FATAL HYPERPYREXIA FOLLOWING THE USE OF PANCURONIUM BROMIDE IN THE PIG

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SUMMARY

Two cases are reported of muscular rigidity and fatal hyperpyrexia occurring in pigs 40–50 seconds after the intravenous injection of pancuronium bromide. When genetically similar pigs of the same weight were given anaesthetics without the use of pancuronium, these were uneventful. Anaesthetists using pancuronium bromide are alerted to the possibility of this occurring in humans.

This communication reports abnormal reactions following the use of pancuronium bromide, our aim being to alert others to the possibility of this occurrence in both human and veterinary anaesthesia.

For the past two years we have used this muscle relaxant during experimental liver transplant operations in pigs weighing approximately 30 kg (Chalstrey et al., 1971).

ANAESTHETIC TECHNIQUE

Atropine (0.04 mg/kg) was given half an hour before the operation by intramuscular injection. Anaesthesia was induced using 10 per cent halothane in an oxygen and nitrous oxide mixture (4 l./min of each) via a Magill circuit, using a Hall dog mask. After intubation, pancuronium bromide (0.13 mg/kg) was given by intravenous injection and anaesthesia was maintained with a mechanical ventilator using oxygen 3 l./min, nitrous oxide 5 l./min and occasional additions of 0.5 per cent halothane. The apparatus was adjusted to give a tidal volume of 450–500 ml at a ventilation rate of 18–20/min. The same dose of pancuronium bromide was repeated after 10 min and subsequently half the quantity administered at 10–15 min intervals during dissection of the liver. Little pancuronium was required during the anhepatic phase of the transplant operation.

This technique was used without any untoward reaction on eighteen consecutive occasions. It provided excellent relaxation and, by permitting the use of low concentrations of halothane, resulted in rapid recovery of the animals after completion of surgery. On seven occasions the breed of pig used was Large White, eight were Landrace, and in three cases the type was not recorded. All these animals were obtained from the same pig farm.

Following a change in the source of supply of pigs, two animals anaesthetized by this method in two consecutive experiments died following the administration of pancuronium bromide. On both occasions, a pig of similar weight and genetic background (probably a litter mate) which received a simultaneous anaesthetic consisting of nitrous oxide, oxygen and halothane, but no pancuronium bromide, had an uneventful anaesthetic.

CASE REPORTS

Case 1.

This animal was a crossbred, Large White/Landrace pig. Administration of pancuronium bromide 3 mg by intravenous injection was followed in 40–50 sec by intense rigidity of the skeletal muscles, cyanosis of the mucous membranes and mottling of the skin. Anaesthesia was maintained with the ventilator, using nitrous oxide, oxygen and very small amounts of halothane. Forty-five minutes later the limb muscles were less rigid and the jaws were sufficiently relaxed to allow the passage of a stomach tube. However, by this time the rectal temperature had risen to 109°F (43°C). Injection of a further 2 mg of pancuronium bromide immediately caused the muscles to become rigid again and they remained so until death occurred 75 minutes after the initial injection of the muscle relaxant.

Case 2.

This was also a crossbred Large White/Landrace pig. In view of our experience with the previous case, the initial dose of pancuronium bromide was reduced to 2 mg. However, its administration was followed in less than 60 sec by muscular rigidity and cyanosis. The rectal temperature, which had been normal prior to anaesthesia, rose steadily and was above 109°F (43°C) when death occurred 45 min after the administration of the muscle relaxant.

DISCUSSION

Hall and associates (1966) first described fatal hyperpyrexia and muscular rigidity in pigs following the administration of the muscle relaxant suxamethonium. As this occurred in three litter mates and different batches of the relaxant were used in L. J. CHALSTREY, M.D., F.R.C.S., St Bartholomew’s Hospital, London; G. B. EDWARDS, B.V.SC., M.R.C.V.S., The Royal Veterinary College, London.
each experiment, they suggested that the abnormal reaction was probably genetically determined. Since then, malignant hyperpyrexia has become a well recognized syndrome occurring during anaesthesia in both humans and animals. Actiological factors and possible mechanisms of heat production have been reviewed in detail by Furniss (1971). There is evidence that this idiosyncrasy is familial in many cases, both in humans (Denborough et al., 1962; Britt, Locher and Kalow, 1969) and in pigs (Hall et al., 1966; Harrison et al., 1969).

A variety of triggering agents has been incriminated. The commonest of these has been suxamethonium, but halothane and chloroform have also been quoted as being responsible (Harrison et al., 1969). However, we have been unable to find any previous report of malignant hyperpyrexia and rigidity following the use of pancuronium bromide. Although halothane was also used in our cases, the following facts strongly suggest that these abnormal reactions were triggered by the pancuronium bromide.

(1) Induction of anaesthesia with halothane was uneventful.
(2) Simultaneously administered anaesthetics consisting of nitrous oxide, oxygen and halothane administered to closely related pigs were uneventful.
(3) The onset of muscular rigidity followed 40-50 sec after the intravenous injection of pancuronium bromide on both occasions. Further, in the first case, the rigidity became worse after a second injection of the relaxant.

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