MALIGNANT HYPERTHERMIA SYNDROME IN AN ANXIOUS PATIENT

R. FLETCHER, E. RANKLEV, A. -K. OLSSON AND S. LEANDER

SUMMARY

A 30-yr-old patient with fulminant ulcerative colitis was anaesthetized on three occasions, for colectomy and rectal stump removal. The first anaesthesia, with droperidol and fentanyl and pancuronium neuromuscular block, was uneventful. Addition of suxamethonium on the second occasion and use of the original drugs plus nitrous oxide for the third anaesthesia produced symptoms of MH, which was confirmed by muscle biopsy. There was no hyperthermia. The patient's admitted anxiety before the last two operations is believed to have played a role in the genesis of MH.

CASE REPORT

A 30-yr-old farmer (height 186 cm, weight 71 kg), in good health until 2 months previously, underwent colectomy during an episode of fulminant ulcerative colitis. Anaesthesia was induced with droperidol and fentanyl, followed by pancuronium 1 mg and suxamethonium 75 mg. Masseteric spasm developed immediately, and the heart rate increased from 90 to 160 beat min⁻¹. Two more doses of suxamethonium (25 mg and 50 mg) were given without the desired effect. The patient's forehead felt hot and the diagnosis of malignant hyperthermia (MH) was made. Tracheal intubation was performed with greater force than is usually necessary and the lungs were ventilated with 100% oxygen. Two litre of iced-cold fluid was infused i.v. and a urinary catheter inserted. Methylprednisolone 2 g, procaine 2 g and frusemide 40 mg were given. The rectal temperature after these measures was 37 °C and decreased thereafter.

A CO₂ Analyzer 930 (Olsson et al., 1980) showed a persistent carbon dioxide production of more than 400 ml min⁻¹ with an end-tidal PCO₂ of about 4.5 kPa. Base excess was −1.0 and pH 7.39 after sodium bicarbonate 80 mmol had been given.

Ninety minutes after induction the patient was rouseable, and the rectal temperature was 36°C. The trachea was extubated and the patient made a good recovery from anaesthesia. There was no muscle tenderness.

A muscle biopsy was later performed under local anaesthesia. In vitro, the muscle was initially stretched to 0.4 g. It showed an increase in basal tension of 0.6 g at 37°C on exposure to 2% halothane. Caffeine 0.25 mmol litre⁻¹ caused a further increase of basal tension of 0.5 g, and caffeine 0.5 mmol litre⁻¹ a further 1.0 g increase (fig.1).

The pathologist reported that in some areas the muscle had been completely replaced by connective tissue. There was pronounced muscle atrophy, with some vacuolar degeneration and internal placing of sarcolemma nuclei. There were cores in many muscle fibres. In some areas the features were those of collagenosis with vasculitis, in others the findings were typical of MH myopathy.

The patient was informed of this result and its implications. He was reassured that he need be in no danger from subsequent anaesthetics provided the anaesthetist was informed.

At the second attempt to excise the rectal stump, the anaesthetist was aware of the past history. The rectal temperature was 36.2°C. Anaesthesia was induced with droperidol, fentanyl and...
pancuronium. Tracheal intubation was easy. Ventilation of the lungs was with 65% nitrous oxide in oxygen. Almost immediately, the heart rate increased from 90 to 145 beat min\(^{-1}\), \(V\text{CO}_2\) was 450 ml min\(^{-1}\) and end-tidal \(P\text{CO}_2\) 5.0 kPa. Ventilation (12 litre min\(^{-1}\)) was continued with 100% oxygen. As it seemed that the syndrome of MH was developing again, methylprednisolone, procaine and 1 litre of ice-cold Ringer acetate were given immediately i.v., after which the rectal temperature was 36°C. Sodium bicarbonate 300 mmol was given i.v. At 40 min \(P\text{a}_{\text{CO}_2}\) was 3.0 kPa, \(P\text{a}_\text{O}_2\) 24.4 kPa, pH 7.495, base excess \(-4.0 \text{ mmol litre}^{-1}\).

The heart rate had decreased to 70 beat min\(^{-1}\) and \(V\text{CO}_2\) was 250 ml min\(^{-1}\) at 1 h. The operation continued. High lumbar extradural blockade was performed with the aim of blocking the adrenal innervation. The total anaesthetic time was 10 h. The lowest temperature recorded in the nasopharynx was 33.4°C at 5.5 h. Thereafter it increased spontaneously to 36.5°C during the 7-h abdomino-perineal operation. \(V\text{CO}_2\) was frequently increased in the presence of a normal end-tidal \(P\text{CO}_2\) (mean of 16 observations: 280 ml min\(^{-1}\)). In the first 3 h after operation the heart rate was 140–160 beat min\(^{-1}\) although there was no hypovolaemia, and the nasopharyngeal temperature increased to 37.8°C.

**DISCUSSION**

There was no hyperthermia on either occasion when the diagnosis of MH was made. At the time of the second anaesthetic, the diagnosis was made on the grounds of masseter spasm after suxamethonium, increased heart rate and \(V\text{CO}_2\), and the *in vitro* response to halothane and caffeine (Ellis et al., 1978). Ice-cold fluids, steroids and procaine were injected without awaiting temperature measurement, which may explain the lack of hyperthermia.

At the third anaesthetic, the diagnosis was less clear. Induction was associated with a rapid increase in heart rate, which decreased only slowly and which could not be explained by difficult intubation. There must have been a large metabolic acidosis, since 300 mmol of bicarbonate was required to produce a base excess of \(-4.0 \text{ mmol litre}^{-1}\). In spite of the extradural anaesthesia, two surgical incisions, and the deliberate lack of any attempt to prevent heat loss, body temperature after and \(V\text{CO}_2\) during operation were unusually high in our experience, and suggest an increase in metabolism. This third anaesthetic may perhaps be regarded as an incomplete form of the MH syndrome. The condition was treated even more quickly than the previous occasion, since the anaesthetist was aware of the possibility. This, too, may explain the absence of hyperthermia.

We consider suxamethonium to have been the triggering agent in the second anaesthetic. For the third anaesthetic, droperidol, fentanyl, pancuronium and nitrous oxide were given. The first three drugs have been listed as suitable for MH-sensitive (MHS) patients (Cain and Ellis,
1977). The same authors regard the use of nitrous oxide as being justifiable in MHS patients, although it has been implicated (Ellis et al., 1974). It was continued throughout the operation, however, and is therefore less likely to have been responsible. There is a small possibility that the reaction was a result of pyrogens in one of the solutions given i.v. The reaction appears to have been too severe to be accounted for by the sympathicomimetic properties of pancuronium. Pancuronium has been shown to afford partial protection against MH in pigs (Hall, Lucke and Lister, 1976) and Cain and Ellis (1977) believe that it may be used with caution in MHS patients.

The same drugs were used for the first and third anaesthetics. That they did not elicit the MH response at the first anaesthetic may be explained by the patient’s (unsolicited) admission that whereas he was calm on the first occasion, he was very nervous before the second and third anaesthetics. Anxiety is believed to play an important role in the genesis of MH (Mogensen, Misfeldt and Hanel, 1974) and this may explain why some MH patients may previously not have reacted to known triggering agents. The part played by the extradural blockade is not clear. It was performed in the knowledge that, in the pig, MH can be prevented by adrenalectomy and treatment with bretylium (Lucke et al., 1978). At least it avoided the need for more muscle relaxants. Nevertheless, increased carbon dioxide production continued, suggesting that muscle metabolism had not returned to normal.

REFERENCES


SYNDROME DE L’HYPERTHERMIE MALIGNE CHEZ UN PATIENT ANXIEUX

RESUME

Un malade de trente ans souffrant d’une rectocolite ulcéro-hémorragique suraiguë a été anesthésié à trois reprises, pour une colectomie et pour l’ablation d’une exérèse rectale. La première anesthésie, par blocage neuromusculaire au droperidol, fentanyl et pancuronium s’est passée normalement. L’addition de suxaméthionium pour la seconde opération et l’usage des produits originaux plus protoxyde d’azote pour la troisième anesthésie ont produit des symptômes de MH, qui ont été confirmés par une biopsie des muscles. Il n’y a pas eu d’hypertension. Le malade a reconnu qu’il était anxieux avant les deux dernières opérations, et on pense que ceci a pu jouer un rôle dans la génèse de la MH.

MALIGNES HYPERTHERMIE-SYNDROM BEI ÄNGSTLICHEM PATIENTEN

ZUSAMMENFASSUNG


SINDROME DE HIPOTERMIA MALIGNA EN UN PACIENTE CON ANSIEDAD

SUMARIO

Un paciente de 30 años de edad con colitis ulcerativa fulminante fue anestesiado en dos ocasiones para efectuar una colectomía y la extracción del muñón rectal. La primera anestesia, que se efectuó mediante droperidol, fentanilo y bloqueo neuromuscular por pancuronio, no presentó acontecimientos alguno. La incorporación del suxamethonium en la segunda ocasión y el uso de la droga original más óxido nitroso para la tercera ocasión, produjo síntomas de MH, lo que se confirmó mediante la biopsia muscular. No tuvo lugar hipertermia alguna. El paciente admitió sufrir ansiedad antes de las dos últimas operaciones, lo que se cree jugó un papel en la génesis de MH.