the middle of my hand up to my elbow. It has been 8 months since the accident and I still have pain in my hand and arm sometimes. The dose of oxycodone I was taking before the accident was not strong enough to help with the new pain but I did not want to increase the dose as I was and still am afraid to take too much and possibly have another accident. Over the past 6 months, I have been slowly decreasing my dose and learning to handle the pain better. The whole incident was very scary and a wake-up call, so to speak, as to the dangers of pain medication use and mixing with other medications, even over-the-counter medications. In the past 10 years I have had three cancers and nine surgeries, this surgery was the most painful of all.

Learning points

- ▶ Physicians should be very careful when prescribing narcotic pain medications to patients taking other central nervous system depressants, always balancing risks and potential benefits.
- ▶ Narcotics should be prescribed to patients with cancer very cautiously and in a controlled fashion, as it is crucial to avoid unwanted complications while attempting to control cancer-related pain.
- ▶ Opiate prescribing guidelines must include recommendations to help physicians prescribe opiates to patients with cancer in a safe and effective manner, especially when combined with other controlled substances.
- ▶ Education about potential interactions between opioids, benzodiazepines and alcohol should be provided constantly. Also, close follow-up and re-evaluation for the need for these medications should be considered at every physician–patient interaction.
- ▶ High suspicion for compartment syndrome should be kept when patients present unconscious for a long period of time, and thorough physical exam should be done as patients can present with milder symptoms masked by the effects of these medication.

The fact that our patient had a history of malignancies is also certainly new in terms of prescribed medication-induced loss of consciousness resulting in compartment syndrome. Although

compartment syndrome was reported in association with cancers, opioids overdose was not involved in the cause. This patient's pain was possibly masked by the effect of the medications, as she failed to mention the pain on her EC arrival. This raises the point that patients with prescribed controlled substances should be fully and thoroughly evaluated on presentation as these medications could potentially mask pain and cause central nervous system depression.

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