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Case Report

Bilateral brachial plexus block as alternative to general anaesthesia in high-risk patient; a case report and literature review

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ABSTRACT

Introduction: Bilateral brachial plexus blocks can be an alternative to general anaesthesia in the surgery of arm, forearm, wrist, or hand. This study aims to report a case in which a risky patient underwent amputation surgery under regional anaesthesia.

Case presentation: A 64-year-old male was admitted to the hospital for an amputation operation. Ultrasonography revealed normal findings regarding internal organs, aside from grade II increased echogenicity of both kidneys and a small bladder cyst. Echocardiography revealed mildly left ventricular dilation, moderate systolic left ventricular dysfunction, ejection fraction 38%, left ventricular wall hypokinesia with left ventricular dilation. The amputation was performed under a bilateral supraclavicular brachial plexus block with the guidance of ultrasound.

Discussion: Theoretically, there are some advantages to regional anaesthesia in comparison to general anaesthesia, such as decreasing the ordinary body response to stress in the presence of low levels of cortisol and catecholamines, increasing blood flow and peripheral vasodilatation, decreasing hypercoagulability, lower risk of arterial and venous thrombosis and it aids to prevent endotracheal intubation and mechanical ventilation.

Conclusion: Bilateral brachial plexus blocks, as a type of regional anaesthesia under ultrasound guidance, can be depended upon as a reliable substitute for general anaesthesia in perilous conditions.

1. Introduction

Bilateral brachial plexus blocks (BBPB) are a kind of regional anaesthesia that can be used instead of general anaesthesia in the surgery of the arm, forearm, wrist, or hand [1]. Several complications may be encountered during the process of BBPB, including diaphragmatic paralysis, pneumothorax, and local anaesthetic toxicity. So, the success of the blocks depends on the techniques like proper localization of the nerve, needle placement, and local anaesthetic injection [2]. Many of the standard approaches are blind techniques that were relied on previously, sometimes requiring several trials and attempts, and as a consequence, increasing pain and complications [2,3].

Conducting BBPB with the guidance of ultrasound makes the process more accurate and successful with lower rates of complications [4]. It leads to a better reaching of the local anaesthetic to the targeted area, less time consumption, higher block quality with fewer complications, and it prevents using excessive amounts of local anaesthetic by monitoring its distribution [5–7]. In the brachial plexus blocks, the two techniques of subclavian perivascular and supraclavicular are available. In which a needle is caudally inserted perpendicular to the brachial plexus. The block can be extended for a longer period in the supraclavicular technique due to the involvement of the musculocutaneous and axillary nerves [4]. Due to the efficacy and overlong postoperative analgesia, brachial plexus blocks are usually selected for the surgeries of the upper extremity, especially in those patients that need amputation as a result of chronic diabetes and peripheral vascular disease, infection or tissue loss, and in patients with hypertension, or heart failure [8,9]. Even with the guidance of ultrasound in the BBPB, some complications may

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develop; therefore, the process must be done carefully [10,11].

This study aims to report a case in which a risky patient underwent bilateral upper limb amputation under regional anaesthesia. The report has been written according to the SCARE 2020 guidelines [12].

Patient information: A 64-year-old male was admitted to the hospital for an amputation operation because of gangrene and ischemia of the left-hand index and middle fingers, and the ring finger of the right hand. The patient was considered high risk for the operation due to heart failure, diabetes mellitus, renal failure on dialysis two times a week, rapid atrial fibrillation, and anaemia (Hb 5.6 g/dl). Last year, an above-knee amputation was done for gangrene due to popliteal artery occlusion under general anaesthesia. Family history was negative.

Clinical findings: There was no significant finding apart from gangrene of left-hand index and middle fingers, and the ring finger of the right hand.

Diagnostic assessment: Ultrasound showed normal size and shape of most internal organs, but there was a grade II increase echogenicity in both kidneys with a 12*7 mm cyst in the left urinary bladder base without herniating into the urinary bladder. Echocardiography revealed mild left ventricular dilation, moderate systolic left ventricular dysfunction, an ejection fraction of 38%, and left ventricular wall hypokinesia with left ventricular dilation. The blood examination showed abnormal blood compositions and high urea and creatinine.

Therapeutic Intervention: The amputation was performed under bilateral supraclavicular brachial plexus block with ultrasound guidance. 20 cc of the solution was given to each side (50 mg (10 cc)isobaric bupivacaine 0.5% + 200 mg lidocaine 2% diluted with 20 cc normal saline). It lasted about 2 hours. Throughout the surgery, the vital signs were normal and stable. Furthermore, no complications or difficulties emerged during and after the operation.

Follow-up: The postoperative period was uneventful. The patient was followed up by phone call.

2. Discussion

Although different types of complications such as diaphragmatic paralysis, pneumothorax, and local anaesthetic toxicity can emerge in the process of BBPB, it is applicable as an alternative to general anaesthesia in the surgery of the arm, forearm, wrist, or hand [1,2]. Appropriate nerve location selection, needle placement, and injection of the local anaesthetics are the techniques that decide the success of the BBPB [2]. Doing BBPB under ultrasound guidance increases the success rate by facilitating the reach of the anaesthetic agents to the target, less time consumption, higher quality block, and preventing the use of excessive amounts of the local anaesthetics [4]. Local anaesthesia seems like a felicitous option in amputation surgeries due to chronic diabetes and peripheral vascular disease, infection or entire tissue loss, or hypertension and heart failure [8,9]. In the present study, the patient was a 64-year-old who required amputation surgery due to gangrene and ischemia of the left-hand index and middle fingers and the ring finger of the right hand. The patient had heart failure, diabetes mellitus, renal failure, rapid arterial fibrillation, and anaemia.

Clinicians are always ambitious to identify the pre-operative, intra-operative, and postoperative factors that can affect the morbidity and mortality rates in risky procedures [13]. In certain circumstances, where there is high perioperative morbidity and mortality, regional anaesthesia seems to be the proper option. Klassen et al. in their experimental study, demonstrated the improvement of the myocardial activity when using regional anaesthesia. They tested the impact of acute sympathectomy in a canine model by using epidural anaesthesia. The results showed increased endocardial to epicardial blood flow under the circumstances of low coronary blood flow and coronary infarction [13,14]. Theoretically, there are some advantages of regional anaesthesia in comparison to general anaesthesia, such as decreasing the ordinary body response to stress in the presence of low levels of cortisol and catecholamines, increasing blood flow and peripheral vasodilatation, decreasing hypercoagulability, lower risk of arterial and venous thrombosis and it aids to prevent endotracheal intubation and mechanical ventilation [15]. In addition, it has been revealed that regional anaesthesia helps in pain management postoperatively and decreases the risk of phantom limb pain in patients undergoing amputation surgery [16]. A meta-analysis study by Rodgers et al. confirmed the advantages of regional anaesthesia, in which the result of the study shows a lower mortality rate, less myocardial infarction incidence, and lower risk of pneumonia and respiratory depression [17]. In contrast to the previous study, Cochrane et al., in their meta-analysis comparing the effects of general anaesthesia and regional anaesthesia in the revascularization of the lower limb, revealed that there is no significant difference in the outcomes like mortality rate and incidence of myocardial infarction. It has been observed that pulmonary complications are less likely to develop postoperatively when using regional anaesthesia [15]. O'Brien et al. also support using regional anaesthesia for patients undergoing limb amputation [18]. In the current study, regional anaesthesia under ultrasound guidance was used. Despite the risky condition of the patient, no complications developed during and after the surgery, and the outcome was satisfying.

Many factors involve post-surgical mortality, including surgical stress. It enhances many physiological responses and causes of organ dysfunctions, so regional anaesthesia by any techniques (neuraxial, peripheral, local wound perfusion) is regarded as the most ideal modality in reducing post-operative pain [19]. The incidence of chronic pain following amputation surgery as phantom limb pain is about %30 -%80. Distressed intraoperative stimuli and acute pain after surgery are regarded as the main factors to enhance chronic pain, so regional anaesthesia like neuraxial and analgesia may have an observable role in decreasing phantom limb pain [19]. Ong et al. compared the impacts of epidural and spinal anaesthesia to the general anaesthesia on pain relief after 1–24 months of amputation surgery, the results showed that patients with regional anaesthesia were recalled more easily than those who received general anaesthesia [20]. However, it's worth mentioning that several complications may also arise even in ultrasound-guided blocks. Hemi-diaphragmatic paralysis develops in almost one-third of patients by using 30 ml of %0.5 ropivacaine in ultrasound-guided supraclavicular brachial plexus block [10]. Hematoma in the neck has been also reported after brachial plexus blocks [11].

It has been mentioned that ultrasound-guided axillary blockade requires 2% lidocaine 1 ml for minimal effect per nerve [21]. Furthermore, Harper and his colleagues reported that each nerve needs 2–3 ml of local anaesthetic under ultrasound guidance and 20 ml is quite plentiful for the blockade of all the nerves like median, ulnar, radial, and musculocutaneous [22]. 30–40 ml local anaesthetic is normally used in the standard supraclavicular method. There is another opinion in which positioning the needle appropriately by using ultrasound provides a perfect blockade with less than 20 ml local anaesthetic [23]. In this case, each side was successfully blocked by a 20 ml mixture of Bupivacaine, Lidocaine, and normal saline.

3. Conclusion

Bilateral brachial plexus blocks, as a type of regional anaesthesia, under ultrasound guidance can be depended upon as a reliable substitute for general anaesthesia in perilous conditions.

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Ethical approval

The manuscript approved by ethical committee of Kscien organization for scientific report.

Consent

Consent has been taken from the patients and the family of the patients.

Authors contribution

Abdulwahid M. Salh: major contribution of the idea, literature review, final approval of the manuscript.

Blind G. Al-Talabani: The anesthesiologist performing the anaesthesia, final approval of the manuscript.

Hiwa O. Abdullah: literature reviews, writing the manuscript, final approval of the manuscript.

Shvan H. Mohammed, Fahmi H. Kakamad, Karzan M. Salih, Berwn A. Abdulla: literature review, final approval of the manuscript.

Registration of research studies

1. registration was not performed (case report)

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There is no conflict to be declared.

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