

Successful using combined interscalene block and deep cervical plexus block for clavicle fracture in patients with impaired airway integrity due to combat injury

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Abstract

General anaesthesia has a priority in surgical interventions of clavicle; however, regional techniques may come to the fore in the presence of increased risk factors due to possible airway problems. The innervation of the clavicle region is very complex and has not been fully described; therefore, only a limited number of different regional anaesthesia approaches should be considered. Here, we present the management of a clavicle fracture with a combination of an interscalene block and deep cervical plexus block in a patient with severe maxillo-facial trauma and diaphragmatic hernia due to combat injury. A 35-year-old male admitted to the emergency room as a war-wounded patient had suffered maxillo-facial trauma and an unstable clavicle defect during the Syrian Civil War. A diaphragmatic hernia was also detected during examination. The patient underwent operation with regional anaesthesia of the clavicle under spontaneous respiration. With standard monitoring and premedication, interscalene block and deep cervical plexus block were performed under ultrasound guidance with a mixture of 0.25% bupivacaine (20 mL) and 0.5% lidocaine (10 mL). In the perioperative period, the patient's vital signs remained stable. The patient had no pain during the surgery. We suggest that the combination of interscalene block and deep cervical plexus block is an efficient option for management of clavicle fracture in patients with multiple comorbidities.

Key words: interscalene block, deep cervical plexus block, diaphragmatic hernia, maxillo-facial trauma, Syrian Civil War

Introduction

Clavicle fractures represent 2.6% of all fractures and 44% of those in the shoulder girdle [1]. Conservative methods have been tried to treat these fractures, but young and physically active patients usually require surgical treatment under anaesthesia [2].

General anaesthesia is the customary approach, but regional anaesthesia approaches have been tried recently in patients with comorbid factors. A limited number of small-scale studies have used different anaesthetic methods with the aim of shedding light on the dermatome of clavicle surgery and to provide guidance for this

surgery. Proposed interventional strategies for clavicle fracture have included the combination of the cervical plexus block, and brachial plexus block (interscalene block-*ISB*). These conflicting recommendations arise from the attribution of sensory innervation of the clavicle to the cervical or brachial plexus [3].

Our aim in the present case was to achieve a successful anaesthesia level using *ISB* and deep cervical plexus block (*dCPB*) to manage the existing clavicle pathology while avoiding the complications of general anaesthesia in a patient with maxillo-facial trauma (*MFT*) and diaphragmatic hernia.

Case-presentation

A 35-year-old male ASA I patient (80 kg body weight) was brought to the emergency room after being wounded in an explosion during the Syrian Civil War. A physical examination revealed a poor general condition and a tissue defect in the mandibular region of the face. The orofacial integrity could not be clearly determined, but tissue defects with open fractures soaked in mud and continuing bleeding were observed on the right part of the mandible and the midline of the right clavicle (Figure 1).



Figure 1 - The patient's first admission to the emergency services and the last appearance after surgical procedures

Further evaluation of the patient in the emergency department revealed an arterial blood pressure (BP_a) of 90/50 mmHg, heart rate (HR) of 138, SpO₂ of 96% and Glasgow Coma Score (GCS) of 9–10. Following appropriate fluid resuscitation, the patient's hemodynamic parameters were a BP_a of 102/53, SpO₂ value of 91% and heart rate of 106. The GCS also increased to 13–14 after using the traumatic shock protocol. The patient was taken to the operating room 2 hours after admission.

The intestinal loops were observed in the left chest cavity in the trauma patient and were not associated with trauma. Fractures were observed in the midline of the clavicle and in the right corner of the mandible, but no major vascular pathology was observed. No acute cranial or abdominal pathology was detected (Figure 2).

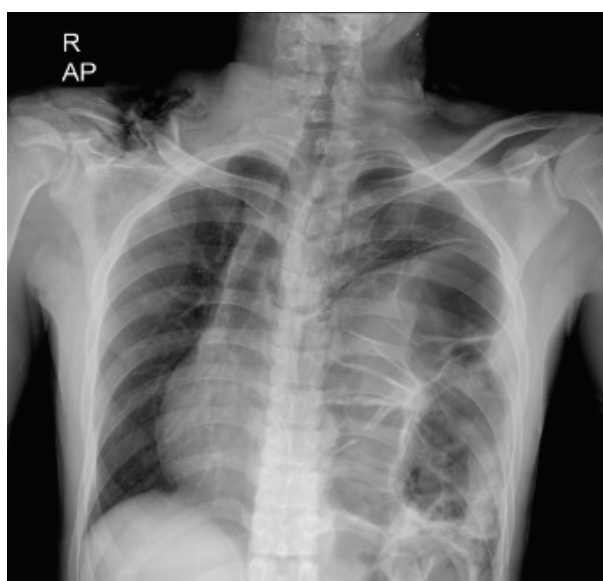


Figure 2 - Preoperative clavicle fracture and raised bowel loops secondary to diaphragmatic hernia

Repairs of the diaphragmatic hernia and the MFT were not planned urgently due to lack of emergency and required materials, respectively. The problem of secondary bleeding into the tissue defect in the region of the clavicle and the presence of an open fracture led to a decision for intervention by the orthopaedic surgeon. Considering that the maintenance of spontaneous breathing of the patient would be more controlled, a regional anaesthesia method was considered to be a priority. Since a possible block failure due to peripheral approaches could not be risked, a combination of ISB and dCPB was chosen as a central approach.

This block was carried out in a semi-sitting position with the head slightly deviated to the opposite side in the operating room. The ISB block was performed first, with linear transducer (8–14 MHz) ultrasound guidance, after standard monitoring and sedation application of 0.2 mg/kg midazolam as a premedication. After the skin disinfection, the probe was positioned in the transverse plane for the identifying branches of the brachial plexus between the anterior and middle scalene muscles. A 5 cm, 23-gauge needle was directed to these branches at in-plane position. A mixture of lidocaine <1.5 mg/kg (intravenous toxic dose 1.5–2.0 mg/kg) and bupivacaine <1 mg/kg was used peripherally due to its rapid onset of action and long block time. After negative aspiration to avoid a possible intravascular injection, the ISB was performed with 20 mL of a 0.25% bupivacaine + 0.5% lidocaine mixture.

We then performed the dCPB with linear probe ultrasound guidance in the longitudinal plane at the same position. The probe was positioned to identify the transverse vertebrae over the posterior border of the sternocleidomastoid muscle at the C4 vertebrae level. After determining the transverse process of the vertebrae, they were used to detect the deep cervical plexus in front of them. The same needle was directed towards the cervical plexus at out-off-plane. After negative aspiration, the dCPB was performed with 10 mL of a 0.25% bupivacaine + 0.5% lidocaine mixture after observing its spread through the fascia at the transverse process level. The operation was started 15 minutes and no additional sedation was required after the operation started.

Abundant soil was removed from the related open wound, and the related defect area of the patient was thoroughly cleaned. Haemostasis was achieved. An intramedullary nail was inserted

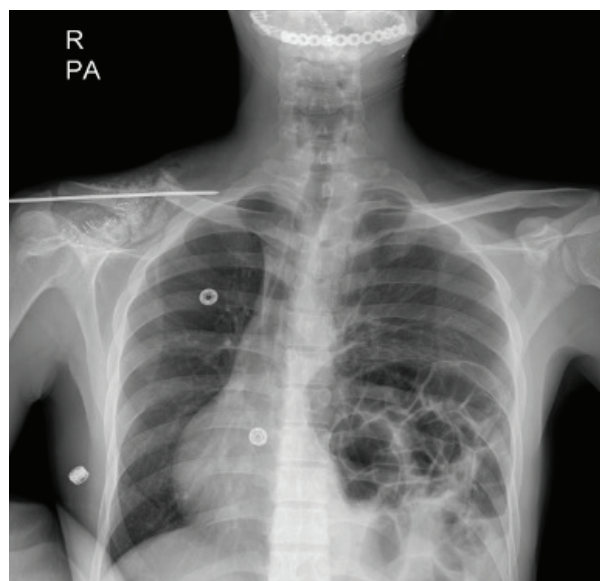


Figure 3 - Postoperative x-ray imaging of the patient

into the existing clavicle defect and the surgery was ended. The time from the block to the end of the surgery was determined as 90 minutes. The patient was admitted postoperatively to the intensive care unit. The patient did not need analgesia within 6 hours of the postoperative period. After this time, paracetamol 3x10 mg/kg and 2x20mg tenoxicam were started as analgesic protocol due to a possible pain tendency.

On the 3rd day of hospitalisation, the patient underwent plastic and reconstructive surgery, during which the patient was nasally intubated and the mandible was fixed. The patient was intubated for 3 days after the MFT surgery and then transferred to the ward on the 9th day of his hospitalisation after extubation (Figure 3).

The intramedullary nail of the patient became displaced after 1 month after discharge. The patient underwent re-operation under regional anaesthesia with ISB and C4 dCPB, the displaced intramedullary nail was removed and a clavicle plate was placed. No additional problems were encountered during this procedure, and the patient was admitted to the postoperative service. The patient was discharged on the 4th postoperative day with recommendations.

Discussion

For the patient in this case report, our aim was to achieve a sufficient anaesthesia level using regional anaesthesia to avoid the acute and long-term complications of intubation in managing the existing clavicle pathology. The reason we preferred the central approach was that we wanted to obtain the highest level of anaesthesia and analgesia that we could create without branching. We used this technique because our patient had the additional problems of MFT and intestinal hernia. We provided a sufficient anaesthesia level in the patient with ISB and C4 dCPB, and we did not encounter any additional problems or complications.

The clavicle fracture is an important form of injury that can occur due to blunt trauma. It can occur due to sports activities and can subsequently limit the patient's comfort because of the anatomical region where it occurs. Non-displaced fractures of the clavicle in children and the elderly can be treated conservative methods; however, combat injuries are nearly always more complex and complicated by multi-organ trauma. These patients need more attentive anaesthetic care during their immediate management, as well as life-preserving interventions [4]. Unfortunately, the regional conflict in Syria has increased our encounters with these patients and therefore our need to develop more approaches and greater expertise in anaesthetic care, especially in utilising regional anaesthesia techniques.

Choosing the most appropriate nerve block to anaesthetise the clavicle requires a thorough understanding of innervation. Even the textbooks do not agree on the sclerotomal and peripheral innervation. In terms of neuronal anatomy and clinical experience, therefore, the combination of ISB and cervical plexus blocks appears to be an effective choice to cover the relevant surgical areas [5].

USG-guided combined ISB and superficial cervical plexus block (sCPB) anaesthesia is one of the recommended methods for clavicle surgery. Many reports on the use of combined ISB and sCPB have shown that patients achieved adequate anaesthesia and had no subsequent complications [6-8]. However, these were limited studies, such as case reports, or were conducted under sedation support. Although adequate anaesthesia has been reported with combined ISB and modified sCPB, it may

be difficult to apply in these patients whose tissue integrity is compromised due to proximity to the surgical area [9].

Comparison of the USG-guided combined ISB and sCPB versus the intermediate cervical plexus block (iCPB) for clavicle surgery indicates a better success rate, with a faster sensory block onset time and prolonged postoperative analgesia, for the iCPB. No significant difference was detected between the groups in terms of haemodynamic parameters and complications [10].

Complications can occur with both deep and superficial cervical plexus blocks. Infection, haematoma formation, phrenic nerve block, local anaesthetic toxicity, intravascular injection, nerve injury and inadvertent subarachnoid or epidural anaesthesia can all occur when performing these blocks. Potential complications of local anaesthetic volumes of around 20–30 mL in brachial plexus blocks cause phrenic nerve palsy in almost all patients, and a 25% decrease in respiratory functions [11].

Concerns about the ISB causing respiratory problems due to phrenic nerve block can be circumvented by combining sCPB and isolated root blocks with very low volumes [12-14]. However, volume reduction to reduce the development of phrenic nerve and diaphragmatic paralysis may cause block failure [15].

Dirzu emphasized that the risk of block failure should be compared to the risk of hemidiaphragmatic paralysis. He stated that the occurrence of hemidiaphragmatic paralysis is rarely clinically related. They were successful with non-invasive respiratory support and position in a patient with chronic respiratory failure who developed hemidiaphragmatic paralysis [16]. We did not have any respiratory problems or complications in our patient, who was followed up under nasal oxygen in an upright position.

In this report, we used a regional method to avoid complications secondary to intubation and extubation in a patient with MFT trauma and intestinal herniation. There was an increased risk of airway due to phrenic nerve block or diaphragmatic hernia. For this reason, necessary preparations were made for emergency airway management in the operating room. Sufficient anaesthesia was provided to the conscious and hemodynamically stable patient with spontaneous breathing. We believe that the combination of ISB and C4 dCPB can provide sufficient and safe anaesthesia, as well as preservation of spontaneous respiration and haemodynamic stability.

Conclusion

Since traumas of the shoulder and neck are blunt traumas, they should not be considered as isolated fractures. When acute intervention is needed, anaesthesia and analgesia should be designed to cover the largest area. In our opinion, the method we use is an approach that allowed to avoid general anaesthesia in patients with this type of war injury. Further studies are needed to determine which is the best option for surgical settings.

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