CASE REPORT

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Stellate ganglion block as a complementary therapeutic modality for arterial thrombosis in upper limb of a neonate

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ABSTRACT

Stellate ganglion block or lower cervical sympathetic block is an interventional procedure, in which a local anesthetic is injected to the sympathetic trunk of the neck, for adjustment of autonomic tone in head, neck and the upper extremity. This procedure is frequently used as a complementary therapeutic modality in a variety of complex heterogeneous problems. We report a case of rapid onset radial and brachial artery thrombosis, which developed in a neonate patient after multiple attempts for a peripheral venous access by cannulation. The condition was diagnosed with Doppler ultrasound, and was successfully managed with stellate ganglion block along with intravenous administration of an anticoagulant.

Key words: Stellate ganglion; Stellate ganglion/Drug effects; Ganglion blockers; Thrombosis; Autonomic nerve block; Lidocaine; Neonate

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INTRODUCTION

Sympathetic nervous system is an apparatus controlling internal homeostatic environment directly, and having an important role in vascular and visceral tone. Stellate ganglion as a part of Sympathetic system is responsible for innervations of head, neck and upper extremity.[1] Stellate ganglion block (SGB) is used in the treatment of a diversity of heterogeneous complex problems, including arterial embolism or vasoconstriction in the area of the upper limbs, accidental intra-arterial injection of drugs, complex regional pain syndrome, phantom limb pain, Reynaud phenomenon, cardiac dysrhythmia and cerebrovascular accident,. It was first introduced in 1953 and indicated for vascular diseases in the head, neck and upper extremities.[1-3]

Anterior paratracheal SGB decreases vascular tone without affecting the capacity of vessels or auto-regulation mechanism. This quality has a therapeutic

role in patients where vascular insufficiency can be attributed to arterial thrombosis or vascular spasm; therefore, SGB can be considered as a practical intervention to manage patients with vascular insufficiency or arterial thrombosis in upper limbs.[1,3,4]

We present the report of a premature, low birth weight neonate, who had had multiple manipulations on left upper limb for venous cannulation and blood sampling; subsequently developed arterial thrombosis that managed with SGB and anticoagulant therapy (heparin).

CASE REPORT

A 28 weeks gestational age female neonate with 1 kg bodyweight was delivered by cesarean section due to premature rupture of membranes. The mother had a history of gestational diabetes mellitus and preeclampsia. The neonate received BLES® (bovine lipid extract surfactant) for rescue treatment of neonatal respiratory distress syndrome (NRDS/ hyaline membrane disease) and respiratory care was provided by mechanical ventilation.

On the third day of her intensive care course a change in the skin color of her left hand was observed and the radial pulsation was felt to be weaker. Topical nitroglycerin was prescribed, and the condition improved temporarily. On 7th day of her admission, skin color changes progressed up to the arm and peripheral pulses disappeared in radial and brachial arteries. Doppler ultrasound confirmed decrease in arterial blood flow in brachial artery and emphasized on absence blood flow in radial artery and distal part of left upper limb. We found multiple marks of needle pricks on skin during attempted venous cannulation for blood sampling and for intravenous access in antecubital area on the left forearm of the baby. A diagnosis of vascular insufficiency secondary to multiple trauma was made. Intravenous bolus of heparin (20 IU) was prescribed and followed by an infusion at 20 IU/h. Stellate Ganglion block was performed by anterior paratracheal technique by standard technique to block.[1-4] A blind technique was used because of clinical condition and small dimensions of our subject. The patient was monitored for ECG, noninvasive blood pressure; pulse oximetry and end tidal CO_2. Temperature sensing probe was also placed on her left hand. After the patient was adequately sedated with 0.5 mg intravenous ketamine, lying supine, and supported with mechanical ventilation, the chin was slightly raised and turned away from needle-insertion site. The skin in front of the neck, next to the larynx was cleaned with antiseptic solution. Cricoid cartilage was selected as the landmark. Transverse process of cervical vertebra (Chassaignac's tubercle) was felt through deep palpation by pulling sternocleidomastoid muscle and carotid sheath immediately lateral to cricoid cartilage with 2nd and 3rd fingers of the left hand. Skin was vertically punctured with a 27gauge needle on syringe containing medication, and then advanced until C6 transverse process was contacted and then 0.3 ml of lidocaine 1% was injected with 27 gauge needle on insulin syringe, at the anterior tubercle of the sixth cervical transverse process. Medication was injected in a controlled and slow manner while monitoring vital sign. 18 hours later, SGB was repeated by the above mentioned technique 2 hours after heparin withdrawal. Fresh frozen plasma was prescribed as empirical therapy of protein C or S deficiency and was stopped after receiving lab results including PT, PTT and INR. All the coagulation factors were reported to be within the normal range. After clinical response to our interventional therapeutic procedure, heparin was tapered off during 7 days and was stop on 14th day of admission to the ICU. Finally, our patient was successfully weaned from mechanical ventilation and was discharged from ICU.

'Patient's consent form' as well as 'consent to publish' form were signed by her legal guardian.

DISCUSSION

This report involves a successful interventional procedure of SGB on a premature, low birth weight neonate for saving her upper limb from a common complication. We considered intra venous cannulation as a triggering factor for starting clot formation in upper limb arteries. The clot formation was sudden onset and rapidly progressive, while we focused at the respiratory problems of our patient. We could manage this complication by using Doppler sonography as a bed-side diagnostic device to diagnose the condition, immediate decision to administer anticoagulant agent (heparin) and to perform SGB. In our patient, the subject showed obvious physiologic signs of Horner's syndrome and conjunctival injection after our practice. SGB is often performed by an anterior paratracheal approach at the level of the sixth cervical transverse process to avoid serious complications. The location of the ganglion varies in different individuals and even may differ on left and right sides of the same person. Fluoroscopy can be used to identify the anterior tubercle at the sixth cervical transverse process in patients whose bony structure cannot be palpated.[1,2,5-7] In clinical practice, special training and experience is required to perform it under fluoroscopy or under ultrasound guidance (USG), hence leads to SGB has been widely performed with blind technique.[2,8] We could not use fluoroscopy or USG method for SGB in our patient because of her clinical condition and very small size.

Serious complications have been observed with SGB that might be potentially fatal, such as inadvertent

entry of local anesthetic into epidural or subarachnoid space, seizures, pneumothorax and retropharyngeal hematomas,[1,5-7] especially in emaciated patient. We had been lucky to employ blind approach without any complication.

Though, any local anesthetic can be used for SGB; a long acting agent is preferable. The block can be repeated using a lower volume of local anesthetic agents.[2,5,8] We used low volume of lidocaine and repeated it after good therapeutic response was noticed.

A number of methods have been used to measure changes in blood supply, including photon emission computed tomography, angiography, Doppler ultrasound, and magnetic resonance imaging.[2,6-9] Physicians have traditionally used Doppler ultrasound for such evaluation because of its ability to detect vessel size changes and its ability to allow the practitioner to measure blood flow. However, using Doppler in neonates is limited by its narrow field of view, smaller size of the neonate's vessels and its inability to visualize smaller arteries located deep within the forearm.[2,6,7] SGB causes sympathetic blockade of the ipsilateral head, neck and arm. Therefore, an effective block produces an ipsilateral Horner's syndrome (ptosis, miosis, and anhydrosis), conjunctival injection and increased temperature of the hand. These side-effects are anticipated during the blockade.[6-10] These symptoms could be an indication of a successful SGB. We cofirmed successful interruption of sympathetic innervation to the head, neck and upper limb with the appearance of flushing of the face and Horner syndrome.[6,8-11]

In conclusion, we could use SGB in association with anticoagulants for treatment of arterial insufficiency due to thrombosis in the upper limb of a neonate. We used Doppler ultrasound technique successfully for diagnosis and follow up of our patient.

Although further evaluation is needed; we feel that practical use of sympathetic blockade may provide effective treatment for upper limb vascular insufficiency, as it is a major complication in infants and neonates after multiple pricks for setting an intravenous access. We recommend this technique to be considered in the pediatric and neonatal patients for treating such complications.

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Authors' Contribution:

MT: protocol development, outcome assessment, and manuscript writing

MR & ShT: conduction of the study.

EA: protocol and analytical framework for the study, manuscript writing

AJ: supervised the design and execution of the study, manuscript editing

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