Rabies vaccine and neuraxial anaesthesia

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Keywords: rabies; vaccine; anaesthesia; neuraxial block

Abstract
This case report of neuraxial anaesthesia for emergency orthopaedic surgery serves to highlight the dilemma faced by anaesthetists when surgical intervention becomes necessary in a patient on anti-rabies vaccine. The two issues of importance are the possible reduction in the efficacy of vaccination by an immunosuppressive effect of anaesthesia and surgery, and the possible need to avoid local anaesthetics for the provision of postoperative analgesia to assist in the early detection of any neurological deficit.

Ⓟ Peer reviewed. (Submitted: 2010-03-08, Accepted: 2010-08-27) ***S Afr J Anaesthesiol Analg 2010;16(5):32-34***

Introduction

Human rabies is a fatal disease and remains a serious health problem in many developing countries, such as India and South Africa.[1] Surgical intervention in a patient on anti-rabies vaccine is a dilemma, as it may cause a reduction in the efficacy of the vaccination through an immunosuppressive effect of anaesthesia and surgery. There are very few reports on the safety of anaesthesia and surgery in a patient receiving anti-rabies vaccination. We report on a patient receiving anti-rabies vaccine who was administered a neuraxial anaesthetic for emergency orthopaedic surgery.

Case report

A 63-year-old, 74 kg male patient presented with a history of falling following an unprovoked dog bite by a stray dog eight days before presentation. He was diagnosed with intertrochanteric fracture of the right femur and was scheduled for an open reduction and screw fixation of the fracture. He did not receive the rabies immunoglobulin (RIG), but had received anti-rabies vaccine (purified chick embryo cell vaccine (PCECV) Rabipur™) on days 0, 3 and 7. He was a chronic smoker (80 pack years) and was a known case of chronic obstructive airway disease (COAD). He was being managed with salbutamol and ipratropium inhaler therapy for symptoms due to COAD. On examination, he had a bite injury in the left calf region. Auscultation of the chest revealed decreased air entry into the left upper zone of the lung, with occasional rhonchi. His chest X-ray revealed emphysematous changes and a large bulla in the left upper zone of the lung. A contrast-enhanced computed tomographic (CECT) scan of the chest confirmed the findings of paraseptal emphysema with a large emphysematous bulla in the left upper lobe and a fibroparenchymal lesion in the right upper lobe, with pleural thickening.

Written informed consent was obtained and the regional block was explained to the patient. The patient was moved to the operating room and routine monitors (electrocardiogram, non-invasive blood pressure, pulse oximeter) were applied. Under aseptic precautions, combined spinal and epidural block was administered using the needle-through-needle technique in the L3–4 interspace in the left lateral position. A total of 2.5 mL of 0.5% bupivacaine (heavy), along with 25 µg fentanyl, was administered intrathecally. The patient remained haemodynamically stable. The intraoperative course was uneventful. Postoperative analgesia was provided with epidural morphine, and the epidural catheter was removed after 48 hours. The patient's neurological examination was normal. The

patient was discharged uneventfully on the eighth day, and was advised to complete the anti-rabies vaccination and follow up in orthopaedic clinics. The patient had an uneventful recovery up to six months of follow-up monitoring.

Discussion

According to the World Health Organization (WHO), more than 30 000 people die from rabies each year, and more than 10 million undergo postexposure treatment after having been bitten by a rabid animal.[2] Rabies is an acute viral disease of the central nervous system that is transmitted by an infected rabid animal. It has an incubation period of one to three months. During most of the incubation period, the rabies virus is thought to be present at or close to the site of inoculation. The presence of fever, malaise, headache, paraesthesia, pain and pruritis near the site of exposure suggests prodromal features of rabies. The administration of rabies postexposure prophylaxis (PEP) during this incubation period is critical to prevent spread to the nerves, with fatal consequences. Standards for PEP have been clearly defined by the WHO expert committee on rabies. The most commonly encountered causes of the failure of PEP management include rabies immunoglobulin (RIG) not being administered, or being administered inadequately, low-potency vaccine or RIG, an exceptionally large viral load, an atypical strain of the virus that is not neutralised by the RIG, or by natural antibodies resulting from the vaccination and inadequate wound care.[3] Apart from these reasons for PEP failure, ketamine anaesthesia has been mentioned as an additional risk factor for treatment failure.[4] Although uneventful general anaesthesia for surgery after a dog bite has been reported, the use of central neuraxial blockade has not been reported to date.[5]

The main concern in our patient was the probability of a reduction in the efficacy of the vaccination due to the immunosuppressive effect of anaesthesia and surgery. Moreover, he had not received RIG, which increased the risk of PEP failure. Several investigations have documented that the surgical stress response suppresses both cellular and humoral immune function for several days after surgery.[6] Anaesthesia can also interfere with many phases of the immune response, including the reduction of leukocyte phagocytic activity, phagocyte mobilisation, antibody production, complement fixation, the neutrophil intracellular killing mechanism and lymphocyte transformation.[7] However, recent results suggest that anaesthesia exposure alone does not significantly affect human immune responsiveness.[8] A study on rats revealed that immune changes following surgery do not recover for four to eight days.[9] Another study showed that an anaesthetised group of puppies that were vaccinated with rabies vaccine had significantly lower antibody titres compared with an unanaesthetised control group.[9] However, although there is concern regarding the vaccination of children requiring surgical procedures under anaesthesia, it is advised to vaccinate the patient when in doubt.[10]

Short et al, after their postal survey among practising anaesthesiologists regarding anaesthesia and immunisation, recommended that elective surgery and anaesthesia should be postponed for one week after inactive vaccination, and for three weeks after live attenuated vaccination in children.[7] In our case scenario, the concern about postponing surgery in view of the patient having received rabies vaccination had to be balanced with the disability that could occur by not operating on the patient in time. The various options available for anaesthetic management included general anaesthesia, central neuraxial blockade and peripheral nerve block. We administered neuraxial anaesthesia and analgesia to our patient, rather than general anaesthesia, to avoid any respiratory complications due to coexisting COAD with the presence of a large emphysematous bulla. A peripheral nerve block, such as femoral sciatic block, was not an option, because of refusal by the patient.

Various reasons can be postulated to explain why the anti-rabies vaccine treatment was successful in our patient, despite him undergoing surgery under anaesthesia. Firstly and most importantly, it is possible that the dog was not rabid. However, the description of the dog (abnormal behaviour, unprovoked bite) is strongly in favour of rabies. The second possible reason why our patient did not have a PEP failure may have been due to good immune status with a high endogenous production of antibodies. Thirdly, we chose to use neuraxial anaesthesia, which is associated with modest preservation of the immune function compared to general anaesthesia, as it attenuates the endocrine stress response to surgery.[10,11] Ahlers et al found that the intraoperative use of a thoracic epidural catheter reduced the stress response and prevented stress-induced perioperative impairment of proinflammatory lymphocyte function.[12] Epidural analgesia for postoperative pain relief leads to reduced suppression of lymphocyte proliferation and an attenuated proinflammatory cytokine response when compared to the systemic administration of opiates.[12] Administration of epidural morphine has been found to be safe, without significant side effects. We used 3 mg of epidural morphine

diluted in 8 mL of normal saline every 12 hours. The patient was monitored for pain (visual analogue score) and respiratory rate (concerns of early and late respiratory depression), and hourly monitoring of vital signs took place for the first six hours, after which it was done every four hours. No side effects related to opioids were seen.

However, the use of neuraxial anaesthesia in a patient on rabies PEP could have medicolegal implications. It is known that rabies may present with a paralytic or Guillain-Barré-like syndrome, without the typical excitation, spontaneous inspiratory spasms and hydrophobia.[2,13] Any neurological deficit because of the disease per se can be attributed to regional block or vice versa. This could pose a diagnostic dilemma, thus mandating documentation and explaining the possible consequences to the patients. Although it has been reported rarely, rabies vaccine has been known to cause neurologic illness simulating Guillain-Barré syndrome after postexposure prophylaxis with PCEV.[14] To avoid confusion in the neurological assessment when using local anaesthetics, we used epidural morphine to provide postoperative analgesia.

To conclude, although our patient had an uneventful recovery after central neuraxial block, the use of regional anaesthesia needs further evaluation in patients receiving anti-rabies treatment. Patients should complete the full course of anti-rabies immunisation. Adequate perioperative analgesia should be maintained to reduce the chances of immune dysfunction, due to the pain and stress of surgery. Local anaesthetics should best be avoided for the provision of postoperative analgesia, to allow for the early detection of any neurological deficit.

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