Case Report

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Desflurane Used in A Patient with Congenital Insensitivity to Pain with Anhidrosis during Septic Shock

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Congenital insensitivity to pain with anhidrosis (CIPA) is a rare autonomic recessive disorder characterized by congenital analgesia, absence of sweating and mental retardation. Because of these abnormalities, the anesthetic managements in patients with CIPA deserve special attention. Here we report a 22-year-old man with CIPA receiving left above-knee amputation due to severe lower extremity infection. General anesthesia was maintained with desflurane, an intervention that has never been reported, and the whole course of operation was uneventful. This is also the first reported case of CIPA in Taiwan.

Key Words
anesthetics, inhalation: desflurane;
hereditary sensory and autonomic neuropathies;
shock, septic

Congenital insensitivity to pain with anhidrosis (CIPA) is a rare hereditary disorder[1] due to the mutation of *TRKA* gene,[2] a high affinity tyrosine receptor kinase of nerve growth factor (NGF). It is clinically characterized by impaired sensation to pain, absence of sweating and mental retardation.[1] Insensitivity to pain leads to trauma, bony fracture and osteomyelitis, which may require surgical treatment.[3,4] However, there had been only a few reports[3-5] on the anesthetic management for patients with CIPA due to its extreme rarity. Neither was there report on using desflurane in CIPA patient. We report a patient with CIPA receiving leg amputation under general anesthesia with desflurane. This is also the first reported case with CIPA in Taiwan.

CASE REPORT

A 22-year-old man, weighing 39 kg, with a history of CIPA was admitted to our hospital due to erythematous swelling and an open wound over his left leg. The CIPA was not diagnosed until he was 18 years old. On admission, tachycardia (120/min) with low blood pressure (78/45 mmHg) was noted. Laboratory examination revealed marked leukocytosis (white blood cell count: 33,400/cumm). There was left leg infection complicated with septic shock and the patient underwent emergent above-knee amputation. Before anesthetic induction, standard intra-anesthetic monitors were applied, including noninvasive blood pressure (NIBP), electrocardiogram (ECG), pulse oximeter, and end-tidal CO_2. Left ra-

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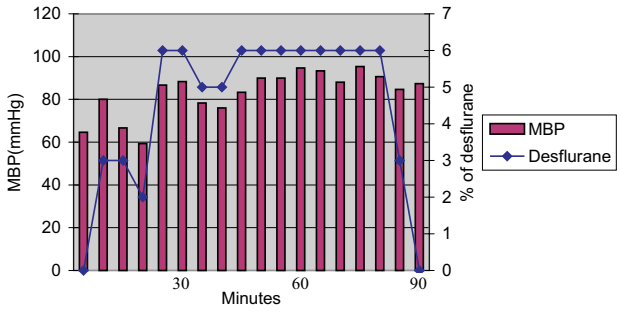

Fig. 1. Mean blood pressure (MBP) and corresponding concentration of desflurane during the course of the operation. The concentration of desflurane was adjusted according to the blood pressure during operation.

dial artery was cannulated to monitor arterial blood pressure, and right internal jugular vein was cannulated to monitor central venous pressure and fluid management. As the vital signs turned stabilized with fluid replacement (500 mL normal saline and 250 mL 6% hydroxyethyl starch) and norepinephrine infusion (10 μg/kg/min), anesthesia was induced with intravenous thiamylal 300 mg by titration. The endotracheal tube was inserted smoothly following 25 mg of intravenous atracurium. No narcotic was given. Anesthesia was maintained with desflurane around 5 to 6% in 100% O_2. (Fig. 1) Oral temperature was measured throughout the whole procedure, and kept around 37.7 °C with proper adjustment of room temperature and warm/cool blanket. The vital signs were relatively stable; therefore norepinephrine infusion was gradually tapered. The duration of operation was around 90 minutes. The patient regained consciousness right after the surgery. The muscle relaxant was reversed with neostigmine 2 mg and atropine 1 mg, and then the trachea was extubated. He was transferred to intensive care unit for further care. No analgesic was given because of insensitivity to pain. The postoperative course was complicated with wound infection, and he was discharged 3 weeks later after complete recovery from infection treated with antibiotic treatment.

DISCUSSION

CIPA is also known as hereditary sensory and autonomic neuropathy type IV (HSAN Type IV) or familial dysautonomia type II. It is an autonomic recessive disorder[1] caused by abnormalities in TRKA gene, which in turn results in defective development in nociception, temperature sensation, and thermoregulation via sweating.[2] Because congenital analgesia leads to recurrent painless trauma, self-mutilation, and bony fractures with consequent chronic osteomyelitis and septic arthritis,[1] these patients may require surgical treatment.[4,5]

In CIPA patients, there were 4 common anesthetic questions. First, is anesthesia necessary for CIPA patients with congenital analgesia? Second, what is the effect of autonomic dysfunction on hemodynamics? Third, temperature management is crucially important; and finally, does the choice of anesthetics matter?

To answer the first question, we have to know that most patients with CIPA display tactile hyperethesia,[4] which may cause unpleasant sensation during surgical manipulation in spite of congenital analgesia.[4] Okuka concluded that anesthesia is necessary and general anesthesia is preferred in order to relieve apprehension in such mentally retarded patients.[3,4] In our case, general anesthesia was conducted but no narcotic was given as in other reports[4,5] because of insensitivity to pain.

Although CIPA patients are noted hemodynamically to have a very low plasma concentration of norepinephrine and epinephrine,[5] their cardiovascular reflexes are preserved,[3] which was evidenced in our case as reflex tachycardia during hypotension. Meanwhile the response to norepinephrine infusion was preserved in our case.

Because temperature regulation is impaired due to anhidrosis, these patients suffer from recurrent episodes of unexplained fever, and 20% of them may die of hyperthermia within the first 3 years of life.[1] Successful prevention from high body temperature can be fulfilled by cautious monitoring, proper adjustment of room temperature and the use of cool blanket, as in our case and other reports.[3,4]

Most anesthetics have been used safely in CIPA patients without unusual effects,[3,4] including atropine, merperidine, fentanyl, succinylcholine, atracurium, pancuronium, vecuronium, ketamine, propofol, barbiturate and benzodiazapine.[3,4] Modern inhalation agents, including enflurane, halothane, isoflurane and sevoflurane, have been reported to have the usual effects either with or without nitrous oxide in oxygen.[4] We used desflurane in 100% O_2 in this case without any complications.

Desflurane is characterized by low solubility in blood and in other tissues. Consequently, the depth of anesthesia can be rapidly titrated[7] and a precise control over the depth of anesthesia, which is desired in patients in septic shock as in our case, can be achieved.[8] Moreover, emergence from anesthesia with desflurane is associated with a more rapid recovery of cognitive function[9] and less delirium[10] than with other inhalation agents, the risk of new injuries from involuntarily forceful body movement during emergence may be minimized. Since patients with CIPA usually undergo operation for severe infectious diseases due to osteomyelitis or septic arthritis, unstable hemodynamics may be accompanied as a result of sepsis or septic shock. Therefore, desflurane may be a favorable choice for them.

In summary, patients with CIPA are typically insensitive to pain and temperature, absent of sweating, and mentally retarded. They need anesthesia and body temperature management in case of surgery. Usually there are no major problems with anesthetics, and desflurane is a good choice for anesthesia maintenance.

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