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CASE REPORT

Transient coma: A complication after neurolytic celiac plexus and splanchnic nerve blocks in a patient with superior mesenteric artery syndrome

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SUMMARY

The unintentional intravascular injection of alcohol or phenol during the neurolytic block of the celiac plexus or splanchnic nerves can cause major side effects, which are rare but potentially fatal. We report a case of a 42-year-old female with a history of epigastric pain, persistent postprandial vomiting, and weight loss due to superior mesenteric artery syndrome, who underwent a fluoroscopy-guided neurolytic splanchnic nerve block with phenol and a celiac plexus block with alcohol, complicated by transient coma immediately after the procedure. Any pain originating from visceral abdominal structures can be effectively reduced by the neurolytic block of the celiac plexus or splanchnic nerves. Although the systemic effects of alcohol and phenol are not normally expected, physicians should be aware of serious complications such as intoxication, seizures, and unconsciousness due to intravascular injection.

Keywords: Abdominal pain; celiac plexus; coma; complication; splanchnic nerve; sympathetic nerve block.

Introduction

Superior mesenteric artery (SMA) syndrome is an unusual and rare cause of abdominal pain, particularly in the postprandial period, and can lead to vomiting and weight loss due to the compression of the third part of the duodenum in young adults.[1] Splanchnic nerve (SN) and celiac plexus (CP) block techniques are usually used for cancer-related pain but are also effective in managing noncancerous visceral pain.[2] Each technique is different; however, their clinical effects and potential complications are similar. Alcohol and phenol induce chemical neurolysis for prolonged analgesic relief. The complication rate is estimated to be 1-2%.[3] Hypotension and diarrhea are relatively common and reversible side effects associated with CP and SN blocks.[4] Intravascular injection, epidural or subarachnoid injection, inadvertent neurolysis of the lumbar somatic nerves, retroperitoneal hematoma, and pneumothorax are other possible complications following CP and SN blocks.

In this article, we present the case of a 42-year-old female with a history of persistent postprandial epigastric pain, vomiting, and weight loss due to SMA syndrome, who fell into a transient coma immediately after a fluoroscopy-guided SN block with phenol and a CP block with alcohol.

Case Report

A 42-year-old female with SMA syndrome was admitted to our pain medicine outpatient clinic with complaints of persistent postprandial abdominal pain and vomiting. There was an involuntary 27% weight loss over the past year (height: 161 cm; weight: 40 kg). The pain intensity was 8/10 (VAS) and did not respond to medical management, including high doses of tramadol (300 mg/day). Informed consent was obtained from the patient for the interventional procedure. Since the patient had previously undergone SN and CP blocks separately without adequate pain relief, we decided to combine both procedures in a single session. CP and bilateral SN blocks under fluoroscopic guidance were scheduled.

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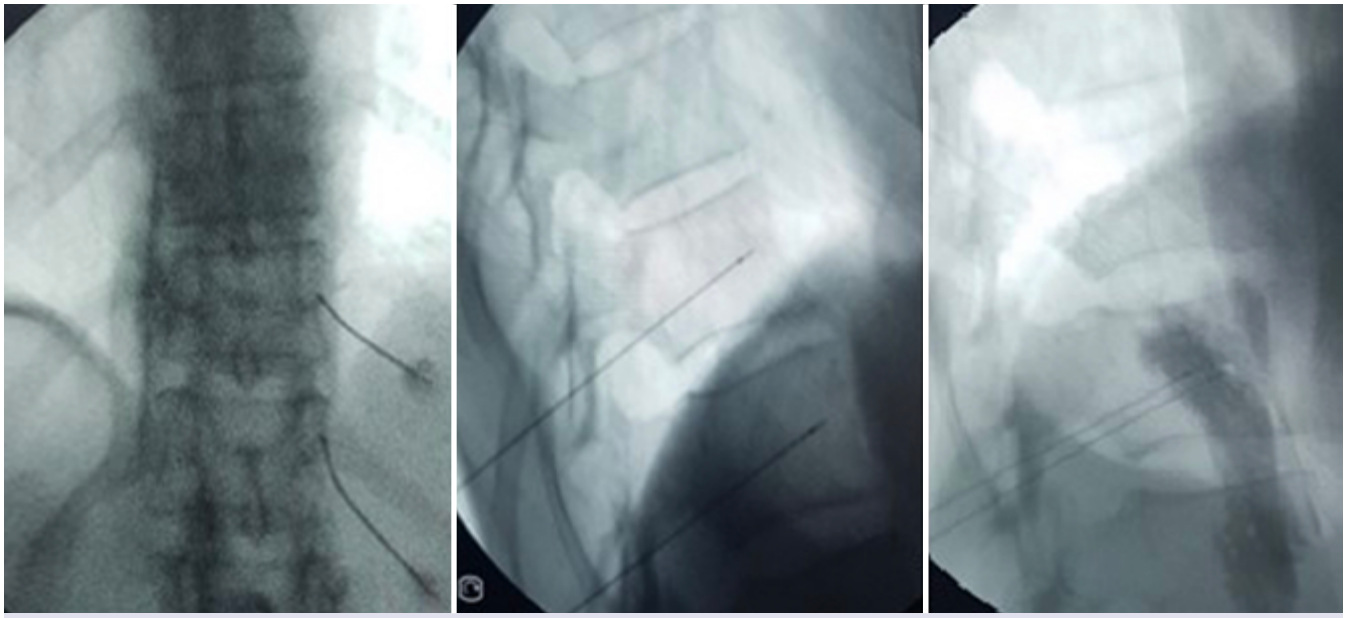

Figure 1. Fluoroscopy images of neurolytic splanchnic nerve block are shown. Bilateral splanchnic neural blocks were performed at the T11 and T12 vertebral levels.

The patient's vital signs were monitored, and two milligrams of midazolam were administered intravenously for sedation. The patient was placed in the prone position with a pillow under the lower abdomen to minimize lumbar lordosis. First, diagnostic blocks with a local anesthetic plus steroid were applied, and pain relief was noted in both neurolytic blocks. SN blocks were performed with phenol at the T11-T12 vertebral levels. The point of entry was at the junction of the rib and the vertebral body (Fig. 1). The needle was advanced to the junction between the anterior one-third and posterior two-thirds of the lateral wall of the vertebral body in the lateral fluoroscopic view. The placement of the tip of the needle was confirmed with a contrast medium, and 6% phenol was injected (4 cc phenol for each level) after negative aspiration for blood.

In addition to the neurolytic SN block with phenol, a trans-aortic CP block was performed with alcohol during the same procedure (after approximately 10 minutes) (Fig. 2). Two milliliters of contrast medium were injected to confirm correct placement, and 4 cc of 2% lidocaine was injected into the pre-aortic space after negative aspiration for blood, followed by 6 cc of 98% alcohol. The patient stated that the pain increased, and her consciousness progressively worsened. Although she responded to painful stimuli with eye-opening, she could not maintain alertness. Within seconds, the patient became completely unresponsive to stimuli, exhibited wandering eye movements, and had bilaterally absent Babinski reflexes.

The patient was hypotensive from the beginning of the procedure. She was determined to be in a coma with a Glasgow Coma Scale score of E1V1M1, with a blood pressure of 85/45 mmHg, a pulse of 80-89 beats per minute, a respiratory rate of 24 breaths per minute, and a core body temperature of 36.4°C; her oxygen saturation was 85% despite airway and oxygen support. Arterial blood gas analysis showed metabolic acidosis (pH 7.26, pCO2 41.5 mmHg, pO2 129 mmHg, HCO3 18.8 mmol/L, base deficit -7.7 mmol/L, lactate 2.1 mmol/L). Initial investigations revealed blood urea nitrogen of 17 mg/dL, creatinine of 0.81 mg/dL, sodium of 137 mmol/L, potassium of 4.5 mmol/L, chloride of 107 mmol/L, glucose of 116 mg/dL, phosphate of 3.21 mg/dL, and albumin of 35.1 g/L.

During follow-up, the patient required tracheal intubation and mechanical ventilation. After a fluid challenge, an infusion of sodium bicarbonate and an inotropic agent (dopamine) was administered. There was no evidence of acute ischemia or intracranial hemorrhage in diffusion-weighted MRI and cranial CT.

After two hours of follow-up in the intensive care unit (ICU), the patient started to regain consciousness and breathe spontaneously. She was able to maintain alertness and follow commands (GCS 12/15,

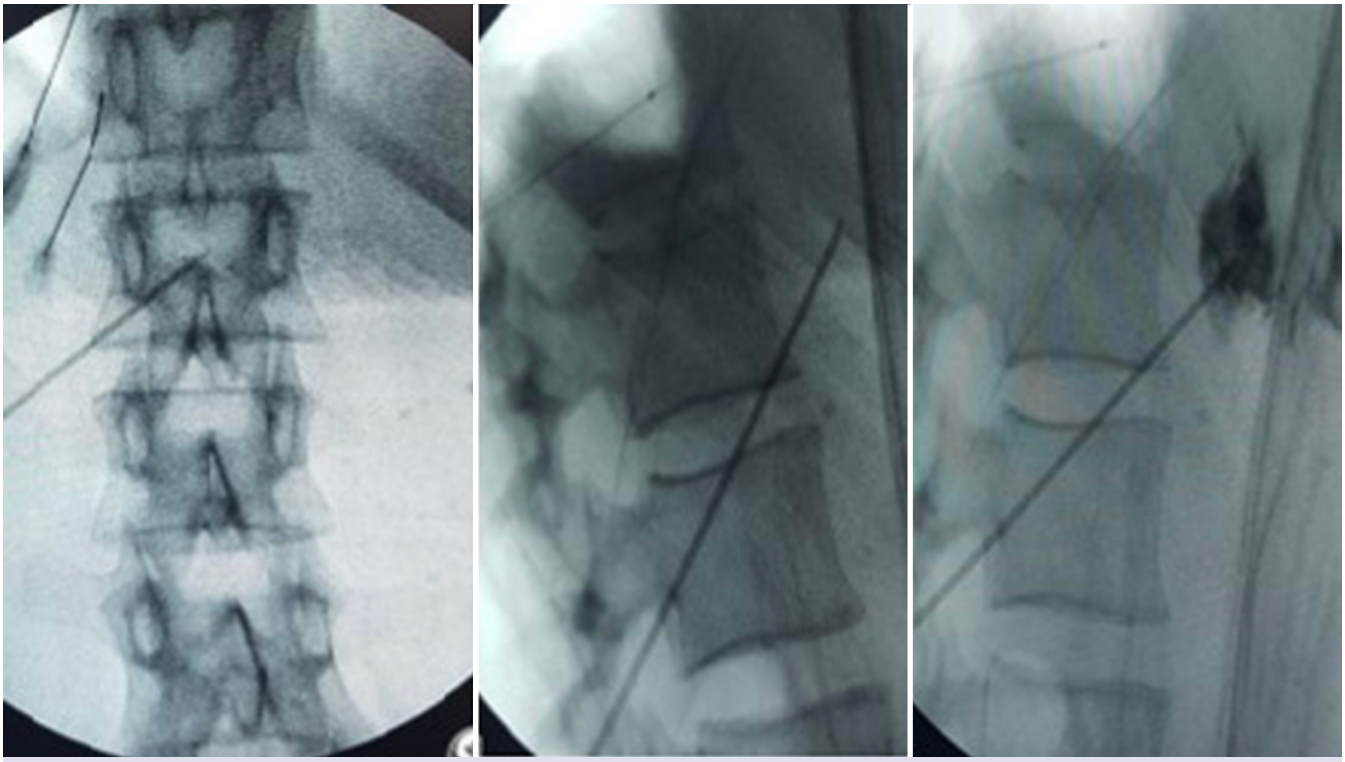

Figure 2. Fluoroscopy images show neurolytic celiac plexus block. Transaortic celiac ganglion block was performed at the L1 vertebral level.

E4V2M6). The patient was extubated and discharged from the ICU the following day with a normal neurological examination. Post-procedure, she did not experience postprandial pain or vomiting.

Discussion

The splanchnic nerves (SN) arise from the thoracic sympathetic trunk at the T5-T12 vertebral levels, and the celiac plexus (CP) is located at the T12-L1 level in the anterolateral portion of the aorta.[5] In cancer-related pain, early neurolysis is recommended.[6] Marra et al.[7] stated that SN blocks had a higher success rate than CP blocks. In addition, in the study by Suleyman Ozyalçin et al.,[8] the efficacy of CP and SN neurolysis in patients with pancreatic cancer-related abdominal pain was evaluated, and they showed that SN neurolysis provided better pain control and quality of life, significantly reducing patients' analgesic consumption. On the other hand, some studies have reported a success rate of up to 95% with CP block.[9]

Fluoroscopy- or CT-guided interventions have advantages, as the SN and CP are close to important vascular structures and viscera. Fluoroscopy provides a real-time view during the injection, and needle placement can be confirmed before injection to prevent intravascular, intraspinal, or lateral spread of the neurolytic agent. We used fluoroscopy guidance because it was more accessible. Additionally, it has been reported that CP and SN blocks can be selected and combined according to patients' needs.[7] Since the patient's improvement was insufficient and short-lasting after two separate procedures in the past, we applied a combination of both methods in a single session.

While no side effects were observed after SN block with phenol, despite negative blood aspiration, the patient gradually lost consciousness immediately after transaortic CP block with alcohol and fell into a coma. The systemic effects of alcohol are not expected during nerve blocks; however, considering the patient's symptoms and clinical course, we attribute her condition to unintended intravascular alcohol administration. Although measuring blood alcohol levels is recommended when alcohol intoxication is suspected, we were unfortunately unable to assess the patient's post-procedure blood alcohol level. Cranial imaging is also crucial in unconscious patients, and no evidence of ischemia or hemorrhage was noted.

When we retrospectively analyzed the patient's fluoroscopy images, no intravascular contrast dye was

observed; however, the needle tip may have shifted when alcohol was injected. Additionally, Kaplan et al.[10] reported a case of a patient who underwent transaortic neurolytic celiac ganglion block with alcohol. Similar to our patient, the patient in their study experienced a generalized increase in pain throughout the body after alcohol injection. They suggested that this pain increase may have been due to some intra-arterial alcohol injection.

Alcohol and phenol cause tissue inflammation and necrosis, resulting in denervation of nerve roots and reducing pain. However, nerve fibers regenerate, and pain may return within 3-6 months.[11] Alcohol provides immediate neurolytic action and causes burning pain at the injection site; therefore, a local anesthetic should be administered first. Alcohol may also be associated with higher rates of neuritis, and larger volumes are required compared to phenol.[12] Phenol, which has a weak local anesthetic effect, provides delayed neurolysis compared to alcohol and does not cause pain at the injection site. The use of phenol has been considered a disadvantage due to its higher affinity for vascular structures rather than nerves. Additionally, another disadvantage is that phenol has a shorter duration of action in persistent pain.[4]

It has been reported that alcohol injection into the celiac plexus is associated with a systemic increase in plasma alcohol levels, possibly due to local vascular uptake. Accidental intravascular injection of 30 mL of 100% ethanol can lead to blood alcohol levels exceeding the legal driving limit.[13] When we performed transaortic neurolytic CPB with 98% alcohol, the total volume was 6 mL. Although this was not a toxic alcohol dose, unconsciousness progressing to coma may have developed because our patient was not a chronic alcohol user, was cachectic, and was sensitive to a bolus injection of alcohol.

On the other hand, our patient did not experience the possible early side effects of intravascular phenol injection, such as transient tinnitus and flushing. Unintended intravascular administration of a higher dose of phenol causes hypotension, cardiac arrhythmias, and central nervous system stimulation, which manifests as muscle tremors and convulsions, followed by depression.[14] It has been suggested that phenol should be avoided for celiac plexus block and reserved for splanchnic block, which is usually applied in lower volumes.[4]

The rate of serious complications associated with CP and SN blocks is low. It has been noted that moderate complications are usually caused by mechanical or chemical damage to the structures adjacent to the targeted nerves and that, despite anatomical changes due to cancer or surgery, major complications near such an important and sensitive structure are surprisingly rare.[4]

Hypotension and diarrhea are common and usually reversible side effects associated with CP and SN blocks. Hypotension is also thought to be a sign of a successful block. It should be known that hypotension can sometimes be severe enough to be life-threatening. Although back pain is often caused by alcohol irritation and trauma of retroperitoneal structures, retroperitoneal bleeding should always be kept in mind in patients who develop post-procedure back pain and hypotension.[15] Diarrhea is another consequence of relatively increased parasympathetic activity after celiac or splanchnic nerve blocks. Although it is mostly a self-limiting condition, long-lasting and severe cases without response to medication (octreotide, loperamide, etc) have been reported.[16] Pneumothorax occurs infrequently, especially during SN block, and sometimes requires hospitalization. There have been reports of much rarer complications such as spinal cord injury, end-organ ischemia, paraplegia, vascular thrombosis, and bilateral diaphragmatic paralysis.[17] These injuries with neurolytic agents may not be reversible but may also be fatal sometimes. Extensive retroperitoneal soft tissue necrosis after trans-aortic L1 celiac plexus neurolysis was also reported by Zhou et al.[18] On the other hand, it's suggested that a single fine needle puncture of the stomach, liver, kidney, intestines, pancreas, and aorta may not always result in complications and is usually self-limiting.[19] Paraplegia is another known serious complication with all posterior approach techniques of CP and SN. Paraplegia is thought to develop from spasms in spinal segmental arteries or from necrosis or occlusion in the Adamkiewicz artery, which starts around T12–L1 in the lumbar region, mostly on the left side, and supplies the anterior two-thirds of the spinal cord. A left-sided celiac plexus block could have a higher chance

of damaging the artery. Kumar et al.[20] reported a case of a patient with metastatic pancreatic tumor who developed reversible paraparesis after CP block and they indicated that any CP block technique in the region of the thoracoabdominal aorta seems to have the potential for this complication. Therefore, it is considered to be unrelated to technique and experience. In addition, some authors suggested that transaortic approaches should be avoided in patients with aortic atherosclerotic disease due to the increased risk of rupture or aorta dissection and bleeding.[15]

Apart from the neurolytic block with alcohol and phenol, neurolysis of splanchnic nerves is also possible with radiofrequency ablation (RFA) techniques. Although it seems safer because the lesion can be controlled with RFA,[4] Tewari et al.[21] reported a case of chronic pancreatitis who developed intercostal neuralgia of the left 11th intercostal nerve after bilateral splanchnic nerve RFA due to one of the needles having a thin slit in the insulating sheath about 30 mm from the active tip. They recommended checking of equipment before use in the RFA procedure. Especially, special attention should be paid to ensuring the integrity of the insulating sheath of the needles to be used to prevent injury to non-target nerves.

Increased blood ethanol level, metabolic acidosis, hypoglycemia, hyponatremia, hypokalemia or hyperkalemia, hypophosphatemia, and hypoalbuminemia are the laboratory findings seen in alcohol intoxication. Consistent with these findings, metabolic acidosis was detected in the patient's blood gas. Hypoalbuminemia was not surprising because the patient was cachectic. Our patient's glucose level was higher than the previous blood glucose values in response to metabolic stress. Since the first step in the treatment was to support vital functions, our patient was followed up in the intensive care unit.

We presented a patient who underwent neurolytic SN and CP block and fell into a transient coma immediately after the procedure. Due to the clinical course of the patient, we attributed this to alcohol intoxication. We would like to emphasize in this case that despite negative blood aspiration in CP and SN block, unintended intravascular neurolytic injection resulting in serious complications is possible.

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