Spinal anaesthesia for caesarean delivery in a parturient with babesiosis and Lyme disease

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Summary
We present a case of a parturient with babesiosis and Lyme disease who was scheduled for elective caesarean section. The caesarean section was performed under spinal anaesthesia, and the patient had a coronary artery dissection 4 days postoperatively. Neuraxial anaesthesia and possible mechanisms for the coronary artery dissection in a patient with babesiosis and Lyme disease are discussed.

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Babesiosis is a tick-borne infectious disease caused by intra-erythrocyte protozoa, that has many clinical features similar to malaria [1, 2]. An increasing number of cases are occurring in endemic parts of North Eastern USA [3]. Lyme borreliosis is caused by the spirochete Borrelia burgdorferi sensu lato, and is the most common human tick-borne disease in the northern hemisphere. The prevalence of Lyme borreliosis is estimated to be 20–100 cases per 100 000 population in the USA, and about 100–130 cases per 100 000 in Europe [4, 5]. The Centers for Disease Control and Prevention (CDC) reported 28 921 Lyme disease cases in 2008, and estimated that this may only represent 10% of the actual number of cases.

To our knowledge, there have been no reports describing neuraxial anaesthesia in patients with either Lyme disease or babesiosis. We present the anaesthetic management of an obstetric patient with both babesiosis and Lyme disease who presented for elective caesarean section, and consider possible mechanisms for the coronary artery dissection that occurred postoperatively.

Case report
A 34-year-old primigravida, with a singleton pregnancy, presented for obstetric care at 20 weeks’ gestation. The patient’s clinical history of babesiosis began abruptly seven years previously with symptoms of fever, sore throat and a viral-like syndrome, followed by sweats, periodic rigours and chills, weakness, fatigue and severe nausea; all of these symptoms were not responsive to treatment.

The patient reported several tick bites since childhood, and after an extensive investigation for chronic fatigue, she tested positive to Babesia WA-1 species (titre 1:1280) in 2005, and also showed evidence of exposure to Borrelia burgdorferi. The laboratory diagnosis of Babesia duncani (then WA-1 babesia) was further established by a fivefold titre change (from 1:1280 in 2005 to < 1:40 in 2008). Following a further tick bite in 2007, an increase in IgM titres from 1:40 to 1:160, and positive FISH (fluorescent in situ hybridisation) to babesia species suggested active infection caused by a new exposure. Consequently, between 2007 and 2009 the patient required prolonged treatments of atovoquone, azithromycin and malarone, each treatment lasting several weeks to months. Before conception, laboratory evidence of babesiosis had resolved, and the patient’s symptoms had improved. She had a previous history of Herxheimer–Jarisch reaction, a reaction caused by endotoxins released into the body when bacteria are destroyed by antibiotic treatment, following azithromycin and penicillin therapy. Her other past medical history included adrenal insufficiency, which had been diagnosed during surgery for...
removal of uterine polyps. The aetiology for adrenal insufficiency was never established but subsequently the patient had been prescribed long term fludrocortisone and hydrocortisone therapy. The patient also reported a history of a herniated L4-5 disc, osteoporosis and hypothyroidism; she was currently euthyroid on levothyroxine therapy. She had no known cardiac risk factors or family history of cardiac disease or Ehlers-Danlos syndrome. A normal echocardiogram and thyroid function tests had been reported at twelve weeks’ gestation.

During pregnancy, her symptoms of malaise and fatigue worsened and she had recurrence of night sweats during her second trimester. Piroplasm, fluorescent in situ hybridisation to babesia species, and RNA and babesia duncani titres tests were unchanged compared to previous results. These symptoms gradually improved but did not resolve during her third trimester. She was admitted to the labour ward at 39 weeks’ gestation for elective caesarean section for maternal request. On admission her weight was 87 kg and her height was 1.73 m (BMI 29 kg.m$^{-2}$). An ultrasound of the abdomen revealed an anterior placenta with no anomalies. Laboratory tests performed on the day before surgery were normal and included a haemoglobin level of 13.1 g.dl$^{-1}$, white cell count of $10.1 \times 10^9$.l$^{-1}$, platelet count of $232 \times 10^9$.l$^{-1}$, activated partial thromboplastin time (APTT) 26.9 s, prothrombin time (PT) 12.0 s and international normalised ratio (INR) 0.9. The haemoglobin, white cell and platelet counts were stable throughout pregnancy. She was apyrexial (36.5 °C) and her vital signs were normal on the day of surgery.

A 18-G peripheral intravenous cannula was sited, and the patient received 10 mg metoclopramide, 50 mg ranitidine, 100 mg hydrocortisone and 1 g cefazolin, intravenously. With the patient in a sitting position, spinal anaesthesia was performed with a 25-G Whitacre needle. A total of 1.6 ml 0.75% hyperbaric bupivacaine with 10 mg fentanyl and 200 µg preservative-free morphine was injected intrathecally. The patient was then placed into the supine position with a left lateral tilt. A sensory level to the T3 dermatome was recorded using pinprick sensation. A total of 1 mg phenylephrine was given intravenously for the treatment of hypotension in order to maintain blood pressure at the patient’s baseline throughout surgery. The patient’s oxygen saturation remained ≥ 97% throughout the peripartum period. Surgery proceeded uneventfully and a healthy infant with Apgar scores of 9 and 9, at 1 and 5 min, respectively, was delivered. The patient required a total of 150 µg fentanyl intravenously in the last 30 min of the procedure for breakthrough discomfort; the total duration of surgery was 55 min. Estimated surgical blood loss was 800 ml, and the patient received 500 ml Hespan (6% hetastarch in 0.9% sodium chloride; B.Braun Medical Inc., Bethlehem, PA) and 2 l Hartmann’s solution. Following delivery, an initial bolus of 2 IU oxytocin followed by an infusion (20 IU in 1 l Hartmann’s solution at 125 ml.h$^{-1}$) was administered. No neurological complications or postpartum haemorrhage occurred following surgery.

The patient’s postpartum haemoglobin and haematocrit on the fourth postoperative day were 11.7 g.dl$^{-1}$ and 0.35, respectively. The patient’s postpartum course was uneventful until the fourth postoperative day, when she suddenly developed severe substernal pain radiating to her left arm and jaw, associated with palpitations and shortness of breath. The pain lasted for 2 h before gradually resolving. The initial ECG showed subtle ST depression in leads II and III, with subtle ST elevation in lead I. Blood tests included a creatine kinase of 1081 U.l$^{-1}$, a CK-MB 62.5 ng.ml$^{-1}$ and a troponin level of 15.2 µg.l$^{-1}$. A bedside echocardiogram demonstrated apical akinesis with moderate-severe hypokinesia of the distal septal and anterior wall and a hyperdynamic base. There was a normal left ventricular size with overall ejection fraction at the lower limits of normal, mild aortic regurgitation, mild tricuspid regurgitation and a trace of mitral regurgitation, and the right ventricular systolic pressure was estimated at 35 mmHg. She was provisionally diagnosed with a non-ST elevation myocardial infarction and was subsequently transferred to the cardiac catheterisation laboratory for further management, following a bolus dose of intravenous heparin. Urgent angiography revealed evidence of dissection in the proximal obtuse marginal branch of the left circumflex artery. The dissection was not flow limiting (Thrombolysis In Myocardial Infarction grade three flow) within this vessel. There was no evidence of coronary dissection elsewhere and due to her stable haemodynamics, revascularisation was not indicated. She was admitted to the coronary care unit for further medical management and was discharged from hospital seven days after her caesarean section.

**Discussion**

Babesiosis was recognised in biblical times as an important disease of livestock, and has more recently been identified as an emerging health problem in humans [2]. It was first described in humans in 1888 by the Hungarian pathologist, Victor Babes [6]. Subsequently, cases have been reported in North America, South America, Africa, Europe and Asia [7]. Babesia has evolved multiple mechanisms to establish persistent infection in hosts [1]. The true incidence is unknown since babesiosis is generally not diagnosed and cases are usually not reported. The clinical features of babesiosis are similar to those of malaria, and the severity ranges from asymptomatic to a rapidly fatal or, as in this
case, a persistent relapsing course [8]. Babesiosis and Lyme disease are two separate infections with differing clinical pictures; however, both may occur simultaneously. The same tick (*Ixodes pacificus* on the west coast of North America and *Ixodes scapularis* on the east coast) that carries *Borrelia burgdorferi* also carries babesia species. Patients simultaneously infected by the agents of Lyme disease and babesiosis may experience a greater number of symptoms and a more prolonged illness than patients experiencing Lyme disease alone [9]. Furthermore, physicians tend not to recognise babesia infection in patients who are co-infected with the agent of Lyme disease, as symptoms of babesiosis tend to be ascribed to Lyme disease [9]. Two previously published reports on babesiosis in pregnancy do not comment on the type of labour analgesia or anaesthesia used for delivery [10, 11].

Laboratory testing is required for the diagnosis of babesiosis as symptoms and signs are usually non-specific. Blood film, polymerase chain reaction or immunoglobulin serology with titre change are the investigations of choice [7]. The titre change (from 1:1280 in 2005 to < 1:40 in 2008) that occurred in this case is characteristic of babesiosis. Many cases of babesiosis are associated with some degree of haemolytic anaemia with an elevated reticulocyte count. The leucocyte count may be normal or slightly decreased and thrombocytopenia is common. Elevated serum liver enzymes, increased blood urea and creatinine and proteinuria may also occur [7]. Our patient had a history of intermittent mild anaemia, thrombocytopenia and raised liver transaminases; however, these were not evident during pregnancy.

Information on Lyme disease during pregnancy is limited. Lakos et al. reviewed adverse pregnancy outcomes of 95 parturients, who acquired Lyme disease during pregnancy [12], but they did not comment on the anaesthetic technique used. The effects of babesiosis on pregnancy and the fetus in humans are lacking. As lumbar puncture is the main technique used in the diagnosis of Lyme neuroborreliosis [13], Lyme disease cannot be considered a contraindication to intrathecal injection. The safety of dural puncture in patients with babesiosis is unknown.

Stress-induced cardiomyopathy, congestive cardiac failure, coronary artery disease and atrial fibrillation are all described complications of babesiosis infection [14]. To our knowledge, this is the first report of coronary artery dissection in a parturient with babesiosis and Lyme disease. Piroplasm-induced erythrocyte adherence to vascular endothelium may facilitate persistent babesia infection [15]. Whether the coronary artery dissection in this case was secondary to weakening of the vessel wall caused by inflammation of exposed vascular endothelium, or simply an incidental occurrence, remains unclear. However, the coronary artery dissection was unlikely to be related to the anaesthesia that the patient received. Following discharge from hospital, the patient was followed up by the cardiology team and a repeat echocardiography was done five months after delivery. This revealed a normal left ventricular function (ejection fraction of 54%), apical hypokinesis, a trace of tricuspid and mitral regurgitation and improved right ventricular function, compared with the previous echocardiography conducted at the time of coronary artery dissection. She was also prescribed cardiac medications including 6.25 mg carvelevidol, 2.5 mg lisinopril, 40 mg atorvastatin and 325 mg aspirin.

The presence of systemic infection is considered by some clinicians to be a relative contraindication to neuraxial blockade [16]. Babesiosis may cause haemolysis and thrombocytopenia [7], which may influence the decision whether or not to perform neuraxial blockade. The presence of acute sepsis in our patient was excluded (apyrexic and normal white cell count) before neuraxial anaesthesia, and she was already on antibiotic therapy. In addition, our standard prophylactic dose of 1 g cefazolin was administered before the spinal anaesthetic. A theoretical concern with neuraxial blockade in patients with babesiosis is possibly introducing red blood cells containing the babesia organism into the neuraxial (epidural or spinal) compartment. A large number of cases would need to be studied to determine if central nervous system babesiosis may occur in this way [17]. The degree of parasitaemia in the red blood cells and the amount of iatrogenic bleeding during the block are factors that could possibly affect the likelihood of this transfer. Given the significant duration of illness in this patient, it was likely that both borrelia and babesia organisms were already present within the central nervous system.

The decision to proceed with a neuraxial vs a general anaesthesia was made after extensive risk-benefit considerations. The case was discussed with an infectious disease specialist familiar with the disease. In addition, our patient maintained a strong desire to avoid general anaesthesia for her caesarean section. A literature review found no documented adverse events secondary to neuraxial anaesthesia in patients (pregnant or non-pregnant) with babesiosis or Lyme disease. Similarly, there are no reports of central nervous system transfer of malaria secondary to neuraxial blockade. Malaria is a similar disease state to babesiosis since the parasite remains within erythrocytes during the erythrocytic phase. Malaria is one of the most common infectious diseases in the world, affecting approximately 250 million people and resulting in approximately one million deaths per annum [18]. These numbers would suggest that although not reported in the literature, many neuraxial
blocks would have previously been performed without deleterious consequences in patients with malaria and other parasitic diseases.

Neuraxial anaesthesia has many maternal and fetal advantages over general anaesthesia in this setting. These include avoidance of a possible failed intubation, avoidance of potential acid aspiration, improved maternal postoperative analgesia and higher maternal satisfaction. We elected to use a single-shot spinal over an epidural or combined spinal epidural technique for a number of reasons. Spinal anaesthesia is our standard technique for elective caesarean section, when a long duration of surgery is not anticipated. A survey of Society of Obstetric Anesthesia and Perinatology members reported that 85% of respondents use single-shot spinal as their standard technique for elective caesarean delivery [19]. In addition, spinal anaesthesia is easy and quick to perform, provides excellent anaesthesia, has a low failure rate, is associated with high maternal satisfaction, is cost-effective compared with epidural anaesthesia, and has a low risk of post-dural puncture headache when a small-gauge pencilpoint needle is used [20, 21]. A theoretical advantage to performing spinal anaesthesia in this case, rather than an epidural or a combined-spinal epidural, is that a smaller gauge needle (25-G Whitacre as opposed to an 18-G Tuohy needle) in the neuraxial compartment would cause less trauma and bleeding; potentially this may mean that there is a reduction in risk of parasites’ being transferred to the neuraxial compartment by red blood cells. Furthermore, the epidural catheter, although only inserted for a short duration, may be a nidus for an infective complication. One potential disadvantage of a spinal compared to an epidural technique would be the possible risk of transfer of erythrocytes into the cerebrospinal fluid by puncturing the dura.

In conclusion, spinal anaesthesia was safely used for elective caesarean section in this patient with babesiosis and Lyme disease. We also report coronary artery dissection postoperatively which was probably unrelated to Lyme disease and babesiosis. We believe that neuraxial blockade is not contraindicated in patients with Lyme disease or babesiosis providing that symptoms are stable. While studies documenting the safety of spinal anaesthesia in patients with rare diseases like babesiosis are not practical, more common parasitic diseases like malaria could be studied to evaluate the safety of neuraxial techniques in these settings. There is no ideal anaesthetic technique, and the decision to proceed with spinal vs epidural vs general anaesthesia must be individualised after consideration of the risks vs benefits.

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References