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USG Guided Interscalene Nerve Block as Perioperative Management in Close Fracture Clavicula with Traumatic Brain Injury Patient and Contusio Pulmonum: A Case Report

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A B S T R A C T

Introduction: Blunt trauma from motor vehicle accidents (MVA) often results in multisystem injuries, including chest, head, and musculoskeletal injuries. Management of these complex injuries requires a multidisciplinary approach and can present unique anesthetic challenges. **Case presentation:** A 22-year-old man was treated in the emergency department (ER) after experiencing an MVA. The patient experienced chest and shoulder pain and was found to have anemia, increased creatinine, respiratory acidosis, prolonged prothrombin time (PT), and increased serum glutamic oxaloacetic transaminase (SGOT). Radiological examination revealed left tension hydropneumothorax, right hydropneumothorax, bilateral lung contusions, fractures of the ribs, clavicle, and scapula. In addition, the patient also experienced subarachnoid hemorrhage (SAH) in the left parietotemporal region and right cistern (Fisher Scale III), brain edema, right pneumo-orbita, type III septal deviation, bilateral inferior nasal concha hypertrophy, and concha bullosa on the medial nasal concha. The patient's physical status was assessed as ASA III. The patient underwent open reduction and internal fixation (ORIF) with an S-plate on the right clavicle. Anesthesia was provided with an interscalene block using 0.375% levobupivacaine and premedication with Fentanyl and Midazolam. **Conclusion:** This case highlights the complexity of managing blunt trauma patients with multisystem injuries. A multidisciplinary approach, including careful airway management, hemodynamic monitoring, and selection of appropriate anesthetic techniques, is essential for optimal results.

1. Introduction

Blunt trauma, especially that resulting from motor vehicle accidents (MVA), is a significant global health problem. MVA is a major cause of morbidity and mortality worldwide, with a profound impact on individuals, families, and communities.[1,2] Injuries caused by MVA are often multisystem in nature, involving various organs and body systems, thus requiring a comprehensive multidisciplinary approach in management.[3] Based on data from the World Health Organization (WHO), blunt trauma is the number one cause of death in individuals aged between 15 and 44 years. Every year, an estimated 1.35 million people die as a result of traffic accidents, and millions more suffer serious injuries. MVA not only results in death and disability, but also creates a large economic burden due to the costs of medical care, rehabilitation, and loss of productivity. Multisystem injuries in blunt trauma are characterized by the involvement of two or more major organ systems, such as the central nervous system, cardiovascular system, respiratory system, musculoskeletal system, and digestive system. The complexity of these multisystem injuries can vary from minor to life-threatening injuries.[3-5]

Head injuries are one of the most common and potentially fatal injuries in blunt trauma patients. Head injuries can include traumatic brain injury (TBI), intracranial hemorrhage (such as subarachnoid, subdural, or epidural hemorrhage), or skull fracture. TBI can result in a variety of neurological symptoms, ranging from mild impaired consciousness to coma, and can lead to long-term complications such as cognitive, motor, or behavioral disorders.[6,7] Management of head injuries aims to prevent or reduce further brain damage, control intracranial pressure, and maintain adequate cerebral perfusion. Chest injuries are also injuries that often occur in blunt trauma patients, especially due to direct impact to the chest or sudden deceleration. Chest injuries can include lung contusion, pneumothorax (simple, open, or tension), hemothorax, flail chest, or heart injury. Chest injuries can compromise respiratory and cardiovascular function, and increase the risk of complications such as respiratory failure, hypovolemic shock, or cardiac tamponade. Management of chest injuries requires special attention to ventilation and oxygenation, as well as close monitoring of vital signs and hemodynamic status.[8,9] Musculoskeletal injuries are the most common injuries occurring in blunt trauma patients. These injuries can include fractures, joint dislocations, ligament injuries, or tendon injuries. Musculoskeletal injuries can result in pain, limited movement, deformity, and impaired function. Management of musculoskeletal injuries aims to restore function, prevent long-term complications such as deformity, infection, or chronic pain, and improve the patient's quality of life. Abdominal and pelvic injuries also often occur in blunt trauma patients, especially due to direct impact on the abdomen or pelvis. Abdominal injuries can involve solid organs such as the liver, spleen, or kidneys, or hollow organs such as the intestines or bladder. Pelvic injuries can be pelvic fractures or injuries to pelvic organs such as the urethra or rectum. Abdominal and pelvic injuries can result in life-threatening internal bleeding, infection, or organ dysfunction. Management of abdominal and pelvic injuries requires careful evaluation, including physical examination, radiological examination, and surgical intervention if necessary.[9,10]

Anesthetic management of blunt trauma patients with multisystem injuries can be a complex challenge. These patients often have underlying medical conditions, such as heart, lung, or kidney disease, that may influence the choice of anesthetic technique and medications. In addition, blunt trauma patients are also at risk of experiencing anesthesia complications, such as hypotension, hypoxia, or hypercarbia, due to the injuries experienced or underlying medical conditions. Therefore, the selection of appropriate anesthetic techniques and careful monitoring are essential to ensure patient safety and comfort during surgical procedures. The anesthesiologist must consider various factors, such as the type and severity of injury, the patient's medical condition, and the type of surgical procedure to be performed, in determining the most appropriate anesthetic technique. Close monitoring of vital signs, hemodynamic status, and organ function is essential for early detection of complications and appropriate intervention.[10-12] In addition, close collaboration between anesthesiologists and other specialists, such as surgeons, radiologists, and intensive care therapists, is essential in the management of blunt trauma patients with multisystem injuries. A coordinated multidisciplinary approach can help improve clinical outcomes and patient quality of life.

2. Case Presentation

A 22-year-old male was admitted to the emergency room due to a motor vehicle accident (MVA) with chest and shoulder pain two days earlier. The patient's vital signs were found to be normal with anemia (Hb = 10.1 g/dl on October 16th, 2023, and 6.4 g/dl on October 15th, 2023). The patient had high creatinine (1.6 mg/dl), respiratory acidosis, prolonged prothrombin time (PT) (17.5s), and increased serum glutamic oxaloacetic transaminase (SGOT). The patient had a history of right hemothorax and right lung contusion two days earlier with an inserted drain. Through a chest X-ray, we found a left tension hydropneumothorax, right hydropneumothorax, bilateral lung contusion, complete fractures on

bilateral posterior 1st ribs, a complete fracture on 1/3 middle of the right clavicle with soft tissue swelling, and an incomplete fracture on the lateral margin of the scapula with soft tissue swelling. Also, there was an inserted water-sealed drainage (WSD) on the third intercostal space in the right posterior.

Through a head MSCT, a subarachnoid hemorrhage (SAH) was identified in the left parietotemporal region and right cistern (Fisher Scale III) with brain edema, and no fracture was detected on the calvaria. On top of that, bleeding was observed in the right maxillary and ethmoidal sinus with bilateral sphenoid sinusitis. To control the increase of intracranial pressure, loading intravenous mannitol 1 g/kg was given in 20 minutes and continued with maintenance 100 cc/hour.

In the orbital region, pneumo-orbita was noted on the right antebulbar. According to Mladina's classification, there was a type III septum deviation to the left direction. In the nasal region, bilateral inferior nasal conchae hypertrophy and conchae bulosa on the medial nasal conchae were also observed. Overall, the patient's physical status was assessed as ASA III. For this patient, open reduction and internal fixation (ORIF) with an S-plate was planned, and an interscalene block with a single-shot technique using levobupivacaine 0.375% for 20 cc was chosen as the analgesic agent. To proceed with this anesthetic management, the patient's cooperation to remain still during the anesthesia process is required. Therefore, premedication which consisted of Fentanyl 25 mcg and Midazolam 2 mg was given preoperatively. Postoperatively, patients were admitted to the ward.

Table 1. Clinical findings.

Inspection	Results
Vital signs	Normal
Hemoglobin (Hb)	10.1 g/dl (October 16th, 2023), 6.4 g/dl (October 15th, 2023)
Creatinine	1.6 mg/dl (High)
Blood gases	Respiratory acidosis
Prothrombin time (PT)	17.5 seconds (Extension)
SGOT	Increased
Physical status	ASA III

Table 2. Radiological findings.

Inspection	Results
Chest X-ray	Left tension hydropneumothorax, right hydropneumothorax, bilateral lung contusion, fracture of ribs, clavicle and scapula
Head MSCT	Fisher Scale III subarachnoid hemorrhage (SAH), brain edema, sinus hemorrhage, bilateral sphenoid sinusitis, right orbital pneumo

3. Discussion

Blunt trauma patients often present with hemodynamic instability and impaired ventilation. In this case, significant anemia (Hb 6.4 g/dl) is a major concern. Anemia reduces the blood's capacity to carry oxygen, causing tissue hypoxia and organ dysfunction.[11,12] Blood transfusion is a key intervention to increase hemoglobin levels, improve oxygen delivery, and prevent complications such as myocardial ischemia or acute renal failure. Respiratory acidosis, characterized by low blood pH and elevated carbon dioxide (CO_2) levels, indicates impaired gas exchange in the lungs. This can be caused by hypoventilation due to pain, lung injury, or respiratory depression due to medications. Administering supplemental oxygen and mechanical ventilation, if necessary, are crucial steps to improve oxygenation and remove excess CO_2. Close monitoring of vital signs, including blood pressure, oxygen saturation, and respiratory rate, provides real-time information about the patient's hemodynamic and ventilation status. A decrease in blood pressure may

indicate hypovolemia due to bleeding or cardiac dysfunction, while low oxygen saturation and increased respiratory rate may indicate hypoxemia or impaired gas exchange. Appropriate interventions, such as administering intravenous fluids, and vasopressors, or adjusting ventilator settings, should be performed based on monitoring findings to maintain hemodynamic stability and optimal ventilation.[13-15]

Tension hydropneumothorax is a life-threatening emergency. The buildup of air and fluid in the pleural cavity causes increased pressure which can compress the lungs, shift the mediastinum, and inhibit venous return to the heart. Thoracocentesis, i.e. removal of air and fluid with a needle, or placement of a WSD, which allows continuous drainage, are the immediate measures needed to reduce pressure and restore lung function. Bilateral lung contusion, which is bruising of the lung tissue, can interfere with gas exchange and cause hypoxemia. Close monitoring of oxygen saturation, arterial blood gases, and radiological features of the lungs is essential to assess the severity of the injury and determine the need for oxygen therapy or mechanical ventilation. Supportive therapy, such as administering oxygen, adequate pain management, and chest physiotherapy, helps improve lung function and prevent complications such as pneumonia or acute respiratory distress syndrome (ARDS).[16,17] Subarachnoid hemorrhage (SAH) is bleeding in the subarachnoid space, which is the space between the arachnoid layer and the pia mater that surrounds the brain. SAH is often caused by a ruptured cerebral aneurysm or head trauma. Increased intracranial pressure due to hemorrhage and brain edema can cause irreversible brain damage. Mannitol, an osmotic diuretic, is administered intravenously to reduce brain edema and lower intracranial pressure. Mannitol draws water from brain tissue into the blood vessels, thereby reducing the volume of the brain and the pressure within it. Close monitoring of intracranial pressure, either through direct or indirect measurements, is essential to evaluate the effectiveness of therapy and prevent complications such as brain herniation. Careful neurological monitoring, including assessment of the level of consciousness, motor function, and pupil response, is essential for early detection of signs of neurological deterioration. Cerebral vasospasm, namely the narrowing of the brain's blood vessels, is a serious complication of SAH that can cause ischemia and brain infarction. Therapies to prevent or treat vasospasm, such as nimodipine administration or endovascular therapy, should be considered based on individual risk and clinical findings.[18,19]

Clavicle fractures, especially those that are complex or involve significant displacement, often require surgery to ensure optimal healing and prevent complications such as malunion or nonunion. ORIF with S-plate is a technique commonly used for the fixation of clavicle fractures. This technique involves the repositioning of bone fragments and fixation with plates and screws to provide stability and allow bone healing. The choice of anesthetic technique for ORIF of the clavicle must consider the patient's overall medical condition. In these cases, a history of multisystem trauma, including head and chest injuries, increases the risk of anesthetic complications. Interscalene block, namely peripheral nerve blockade that provides analgesia in the shoulder and upper arm areas, was chosen as the optimal anesthetic technique. Interscalene blocks not only provide effective analgesia but also avoid the risk of respiratory depression or impaired consciousness that may occur with general anesthesia. Premedication with Fentanyl, an opioid analgesic, and Midazolam, a sedative benzodiazepine, is administered before surgery to reduce patient anxiety, pain, and discomfort. Fentanyl provides preemptive analgesia, namely analgesia given before the onset of pain, to reduce the need for postoperative opioids and prevent complications such as nausea, vomiting, and constipation. Midazolam provides mild sedation, reduces patient anxiety, and facilitates smooth induction of anesthesia.[20,21]

Management of multisystem blunt trauma patients requires close collaboration between various specialists. Surgeons play a role in diagnosing and treating specific injuries, such as broken bones, bleeding, or internal organ injuries. Anesthesiologists are responsible for providing safe and effective anesthesia, as well as monitoring vital signs and organ

function during surgery. Radiologists play a role in diagnosing injuries through imaging examinations, such as X-rays, CT scans, or MRIs. Intensive therapists play a role in monitoring and managing patients in the intensive care unit after surgery, including monitoring hemodynamics, ventilation, and organ function. Effective communication and good coordination between multidisciplinary teams are essential to ensure that every aspect of patient care is handled appropriately and efficiently. Regular case discussions, ongoing information updates, and shared decision-making can help optimize treatment outcomes and prevent complications.[19,20]

Young patients, as in this case, have some special considerations in their management. Younger patients tend to have better physiologic reserve and thus can tolerate more severe injuries. However, they are also more susceptible to certain complications, such as head injuries or spinal cord injuries, because their body structures are still developing. Additionally, young patients may have difficulty understanding and following medical instructions, requiring a more patient approach and simpler explanations. Family or parental involvement in the treatment process is also important to provide emotional support and ensure compliance with the therapy plan.[17]

After initial stabilization and management of the acute injury, the focus of treatment shifts to long-term rehabilitation and recovery. Rehabilitation aims to restore the patient's physical, psychological, and social function as optimally as possible. Physical therapy, occupational therapy, and counseling can help patients overcome physical limitations, cognitive impairment, or psychological problems that may arise as a result of the injury. Long-term recovery requires ongoing monitoring and support from the medical team and family. Patients may require additional therapy, such as pain management, physical therapy, or counseling, to manage long-term sequelae or complications. Routine monitoring of organ function, neurological status, and psychological condition can help detect problems early and provide appropriate intervention. Management of multisystem blunt trauma patients is a complex challenge, but with a comprehensive multidisciplinary approach, optimal results can be achieved. Early stabilization, specific injury management, selection of appropriate anesthetic techniques, and effective team collaboration are key factors for success. Special attention to the needs of young patients and a focus on long-term rehabilitation can help patients recover fully and return to their normal lives. This case highlights the importance of vigilance and preparedness when dealing with blunt trauma patients. In-depth knowledge of injury pathophysiology, sound clinical skills, and the ability to work in a multidisciplinary team are essential for every medical professional involved in the care of trauma patients. Only then can we provide optimal care and improve the quality of life for patients who have experienced traumatic injuries.[14,18]

4. Conclusion

This case illustrates the complexity of managing blunt trauma patients with multisystem injuries. A multidisciplinary approach involving multiple specialists, including surgeons, anesthesiologists, radiologists, and intensivist therapists, is essential for optimal results. Prompt and appropriate initial management, including hemodynamic stabilization, ventilation, and specific injury management, can save lives and prevent further complications. The selection of appropriate anesthetic techniques and careful monitoring during surgery are essential to ensure patient safety and comfort.

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