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Total Intravenous Anesthesia (TIVA) for Stiff-Person Syndrome

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ABSTRACT

Stiff-Person syndrome is a rare autoimmune neurologic disorder that affects the central nervous system by inhibiting production of the neurotransmitter gamma-aminobutyric acid. Painful muscle spasms and rigidity are the clinical manifestations of the disease. An ideal anesthetic technique has not been described for this patient population because of the rarity of the disease. This case report describes the successful use of total intravenous anesthesia in a patient with Stiff- Person Syndrome.

Keywords: Stiff-Person Syndrome; Stiff-Man Syndrome; Total Intravenous Anesthesia (TIVA)

1. Introduction

Stiff-Person Syndrome (SPS) is a rare autoimmune neurologic disorder first described in 1956 by Moersch and Woltman [1] that producesprogressive muscle rigidity and paroxysmal spasms of the axial and limb musculature. Painful contractions can be provoked by physical stimuli, even light touch. Autoantibodies implicated in this syndrome principally target glutamic acid decarboxylase (GAD), the rate-limiting enzyme of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA). As a result, GABA synthesis is compromised and hyperexcitabilty of the motor neuron system ensues. A recent study further detected autoantibodies directed against the GABA receptor, specifically GABA-A-receptor-associated protein [2]. Treatment of SPS includes benzodiazepines, baclofen, corticosteroids, immunosuppressants and plasmapheresis [3]. The following case documents the successful use of total intravenous anesthesia (TIVA) in a patient with SPS.

2. Case Report

A 47-year-old female, diagnosed with SPS 10 years previously, was scheduled for incision and drainage of a left breast abscess. Her height was 145 cm and weight 45 kg. Other than a low hemoglobin and hematocrit (11.1/31.7), her standard lab values were within normal limits. Past medical history included systemic lupus erythematosus, multiple sclerosis, fibromyalgia, severe cervical nerve damage, temporomandibular joint dysfunction, intracranial aneurysms treated surgically, epilepsy, mitral valve prolapse, vertigo and asthma. Over the previous six years, the patient had received intravenous immunoglobin (IVIG) infusions and diazepam for treatment of SPS. She reported some relief from this treatment but experiences exacerbations of her SPS once every few years. Her last flare-up occurred one year earlier resulting in severe contractures of her upper and lower extremities, esophagus and jaw. A review of systems revealed complaints of weight loss, sleep disturbances, palpitations, syncope, dyspnea on exertion, generalized abdominal pain, indigestion/heartburn, urinary incontinence, hand tremors, vertigo, back pain, neck pain, diffuse arthralgias, diplopia and anxiety. The physical examination was significant for lumbar paraspinal tenderness and stiffness, cervical tenderness with severely restricted flexion, extension and lateral rotation of the neck, as well as bilateral upper and lower extremity hypertonia and tenderness upon palpation. Light touch to the patient's right upper extremity was known to cause a flare-up of her SPS, for which reason the blood pressure cuff and peripheral intravenous catheter were placed on her left upper extremity.

The patient was premedicated with midazolam 2 mg IV and anesthesia was induced with IV propofol 200 mg, lidocaine 100 mg and fentanyl 150 mcg. A size 4 laryngeal mask airway (LMA) was placed while a neutral cervical-spine position was maintained. Maintenance of anesthesia was accomplished with a titrated propofol infusion (100 - 200 mcg/kg/min). No muscle relaxants were given. Ventilation was supported mechanically. Intravenous clindamycin 600 mg, dexamethasone 10 mg,

and morphine 5 mg were also administered. With initial use of the IV catheter, vasospasm occurred, and papaverine 8 mg was administered intravenously to maintain patency of the peripheral vein. The patient remained hemodynamically stable throughout the duration of the case (thirty-three minutes), and the propofol infusion was discontinued once the surgical incision was closed. The LMA was removed after the patient demonstrated sufficient spontaneous tidal volumes of 6 to 8 ml/kg and was alert. The patient emerged uneventfully from TIVA with no muscle spasms/tenderness or difficultly with ventilation.

3. Discussion

Due to the rarity of SPS (prevalence < 1:1,000,000), the literature is scanty with regard to anesthetic management of patients with this syndrome. SPS is strongly linked with other autoimmune disease processes such as pernicious anemia, diabetes, vitiligo and Graves' disease. Glutamic acid decarboxylase (GAD), a rate limiting-step in GABA synthesis, is targeted by autoantibodies causing loss of CNS inhibition supplied to the motor neuron system. Solimena *et al*. detected autoantibodies against GABA-ergic neurons in at least 60 percent of patients with SPS [4]. Treatment involves either immunosuppression or the use of GABA agonists, specifically diazepam, targeting GABA-a receptors, and baclofen, targeting GABA-b receptors. Ledowski and Russel previously documented successful use of TIVA with SPS but similar case reports have been lacking since then [5].

Propofol, an alkyl phenol hypnotic agent, was used as our anesthetic maintenance agent. Hattan *et al*. described the unexpected benefit of propofol in managing acute symptoms of SPS not responding to either diazepam or baclofen [6]. A rodent study utilizing both current- and voltage-clamp recording devices determined propofol to induce thalamocortical suppression via potentiation of GABA-a receptor-mediated inhibitory postsynaptic currents [7]. A second rodent study utilizing patch-clamp experiments demonstrated that propofol shortened the slow phase of GABA-a receptor channel closed time of cortical neurons [8]. Overall, both rodent studies demonstrated propofol's ability to enhance GABA-a receptor activity and explained propofol's benefit in GABA-deficient SPS patients.

Inhalational agents were avoided. A case report by Bouw documented postoperative hypotonia with the use of isoflurane in a patient taking baclofen. This report proposed that isoflurane potentiated the effects of baclofen on GABA-b receptors resulting in prolonged muscle relaxation [9]. Although our patient was not taking baclofen, we feared that volatile anesthetics might enhance the effects of diazepam and cause hypotonia. Muscle relaxants were not used. A case report by Johnson and Miller described prolonged hypotonicity with the use of vecuronium in a patient with SPS. After detection of four twitches by a peripheral nerve stimulator, their patient was reversed with neostigmine and glycopyrrolate. However, the patient remained weak and required mechanical ventilation until she regained full strength on the second postoperative day. When the same patient was scheduled for surgery five months later, muscle relaxants were avoided. Post-operative hypotonia was not exhibited and the patient recovered from surgery in a timely fashion [10].

Although not applicable in this specific case, neuraxial and regional anesthesia may also be considered for anesthetic management of SPS patients. Shanathanna reported the use of combined spinal-epidural with SPS in a patient undergoing bilateral below knee amputation. Although subarachnoid 0.5% bupivacaine (1.8 ml) failed to achieve adequate levels in this patient, post-operative pain relief via continuous epidural analgesia was accomplished. It is also important to note neuraxial and regional anesthesia can potentially induce spasms in a patient with SPS during needle entry or from anxiety surrounding the procedure itself [11].

Optimal anesthetic management of patients with stiff person syndrome remains challenging. However, our success using TIVA in this patient supports Ledowski and Russel's experience in providing a safe general anesthetic for this patient population.

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