CEREBRAL BLOOD FLOW DURING ANAESTHESIA: INFLUENCE OF PRETREATMENT WITH METOPROLOL OR CAPTOPRIL

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Beta-adrenergic blocking agents and ACE-inhibitors are used widely for treatment of cardiovascular disease and as adjuvants in induced hypotension during anaesthesia for some surgical procedures. We have therefore examined the effects on cerebral blood flow (CBF) of these drugs in combination with general anaesthesia.

METHODS AND RESULTS

Following approval by the Hospital Ethics Committee and informed consent, 29 ASA I patients (five female) were studied in the operating theatre before undergoing minor surgery under general anaesthesia. In all patients, CBF was measured before surgery, using an i.v. injection of xenon-133 into an arm vein. The emitted radiation was detected by a Novo Cerebrograph 10A. Recording of remaining activity in the brain was continued for 11 min.

In this study CBF was derived from the initial slope index and the CBF values were corrected for changes in arterial carbon dioxide tension (CBF_corr) by a factor of 0.53 % per kPa of PaCO₂.

Patients were allocated randomly to two groups: one group (n = 9) received metoprolol 0.07 mg kg⁻¹ i.v. at induction of anaesthesia, the other group (n = 11) captopril 1 mg kg⁻¹ by mouth together with premedication. These two groups were compared with a group of nine patients receiving no pretreatment. The three groups were comparable with respect to age (range 20–48 yr), bodyweight (range 55–98 kg) and resting arterial pressure (range 76–113 mm Hg).

All patients received identical anaesthetic techniques. Premedication was with morphine 10–15 mg and hyoscine 0.4–0.6 mg according to age and weight and induction was with thiopentone 4–6 mg kg⁻¹ followed by tubocurarine 0.45–0.75 mg kg⁻¹ with subsequent tracheal intubation. Anaesthesia was maintained with 0.8–1.0 % enflurane and 66% nitrous oxide in oxygen, using intermittent positive pressure ventilation and a non-rebreathing system. Carbon dioxide concentrations were monitored continuously to ensure steady-state at the times of measurement.

SUMMARY

We have studied the influence of a beta adrenergic blocking agent and an angiotensin converting enzyme (ACE)-inhibitor on cerebral blood flow (CBF) during general anaesthesia before surgery. Nine patients served as controls and received no special pretreatment. Two other groups were allocated randomly to receive either metoprolol 0.07 mg kg⁻¹ i.v. (nine patients) at the time of induction or captopril 1 mg kg⁻¹ by mouth (11 patients) 1.5 h before induction. There was no significant difference in CBF or CBF values corrected for changes in PaCO₂ (CBF_corr) between the metoprolol group and controls. In the group pretreated with captopril, CBF_corr values were significantly lower compared with the metoprolol group. Low CBF_corr, in association with low mean arterial pressure was observed in two patients treated with captopril. These findings suggest that treatment with ACE-inhibitors should be discontinued before anaesthesia.


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CBF was measured 30 min after general anaesthesia had been established. At the time of CBF determinations, arterial blood samples were obtained for measurement of oxygen and carbon dioxide tensions (ABL 3—Radiometer).

Values for CBF, CBF corr, and mean arterial pressure (MAP) were analysed using Kruskal-Wallis and Mann-Whitney tests.

There was no significant variation in MAP in the patients pretreated with metoprolol compared with the patients pretreated with captopril. MAP in patients pretreated with either metoprolol or captopril was significantly lower than MAP in patients without pretreatment. There were small, insignificant, differences in PaCO₂ between the groups, with slightly higher values in the captopril group.

In two patients pretreated with captopril we found low CBF corr values (24.3 and 25.4 ml/100 g min⁻¹). MAP in both these patients was low also (53–54 mm Hg).

We found no significant differences in the measured CBF between the groups. There were significantly lower CBF corr values in the group pretreated with captopril compared with those pretreated with metoprolol. There were no significant differences in CBF corr values between the group pretreated with metoprolol and the group without pretreatment (table I).

### COMMENT

Beta-blocking drugs and ACE-inhibitors are used widely in the treatment of arterial hypertension and cardiac disease. Both drugs are used as pretreatment for young patients undergoing surgery during controlled hypotension [1, 2]. Beta-blocking drugs suppress the sympathetic adrenergic system and reduce liberation of renin from the juxtaglomerular cells [3]. ACE-inhibition reduces plasma concentrations of angiotensin II, increases parasympathetic tone, reduces plasma concentrations of aldosterone and decreases the breakdown of bradykinin [1, 2].

Several studies in rats have shown that CBF is preserved during captopril induced hypotension [4, 5]. A study of 22 patients receiving captopril and undergoing cardiac surgery led to the recommendation that captopril therapy should be maintained in the perioperative period [6].

In this study we observed significantly lower values of MAP in the two groups receiving therapy compared with the group without pretreatment. In the captopril group, CBF corr was lower than in the other two groups, with a significant difference between captopril and metoprolol groups. We found low CBF corr values in association with low MAP values in two patients; both received captopril.

There were no complications during anaesthesia associated with pretreatment with either group of drugs.

We suggest that discontinuing ACE-inhibitor treatment should be considered before anaesthesia, whilst therapy with beta-blocking drugs may be maintained.

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REFERENCES


