

Exacerbation of spasticity in ipsilateral shoulder after right brachial plexus block in a patient with right hemiplegia

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Spasticity is a common impairment in patients with central nervous system disease. Clinical observation has demonstrated that spasticity can be aggravated by various factors such as emotional state as well as noxious stimuli. A 51-year-old male patient was scheduled for arteriovenous fistula surgery. He had right hemiplegia including motor weakness and spasticity. It was decided that the surgery would be performed under an axillary brachial plexus block (BPB). He appeared nervous when blockade was terminated. The spasticity of the right shoulder increased after ipsilateral BPB. However, when we administered sedative drugs and performed interscalene BPB 2 days later, spasticity did not occur. Exacerbation of spasticity might be evoked by an anxious emotional state. Thus, it seems to be good to consider removing of anxiety and using an appropriate approach when it is tried to perform nerve blocks in individuals with spasticity.

Keywords: Spasticity; Anxiety; Nerve block

INTRODUCTION

Spasticity is a commonly known sequela following cerebrovascular accident, which is usually characterized as hyper-tonus, hyperreflexia, clonus, and muscle spasm [1]. The manifestations of spasticity can be aggravated in an anxious emotional state [2]. Spasticity often causes extremity muscle contractures and deformities that interfere with performance of routine activity of daily life. Difficulties for patients include problems maintaining personal hygiene, independent dressing, comfortable seating, and maintenance of adequate posture [3]. In such situations, nerve blocks are utilized to decrease spasticity of extremities [4,5].

Brachial plexus block (BPB) is a peripheral nerve block commonly used for regional anesthesia of the upper extremity. Arteriovenous fistula (AVF) surgery can be performed success-

fully under local anesthesia or BPB. However, BPB offers several advantages compared with local anesthesia [6,7].

We report on a case in which the spasticity of the right shoulder increased after ipsilateral BPB in a patient with right hemiplegia following an intracranial hemorrhage.

CASE

A 51-year-old male patient was scheduled for AVF surgery in order to undergo hemodialysis. According to his past medical history, he had been receiving conservative treatment due to chronic kidney disease diagnosed 8 months ago. In addition, he had undergone craniectomy for intracranial hemorrhage 6 years ago. Physical examination showed that the patient had right hemiplegia, including a motor weakness in the right side (grade 0) and a spasticity of modified Ashworth scale (MAS) grade 1 (Table 1) at the right shoulder abduction [8]. However, other range of motion of his right shoulder was not limited. The anterior side of the left arm was covered with thick scar tissue from burns. The medication for the spasticity in the right shoulder had been stopped a month ago because the spasticity had subsided. Preoperative blood test, chest X-ray, electrocardiography, and pulmonary

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Table 1. Modified Ashworth scale for grading spasticity

Grade	Description
0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion (ROM) when the affected part(s) is moved in flexion or extension
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM
2	More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved
3	Considerable increase in muscle tone, passive movement difficult
4	Affected part(s) rigid in flexion or extension

function test were within normal ranges.

Premedication was not administered. Considering the scar on the left arm and the routine activity of daily life, the right wrist was decided as the operation site. The patient's right shoulder was abducted for measurement of muscle spasticity and determined as MAS grade 0 or 1. The surgery was performed under an axillary BPB which could successfully blocked the operation site. The arm was abducted at an angle of 90 degrees. The brachial plexus was detected using an ultrasound system (Prosound a7, Aloka, Mitaka-shi, Tokyo, Japan) with a high-frequency linear probe. A needle connected to the nerve stimulator (Stimuplex HNS 12, B. Braun Melsungen AG, Melsungen, Germany) was inserted using the inplane technique, and 40 mL of 1% lidocaine containing epinephrine was injected when twitches of the brachial plexus were evoked by a current intensity of 0.5 mA. The patient complained of cold during BPB. He appeared nervous and shivered when BPB was terminated. He also confessed his anxious emotional state. After the adduction of the right arm, his body including the right arm was covered with a warm blanket. Injection of a tranquilizer was also attempted to reduce anxiety but the patient refused it. Progress was observed because there were no problems besides anxiety.

The patient still looked uneasy after approximately 10 minutes, but he said that the anxiety was bearable. Ten minutes after the termination of BPB, we checked the sensory blockade at his right wrist, elbow, and shoulder by cold sensation and pinprick test. The blockade was successful at his right wrist and elbow, but his right shoulder was not blocked. After successful blockade at the operation site was determined,



Fig. 1. Difficult abduction of the right arm due to markedly increased muscle tone in the patient's shoulder.

we attempted to abduct the arm for surgery but the arm movement was very difficult due to the resistance of the shoulder muscle to passive extension (MAS grade 3). Maximal possible abduction was only 70 degrees (Fig. 1), and the arm was adducted by itself when we released his arm. The patient was also more anxious and embarrassed. The surgery was delayed with the patient's consent because the spasticity was not relieved even after 30 minutes, and he was transferred to the general ward. According to the physical examination of rehabilitation medicine one hour after arrival at the ward, the spasticity of the right shoulder had already been returned to MAS grade 0 or 1. They also rechecked the sensory blockade at his right arm, but it was recovered. Also, he looked comfortable and did not show any particular symptoms, however, a detailed interview with the patient revealed that his spasticity had sometimes increased in states of very high tension and high emotion such as anxiety. The patient refused addition neurological examinations. Antispastic medications were started with tizanidine and gabapentin. The surgery was rescheduled after 2 days. Unavoidably, it was decided that the AVF would be made at the right arm because of the scar tissue on his left arm. We decided to perform an interscalene BPB to block not only his right wrist region, which was the operation site, but also his right shoulder region. Midazolam 3 mg was injected intravenously into the patient in the holding area. In addition, a small dose of remifentanyl (0.1-0.2 $\mu\text{g}/\text{kg}/\text{min}$) was infused during performance of BPB and surgery, so that he was restful and cooperative. Exacerbation of spasticity did not occur during the entire process. The AVF surgery was accomplished uneventfully and the patient was transferred to the division of nephrology. Afterward, no exacerbation of

spasticity was observed during insertion of a needle into the patient's right arm for hemodialysis.

DISCUSSION

In the patient described here, the augmented spasticity produced a marked increase in muscle tone of the right shoulder, which made passive abduction of the right arm difficult. Spasticity generally occurs when there is a loss in the balance between excitatory and inhibitory inputs into the motor neuron by the loss of the suprasegmental control over the spinal cord [9]. The result causes hyperactivity in muscle fiber by a lack of inhibition [9]. Exacerbation of spasticity can be evoked by skin irritation such as a pinch, a needle stick, pressure sores or ill-fitting orthotic appliances [4,9]. In this case it is also possible that the spasticity was intensified by painful stimuli such as needle insertion or local anesthetic injection during BPB. However, the exacerbation of spasticity occurred while the patient was waiting for surgery after BPB, not during BPB. The spasticity continued even after 30 minutes and the patient had no complaints other than the anxiety. In addition, exacerbation of spasticity did not occur when BPB was performed 2 days later and a needle was inserted into the AVF for hemodialysis after surgery. Thus, it is highly possible that the phenomenon, the exacerbation of spasticity after completion of BPB in this patient, had nothing to do with noxious stimuli during BPB.

Anxiety is an understandable emotional response to upcoming surgery. Although it is difficult to define the pathogenesis, clinical observation has illustrated that the manifestations of spasticity can be aggravated in an anxious emotional state [2]. In this case, the patient had also been anxious when the exacerbation of spasticity occurred. Furthermore, his past medical history included increased clinical manifestation of spasticity sometimes while in a state of very high tension and high emotion such as anxiety. In the second attempt, the exacerbation of spasticity was successfully prevented by administration of midazolam and remifentanyl to reduce the patient's anxiety. All of these things considered, there is a high probability that the exacerbation of spasticity was evoked by the patient's anxiety.

Nerve blocks are used to decrease the spasticity of extremity muscle following a cerebrovascular accident. Not only the use of sedative drugs but also interscalene BPB was useful

in preventing exacerbation of spasticity in the second operation. In the first attempt, axillary BPB was performed, and it successfully blocked the operation site. However it could not block his shoulder region and prevent the exacerbation of the spasticity of his right shoulder. If BPB had been performed on the interscalene groove instead of the axilla from the beginning, it is possible that the spasticity would not have developed during the first surgery.

Performance of AVF surgery in the right arm with spasticity can be controversial. However, AVF is usually created in the non-dominant arm due to activities of daily living and the patient of this case can use only the left arm. Furthermore, his left arm had a scar from burns. Therefore, the plan to create AVF in the right arm seems to be not wrong in this case.

An AVF surgery can be performed successfully under local anesthesia or BPB. However, BPB offers several advantages, including venous dilation and increasing blood flow compared with local anesthesia [6,7]. In addition, local anesthesia requires more needling than BPB. Thus, local anesthesia would have more noxious stimuli than BPB.

Sedation during BPB is not necessary because BPB is associated with minor discomfort and excessive sedation can make cooperation with a patient and landmark assessment difficult [10]. However, a small dose of midazolam or short acting opioid can provide a patient comfort without excessive sedation [10]. Thus, the use of sedative drugs is worth considering when a nerve block is performed in particularly anxious individuals like this case.

In summary, spasticity, a common secondary disability following cerebrovascular accidents, can be aggravated by heightened emotional state such as anxiety as well as noxious stimuli. The possibility of exacerbation of spasticity by various stimuli should be considered when performance of any procedure is attempted in individuals with muscle spasticity. Thus, anxiety or noxious stimuli should be removed by various methods such as the use of sedative drugs, and an appropriate approach of nerve block should be performed in order to prevent exacerbation of spasticity in individuals with muscle spasticity.

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