i.m. instead of i.v. infusion. However, their results in no way justify their statement that meptazinol is "less potent than pethidine". The slightly greater rate of use of meptazinol produced a mean pain score of 38 as opposed to 52 for the patients who received pethidine. Indeed, meptazinol may well be more potent than pethidine in doses smaller than 100 mg.

It is obviously essential that relative potency should be related to a single dose, or level of response, but it is incorrect to use the method of Harmer and co-workers (1983), who related doses of morphine, buprenorphine and meptazinol to pethidine 100 mg. As these relationships were obtained by division of 24-h dosage, they may bear no resemblance to those obtaining at the level of response to pethidine 100 mg. These relative potencies should, like others, only be used in the context in which they were obtained.

Dr Kay is probably correct in saying that equipotency ratios for analgesia should not be compared with the effects of a single dose on respiration. However, most patients receive multiple doses of analgesics, so that the practical question is whether a range of different prescribed doses could have effects on ventilation akin to the agonists pethidine and morphine. This seems at least possible.

Dr Kay alleges that comparing potency by a patient demand technique is generally unreliable. However, determinations of equivalent potency for buprenorphine and pentazocine (Slattery et al., 1983) pethidine and meptazinol (Slattery et al., 1981) and now morphine, pethidine and nalbuphine (Bahar, Rosen and Vickers, 1984), fall within generally accepted ranges. The consistency shown does not support the view that estimates based on self-administered regimens are "full of pit-falls". It is possible that meptazinol is the exception and some of the problems may lie in its lack of efficacy. In a small study of 10 mothers in labour, using self-administration by the i.m. route, meptazinol was 1.5 times less potent than pethidine, and three of five mothers receiving meptazinol asked for an extradural block in future: none of the five receiving pethidine did so.

**REFERENCES**


**BRONCHOSPASM AND HYPOTENSION FOLLOWING CARDIOPULMONARY BYPASS**

Sir,—The case of bronchospasm and hypotension following cardiopulmonary bypass reported by Drs Durant and Joucken (1984) raises several interesting points.

The authors describe the rarity of this phenomenon, with a reported incidence of four cases worldwide. In the recent experience of this hospital there have been three cases of sudden massive increase of airway pressure (>40 cm H₂O) in a series of 90 bypass procedures. None of these patients had a history of allergy or asthma. This incidence of 1 in 30 would imply that perhaps the condition is not all that rare.

The description of this increased airway pressure as bronchospasm would imply an underlying bronchomotor abnormality. This issue is clouded by the use of drugs such as aminophylline and adrenaline, which have profound cardiovascular and bronchomotor effects. So many factors are changing at the end of cardiopulmonary bypass that a simple cause may be hard to find.

This was particularly true of our second patient, in whom no cause was found, the "bronchospasm" improving gradually with aminophylline and adrenaline. However, in our other two patients a specific cause was found or implied. In the first, the...
occurrence of an increase in airway pressure and hypotension responded to the removal of a swab placed under the left atrium; that is, the condition was caused by acute pulmonary venous congestion. In the third patient, the increase in airway pressure and deterioration in cardiac output were accompanied by a decrease in arterial oxygen saturation. The P_o2 was maintained at 10 kPa only by use of FICO_2 1.0 and PEEP 10 cm H_2O. This patient responded slowly to a combination of antihistamine, aminophylline and adrenaline, and the cessation of protamine administration. It was considered that this patient was demonstrating a reaction to protamine (Best et al., 1983) or the protamine-heparin complex (Best et al., 1984).

It is, therefore, worth noting that bronchospasm after cardiopulmonary bypass is not a rare condition and that several causes may exist. The fact that so many cardiovascular and respiratory variables are occurring at this time makes investigation of this phenomenon extremely difficult.

P. A. J. HARDY
Edinburgh

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Sir.—I do agree with Dr Hardy that the incidence of increased bronchomotor activity at the completion of cardiopulmonary bypass may be grossly underestimated. As mentioned in the first part of the discussion, numerous factors modifying airway reactivity during bypass may lead to "bronchospasm". Only the most severe cases are likely to be reported.

Moreover, the vasodilatation without phenylephrine in a patient pretreated with labetalol, a competitive alpha- and beta-adrenoceptor antagonist, may be meaningful and should stimulate anaesthetists to search for similar interaction. In addition to the role played by cimetidine, genetic polymorphism in the oxidative metabolism of beta-adrenoceptor antagonists, such as metoprolol, propranolol, timolol and alprenolol, is largely responsible for individual differences in their plasma concentrations and antihypertensive effects (Lennard et al., 1982). The prevalence of the poor hydroxylator phenotype is about 9% in the United Kingdom, but it varies widely among ethnic groups, from 1% in Arabs to 30% in Hong Kong Chinese. Genetic polymorphism in the metabolism of labetalol, although not demonstrated, is likely. In the present case, shortness of breath with wheezing occurred after 1 week of therapy with metoprolol 100 mg day^{-1} by mouth. In addition, hypotension and bronchospasm were observed during bypass after preoperative infusion of labetalol 600 mg. The role of genetic polymorphism in the metabolism of beta-adrenoceptor antagonists, although questionable in this patient, is worthy of mention and deserves evaluation.

P. A. C. DURANT
Rochester

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