Introduction

Recurrent shoulder dislocation refers to the dislocation of the humeral head from the glenoid arc at the glenohumeral joint. It is often seen in young adults who are subjected to direct posterolateral forces on the shoulder. It is categorized as a soft tissue injury of the glenoid labrum attachment; however, it may also occur due to osseous injury to the glenoid or humeral head. Patients suffering from recurrent shoulder dislocation usually recover after surgical repair directed towards treating glenohumeral instability (Provencher 2010).

In the present case study that will be covered in detail in the subsequent sections, the patient underwent an interscalene block procedure after receiving general anesthesia. As per standard hospital guidelines, performing interscalene block on an anesthesized patient falls under the accepted standard of care. However, appropriate tools such as nerve stimulators need to be used to elicit motor responses from an anesthesized patient. The PS03 ANZCA guidelines state that tools and protocols should be used for pain assessment in patients where feedback is not possible. This is applicable in situations where the patient is heavily sedated, has cognitive impairment, or is a small child (PS03 2014).

This paper aims to discuss the practice of administering local anesthesia to a previously sedated patient and the guidelines that revolve around this practice. It will also throw light on the applicability of the PS03 ANZCA guidelines to the case study regarding the administration of local anesthesia to an anesthesized patient. Additionally, relevant regional, national, and international literature will be used to draw relevant conclusions regarding the specifics of the case study from different regions around the world.

Case Study

The patient is a healthy 17-year old adolescent girl who presented to the hospital with recurrent shoulder dislocation due to injury during playing football. She was advised to go through an arthroscopic stabilization of her left shoulder. At the beginning of the procedure, general anesthesia was administered to the patient in the form of divided doses of midazolam and propofol. The patient's oxygen saturation level was measured to be 100% by pulse oximetry.

Following this, the patient's left interscalene groove was palpated and a 5-cm needle was inserted at the region corresponding to C6. Once wrist flexion was observed in the patient, the advancement of the needle was stopped. Following negative aspiration, bupivacaine and epinephrine were injected in divided doses. Within 20 seconds of injection, the patient's oxygen saturation level decreased to 74%. Immediately, positive pressure ventilation was applied, and

propofol and vecuronium were administered intravenously to increase the patient's oxygen saturation level to 100%.

Once the procedure was completed, it was observed that the patient could not be extubated and had dilated pupils bilaterally. She was given mechanical ventilation for quite some time before it was identified that she had developed a dense left-sided hemiparesis. She also showed symptoms of bowel dysfunction, bladder dysfunction, and postdural puncture headache. An MRI was performed on the patient, which revealed syringomyelia localized to the lower cervical and upper thoracic region of the spinal cord.

Relation to Hospital Guidelines

The patient was administered a local anesthetic into the cervical region of the spinal cord following administration of general anesthesia. Theoretically, when a local anesthetic is intraneurally injected under pressure, there is a possibility that it can directly reach the spinal cord (Borgeat 2006). Despite this contraindication, administration of regional blocks to anesthesized patients is widely accepted as the standard of care in most hospitals (Eldawlatly 2013). As per the patient's hospital's anesthesia-related guidelines and practices, regional anesthesia is often administered to patients who are under general anesthesia or heavy sedation. Patient participation is not considered important or mandatory for the success of epidural or spinal anesthesia. However, the hospital's policies do state that nerve stimulators are essential for these types of procedures so that patients can report paresthesias even under the state of unconsciousness.

There are several pointers that can indicate when the administration of epidural anesthesia is not performed appropriately on the patient. The most important of these is sudden and severe pain during the procedure that is indicative of the endangerment of nerve tissue (Park 2014). If this happens, the needle should immediately be removed and inserted in another more appropriate site. Indication of pain is a crucial patient feedback system which is only applicable if the patient is completely conscious. Regional anesthesias are often associated with painful paresthesias and these can go undetected if the patient is previously sedated. Hence, although nerve stimulators can help in these situations, they do not offset the chance of complications due to regional blocks, and should be avoided where possible (De Andres 2005).

Several studies have reported the development of permanent brachial plexus neuropathy and ipsilateral phrenic paralysis in anesthesized patients for whom regional block is performed using nerve stimulators (Lalkhen 2012). One reason for this could be the inability to elicit and record motor responses in case of sensory paresthesia during regional anesthesia administration. A study conducted by Urmey and Stanton (2002) reported that motor responses were detected by nerve stimulators in only 30% of the patients. Hence, if a patient is

under general anesthesia, lack of detection of motor responses by nerve stimulators is possible in up to 70% of the patients. In such a scenario, there is no chance of knowing if contact with a sensory nerve fascicle has occurred or not.

In light of the concerned patient's procedure, administration of a regional block following general anesthesia was a necessity. However, there is sufficient evidence in the literature that suggest that use of nerve stimulators in unconscious patients does not guarantee that no nerve damage will occur. Despite the fact that hospital guidelines were appropriately followed for the patient and a motor response of wrist flexion was elicited during the procedure, she developed complications due to administration of the interscalene block. This could be due to improper detection of motor responses that led to hemiparesis and other physiological changes in the patient. In light of this case study, nerve stimulators may not be the best tool to elicit motor responses in patients undergoing epidural anesthesia, and hospital guidelines may need review regarding this practice.

Relation to the ANZCA PS03 Guidelines

The Australian and New Zealand College of Anesthetists (ANZCA) is a professional organization that has taken leadership in establishing safe practice guidelines for administration of anesthesia. Specifically, its PS03 guidelines established in 2014 deals with the administration and management of major regional blocks. These guidelines help reduce adverse outcomes of regional block administration and to minimize the risk of inserting the needle in the wrong site (PS03 2014).

Section 3.3.2 of the PS03 guidelines clearly states that optimal control over local anesthesia administration can be achieved through appropriate patient feedback. Apart from this, self-reported measures and pain intensity assessments should be carried out frequently during the procedure. In case the patient needs to be sedated for the procedure, appropriate tools should be used to check pain intensity levels. This is important as sudden pain in the patient may signal compartment syndrome, epidural abscess, or hematoma. Additionally, protocols and tools should be available for the immediate recognition and management of any complications that may arise due to improper nerve puncture (PS03 2014).

In the concerned case study, nerve stimulators that were used for assessment of motor responses in the patient did not perform optimally in diagnosing complications. When wrist flexion was detected in the patient, nerve damage had already occurred which later manifested in the form of hemiparesis and physiological disturbances. Despite the fact that the guidelines do not specify the tools that should be used for pain intensity assessment, it falls under the hospital's discretion to select tools that can give the most accurate and real-time status of the patient. Based on the experiences with patients undergoing regional block administration in the

hospital, the number of patients who develop complications need to be identified and measures need to be taken to reduce this number.

As per the PS03 guidelines, specialized assessment tools need to be used to detect the occurrence of complications during the procedure. However, this is not a requirement as per the hospital's policies and so, the development of complications due to nerve damage were not detected for the patient while she was in the operation theatre. Early detection of complications can lead to a better prognosis and can help avoid lasting neurological and physiological conditions in the patient. The hospital needs to follow the ANZCA guidelines for choosing appropriate detection and management tools for complications due to regional block administration in patients.

Literature Review

The use of nerve stimulators has, over the years, proven to be ineffective and inconsistent in measuring motor responses in patients. Even with the use of electrical nerve stimulators, it can sometimes be challenging to identify the exact position of the needle in the nerve. Once a motor response is detected, there can be a significant time lapse in performing damage control if improper regional block administration is suspected (Munirama 2015). There has been a lot of research in pursuit of identifying new tools that can replace nerve stimulators in hospitals. One such technique is the use of ultrasound guidance for nerve puncture. It has the advantage of allowing real-time observation through which a specific amount of drug can be administered at the appropriate site (Singh 2015).

Especially in the case of interscalene blocks, it has been reported that the anesthesia fails to affect the ulnar nerve in at least 50% of the patients. In such cases, ultrasound guidance can help visualize the best site for injection and avoid damage to nerves and blood vessels. Also, depending on the spread of the local anesthetic in the body, the volume of the drug can be adjusted (Jeon 2016). Due to the many advantages of this technique over traditional nerve stimulation, it has been widely adopted in many regions around the world.

Australia has been recognized as an active participant for conducting research on the benefits of using ultrasound guidance for administering regional blocks. At the 2012 American Society of Anesthesiologists Annual Meeting, Australian scientists presented their results of administering nerve blocks using either nerve stimulators or ultrasound. Their results effectively demonstrated the advantages of using ultrasound guidance for nerve block administration (Barrington 2009). At the same time, another group of Australian scientists have conducted an extensive literature review and showed that there is no clear evidence that points to the decrease in nerve injury while using ultrasound (Barrington 2018).

Despite several contraindications, ultrasound guidance has been widely adopted across the world for performing complex nerve blocks, including interscalene blocks. It is particularly used for high-risk patients where block success rates can be improved and complications can be minimized (Balaban 2014). Ultrasound-guided interscalene blocks have also proven to have a faster onset time, longer duration, and higher reliability as compared to nerve stimulation-guided blocks (Vierula 2019). The use of ultrasound has especially shown to reduce the incidence of hemidiaphragmetic paresis (Ghodki 2016), which is one of the complications in the concerned patient. In light of the evidence obtained from both Australian and international groups of researchers, hospitals need to review their policies and make the use of ultrasound guidance for regional block administration mandatory. This could not only help avoid the complications faced by the concerned patient, but also improve the efficacy and outcomes of the procedure.

Conclusion

Based on the concerned case history, and analysis of hospital policies and ANZCA guidelines, nerve stimulation is probably not the best way to assess pain intensity and motor responses in a patient. Several studies in recent times have consistently proven the advantages of using ultrasound guidance, both with and without nerve stimulation. Hence, based on the available evidence, it is highly recommended that the hospital consider mandating the use of ultrasound guidance for performing regional block administration in patients. This may or may not be used in conjunction with electrical nerve stimulation, and the decision may vary based on specific patient requirements. In any case, ultrasound guidance has a lot more advantages than risks, and it should be made a standard of care in hospitals.

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