

found, recommendations for resection are probably related to symptoms resulting from the membrane.

References

1. Dobbertin A, Warnes C, Seward J: Cor Triatriatum Dexter in an adult diagnosed by transesophageal echocardiography: A case report. *J Am Soc Echocardiogr* 1995; 8:952-7
2. Fiorilli R, Argento G, Tomasco B, Serino W: Cor Triatriatum Dexter diagnosed by transesophageal echocardiography. *J Clin Ultrasound* 1995;23:502-4
3. Valdes-Cruz LM, Cayre RO: Anomalies of the tricuspid valve and right atrium. *Echocardiographic Diagnosis of Congenital Heart Disease*. Philadelphia, Lippincott-Raven, 1999, pp 237-9
4. Lauenstein C: Varietat der klappen des rechten atrium. *Virchows Arch* 1876; 68:632-3
5. Doucette J, Knoblich R: Persistent right valve of the sinus venosus: So-called Cor Triatriatum Dexterum. Review of the literature and report of a case. *Arch Pathol* 1963; 75:105-12

6. Burton D, Chin A, Weinberg PM, Pigott JD: Identification of Cor Triatriatum Dexter by two-dimensional echocardiography. *Am J Cardiol* 1987; 60:409-10

7. Dubin IN, Hollinshead WH: Congenitally insufficient tricuspid valve accompanied by an anomalous septum in the right atrium. *Arch Pathol* 1944; 38:225-8

8. Folger GM: Supravalvular tricuspid stenosis: Association with developmental abnormalities of the right heart and derivatives of the sixth aortic arch. *Am J Cardiol* 1968; 21:81-7

9. Nakano S, Kawashima Y, Miyamoto T, Kitamura S, Manabe H: Supravalvular tricuspid stenosis resulting from persistent right sinus venosus valve: A report of successful correction. *Ann Thorac Surg* 1974; 17:591-5

10. Battle-Diaz J, Stanley P, Kratz C, Fouron JC, Guerin R, Davignon A: Echocardiographic manifestations of persistence of the right sinus venosus valve. *Am J Cardiol* 1979; 43:850-3

Anesthesiology
2000; 93:578-9
© 2000 American Society of Anesthesiologists, Inc.
Lippincott Williams & Wilkins, Inc.

Anaphylaxis during Insertion of a Ventriculoperitoneal Shunt

Edmund D. Carver, F.R.C.A.,* Bernard M. Braude, F.R.C.P.C.,† Adelle R. Atkinson, F.R.C.P.C.,‡ Milton Gold, F.R.C.P.C.§

THE authors describe two episodes of anaphylaxis in a child undergoing revision of a ventriculoperitoneal shunt. Initially, the anaphylaxis was attributed to either vancomycin or latex allergy; however, after the second episode, the child was found to be sensitive to bacitracin that had been

used to soak the shunt tubing before insertion on both occasions.

Case Report

A 9-yr-old boy with a repaired myelomeningocele and congenital hydrocephalus had undergone four previous shunt revisions. He had a history of urticarial reactions to cefaclor and flucloxacillin. One year previously, he experienced urticaria, facial swelling, and difficulty breathing after administration of topical polymyxin B sulfate ointment with bacitracin (Polysporin; Warner-Lambert Canada Inc., Scarborough, Ontario, Canada).

The patient presented with signs of increased intracranial pressure which indicated a need for urgent shunt revision. An intravenous infusion of vancomycin was started to provide antibiotic coverage. Cutaneous flushing occurred, consistent with "Red Man" syndrome, which was treated by slowing the infusion rate and by administration of intravenous diphenhydramine.

In the operating room the next day, routine precautions to avoid exposure to latex were taken. After induction of anesthesia, an intravenous infusion of vancomycin was started. One hour after induction, systolic blood pressure decreased suddenly to 50 mmHg. This was associated with bilateral expiratory wheezing, cutaneous erythema, an increase in peak airway pressure from 20 to 35 cm H₂O, and a decrease in hemoglobin oxygen saturation from 99% to 89%. The patient's lungs were ventilated with 100% oxygen, and he was administered an intravenous fluid bolus of 500 ml Ringer's lactate and 50 µg intravenous epinephrine. Systolic blood pressure returned to 90 mmHg, hemoglo-

* Fellow, Pediatric Anesthesiology. Current position: Specialist Registrar in Anesthesia, Royal Victoria Infirmary, Newcastle-upon-Tyne, United Kingdom.

† Staff Anesthesiologist and Assistant Professor.

‡ Fellow, Immunology and Allergy.

§ Staff Allergist and Associate Professor.

Received from the Departments of Anesthesiology and Immunology and Allergy, The Hospital for Sick Children and the University of Toronto, Toronto, Ontario, Canada. Submitted for publication December 17, 1999. Accepted for publication April 13, 2000. Support was provided solely from institutional and/or departmental sources.

Address reprint requests to Dr. Carver: Specialist Registrar in Anaesthesia, Royal Victoria Infirmary, Queen Victoria Road, Newcastle-upon-Tyne, NE1 4LP, United Kingdom. Address electronic mail to: ed.jus@lineone.net

Individual article reprints may be purchased through the Journal Web site, www.anesthesiology.org

Key words: Allergy; bacitracin; hydrocephalus; neurosurgery.

CASE REPORTS

bin oxygen saturation returned to 99%, and the wheezing discontinued. Two hundred milligrams hydrocortisone and 25 mg diphenhydramine were administered intravenously. The presumptive diagnosis was of an anaphylactic reaction, possibly to vancomycin or to an unknown source of latex. In retrospect, we found that this reaction occurred during insertion of the ventriculoperitoneal shunt.

Ten days after discharge, the boy was readmitted with signs of increased intracranial pressure that necessitated further shunt revision. Antibiotic treatment was initiated with use of clindamycin. Immediately after insertion of the ventriculoperitoneal shunt into the ventricle, systolic blood pressure decreased to 65 mmHg, associated with widespread erythema, and hemoglobin oxygen saturation decreased to 86%; these resolved with administration of 70 µg epinephrine, 200 mg hydrocortisone, and 40 mg diphenhydramine intravenously. Further inquiry revealed that the neurosurgeons had soaked the shunt tubing in a bacitracin solution prepared in a dilution of 2,500 U/ml.

The patient subsequently underwent skin-prick testing by the Division of Immunology and Allergy. Solutions used included a normal saline control, 1 mg/ml histamine (Bencard Laboratories, Mississauga, Ontario, Canada), 0.5 mg/ml vancomycin (Vancocin; Eli Lilly Canada Inc., Scarborough, Ontario, Canada), latex (7-10 mg/ml low-ammoniated, natural-rubber latex protein, previously acquired from Bencard Laboratories), bacitracin ointment (Taro-Bacitracin Ointment; Taro Pharmaceuticals, Bramalea, Ontario, Canada), polymyxin B sulfate cream (Polysporin) without bacitracin, and polymyxin B sulfate ointment (Polysporin) containing bacitracin. A 4-mm wheal to the histamine positive control developed in the patient. There was no response to normal saline, latex, vancomycin, or the Polysporin cream without bacitracin. A marked response in the form of a wheal greater than 10 mm developed within seconds in response to the bacitracin ointment and to the Polysporin ointment containing bacitracin. None of the preparations except histamine elicited a positive response on the arm of a control subject. On the basis of medical history and of the results of the skin-prick testing, this child was confirmed to be sensitive to bacitracin.

Discussion

Bacitracin has been reported to cause anaphylaxis when applied topically in the management of skin ulceration^{2,3}; however, there may have been significant systemic absorption in these cases because of breakdown of the integrity of the skin barrier. Reports exist of intraoperative anaphylaxis occurring after bacitracin irrigation

during lumbar laminectomy⁴ and nephrectomy.⁵ Recently, anaphylactic shock has been reported after the use of gauze nasal packing coated with bacitracin ointment after septorhinoplasty.⁶

Anaphylaxis to bacitracin is rare. This is the first report of which we are aware of such an event occurring during insertion of a ventricular shunt soaked in a bacitracin solution. The first anaphylactic reaction was considered to have been triggered by exposure to latex on vancomycin. However, we were unaware of the potential risk of soaking the ventricular shunts in a bacitracin solution before insertion in this child.

Although latex allergy remains the most common cause of anaphylaxis in children with myelomeningocele,⁷ other potential triggers should always be considered.

The authors thank Gillian Woodhouse, R.N., Perioperative Nurse, The Hospital for Sick Children and University of Toronto, Toronto, Ontario, Canada, for her assistance in the operating room.

References

- Wallace MR, Mascola JR, Oldfield EC: Red Man syndrome: Incidence, etiology, and prophylaxis. *J Infect Dis* 1991; 164:1180-5
- Knowles SR, Shear NH: Anaphylaxis from bacitracin and polymyxin B (Polysporin) ointment. *Int J Dermatol* 1995; 34:572-3
- Saryan JA, Dammin TC, Bouras AE: Anaphylaxis to topical bacitracin zinc ointment. *Am J Emerg Med* 1998; 16:512-3
- Netland PA, Baumgartner JE, Andrews BT: Intraoperative anaphylaxis after irrigation with bacitracin: Case report. *Neurosurgery* 1987; 21:927-8
- Sprung J, Schedewie HK, Kampine JP: Intraoperative anaphylactic shock after bacitracin irrigation. *Anesth Analg* 1990; 71:430-3
- Gall R, Blakley B, Warrington R, Bell DD: Intraoperative anaphylactic shock from bacitracin nasal packing after septorhinoplasty. *ANESTHESIOLOGY* 1999; 91:1545-7
- Murat I: Anaphylactic reactions during paediatric anaesthesia: Results of the survey of the French Society of Paediatric Anaesthetists (ADARPEF) 1991-1992. *Paediatr Anaesth* 1993; 3:339-43.