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CASE REPORT OPEN ACCESS

Axillary Brachial Plexus Block for Reduction of Radius Head Fracture and Elbow Dislocation which Developed after the Trauma in Vertical Wind Tunnels

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Introduction: To attain and maintain the level of training and skill necessary for the free-fall stage, vertical wind tunnels (VWT) are commonly used. Skydiving trials might result in extremity fractures. In order to manage pain, peripheral nerve blocks consisting Axillary Brachial Plexus Block (ABPB) is a novel technique with shows promising results in this area.

Case Presentation: We presented a case on the successful application of an ABPB in the reduction of radius head fracture and elbow dislocation. A 26-year-old male patient fell on his left side, as he could not maintain his position in the VWT. In plain radiography, an oblique fracture line on the left radius head and dislocation on the left elbow were observed. During the examination his Visual Analog Score was identified as 98 mm, and in order for the patient to be able to tolerate the painful procedure, an axillary brachial plexus block was preferred. We were unable to establish in the literature the traumatic injuries that occur in VWTs, as a result of free-fall simulations, or any statistics on such injuries.

Conclusion: In emergency rooms, where patient load is heavy and the amount of healthcare personnel is low, peripheral nerve block can be an appropriate choice for the emergency physician before undertaking a painful procedure. It is considered that the application of axillary brachial plexus block for reduction in a case of upper extremity dislocation with fracture that happened during a VWT simulation training was safe and effective.

Keywords: Analgesia, axillary block, regional block, vertical wind tunnels

Introduction

During military operations, airborne forces are required to make parachute jumps into depths of hostile territories (1). Paratroopers must receive repetitive training before making the jump. For landing safely on the ground following their exit from aircraft. This repetitive training includes different stages, such as exiting the plane, free-fall and landing. The preliminary training required before skydiving can begin is held at simulation center suitable for all phases (2). To attain and maintain the level of training and skill necessary for the free-fall stage, vertical wind tunnels (VWTs) are used. Skydiving can result in extremity fractures and, following an analysis of the

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anatomical locations of these fractures, it was reported that upper extremity fractures were less frequently observed (2,3). Furthermore, in the reduction of upper extremity fractures, pain management is significant not only for comfort of patient but also for physician. To manage pain, Procedural Sedation Analgesia (PSA), Regional Intravascular Anesthesia (RIVA) and peripheral nerve block (PNB) can be applied. Peripheral nerve blocks consisting Axillary Brachial Plexus Block (ABPB) is a novel technique with shows promising results in this area.

We presented a case on the successful application of an axillary block in the reduction of radius head fracture and elbow dislocation, which developed secondarily to the trauma that occurred in VWT.

Case Presentation

A 26-year-old male patient fell on his left side, as he could not maintain his position in VWT. He was brought to the Emergency Room due to deformity and pain localized in left forearm. The ambulance staff reported that intramuscular injection of 75 mg diclofenac (Diclomec®) sodium was administered as analgesic during pre-hospital emergency care. The vital signs of the patient were stable; he had no history of a known disease, chronic drug use or drug allergy. His peripheral pulse was palpable, and the flexion and extension of his fingers were evaluated as complete. No pathologies, other than sensitivity during palpation of left radius head, and deformity and swelling in the left elbow, were detected. Neurological examination was deemed normal.

In plain radiography, an oblique fracture line on the left radius head and dislocation on the left elbow were observed. During the examination his VAS (Visual Analog Score) was identified as 98 mm, and in order for the patient to be able to tolerate the painful procedure, ABPB was preferred.

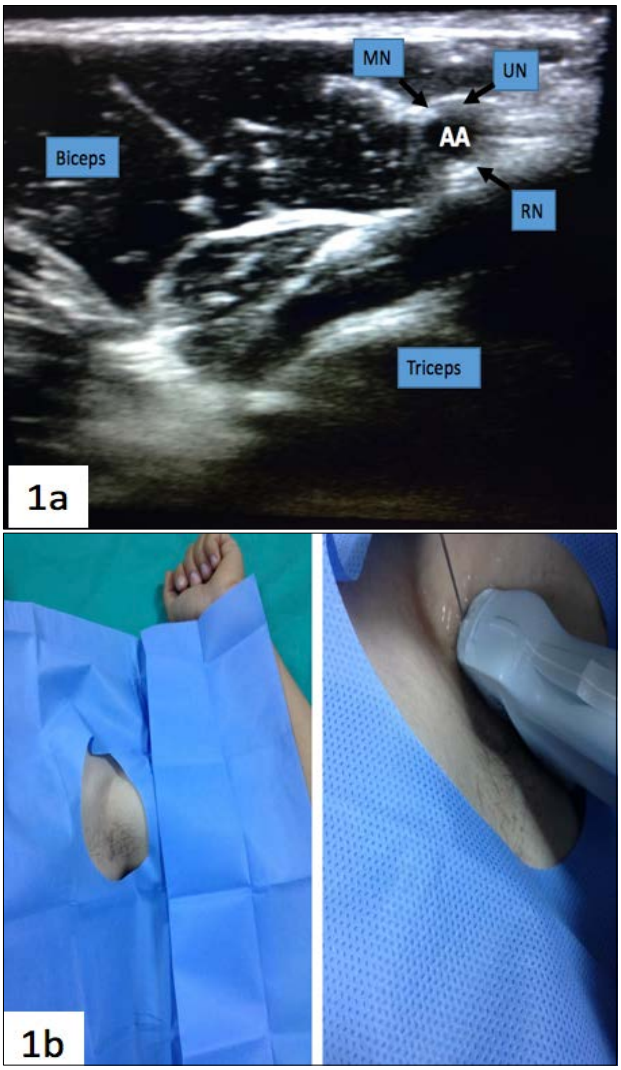

Figure (1a) USG view of anatomic structures during procedure (AA: Axillary Artery, MN: Medial Nerve, UN: Ulnar Nerve, RN: Radial Nerve) (1b) Location of axillary puncture side

Axillary Brachial Plexus Block

The patient's head was turned to opposite side from where anesthetic was administered and he was placed in supine position. The elbow was flexed 90° and arm was abducted to 90°. The axillary artery is the main reference structure within the neurovascular bundle. A US probe was placed at the marked point on

the axillary skin tag. On the lateral section, axillary artery and vein was brought to the center of the image on US screen. Terminal branches of the brachial plexus in the axillary sheath were observed as hyperechoic nodules around the hypoechoic axillary artery (Fig-1a).

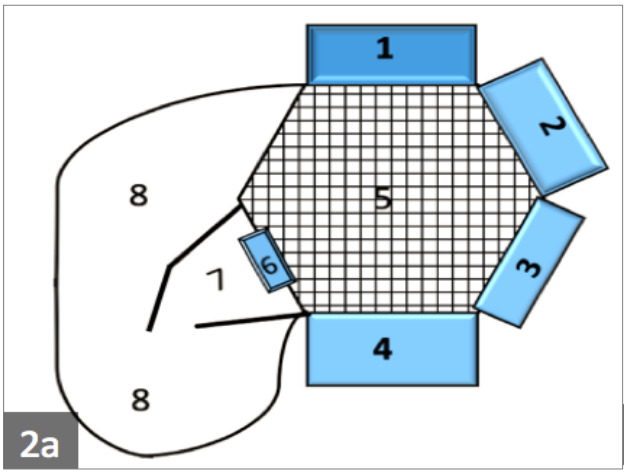

Figure (2a) Scheme of vertikal wind tunnel (overhead view) 1-2: Observers 3: Mirror 4: Controller 5: Fence 6: Entrance to vertical wind tunnel 7: Final check area before simulation 8: Waiting Area

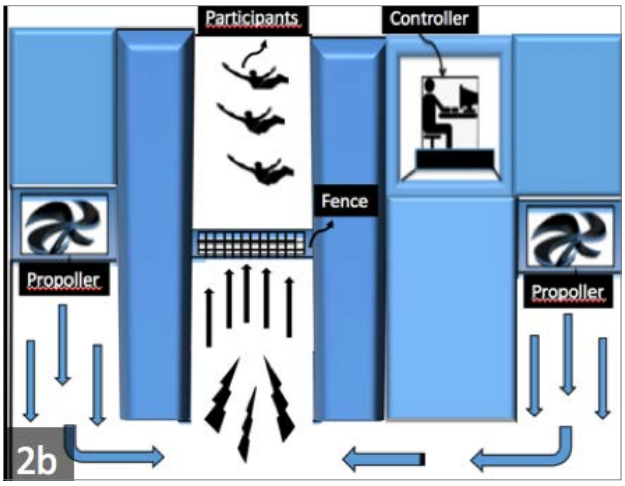

Figure (2b) Scheme of vertikal wind tunnel (laterally view).

The injection was placed at the superior of the long axis of the US probe and pushed forward slowly with the aid of the US (Fig-1b). In order to make sure that the injection was not inside the blood vessel while it was between the artery and the vein, aspiration was applied. 2 cc of prilocaine (Citanest %2®) local anesthesia solution was administered as a test dose. As regards the structures inside the plexus sheath, 30 cc of prilocaine (Citanest %2®) was administered around the nerves as local anesthetics, initially to the radial nerve, and subsequently to the median and ulnar nerves. An oreo cookie sign was observed. Following the procedure, there was a waiting period of 20 minutes after anesthetic was administered. The reduction procedure was carried out successfully with ABPB. The VAS score during the reduction was established as 7 mm. The patient was hospitalized by the orthopedics clinic for radius head fracture operation. He was discharged from the hospital without any complication or sequelae. The patient has approved the inform consent form to be used for this case report.

Discussion

Training is required before making high altitude parachute jumps for military purposes (2). This training enables skydivers to gain experience and improve their skills. Making an actual parachute jump and maintaining these skills are costly and time-consuming. Hence, VWTs have been designed as simulation centers for free-fall. As part of its design, a VWT has a fan at the base, which generates the wind, a wire cage above and room on top, which enables simulation. Owing to the high speed wind generated by the fan, the skydiver hovers in the air, so that she/he can improve her/his free-fall aerodynamical skill (Fig. 2a,2b). This simulation enables skydivers to avoid potentially lethal complications of a real high altitude jump such as hypoxia and decompression sickness (4). We were unable to establish in the literature the traumatic injuries that occur in VWTs, as a result of free-fall simulations, or statistics on such injuries.

Analyzing anatomical localizations of fractures encountered after parachute jumps, Dhar et al (5) indicated that upper extremity fractures were of lowest frequency. Reviewing the literature on injuries that occur as a result of free-fall simulations in vertical wind tunnels, we could not find any paper aside from that of Mautner et al. (3), which identified a case of musculocutaneous nerve injury and Oong (6) that identified a case of brachial plexus injury.

In both cases, the nerve injuries resulted from the position of the upper extremities of skydivers during the free-fall simulation. In our case, there were no findings indicating that the patient had any sort of nerve injury from his initial examination until his discharge. In order to be able to reduce extremity fractures and dislocations at emergency rooms, it is often suggested that PSA, RIVA and PNB can be used for managing pain before the reduction procedure (7). In our case study, PNB was preferred, and applied by an emergency medicine specialist and an emergency nurse. In emergency rooms, where patient load is heavy and amount of healthcare personnel is low, PNB can be an appropriate choice for the emergency physician before undertaking a painful procedure. In terms of safety, the PNB procedure does not result in any potential nerve injury complication. Moreover, in free-fall simulation training, nerve injuries can occur due to the position of the upper extremity regardless of the trauma itself. Even though no nerve injury was identified before or after PNB in our case, a thorough neurological examination should be made and recorded before the reduction procedure. Failing to do so might lead not only to undesired legal consequences for the physician, but also to further potential nerve injuries for the patient. Therefore, in diagnosis and treatment of trauma due to VWT injuries, emergency physicians should make the decisions carefully before proceeding with PNB in conditions that require painful procedures.

Conclusion

At conclusion, at training of VWT simulation upper extremity injuries can be seen due to uncontrolled fall. Upper extremity fracture and dislocations after VWT injuries should be reduced effective and safety with ABPB.

Conflict of interest

The authors declare there is no conflict of interest.

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