Correspondence

Analgesic effects of thoracic epidural bupivacaine and fentanyl

To the Editor:

The use of epidural narcotics for analgesia after thoracotomy is a well accepted technique. Epidural analgesia studied in the postthoracotomy patient usually involves fentanyl alone or with bupivacaine in concentrations up to 12.5 $\mu g \cdot ml^{-1}$ at rates up to 1.9 $\mu g \cdot kg^{-1} \cdot hr^{-1}$.[1,2]

We would like to report the use of bupivicaine 0.1% and fentanyl 2 $\mu g \cdot ml^{-1}$ infusion administered via a thoracic epidural for postthoracotomy pain. Informed consent was obtained from all patients. Fifteen ASA physical status I–III patients who were scheduled for elective thoracotomy were studied. The only anaesthetic restrictions were the administration of opioids and the conduct of the epidural. The epidural catheter was introduced using a midline approach between the fifth and eighth thoracic vertebral interspaces and advanced 2–3 cm cephalad before induction of anaesthesia. An epidural test dose of 3 ml of CO_2 xylocaine 2% was administered to confirm correct placement of the catheter. Intravenous fentanyl could be administered on or shortly after induction of anaesthesia up to 2 $\mu g \cdot kg^{-1}$. The initial bolus administered after induction and patient positioning was 15–20 ml of bupivicaine 0.1% with 5 $\mu g \cdot ml^{-1}$ fentanyl. An epidural infusion of bupivacaine and 2 $\mu g \cdot ml^{-1}$ fentanyl was started at 10 $ml \cdot hr^{-1}$ intraoperatively. The patients were studied for 24 hr postoperatively and were required to evaluate their pain and level of pruritus using visual analogue scales (0–10 cm line). If the VAS pain score was >3 the patient was given an epidural bolus of 50–75 μg fentanyl in 10 ml saline and the infusion was increased to 15 $ml \cdot hr^{-1}$. If the VAS pain score was still >3 the bolus dose was repeated and the infusion increased to 20 $ml \cdot hr^{-1}$. Nalbuphine 10–20 mg *iv* could be administered for nonincisional pain and diphenhydramine 50 mg followed by naloxone 0.1 mg *iv* for treatment of pruritus. The VAS pain and pruritus scores were done every six hours or after any of these medications were administered. All patients achieved excellent analgesia (VAS <3) during the study period. Eight patients required only the basal infusion rate. Five more were analgesic with infusion rates of <15 $ml \cdot hr^{-1}$. Two patients required an infusion of 20 $ml \cdot hr^{-1}$. Only three patients (20%) required treatment for pruritus (VAS >3). Neither diphenhydramine nor naloxone seemed to affect the pain scores. Five patients maintained a PCO_2 between 45 and 58 or pH <7.35.

We believe the described technique is efficacious in providing effective postoperative analgesia for thoracotomy utilizing fentanyl at a concentration and dosage lower than previously described. This reduced fentanyl dose was at the cost of a higher dose of bupivacaine by virtue of the high volumes infused.[1-3] Whether or not this relates to any improvement in morbidity or compares to other analgesic techniques will require more study.

Elliot T. Hudes MD FRCPC
Gail M. Hirano MD FRCPC
Brian A. Kashin MD FRCPC
Ken Ho MD FRCPC
I. Ashley MacDonald MB ChB FRCA
Kevin Shine BSc MD FRCP
Peel Memorial Hospital
20 Lynch St.
Brampton, Ontario L6W 2Z8

REFERENCES

1 *Salomaki TE, Laitinen JO, Nuutinen LS.* A randomized double-blind comparison of epidural versus intravenous fentanyl infusion for analgesia after thoracotomy. Anesthesiology 1991; 75: 790–5.

2 *Sandler AN, Stringer D, Panos L, et al.* A randomized, double-blind comparison of lumbar epidural and intravenous fentanyl infusions for postthoracotomy pain relief. Anesthesiology 1992; 77: 626–34.

3 *George KA, Wright PMC, Chisakuta A.* Continuous thoracic epidural fentanyl for post-thoracotomy pain relief: with or without bupivacaine. Anaesthesia 1991; 46: 732–6.

Tracheal granulations secondary to wall compression by endotracheal tubes in infants

To the Editor:

Tip stenosis is a complication of tracheal intubation. We report here two infants who suffered airway stenosis caused by tracheal granulation resulting from compression of the anterior tracheal wall between the dilated pul-

monary artery or ascending aorta and the endotracheal tube.

Case 1. At birth the patient, a 2761 g, full-term boy, was noted to be cyanotic. Ivemark syndrome was diagnosed by echocardiographic examination which showed a single atrium, double outlet of the right ventricle, common atrio-ventricular canal, subpulmonic stenosis and a patent ductus arteriosus (PDA). Over the next five weeks, episodes of respiratory distress developed and on the 47th day after birth, IPPV was initiated. On the 57th day he underwent PDA ligation. On postoperative day (POD) 8, the trachea was extubated under light sedation because his respiration pattern deteriorated as he became alert. On POD 23, his respiration became compromised and IPPV was again instituted. Bronchoscopy revealed an anterior tracheal wall granulation, 7 mm in diameter 1 cm proximal to the carina and an external compression of the orifice of the left main bronchus (Figure 1). Management of the patient in the semiprone position improved airway patency since the dilated pulmonary arteries were displaced anteriorly and the tracheal calibre was improved. On POD 30, the tracheal was extubated with the patient in the semiprone position, and on POD 53, he was discharged from the institution.

Case 2. A 14-mo-old, 4.2 kg girl with Ivemark syndrome and a left ventricular outflow tract obstruction was scheduled for a modified Konno operation. The operation was uneventful except for mild mitral regurgitation. The trachea was extubated on POD 5, but she soon showed respiratory distress. Bronchoscopy revealed an anterior tracheal granulation, 1.5 cm proximal to the carina, and cineangiography showed external compression of the trachea by the poststenotic dilated aorta (Figure 2). She was managed in the semiprone position and was then free from airway stenosis. Bronchoscopy on POD 34 showed an almost healed tracheal mucosa. She was extubated uneventfully on POD 40 and discharged from the institution on POD 60.

Respiration was compromised in these patients by the granulation secondary to external compression by the dilated pulmonary artery or dilated ascending aorta which could be relieved by managing the patients in the semiprone position. We believe that the tracheal granulations were not caused only by prolonged intubation and endotracheal tube handling and toilet protocols since we have never experienced similar tracheal problems in infants who underwent prolonged periods of tracheal intubation without dilated great vessels. We should be mindful of the arrangement of the pulmonary arteries when positioning an endotracheal tube to avoid its tip forcing the anterior tracheal wall against the dilated vasculature. In our infants, relieving the compression of the tracheal wall permitted natural healing of the granulation.

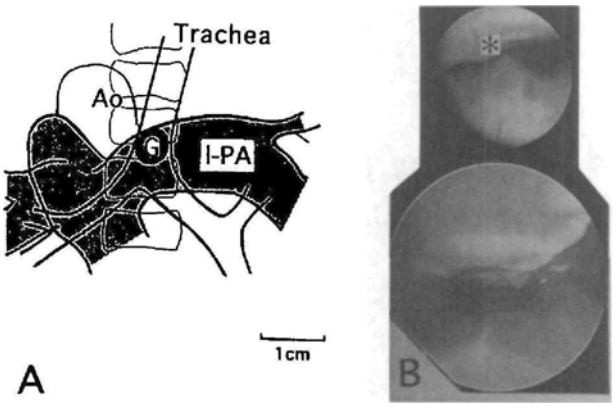

FIGURE 1 (A) Schematic drawing of the relation of trachea and pulmonary arteries in case 1. The dilated left pulmonary artery overrides the carina of the trachea and the orifice of the left main bronchus. Ao: aortic arch; G: granulation; l-PA: left pulmonary artery. (B) Bronchoscopic views in case 1 (upper). The granulation (*) protrudes into the tracheal space on POD 23 (lower). The trachea is fairly well healed ten months after the operation.

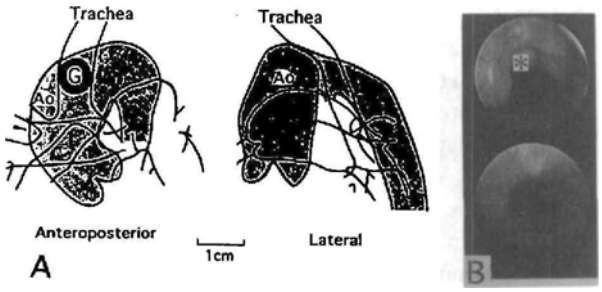

FIGURE 2 (A) Schematic drawing of the relation of trachea and ascending aorta in case 2. External compression of the trachea by the poststenotic dilated aorta is illustrated. Abbreviations are the same as in Figure 1. (B) Bronchoscopic views in case 2 (upper), The granulation (*) protrudes into the tracheal space on POD 6 (lower). The trachea is almost healed on POD 34.

Naoki Yahagi MD*
Hironobu Tanigami MD*
Keiji Kumon MD*
Katsuhiko Yamada MD†
Osahiro Takahashi MD†
Toshikatsu Yagihara MD‡
*Surgical intensive Care Unit
Departments of †Pediatrics and ‡Cardiovascular Surgery
National Cardiovascular Center
Suita, Osaka 565, Japan