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Case Report

Bilateral Brachial Plexus Block and Avoiding Its Complications: A Case Report

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ABSTRACT

Literature on performing bilateral brachial plexus blocks is rare as it's seldom performed due to the reluctance of anaesthesiologist. It's due to the fear of the associated complications such as hemi-diaphragmatic paralysis, local anaesthetic systemic toxicity, and pneumothorax and block failure. We present the case of a 21-year-old patient flowing a road traffic accident with anticipated difficult airway, who underwent bilateral upper limb surgery where bilateral brachial plexus blocks were used as the sole mode of anaesthesia. Through careful patient selection, use of ultrasound guidance to reduce the minimum effective volume of local anaesthetic and to identify anatomy to prevent inadvertent injury, prevention of rapid rise of plasma concentration of local and using a combination of brachial plexus blocks the potential complications can be mitigated.

Keywords: Bilateral; Anesthetic pharmacokinetics; Orthopaedic; Musculocutaneous

INTRODUCTION

Evidence on the use of bilateral brachial plexus blocks is rare due to many anesthesiologists being reluctant to perform it due to fear of associated complications. These being diaphragmatic paralysis [1], local anesthesia systemic toxicity (LAST), pneumothorax [2] and block failure, which can be reduced through the usage of ultrasound guidance, choosing the correct patient and application of local anaesthetic pharmacokinetics. We present a patient who underwent bilateral upper extremity surgery under bilateral brachial plexus block due to anticipated difficult airway and patient preference Left distal radius fracture open reduction and internal fixation was performed in 1 hour 15 minutes.

CASE DESCRIPTION

A 21-year-old healthy (American Society of Anesthesiologists (ASA) physical status 1) male presented following a fall from a bike with facial trauma resulting in, missing teeth and loose teeth which were replanted and Essig's wiring done to stabilize them, awaiting restorative dentistry. He had right distal humerus fracture and left distal radius fracture which the orthopaedic team planned for open reduction and internal fixation. With his facial trauma leading to orofacial swelling and loose teeth, he had an anticipated difficult airway and regional anesthesia with bilateral brachial plexus blockade was considered appropriate. Patient preferred being awake during surgery and was informed of the procedure and consented for surgery under regional anaesthesia.

He was 180 cm in height and weighed 79 kg (BMI 24.3 Kgm-2). His basic blood investigations, electrocardiogram and chest x-ray were normal. Intravenous access was secured on the left foot. The respiratory examination was normal, the mouth opening 2 fingers breath and Mallampati airway grade 3. Pre-operative diaphragmatic excursion was measured in quiet breathing (QB) and deep breathing (DB) (Table 1). (Right QB=2.20 cm, Right DB=6.95 cm. Left QB=2.43 cm, Left DP=6.80 cm). Difficult airway trolley with equipment and drugs was kept ready.

Table 1: Measured pre-operative and post-operative diaphragmatic excursion.

	Quiet breathing (QB)		Deep breathing (DB)	
	Right diaphragm	Left diaphragm	Right diaphragm	Left diaphragm
Pre-operative diaphragmatic excursion	2.20 cm	2.43 cm	6.95 cm	6.80 cm
Pre-operative diaphragmatic excursion	1.95 cm	2.3 cm	6.05 cm	6.50 cm
Change as a percentage in pre and post-operative diaphragmatic excursion	11.36%	5.34%	12.94%	4.41%

Standard ASA monitors were applied and supplemental oxygen was provided through nasal cannula. The patient was kept supine comfortably with the head turned away from the surgical site. Under strict aseptic conditions a 50 mm 22 gauge Simplex A

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30-degree bevel insulated needle was used with a linear array high frequency ultrasound probe.

Right supraclavicular brachial plexus block (SCB) was performed first with 0.5% bupivacaine 15 ml injected with frequent aspirations in between and satisfactory surgical anesthesia was achieved in 30 minutes. Right distal humerus fracture open reduction and internal fixation was done in 2 hours 15 minutes without any complications.

Following which, left axillary brachial plexus block was performed with 0.5% bupivacaine 15 ml. Satisfactory motor and sensory block was achieved following 30 minutes. Left distal radius fracture open reduction and internal fixation was performed in 1 hour 15 minutes.

No features suggestive of LAST were noted. Patient did not complain of difficulty in breathing or pain and no rescue analgesia were used during surgery. Visual analog score (VAS) for pain during surgery was 0.7/10. Post-surgery diaphragmatic excursion was measured in QB and DB (Right QB=1.95 cm, Right DB=6.05 cm. Left QB 2.3 cm, Left DB=6.5 cm) and no ultrasound evidence of pneumothorax (M-mode analysis) was noted. 24 hr post-operative VAS was 2.3/10 with no opioid analgesics being prescribed. Patient was satisfied with the anaesthetic management and the surgery and was willing to undergo similar type of regional anaesthesia in the future.

DISCUSSION

Brachial plexus block is a useful alternative to general anaesthesia, but its bilateral use is not commonly documented due the potential complications and steps need to be taken to mitigate them.

To reduce the incidence of phrenic nerve block, ultrasound guidance was used, which was found to reduce the rate to nearly 0% [3] from 67% [1]. Phrenic nerve blockade was noted to be volume dependent without any differences in block success using the minimum effective volume (MEV) of the local anaesthetic [4]. Thus, the MEV of local anaesthetic for each block documented in prior research was used. 0.5% bupivacaine 15 ml [5]. (7.5 ml each at intersection of the first rib and subclavian artery "corner pocket" and neural cluster) was deposited in the SCB while 2-4 ml of 0.5% bupivacaine was used to surround each of radial, median, musculocutaneous and ulnar nerves with a total of 15 ml being used in the axillary block [6]. No evidence of phrenic nerve paralysis following axillary block was found in previous reports.

Studies also found diaphragmatic paresis following SCB results in no reduction in pulmonary function tests (PFT) and healthy subjects were asymptomatic, however it may result in significant pulmonary dysfunction in patients with underlying lung disease [7]. Studies to examine clinical predictors of symptomatic phrenic nerve palsy after brachial plexus block are lacking, thus careful selection of patients is needed.

Incidence of Local anaesthetic toxicity can be reduced by calculating total dose according to ideal body weight and up to the maximum safe dose for the anaesthetic (150 mg of .5% bupivacaine was used compared to the maximum safe dose of 158 mg (2 mg/kg)), using ultrasound-guided technique as it facilitates a reduction in the MEV of local anesthetic, pacing the procedures adequately apart thus preventing a rapid rise in plasma concentration, frequently aspirating and visualizing the needle position through ultrasound guidance to prevent inadvertent intravascular injection of local anesthetic [8,9].

Ultrasound-guided technique also appears to reduce the risk of pneumothorax following SCB to 0.04% from 6.1% without ultrasound guidance [2].

CONCLUSION

Bilateral brachial plexus blocks still remain a controversial issue due to the modest amount of evidence in the form of only case reports. Complications of bilateral diaphragmatic paralysis, LAST, pneumothorax and block failure can be mitigated by ultrasound guidance, choosing the correct patient and utilizing the appropriate brachial plexus block. Further research on this topic needs to be done to come to a clear consensus. We would like to present this clinical experience where to two regional blocks were combined successfully mitigating these complications.

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