Four days later, at the age of 15 weeks, he was reanaesthetised, and the bronchoscopic findings confirmed. An uncut, 3·5-mm Portex nasotracheal tube was passed, and as ventilation was easy he was given alcuronium and intermittent positive pressure ventilation with nitrous oxide and oxygen. The trachea was exposed via a right thoracotomy, and then incised vertically. Ventilation then being impossible, the surgeon tried unsuccessfully to pull the endotracheal tube down the trachea and push it into the left main bronchus. Instead, he wedged a 12FG Warne tube into the open end of the left bronchus; connected a sterile, Jackson-Rees modified Ayres T-piece circuit to the tube; and passed the other end of the circuit to the anaesthetist. One-lung anaesthesia was continued without difficulty until the trachea was repaired after complete excision of the tumour. At the end of the operation the child was extubated, and made an uneventful recovery.

The solid tumour was confirmed to arise from the carina and to prolapse into the right main bronchus. It measured 6 · 4 · 3 mm, the internal diameters of the trachea at his age being roughly 6 · 7 mm. The histological diagnosis was postintubation granuloma, the alternative diagnosis of pre-existing capillary haemangioma being considered unlikely.

Comment

Endotracheal intubation is now a well-recognised and accepted aid in the treatment of cardiac and respiratory failure and after some forms of major surgery. Postintubation granulomata are not uncommon, but usually occur on the arytenoids or in the subglottic region, where trauma from the tube is greatest.[3,4] Probably the long tube used after the child's first operation damaged the carinal mucosa leading to granuloma formation, but possibly also suction catheters used for routine bronchial toilet were responsible.[5]

This case illustrates yet another rare hazard of modern treatment, and the need for careful preparation and co-operation between surgeons and anaesthetists when operating in the presence of airway obstruction.

We thank Dr K D Roberts and Dr J M Edwards of Birmingham Children's Hospital for permission to report this case and for their encouragement.

All correspondence to PMS at 34, Elwyn Road, Sutton Coldfield, West Midlands B73 6LB.

[1] Carden, E, and Ferguson, G B, *Annals of Otology, Rhinology, and Laryngology*, 1975, **84**, 233.
[2] Sanders, R D, *Delaware Medical Journal*, 1967, **39**, 170.
[3] Epstein, S S, and Winston, P, *Journal of Laryngology and Otology*, 1957, **71**, 37.
[4] Hatch, D J, *Lancet*, 1968, **1**, 1272.
[5] Fisk, G C, and Baker, W de C, *Anaesthesia and Intensive Care*, 1975, **3**, 209.

(*Accepted 9 May 1977*)

East Birmingham Hospital, Birmingham B9 5ST
N ABEYEWICKREME, FRCS, thoracic surgical registrar (present address: Queen Elizabeth Hospital, Birmingham B15 2TH)

Dudley Road Hospital, Birmingham, B18 7QH
P M SIMPSON, FFARCS, anaesthetic senior registrar

Does antibiotic spray reduce wound infection?

Antibiotic sprays are now widely used during surgical wound closure, although their value is not universally accepted. During our six-month tenure as house officers in two surgical wards we found that their use in a small series during abdominal surgery reduced postoperative wound infection.

Patients, methods, and results

The survey was conducted on 115 patients from two surgical wards (one male, one female) who had had operations in one of two theatres between February 1975 and July 1975. Wounds were classified as "clean," "contaminated," or "dirty." In "clean" wounds endodermal cavities were not entered—for example, plastic surgery, hernia operations, mastectomies, and vascular surgery. In "contaminated" wounds endodermal cavities were entered—for example, routine abdominal surgery. In "dirty" wounds there was extensive contamination of the surgical field—for example, perforated, infected, or gangrenous viscera. We excluded from the survey those patients with preoperative wound infections or those who died within three postoperative days.

Antibiotic spray and prevention of wound infections

Treatment	Clean wounds		Contaminated wounds		Dirty wounds	
	Total No	No infected (%)	Total No	No infected (%)	Total No	No infected
(*a*) Antibiotic spray	45	3 (7)	28	2 (7)	3	1
(*b*) No antibiotic spray	21	1 (5)	17	6 (35)	1	1

Wounds were treated during closure in one of two ways: (*a*) they were sprayed with Polybactrin or Rikospray, both preparations containing neomycin sulphate, bacitracin zinc, and polymyxin B sulphate: (*b*) the wound was washed with either sterile saline (for "clean" wounds) or chlorhexidine 1 in 5000 aqueous solution (for "contaminated" or "dirty" wounds). Two surgeons routinely used treatment (*a*), one treatment (*b*). Each surgeon performed a similar spectrum of operations. The table shows that the wound types were in approximately 2:1 ratio between groups, as were the sex ratio (treatment (*a*) 41 male, 35 female; treatment (*b*) 21 male, 18 female), while the mean age of each group was 55 years. The theatre suite, theatre and ward staff (for each ward), pre-, intra-, and post-operative care was the same in each treatment group.

For the purpose of this study a "wound infection" was described as a purulent wound exudate from which bacteria were isolated. Postoperative wound infections developed in eight (20·5 %) of the 39 wounds not receiving antibiotics, compared with six (7·9 %) of the 76 wounds receiving antibiotics. For the "contaminated" wounds the difference is significant ($\chi^2 = 3{\cdot}97$, $P < 0{\cdot}05$).

Comment

Several reports have stated that application of certain antibiotics in powder or solution form during wound closure significantly decreased postoperative wound infection.[1,2] Nevertheless, we could find only two recent reports on the incidence of wound infections after the use of combination antibiotic sprays: Jackson *et al*,[3] using the same wound grouping as we, reported no significant decrease in wound infections when Rikospray was used; Gilmore[4] showed that a similar antibiotic spray reduced postoperative wound infections, particularly with "contaminated" wounds. Although the numbers in our study were small, the results suggest that the use of this antibiotic spray during closure of "contaminated" wounds reduced the incidence of subsequent wound infection.

We wish to thank the consultant surgeons, Mr J Moore and Mr A Murison; the clinical assistant, Mr T Hassan; and the consultant microbiologist, Dr C A C Ross, for advice and co-operation.

[1] Logan, C J H, *British Journal of Surgery*, 1973, **60**, 355.
[2] Scherr, D D, *et al*, *Journal of Bone and Joint Surgery*, 1972, **54A**, 634.
[3] Jackson, D W, *et al*, *British Journal of Surgery*, 1971, **58**, 564.
[4] Gilmore, O J A, *British Journal of Surgery*, 1973, **60**, 910.

(*Accepted 11 May 1977*)

Ballochmyle Hospital, Mauchline, Ayrshire
S J HILDRED, MB, BSC, house officer in surgery
C J HENDERSON, MB, BSC, house officer in surgery

Reptilase time in cirrhosis and hepatocellular carcinoma

There have been several isolated case reports of dysfibrinogenaemia in patients with hepatocellular carcinoma, but Barr *et al*[1] have now reported evidence of dysfibrinogenaemia in a larger series of 28 Kenyan patients. In the presence of normal amounts of fibrin(ogen) degradation

products and fibrinogen, dysfibrinogenaemia may be detected by a prolongation of the reptilase clotting time.[2] Barr *et al* have suggested that the reptilase time may prove to be a sensitive screening procedure in patients with cirrhosis, who have an increased risk of developing hepatocellular carcinoma. Nevertheless, a prolongation of the reptilase time (due to a delay in the production of fibrin monomer) has also been reported in some cases of cirrhosis alone.[3] In the present study we have measured coagulation factors, including reptilase and thrombin clotting times and fibrinogen concentrations, in 22 patients with hepatocellular carcinoma, 40 with cirrhosis alone, 14 with secondary carcinoma of the liver, and 45 normal controls.

Patients, methods, and results

The 22 patients with hepatocellular carcinoma came from Britain (14), Eastern Europe (4), Africa (2), Greece (1), and Italy (1). Fourteen of them had underlying cirrhosis. In the 40 patients with cirrhosis the underlying aetiology was alcoholic (15), chronic active hepatitis (8), haemochromatosis (7), and cryptogenic (10). Hepatocellular carcinoma was confirmed histologically in 15 patients and diagnosed on the basis of arteriography and α-fetoprotein (>1000 μg/l) in seven. The reptilase time was measured by the standard technique using 0·2 ml plasma and 0·1 ml reptilase, and was considered abnormal when greater than 20 s.

The patients with cirrhosis, whether or not they had developed a tumour, had significantly prolonged thrombin and reptilase times when compared with controls. A total of 16 patients with cirrhosis and 8 with cirrhosis complicated by hepatocellular carcinoma had prolonged reptilase times, but there was no significant difference between these two groups ($P < 0.5$). In the eight cases of hepatocellular carcinoma without cirrhosis, the reptilase time was within the normal range (figure). The striking difference in this group was the raised fibrinogen concentrations of 3·95 g/l, as compared with mean values of 2·42 g/l in controls ($P < 0.001$). This was also found in patients with secondary carcinoma in whom the mean value was 4·14 g/l. Fibrinogen concentrations in patients with cirrhosis with or without tumour development (mean values 2·8 g/l and 2·3 g/l, respectively) were within the normal range.

Discussion

The lower fibrinogen concentrations in patients with hepatocellular carcinoma in cirrhosis may be accounted for by the well-documented increase in the catabolism of fibrinogen,[4] which may counteract the anti-fibrinolytic activity reported in patients with hepatocellular carcinoma.[5]

Our results would imply that the prolonged reptilase time found in patients with hepatocellular carcinoma is usually a consequence of the underlying cirrhosis rather than directly related to the tumour and, in our experience, it is of no value for screening for hepatocellular carcinoma.

[1] Barr, R D, *et al*, *Quarterly Journal of Medicine*, 1976, **180,** 647.
[2] Funk, C, *et al*, *British Journal of Haematology*, 1971, **21,** 43.
[3] Green, S L, *et al*, *British Journal of Haematology*, 1976, **34,** 427.
[4] Clark, R D, *et al*, *British Journal of Haematology*, 1975, **30,** 95.
[5] Kwaan, H C, *et al*, *Clinical Science*, 1959, **18,** 251.

(*Accepted 18 May 1977*)

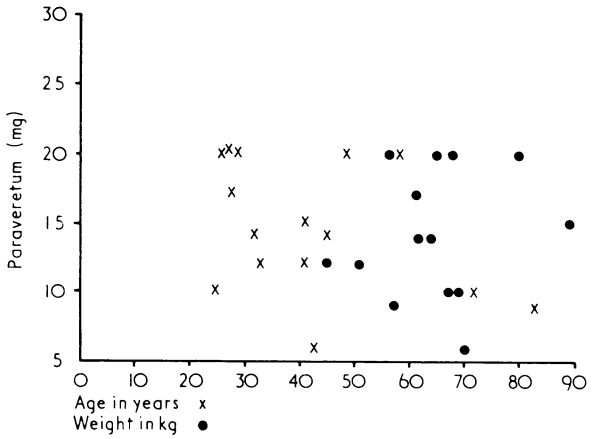
Liver Unit, King's College Hospital and Medical School, London SE5
P J JOHNSON, MB, MRCP, research fellow
YVETTE WHITE, DIPMLT(SA), research technician
I L WOOLF, BM, MRCP, lecturer (present address: North Middlesex Hospital, London N18)
ROGER WILLIAMS, MD, FRCP, director of unit and consultant physician

Postoperative analgesia by titration of papaveretum

"No, you cannot have 'something' for at least seven hours" is still too often the response to the plea, "Can I have something for my pain, nurse?"[1 2] Papaveretum 10 mg is an overdose for some, but there are others, not easily recognisable, for whom 20 mg is not enough. This study is designed to show that doses of analgesic drugs vary so much that no set scheme of postoperative analgesia is practicable, but that the patient's initial requirement should be determined by intravenous titration.

Patients, methods, and results

Sixty-one patients anaesthetised by us for laparotomy were studied. They were given diazepam as premedicant, induced with althesin, and maintained with nitrous oxide, oxygen, halothane, pancuronium, and pentazocine, 30 mg. The patients were admitted to the intensive care unit for titration by senior house officers who did not know the purpose of the procedure. They were the first patients anaesthetised by us who consented to be studied when there were vacancies on the unit.



Papaveretum requirements of 14 women who had undergone hysterectomy. Mean dose (±SD) 14·2±4·66 mg (range 6–20 mg). Correlation of age to dose −0·32, slope −1·18. Correlation of weight to dose −0·16, slope 0·39.

When the patient required analgesia papaveretum diluted in physiological saline solution, 1 mg/1 ml, was injected intravenously in 2-mg boluses up to 8 mg, and then in 1-mg boluses until the patient said that the pain was relieved and could cough comfortably and effectively. The dose of papaveretum was correlated with the age and weight of the patients. There were 17 men, mean dose 17·2 mg, range 9–30 mg, standard deviation 4·98, coefficient of correlation between dose and age 0·03, slope of least squares line 0·09, coefficient of correlation with weight 0·65, slope 0·43. There were 44 women, mean dose 13·6 mg, range 6–25 mg, standard deviation 4·66, coefficient of correlation with age −0·29, slope of least squares line −1·19, coefficient of correlation with weight 0·37, slope 1·09. Fourteen of the women had hysterectomy performed by one surgeon using a transverse incision. The papaveretum requirements of these are shown in the figure.

Comment

The variation of the titrated dose and poor correlation with age or weight explain why drug regimens based on these factors are unsuitable for many patients and indicates that the only safe and effective relief of severe pain is intravenous titration of a potent analgesic drug.

After the titration, analgesia was maintained by three intramuscular injections of the same dose of papaveretum. When spaced six-hourly the first injection was too delayed. Most patients required further analgesia after four and a half hours. Forty patients were treated by repeating the titrated dose of papaveretum intramuscularly at intervals of four, six, and eight hours. This regimen gives safe, effective analgesia after abdominal operations. We now give the first titrated dose in the recovery ward with the intramuscular injections given by nursing staff on the wards.

[1] *British Medical Journal*, 1976, **3,** 664.
[2] *Lancet*, 1976, **1,** 1338.

(*Accepted 18 May 1977*)

North Tees General Hospital, Hardwick, Stockton-on-Tees, Cleveland TS19 8PE
E N S FRY, MB, FFARCS, consultant anaesthetist
S DESHPANDE, MB, DA, registrar anaesthetist