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Intraoperative Diagnosis and Use of Glidescope™ Video Laryngoscope for Cephalic Tetanus

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ABSTRACT

This case report describes the clinical characteristics and management of a 38-year-old man with cephalic tetanus. He presented with a massive facial infection after a dental procedure. After induction of anesthesia, cephalic tetanus was clinically diagnosed during induction based on the presence of a new facial nerve palsy and nuchal rigidity even after the administration of succinylcholine. The first attempt at intubation was unsuccessful with a Macintosh laryngoscope due to persistent nuchal rigidity and lockjaw despite the use of succinylcholine. Consistent with other reports, intubation was remarkably uncomplicated when the video laryngoscope was used. Postoperatively, the *Clostridium tetani* infection progressed to generalized tetanus and responded to supportive care. This case highlights the difficulties of diagnosis, and supports the utility of the Glidescope™ video laryngoscope in this unusual pathological condition.

Keywords: Tetanus; Intraoperative; Diagnosis; Glidescope

1. Introduction

Tetanus is disease caused by gram positive bacilli that grow under anaerobic conditions. Laboratory tests cannot confirm or exclude the disease as it is caused by a protein toxin produced by C. tetani. Under anaerobic conditions, spores germinate and produce the neurotoxin tetanospasmin, which is responsible for the clinical manifestations of tetanus [1]. There are four types of tetanus: generalized, localized, cephalic and neonatal. It is the site of inoculation rather than the difference of toxin that determines the clinical syndrome. Cephalic tetanus accounts for 1% - 3% of the total number of reported cases of tetanus and has a mortality of 15% - 30% [2]. The incubation period is 1 - 14 days, and approximately 66% of cases eventually progress to generalized tetanus [2-4].

Cephalic tetanus is a localized form of tetanus which causes trismus and variable dysfunction of cranial nerves [1]. The seventh cranial nerve is most frequently involved [5]. Unilateral blepharospasm can be an early sign [6] and involvement of the eighth cranial nerve has also been reported [3,5]. Trismus is a prominent feature of cephalic tetanus, leading to considerable difficulty in feeding, swallowing and hygiene [7]. These difficulties often precede respiratory problems where aspiration bronchopneumonia is a frequent and life-threatening complication [7,8]. The high mortality rate is related to frequent tetanic fits with laryngeal spasm and airway obstruction [9].

The Glidescope™ was invented by Dr. Jack Pacey, a vascular surgeon in 2001 and belongs to the class of video laryngoscopes. Video laryngoscopy has been shown to be superior to direct laryngoscopy in difficult intubations. However, there is no report of its utility in cephalic tetanus. This case illustrates the diagnosis of cephalic tetanus during intubation as well as the utility of the video laryngoscopy in intubating this patient.

2. Case Report

The patient is a 38-year-old male sanitation worker from West Africa, who has been residing in the United States for the past eleven years. The patient had no significant personal or family medical history or previous medical problems. The patient denies alcohol, tobacco or illicit drug use and had no known allergies. He had no known history of childhood immunizations. He initially presented to the emergency department due to dental discomfort. At that time, he had no significant signs or symptoms other than localized pain. The patient was prescribed an analgesic/anti-inflammatory in addition to an antibiotic and discharged with instructions to seek dental care. Two days later, he had a left upper molar extracted and an abscess drained by his dentist. After two days, he presented to the hospital again with progressive left facial and periorbital swelling. The swelling began after his dental extraction procedure and initially involved only his cheek. He noted no other symptoms.

On physical exam, extensive facial edema was noted to extend from the left nasolabial fold to the superior aspects of the orbit. Both upper and lower lids were involved, limiting opening of the eye. A slight left lip droop, which was not present at his visit four days prior, was now observed. No buccal fluctuance was noted in the area of tooth extraction, there were no grossly visible signs of additional dental decay or fever. Vision was tested with no observed deficits or ocular discharge. Maxillofacial CAT scan was noted for a left maxillary and ethmoid sinusitis associated with periorbital cellulitis. Infectious infiltrates and an abscess with multiple septations were noted. The left facial abscess measured 2.2 cm × 2.7 cm × 0.7 cm (CC) in size.

The patient was started on IV antibiotics with broad-spectrum aerobic and anaerobic coverage. He was scheduled for emergency inferior orbitotomy with abscess drainage. He arrived in the operating room (OR) with the tentative diagnosis of an orbital abscess with periorbital extension secondary to dental infection. Preoperatively he was noted to have a Malampatti Class of 3. His neck mobility was difficult to assess due to pain. After intravenous induction with fentanyl 100 mg, lidocaine 80 mg, propofol 200 mg and succinylcholine 100 mg, the patient was observed to have decreased cervical range of motion and difficulties were encountered in opening his buccal cavity. We were unable to visualize the vocal cords with a Macintosh Laryngoscope blade (#3 and #4) despite multiple attempts. An attempt to reposition the patient, by placing a closed fist between the patient’s scapulae was made. During this maneuver, we observed that his head, neck and upper torso were completely rigid despite previous administration of succinylcholine; opisthotonus was diagnosed. His body did not appear to have any rigidity below the chest and the patient was not grinning, therefore risus sardonicus was not present. The patient’s physical presentation, absence of any generalized rigidity, new lip droop, lockjaw and nuchal rigidity led us to the clinical diagnosis of cephalic tetanus in the operating room. Neither phenothiazine, nor metoclopramide had been administered. He was successfully intubated with a GlidescopeTM video laryngoscope (Model: Portable GVL, manufactured by Verathon Medical (Canada) ULC). In contrast to direct laryngoscopy, his intubation with the video laryngoscope was exceptionally easy. Post-operatively, the patient remained intubated and returned to the OR later that day for maxillotomy and ethmoidectomy for further drainage of the facial abscess. As the diagnosis is made clinically and tetanus toxoid was soon after the diagnosis was made, there was no need for further titers.

The patient was extubated in the MICU and was noticed to have mild residual inferior lip edema with left periorbital edema that improved. No trismus was noted on exam. The patient clinically improved and was discharged home with a PIC line in place for continued out-patient antibiotic therapy.

3. Discussion

Clinically, cephalic tetanus is the most serious manifestation of tetanus. It is a rare condition, whose diagnosis can be problematic [10]. Generally, cephalic tetanus has been observed to occur following head or face trauma, otitis media and dental infections [11]. Patients with cephalic tetanus frequently present with cranial nerve palsies as well as trismus. However, patient presentation can be highly variable as well as masked by concomitant pathologies, as the patient’s dental infection in our case. In one reported case of cephalic tetanus, onset was accompanied by an unusual and incomplete palsy of the muscles supplied by the upper branch of the seventh cranial nerve [3]. Another case described cephalic tetanus in a patient who presented with complaints of horizontal diplopia with normal her eye movements on clinical examination. Further evaluation with infrared reflection oculography revealed a saccadic abnormality which could explain her diplopia [12]. One unusual case of cephalic tetanus was caused by a rooster peck to the face [13]. Another report presented the case of cephalic tetanus that occurred in a fully immunized patient [14]. These cases depict the variety of presentations and the difficulty in arriving at the correct clinical diagnosis.

Cases of facial trauma with subsequent right facial nerve palsy, disorders of swallowing, contralateral III cranial nerve palsy, and trismus [1] are considerably more obvious in the their classical presentation. In cases when patients present with cranial nerve palsy associated with injury, as well as in the 49-year-old man who presented with unilateral cranial nerve involvement, cephalic tetanus should be considered [10,15].

Although the exact mechanism remains unclear, cephalic tetanus pathology has been studied with a single fiber EMG and points to a pre-synaptic defect in neuromuscular transmission [16]. Another clinical and electrophysiological study of 15 cases proposed that paralysis is due to high local concentrations of toxin in the brainstem while lesser concentrations cause spasm by abolishing inhibition. In this study, electrophysiological testing indicated that paralysis was of the lower motor neuron type with denervation potentials, hyper-irritability, loss of motor units, and marginally increased distal latencies [17]. Another study concluded that facial palsy in cephalic tetanus is mainly due to a functional block of conduction in the course of the peripheral nerve [18].

One study even identified an indicator of improvement or impending deterioration in three patients afflicted with cranial nerve dysfunction. They proposed the stapedius muscle activity preceded that of the muscles of the face [15].

Treatment of tetanus involves debridement of wounds, which does not relieve the rigidity even if it does help remove the local necrosis; administration of metronidazole is preferred over penicillin as well as tetanus immune-globulin, aggressive supportive care, and initiation of active immunization [2,19]. Other than neuromuscular blocking agents, lorezapam, diphenhydramine and bentropine may show a benefit for relieving trismus [7]. One study also highlighted the use of ketamine as an adjunctive therapy in the management of tetanus when breakthrough seizures were refractory to diazepam [9]. Ironically, the Clostridial flaccid paralytic Botulinum toxin A has been used to treat residual contractures after cephalic tetanus [20]. Another case of cephalic tetanus presenting with opisthotonus utilized intravenous administration of diazepam and phenytoin [21]. Despite treatment, early diagnosis and treatment are still important in preventing generalized convulsions, as they are more frequent and is more likely to be lethal in cephalic tetanus than in the common form [21].

The single most important action in any form of tetanus is to quickly and efficiently secure the airway and provide ventilation. Obtaining a patent airway is a crucial task [22], especially in emergent settings. While succinylcholine is routinely used to paralyze the muscles in order to intubate a patient with tetanus, its effect appeared attenuated. This could be attributed to an insufficient dose or the timing of the attempt of intubation. Despite this, the intubation with Glidescope™ video laryngoscopy (GVL) was remarkably easy.

Glidescope™ video laryngoscopy has been shown to improve glottic view and intubation success in a number of studies [23-27]. One study identified GVL was 98% successful as a primary technique and GVL after failed DL was 94% successful in 2004 cases [27]. In addition to being more effective, GVL also allows practitioners to achieve successful intubation while applying lower forces [28]. Therefore, causing less trauma, decreasing risk of possible complications, and increasing efficacy as well as precision of procedures and treatment modalities.

Another study compared the success rates of GVL versus DL in airways with known difficult airway predictors (DAPs) [29]. DAPs included cervical immobility, obesity, small mandible, large tongue, short neck, blood or vomit in the airway, tracheal edema, secretions, and facial or neck trauma. First-attempt success rate with GVL was 78% while DL was only 68%. In this study the adjusted odds of success of GVL compared to DL on first attempt was 2.20 [29]. Logistic regression showed that DAPs were statistically significant risk factors for decreasing the odds of success with DL and increased the odds of success of GVL. For difficult airways GVL had a higher success rate at first attempt than DL. In both difficult and conventional airways GVL was more likely to succeed on first attempt than DL [29], had a higher overall success rate, and lower number of esophageal complications [30].

Another study demonstrated significantly fewer intubation attempts were required with GVL compared to the Macintosh DL [31]. In yet another study, GVL intubation was performed within one minute in 81/100 cases and 75/100 obtained a 75% or better glottic opening score [32]. In an additional study, of 45 volunteer physicians inexperienced with airway management, the GVL provided extremely high intubation success rates in short times on the first attempt [33].

The GVL was easily handled not only by experienced anesthetists but also by novice personnel [32]. Out-of-hospital endotracheal intubation performed by paramedics using the Macintosh blade for DL is associated with a high incidence of complications [26]. However, Airtraq, Glidescope, and C-Mac were similar to each other and better than the Macintosh in regard to ease of intubation, controller satisfaction, and number of attempts. These newer instruments appear to be better than the Macintosh when used by novice medical students [22]. One study drew a parallel between GVL and LMA intubations in paramedic students. They published successful intubation by 78.5% of students with DL, 92.6% with i-LMA and 91.7% with GVL. Even mean time of intubation (25.06 s for DL, 22.32 s for i-LMA, and 22.63 s for GVL) and success rates for i-LMA and GVL were significantly higher compared with DL [34].

GVLs are also associated with less dental trauma than C-Mac and Macintosh [22]. This is because the forces applied to the maxillary incisors are significantly greater with the Macintosh blade compared with all video laryngoscopes (VLSs) [23]. One study measured the mean forces applied by trained and untrained personnel. Participants applied, on average, lower force with the GVL than with the Macintosh in a normal airway: [Anesthesiologists: Macintosh 39 and GVL 27] [Trainees: Macintosh 45 and GlideScope 21] as well as in the difficult airway scenario: [Anaesthetists: Macintosh 95 and GVL 66] [Trainees: Macintosh 100 and GlideScope 48]. All the intubations using the GVL were successful, regardless of the scenario and previous intubation experience [28]. VLSs were safer for the patient than the Macintosh blade in terms of the forces applied to the maxillary teeth, time, number of insertion attempts, and views achieved of the glottic arch [23,28].

When considering these publications and the clinical experience with our 38-year-old West Africa patient, we are inclined to draw similar conclusions. Despite operative complications of facial edema, lip droop, lockjaw, and opisthotonus, we were able to intubate our patient with relative ease with the GVL when the DL did not prove to be an effective instrument. Convention led us to implement our Macintosh blades as a first line instrument for intubation.

However, it is the opinion of the authors that it may be time to reflect on this convention when dealing with difficult airways. The literature supports the use of direct laryngoscopy as the first choice for easy intubations and video laryngoscopy as the first choice for suspected difficult intubations.

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