Cardiac arrest following administration of vancomycin

James F. Mayhew MD, Stanley Deutsch PhD MD

A two-year-old female child status post-bilateral nephrectomies sustained a cardiac arrest following the central intravenous administration of vancomycin chloride. This report reviews the literature concerning the problems associated with the use of vancomycin chloride in the perioperative period.

Key words

COMPLICATIONS: cardiac arrest; ANTIBIOTICS: vancomycin.

Antibiotics are frequently administered during anaesthesia. Vancomycin has increasingly become the antibiotic of choice due to the rising incidence of resistant staphylococci infections.¹ Vancomycin has been shown, as have other antibiotics,² to cause myocardial depression and peripheral vasodilation. Although hypotension following rapid intravenous administration of vancomycin during anaesthesia has been reported in adult patients^{3,4} and recently in an eight-month-old child,⁵ this report describes a case of severe hypotension and cardiac arrest following its administration into the central venous line of a two-year-old child.

Case report

A two-year-old female child was anaesthetized for placement of a central Hickman catheter in prepara-

tion for kidney transplantation. She had previously undergone multiple anaesthetics for various surgical procedures, including bilateral nephrectomies for end-stage renal disease secondary to congenital polycystic kidney disease. Her preoperative medication included chloramphenicol 125 mg q 6H IV and vancomycin 100 mg q 6H IV for two days prior to surgery. She had been maintained on continuous ambulatory peritoneal dialysis and had been dialyzed the previous day.

The patient's weight was 10 kg; preoperative laboratory values were: haematocrit 39 per cent, Na⁺ 137 mEq/L, K⁺ 4.8 mEq/L, Cl 101 mEq/L, and total CO₂ of 23. She was monitored with an electrocardiograph, a precordial stethoscope that was changed to an oesophageal stethoscope, a rectal temperature probe, and a Dinemapp® for noninvasive arterial blood pressure measurement. Preoperatively her lungs were clear to auscultation and her blood pressure was 80–90 mmHg systolic on the pediatric renal ward.

Anaesthesia was induced with nitrous oxide, oxygen, and halothane, and the patient was intubated without the aid of muscle relaxants. The two-hour intraoperative course was uneventful. She awoke in the operating room and was extubated without difficulty. Before leaving the operating room vancomycin chloride 500 mg was diluted with 10 ml of 0.9 per cent saline. 5.0 ml of the mixture (250 mg vancomycin) was then injected into a long intravenous line connected to the newly placed central Hickman catheter. En route to the recovery room, she was crying and in the kneeling position. Shortly after arriving in the recovery room, the patient's pulse rate was recorded at 80/minute and there was no blood pressure or respiratory effort. Cardiopulmonary resuscitation with closed chest massage and ventilation with 100 per cent oxygen was started immediately. An electrocardiograph

From the Department of Anesthesiology, The University of Texas, Health Science Center at Houston, Houston, Texas.

Address correspondence to: Dr. James F. Mayhew, Department of Anesthesiology, Arkansas Children's Hospital, 804 Wolfe Street, Little Rock, Arkansas 72202

revealed a marked bradycardia of 40/minute which did not respond to atropine and progressed to asystole. Cardiopulmonary resuscitation continued for one hour, using atropine, calcium chloride, epinephrine and sodium bicarbonate, without success. Postmortem examination showed the Hickman catheter to be in the right atrium with no evidence of perforation or pericardial bleeding. There were no gross anatomical reasons for the patient's demise.

Discussion

Many antibiotics such as penicillin, streptomycin and nitrofurantoin have been shown to produce anaphylactic reactions,⁴ dose-dependent cardiac depression,² and peripheral venous dilatation.² Hypotension usually associated with a rash has been reported following administration of intravenous vancomycin in adult patients.³

Odio *et al.*⁵ reported a 35 per cent incidence of adverse reactions in a paediatric population following intravenous administration of vancomycin; their report also describes a child who developed a rash and hypotension during an infusion of vancomycin. The child was given a general anaesthetic and had been given, or was receiving at the time of the infusion, pentobarbital, curare hydrochloride, pancuronium bromide, nitrous oxide, and halothane.⁵ The child's response was similar to that of the adult patients reported by Miller⁴ and Newfield,⁶ who were also receiving general anaesthesia at the time of the vancomycin infusion and whose hypotension was severe enough to require resuscitative measures. It is possible that the anaesthetic agents and/or the position of the patients contributed to the hypotensive episodes in all of these patients. Our patient, however, was awake and not under the direct influence of the anaesthetic drugs.

Vancomycin can cause hypotension secondary to histamine release,⁶ direct myocardial depression,² and direct peripheral vasodilation.² One or all of these mechanisms may have been the aetiology in our patient, but like the patient reported by Waters *et al.*,³ we observed no rash and do not believe this was an anaphylactic reaction.

Our patient did receive a total dose of 250 mg which was placed in the intravenous line and permitted to run into the patient in approximately five to ten minutes while the patient was being moved from the operating room to the recovery

area. We believe that this was the factor leading to the sinus bradycardia and profound hypotension which was unresponsive to therapy.

We do not feel that airway obstruction or hypoventilation secondary to residual anaesthetic agents were the aetiology of our patient's cardiopulmonary arrest since she was awake, crying and crawling in the operating room and on the way to the recovery room.

Our report is intended to alert others to the more serious potential complication of rapid intravenous administration of vancomycin, and to emphasize, as have Banner and Ray,⁷ that despite its 25-year history of clinical use, vancomycin needs further study in children to avoid the reported excessive toxic effects.¹

References

- 1 Alpert G, Campos JM, Harris MC, Preblud SR, Plotkin SA. Vancomycin dosage in pediatrics reconsidered. *Am J Dis Child* 1984; 138: 20-2.
- 2 Cohen LS, Wechsler AS, Mitchell JH, Glick G. Depression of cardiac function by streptomycin and other antimicrobial agents. *Am J Cardiol* 1970; 26: 505-11.
- 3 Waters BC, Rosenberg M. Vancomycin-induced hypotension. *Oral Surg Oral Med Oral Path* 1981; 52: 239-40.
- 4 Miller R, Tausk HC. Anaphylactoid reaction to vancomycin during anesthesia: A case report. *Anesth Analg* 1977; 36: 870-2.
- 5 Odio C, Mohs E, Shlar FH, Nelson JD, McCracken GH. Adverse reactions to vancomycin used as prophylaxis for CSF shunt procedures. *Am J Dis Child* 1984; 138: 17-19.
- 6 Newfield P, Roizen MF. Hazards of rapid administration of vancomycin. *Ann Int Med* 1979; 91: 581.
- 7 Banner W, Ray CG. Vancomycin in perspective. *Am J Dis Child* 1984; 138: 14-16.

Résumé

Une enfant de deux ans, anéphrique, a présenté un arrêt cardiaque à la suite de l'administration intraveineuse de chlorure de vancomycine. Ce travail revise les publications portant sur les problèmes associés à l'usage du chlorure de vancomycine dans la période péri-opératoire.