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Case Report

First Reported Helicopter In-flight Serratus Plane Block for Rib Fractures

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Pain control of suspected rib fractures in the prehospital environment is challenging. Intravenous narcotic medication can provide temporary relief but comes with the risk of significant side/adverse effects, including life-threatening respiratory compromise.[1-3] Incremental doses of ketamine can cause dysphoria, laryngeal spasm, excessive salivation, and vomiting, all of which are particularly difficult in a trauma patient in the aeromedical environment. Alternatively, oligoanalgesia in the supine trauma patient can lead to splinting, atelectasis, and pneumonia.

Regional nerve blocks have become an adjunct to the prehospital provider's armamentarium of analgesia options. Many of the prehospital regional anesthesia literature surrounds fascia iliaca blocks for femoral fractures.[4-7] Rib fractures are a common and significant cause of morbidity and mortality in blunt trauma, particularly in patients over 65 years of age.[8-10] The serratus plane block is a novel ultrasound-guided regional nerve block that may play a significant role in prehospital rib fracture pain control and become the standard of care.[11]

Case Report

A 67-year-old man was riding a quadbike (ATV) at approximately 40 kph (25 mph) and lost control. The vehicle rolled with impact to his right chest and right hip. There was a self-reported loss of consciousness. The patient was not wearing a helmet or other protective gear and was without restraint or roll bar. On arrival of ground emergency medical service paramedics, the patient was complaining of severe right chest pain and right hip pain. He had a heart rate of 118 beats/min, systolic blood pressure of 111 mm Hg, SpO_2 of 92% on room air, and a respiratory rate of 22 without paradoxical movement or crepitus on examination. The duration of the loss of consciousness was unknown. The patient had a Glasgow Coma Scale score of 15. The initial management included 5 mg morphine and 4 mg ondansetron intravenously, application of a semirigid cervical collar and pelvic binder for mechanism, and relocation to inside a heated ambulance.

Given the remote location, approximately 100 km from a trauma center, Sydney helicopter emergency medical services (New South Wales Ambulance) was tasked with a retrieval physician and a critical care paramedic. Upon the helicopter emergency medical services team arrival, 20 minutes after the initial contact by the ground emergency medical services team, the patient's primary survey showed right rib tenderness without signs of flail chest, no abdominal tenderness, and a stable pelvis with tenderness over the right hip and pain with range of motion. His blood pressure was 118/76, SpO_2 was 100% on 6 L/min oxygen via a Hudson mask, Glasgow Coma Scale score was 15, and heart rate was 100 beats/min. Despite a total of a 10-mg morphine dose, he still complained of 10/10 chest wall and hip pain on the numerical rating pain scale. The patient denied abdominal pain or dyspnea. The on-scene extended focused assessment with sonography in trauma (EFAST) (iViz; SonoSite, Bothell, WA) was negative for a pneumothorax. The patient was packaged in the helicopter for transport to the major trauma center with an estimated 25-minute flight time. The patient was oriented in a north/south configuration in the AW-139 cabin with the doctor and paramedic facing aft on the patient's right and left, respectively.

Before departure, the patient verbally consented to a serratus plane block and fascia iliaca block. En route, the EFAST was repeated and remained negative. Two anterolateral rib levels were identified as likely areas of rib fractures given pinpoint tenderness on palpation using the ultrasound transducer. The patient's right arm was abducted, and he was able to hold his own arm behind his head. The clinician performing the procedure remained in a seat belt, and the ultrasound screen was placed in the clinician's lap (Fig. 1). Potentially, the procedure would be easier to perform if the clinician was out of the seat belt or on a wander lead, but the safest position is to remain in a seat belt. The patient's skin was prepared with a chlorhexidine 2% swab stick at the procedure site. Sterile gloves and an ultrasound probe cover were used. The probe was placed sagittally in at the midaxillary line at the fifth rib. The key anatomy was visualized with the L38 10-5 MHz linear array ultrasound probe (SonoSite), including the latissimus dorsi (LD),

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Figure 1. The doctor performing the serratus plane rib block.

serratus anterior (SA), ribs, and pleura with the intention to perform a superficial serratus plane block. Under ultrasound guidance, a 21-G 110-mm SonoTAP needle (Pajunk, Geisingen, Germany) was inserted from the anterior side of the probe through the LD and hydrodissected the serratus plane between the LD and the SA. The injectate was 20 mL ropivacaine 0.75% diluted with 20 mL sodium chloride 0.9%. There were no known immediate complications. After landing, the patient reported 0 out of 10 rib pain and no dyspnea. His oxygen saturation remained at 100% on room air at this time.

On arrival at the major trauma center, resuscitation room chest and pelvis X-rays showed multiple right-sided displaced rib fractures, no pneumothorax, and an acetabular fracture. During the hospitalization, the patient did not require further regional anesthesia or a patient-controlled analgesia pump for the rib pain. The patient reportedly remained pain free at the rib fracture sites until he went to the operating room the following morning (approximately 12 hours later) for open reduction and internal fixation of the acetabular femur.

Discussion

This case report shows the feasibility of ultrasound-guided regional anesthesia in rotary wing flight for rib fracture pain control. The SA block can be easily performed with the patient in the supine position, which is an important consideration in patients with significant trauma before spinal imaging. Anatomic landmarks are the fifth rib in the midaxillary line. At this location, an ultrasound can easily identify the serratus, LD, and teres major muscles overlying the fifth rib. Blanco et al[11] first described the serratus plane block to target the thoracic intercostal nerves either superficially to the SA muscle or deep to the muscle originally intended for patients undergoing chest wall surgery to provide analgesia to the lateral thorax. There are several case series of the serratus plane block being used in the hospital for rib fractures and post-thoracotomy pain.[12-15] Risks of the procedure include introducing a small pneumothorax, and, with changes in altitude, the pneumothorax may increase. Additionally, intravascular injection of bupivacaine or ropivacaine could lead to systemic toxicity. Both of these complications are minimized with the use of point-of-care ultrasound to visualize the muscular and vascular anatomy. Furthermore, we advocate for thoracic ultrasound imaging before the procedure to exclude a pneumothorax. This procedure in the prehospital environment needs appropriate patient selection because some polytraumatized patients require intubation, systemic analgesia, sedation, and more aggressive resuscitation. To our knowledge, this is the first prehospital in-flight use of the serratus plane block performed during a helicopter emergency medical services flight. Because this type of regional block is a recently described procedure, not many organizations have incorporated it into their pain control regimens. As ultrasound becomes more accessible to prehospital providers, there are opportunities for alternative models of pain control. The serratus plane block is a simple and safe procedure when performed under point-of-care ultrasound and can provide significant regional anesthesia. In this case, the block was performed in-flight, which may not be feasible in other cabin sizes/setups.

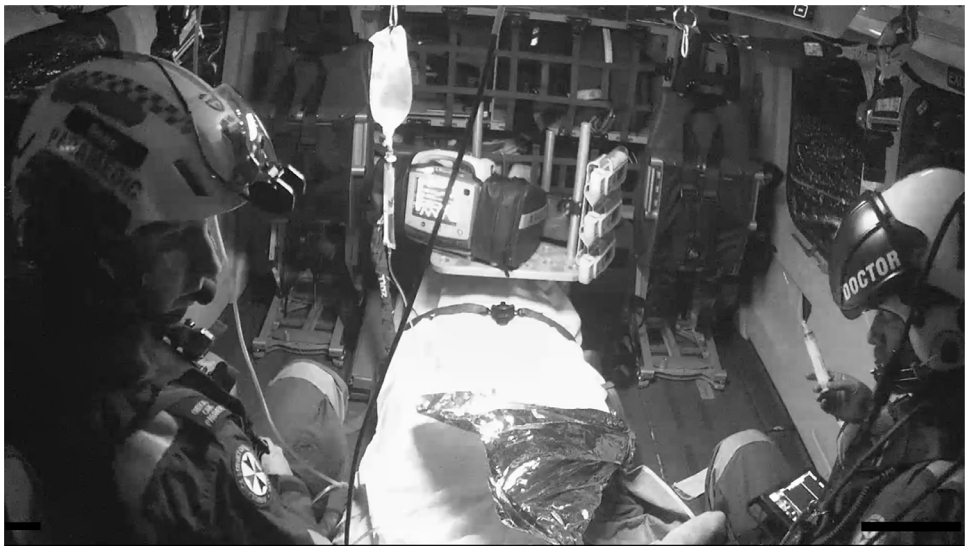

Figure 2. Procedure set up.

Figure 3. The procedure being performed.

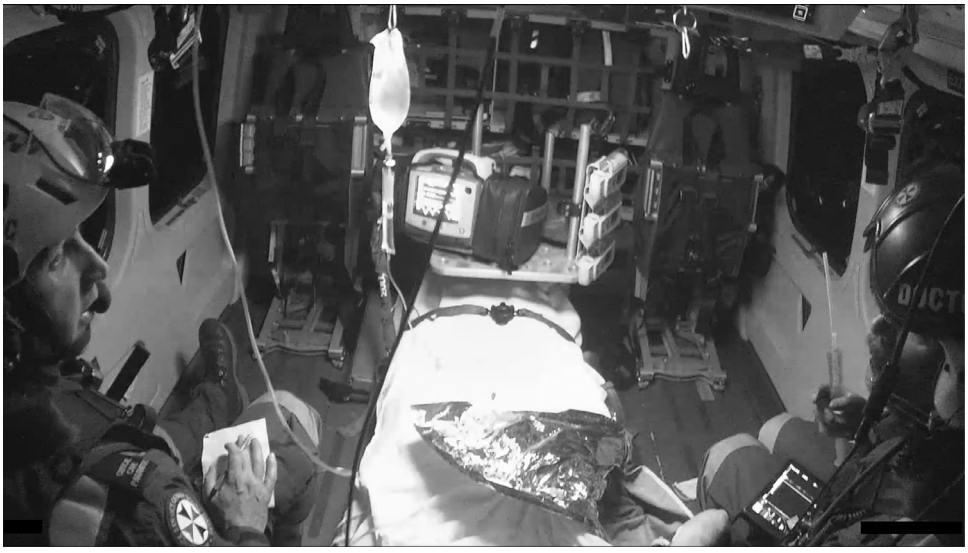

Figure 4. Procedure preparation.

However, the block can be performed rapidly before loading in an aircraft.

Supplementary materials

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.amj.2019.06.003.

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