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0959-289X/$ - see front matter
https://doi.org/10.1016/j.ijoa.2018.08.010

Anaesthetic implications of a patient with cold-induced anaphylaxis presenting to the labour ward

L. Starsmore, J. Durbridge
Chelsea and Westminster Hospital, Magill Department of Anaesthesia, London, United Kingdom

ABSTRACT
Cold contact urticaria is a well described condition, with reactions ranging from localised wheals to systemic and anaphylactic reactions. Case reports involving anaesthetic care are rare. This report describes a patient with cold-induced urticaria with systemic reactions who had been advised to carry an adrenaline autoinjector. She presented to the labour ward out-of-hours and in established labour requesting epidural analgesia. She subsequently had an uneventful instrumental delivery following an epidural 'top-up'. This report focuses on the anaesthetic implications of her condition.

Keywords: Cold induced urticaria; Anaphylaxis; Labour; Epidural

Introduction

Cold contact-induced urticaria is a well described physical urticaria that occurs following contact with cold objects.[1] The pathophysiology remains unclear, but there is IgE-mediated mast cell and basophil degranulation.[2] Release of histamine and other inflammatory mediators results in reactions ranging from mild localised wheals to systemic reactions such as bronchospasm, hypotension and anaphylaxis. The incidence is about 0.05%, with 50% of patients experiencing systemic reactions and one-third anaphylaxis.[3–5] Primary acquired cold-induced urticaria is the most common subtype, and reactions typically occur within minutes of exposure. Rarer forms exist: in delayed cold-induced urticaria symptoms may occur hours after exposure to cold.[5] Case reports have described particularly severe reactions following exposure to cold water.[6,7] Cases described in the anaesthetic literature are rare, but include one case of hypotension and facial oedema following administration of refrigerated atracurium.[4,8]

This case report describes a patient with a diagnosis of cold-induced anaphylaxis who presented to the labour ward. The anaesthetic implications of epidural insertion and bolusing for a trial of instrumental delivery are described.

Case report

A 39-year-old primigravida with an uneventful pregnancy attended antenatal visits. She had no other medical co-morbidities or allergies and no relevant family history. She gave a clear history of cold-induced urticaria, including whole limb urticaria and oedema following administration of an intramuscular (IM) vaccination that had been refrigerated, and oropharyngeal swelling after consumption of a cold drink. Anaphylaxis had not occurred, but the presence of respiratory involvement meant she was advised by an immunologist

Accepted September 2018
Correspondence to: L. Starsmore, Chelsea and Westminster Hospital, Magill Department of Anaesthesia, London, United Kingdom.
E-mail address: lorna.starsmore@nhs.net

to carry an adrenaline autoinjector. A referral to the antenatal anaesthetic clinic was not made.

The patient presented to the maternity unit with three episodes of reduced fetal movements and the decision was made to induce labour at 38+6 weeks' gestation. She received dinoprostone (prostaglandin E2) and was transferred to the labour ward in established labour after 48 hours.

The first contact with anaesthesia services was a request for intravenous (IV) cannulation and epidural analgesia. Intravenous access was established following skin preparation with a 70% alcohol wipe, which resulted in a noticeable area of erythema. Concern that preparation of a larger area of skin for epidural insertion might also result in erythema and/or urticaria prompted the use of an aqueous iodine solution which had been warmed in a fluid warmer for 10 minutes. Local anaesthetic skin infiltration and epidural insertion at the L3/4 level, using a loss-of-resistance to saline technique (both injections using agents at room temperature), were uneventful. A test dose of 7 mL 0.1% levobupivacaine, containing 2 μg/mL fentanyl, was administered at room temperature prior to setting up patient-controlled epidural analgesia using the same mixture.

After 14 hours of labour and effective epidural analgesia, a prolonged second stage (132 minutes) prompted a trial of forceps extraction in the operating theatre. The epidural catheter was 'topped up' with a total of 20 mL 1.8% lignocaine with 0.76% sodium bicarbonate and adrenaline 1:200 000. After 12 minutes the block was assessed by means of pedal warmth, Bromage score and light touch. The block height was T5 bilaterally. A baby was delivered in good condition, with Apgar scores of 9 and 10 at 1 and 5 minutes respectively. Blood loss was estimated as 650 mL and no blood products were required. Uterine tone was managed with two slow IV boluses of 5 IU oxytocin, an IV infusion of 40 IU in 500 mL over four hours and external uterine massage. One gram of IV tranexamic acid was given prophylactically and ergometrine was not required. Recovery from anaesthesia was uneventful and the patient was discharged home on day two post-delivery. No allergic reactions occurred while she was an inpatient.

Discussion

This case report describes a patient with a diagnosis of cold-induced urticaria, which had previously resulted in severe systemic reactions, presenting to the labour ward. The prevalence of this condition is higher in younger individuals, making the possibility of encountering this in the obstetric population more likely.[4] She had not been referred for anaesthetic assessment during the antenatal period.

Anaesthetic considerations included warming the skin preparation solutions and the IV or IM drugs, and changing the modality of testing of the neuraxial block. In our unit the standard skin preparation prior to epidural analgesia or anaesthesia is 2% chlorhexidine with 70% alcohol.[9] The cooling effect of the sterilisation solution is attributed to its rapid evaporation and the high latent heat of vaporisation of the alcohol component. Alcohol-free solutions include aqueous chlorhexidine and 7.5% povidone-iodine. Since these have similar efficacy, we chose the iodine preparation to reduce the risk of chronic adhesive arachnoiditis.[9,10] The manufacturer's guidelines state that povidone-iodine 7.5% solution can be stored safely at 30°C.

General principles to prevent cold-induced stress should be used. These include maintenance of the environmental temperature in the obstetric unit and operating theatre, warming of skin solutions and IV fluids, and use of forced-air warming or a warming mattress. The potential need for general anaesthesia (GA) means that drugs should be prepared beforehand. Storage recommendations for commonly used anaesthetic agents are shown in Table 1. Suxamethonium 50 mg/mL degrades at a rate of 2.1% per month and may be kept at room temperature for up to 4.8 months.[11] Ease of storage and ready reversibility with sugammadex made rocuronium our favoured choice of neuromuscular blocker should GA have become necessary. Thiopentone was available and stored unreconstituted. Anaesthetic drugs known to cause direct histamine release include pethidine, morphine, atracurium and mivacurium[12] and whilst these may not precipitate cold contact urticaria, they might exacerbate active symptoms or complicate the diagnosis.

Oxytocin and misoprostol are suitable for storage at room temperature. The previous history of a systemic reaction following an IM injection mandated that other uterotonics be used prior to considering IM ergometrine or carboprost. Carbetocin (not available in our unit) requires storage at 2–8°C. Ergometrine degrades at room temperature and on exposure to light at 21–27% per month.[13] Short periods of unrefrigerated transport are permissible, therefore allowing an ampoule to warm to room temperature for a short duration seems reasonable. Some combination ergometrine and oxytocin injections can be stored at <25°C for between five days and two years, depending on the manufacturer.

Pain during caesarean section is a common problem and careful assessment of block adequacy is mandatory to minimise risk.[14] Commonly-used methods to assess neuraxial block include ethyl chloride spray and ice, but both are contraindicated in patients with cold-induced urticaria due to their pronounced cooling effects. In our patient, block height during labour was deemed adequate when contractions were no longer perceived as painful. For instrumental delivery, light touch was used to assess the level of the sensory block. Although touch has been advocated as being a better

Table 1 Anaesthetic drugs and manufacturer's recommendations for storage

Drug	Manufacturer's storage advice
Thiopental sodium (500 mg powder for solution for injection, Archimedes Pharma)	Before reconstitution: The vials should be kept in the outer carton and not stored above 25°C After reconstitution: The product contains no preservatives and should be used immediately. If the solution is stored keep upright and store between 2°C and 8°C. The reconstituted solution must be used within seven hours
Propofol (10 mg/mL emulsion for injection, Peckforton Pharmaceuticals Limited)	Store below 25°C. Do not freeze. After opening, the product must be used immediately
Anectine® (Suxamethonium chloride 50 mg/mL, GlaxoSmithKline)	Store in a refrigerator, between 2 and 8°C
Esmeron® (Rocuronium bromide 10 mg/mL, Organon)	Storage in the refrigerator: Esmeron should be stored at 2–8°C in the dark and used within the expiry date given on the pack. Storage out of the refrigerator: Esmeron may also be stored outside of the refrigerator at a temperature of up to 30°C for a maximum of 12 weeks, after which it should be discarded. The product should not be placed back into the refrigerator once it has been kept outside
Oxytocin (5 IU, EVER Pharma)	Pharmacy will store this medicine in a refrigerator at 2–8°C. It may be stored at 25°C for 6 months but then discarded
Ergometrine (Ergometrine maleate, 500 μg/mL, Hameln)	Store in a refrigerator between 2 and 8°C and protect from light
Hemabate® (Carboprost tromethamine 250 μg/mL, Pfizer)	The ampoules must be stored in a refrigerator between 2 and 8°C
Carbetocin (100 μg/mL, Ferring Pharmaceuticals Ltd)	Keep ampoules in the outer carton, in order to protect from light. Store in a refrigerator (2–8°C). Do not freeze

predictor of pain than cold, there is a discrepancy in block height when tested with different modalities.[15–17]

Treatment for cold-induced urticaria may fall into chronic preventative treatment and management of acute life-threatening reactions. Patients may be established on non-sedating histamine-$_1$ receptor antagonists, at up to four times the licensed dose.[18] Although there is no evidence of teratogenicity of antihistamines during pregnancy, most manufacturers advise against their use. Patients rarely take long-term oral corticosteroids but these may be required intravenously in the treatment of severe systemic reactions.[16] Adrenaline is advocated as treatment for cold-induced anaphylaxis involving severe laryngeal angioedema and autoinjectors are provided to patients at a high risk of a severe reaction.[16] Immunomodulating therapies such as omalizumab have also been developed for long-term control.[19]

This case highlights the importance of antenatal anaesthetic assessment, as seeking diagnostic information urgently may be challenging. Our patient presented out-of-hours and postponement of some interventions was not feasible. A further difficulty was that her initial diagnosis and investigations had been performed overseas, and an earlier review would have allowed a comprehensive multidisciplinary plan to be formulated.

In summary, many procedures which may not typically be considered potentially harmful to patients are commonly performed by anaesthetists on the labour ward. These procedures may have serious and potentially life-threatening implications for a patient with cold-induced urticaria. Following careful consideration of the anaesthetic technique, it was possible to adapt usual practices to provide safe epidural analgesia and anaesthesia for a patient with a risk of an anaphylactic reaction to cold.

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0959-289X/$ - see front matter
https://doi.org/10.1016/j.ijoa.2018.09.009