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Stellate Ganglion Block: A Therapeutic Modality for Arterial Insufficiency of the Arm in Premature Infants

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Therapeutic modalities for arterial insufficiency of the upper limb include microvascular reconstruction, pharmacologic and psychologic palliation, and local and regional sympathetic block.¹ However, in very small children the options are limited severely; the small caliber of the vessels makes vascular surgery extremely difficult, and palliation cannot be achieved with any reasonable degree of success. Regional sympathetic blockade, to our knowledge, has not been reported in this age group. We thought it therefore of interest to describe the successful use of a stellate ganglion block in a premature infant that suffered from arterial insufficiency in the upper extremity.

REPORT OF A CASE

A 1,600-g female infant, product of a twin pregnancy of 32 weeks' gestation, was delivered by cesarean section that was indicated for abruptio placentae. A diagnosis of prematurity with severe respiratory distress was established. The infant received mechanical ventilatory support and parenteral fluids and medications. The other twin did exceptionally well.

At the age of 2 weeks, a venous cut-down became necessary for continued administration of nutrition and medications. It was performed on the upper arm, and a 22-g Teflon® catheter was introduced through which iv fluids were administered by means of an infusion pump. An hour after the cut-down and the start of the infusion, the left forearm and hand began to blanch. In approximately 4 h, the involved extremity became cold and showed a blue discoloration. The radial and brachial pulses could not be palpated, nor could they be detected by ultrasound technique. It thus became apparent that the brachial artery had been cannulated. Removal of the catheter had no beneficial effect. A few hours later, a left stellate ganglion block was performed using the paratracheal approach.² After identification of landmarks, 0.5 ml lidocaine 0.5% (1.6 mg/kg) was injected following a careful aspiration.

The skin temperature of the extremity was monitored, and an ultrasonic doppler monitor was used to check arterial pulsations.³ A few minutes after the block, ipsilateral ptosis of the eyelid was observed. A maximum response was noted in 30 min. The skin temperature rose from 34.0° C to 35.3° C and remained in the 35.0-35.5° C

range. A mild swelling of the hand and forearm developed that subsided in 2 days. The baby has had no further difficulty with this extremity.

DISCUSSION

To differentiate between an artery and a vein for cut-down cannulation of a peripheral vessel in premature infants, it is most often necessary to use a magnifying loupe or be guided by an ultrasonic device. Still, the artery may be cannulated accidentally instead of the vein. The use of an infusion pump could make the recognition of intraarterial cannulation even more difficult; the pressure exerted by the pump will exceed the arterial pressure, and there is no back flow of arterial blood into the cannula. Thus, the error becomes obvious only by the appearance of clinical symptoms.

Therapeutic measures being limited in small infants, we decided to perform a stellate ganglion block, though this procedure for this age group had not been described in the literature. We elected the paratracheal approach, looking for the sixth cervical vertebral transverse process, a similar landmark as can be found in adults.² The top of this process (Chassaignac's Tubercle) was palpated easily at the level of the cricoid cartilage, and the anteriorly inserted needle impacted upon the process at a very shallow depth.

Signs of a successful stellate ganglion block include the development of Horner's syndrome, anhidrosis, vasodilation of the hand and arm, and an injected conjunctiva.⁴ In addition, blockade of the psychogalvanic reflex, increased pulse amplitude by digital plethysmography,³ and an increase in capillary oxygen tension exceeding 8 mmHg may be found.⁵

In the present case we were able to observe ipsilateral ptosis, vasodilatation of the hand and arm, an increase in skin temperature, and a greater pulse amplitude as measured by ultrasonic Doppler monitor. The swelling of the forearm and hand seen after the stellate ganglion block probably resulted from the reactive hyperemia in an area with tissue acidosis and poor venous drainage that had been caused by the arterial insufficiency.

Although we do not know what the outcome would have been without a stellate ganglion block, we believe that in premature infants stellate ganglion blockade may be a useful therapeutic modality for arterial insufficiency of the upper extremity.

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An Unusual Presentation of an Airway Tear

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Serious injury resulting from endotracheal intubation is uncommon and usually immediately apparent. Among the more serious injuries are those causing disruption of the airway. A significant airway injury is described that was not evident until 24 h postoperatively. The emergent management of this injury may have worsened the original damage, resulting in near fatal respiratory problems.

REPORT OF A CASE

An 82-year-old, 60-kg, non-English-speaking woman was admitted following 2 weeks of epigastric pain secondary to an obstructing lesion of the colon. She took no medications other than 1 g thyroid extract per day orally for long-standing thyroid insufficiency. She did not smoke. Because colonoscopy was unable to decompress her markedly dilated colon, an exploratory laparotomy was scheduled. The day prior to surgery, multiple attempts at insertion of a nasogastric tube were unsuccessful and reportedly caused minor trauma to the nasopharynx. Following administration of 100% oxygen and application of cricoid pressure, anesthesia was induced with 350 mg thiopental and 100 mg of succinylcholine iv. The larynx was visualized easily with a #3 MacIntosh blade. The trachea was intubated with a soft cuff #7.5 endotracheal tube with the aid of soft copper stylette with a blunt tip. The stylette did not protrude beyond the endotracheal tube, and the anesthesiologist reported no difficulty with any aspect of the intubation. A total of 6 ml air was added to the cuff to cause a seal, and breath sounds were heard bilaterally. An esophageal stethoscope, oral temperature probe, and a nasogastric tube subsequently were inserted without difficulty. Anesthesia proceeded with 2 mg morphine iv and the inhalation of enflurane and 66% nitrous oxide. Additional intermittent succinylcholine was given in an iv drip. A transverse loop colostomy for an obstructing adenocarcinoma with multiple distant metastasis was performed in a routine fashion. The endotracheal tube cuff was not deflated periodically intraoperatively.

The procedure lasted 3 h, and the patient was taken to the recovery

room, breathing spontaneously but still anesthetized deeply. The trachea remained intubated. Chest roentgenogram exhibited low lung volumes but was otherwise normal. With an FI_{O₂} of 0.4; Pa_{O₂} was 81 mmHg, Pa_{CO₂} was 43 mmHg, and pH_a was 7.37. The patient appeared very drowsy but comfortable, with a respiratory rate of 16 breaths · min⁻¹, a blood pressure of 160/90 mmHg, and a heart rate of 80 beats/min. Copious secretions were noted from the posterior pharynx and nasogastric tube, but no significant respiratory distress was seen. The trachea was extubated 90 min later with the patient awake but mildly agitated and requiring arm restraints. Two and one-half hours later, she was transferred to the ward. Moist crackles at the lung bases, a temperature of 37.5° C, and a "puffy appearance" to the face were noted prior to transfer. She remained disoriented, agitated, and continued to require passive restraints to keep her from pulling out her catheters. Five hours later, she was unable to cough effectively and exhibited coarse rhonchi on auscultation. Chest physical therapy was administered with little improvement.

No mention of subcutaneous emphysema was made until several hours later (13 h after discharge from the recovery room, 19 h after induction of anesthesia), when crepitus from the face to the sternal notch, bloody sputum, and ineffective cough were noted. Chest roentgenogram revealed marked subcutaneous emphysema and a small left pleural effusion. An esophageal tear from traumatic nasogastric tube insertion was suspected, and a normal gastrografin swallow was obtained. Agitation, secretions, and respiratory distress worsened. A large right pleural effusion was diagnosed by subsequent chest roentgenogram, and because of worsening respiratory distress, the trachea was reintubated with a 7.0 soft cuff, high-volume, low-pressure endotracheal tube. Following intubation, a seal could not be obtained with the endotracheal tube cuff. Ventilation was inadequate with little chest expansion due to a large air leak. The respiratory distress worsened further, and another roentgenogram was obtained. The endotracheal tube tip was 23 cm from the incisors to the right mainstem bronchus (fig. 1). The cuff pressure was a measured 60 cmH₂O. A consulting physician removed the original endotracheal tube and replaced it with a similar 8.0 low-pressure cuff tube under direct vision with no difficulty. A total of 20 ml of air inserted into the cuff still was insufficient for a good seal or adequate ventilation. Ventilation was maintained by institution of a low-tidal volume and rapid respiratory rate, which allowed for transport to the operating room.

Upon arrival in the operating room, the patient was extremely agitated with discoordinate respiration. She intermittently exhibited cyanosis and had bradycardia (heart rate 30 beats/min). Systolic blood pressure was palpable at 100 mmHg. A brief trial of anesthesia with oxygen and halothane was unsuccessful due to both inadequate ven-

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