train-of-four on a peripheral nerve stimulator and sustained head lifting.

General anaesthesia for ECT has three main functions: lack of awareness of the therapy; modification of the motor effects of the fit to prevent injury; fast recovery of reflexes and consciousness enabling early airway protection. Suxamethonium is the best neuromuscular blocking drug for ECT, because of its short duration of action which permits rapid return of laryngeal reflexes and ventilation.

Plasma cholinesterase deficiency causing prolonged apnoea following suxamethonium is well known [5]. Atracurium has been used in a patient with severe hepatic disease, who had low plasma cholinesterase activity, without prolongation of its effect [6].

In this patient, atracurium was successfully used to modify the motor effects of ECT, as judged clinically. Antagonism of the neuromuscular blockade with anticholinesterase was successful at the end of the procedure without any ill effects. We would therefore recommend that atracurium in low dosage is a suitable alternative to suxamethonium for ECT in a patient with plasma cholinesterase deficiency.

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PLASMA PROLACTIN CONCENTRATIONS DURING HIGH-DOSE OPIOID ANAESTHESIA

Sir, - Among other hormones [1], prolactin is one of those of which the concentration increases as a response to surgical stress [2]. Since narcotic analgesics also induce an increase in basal plasma prolactin concentration [3], the significance of prolactin as an indicator of stress under the influence of opioids is obscure.

We reported in this Journal [4] plasma concentrations of three hormones regarded as indicators of stress (cortisol, β-endorphin immunoreactivity and arginine vasopressin) during cardiac surgery under fentanyl or alfentanil anaesthesia. Since we considered it interesting to know if changes in the level of stress observed during high-dose opioid anaesthesia could be reflected in changes in plasma concentrations of prolactin, we measured prolactin concentrations in the stored samples obtained from the patients of our previous study.

As previously described [5], nine patients received fentanyl and 10 alfentanil as a combination of a loading dose and a continuous infusion for coronary artery bypass grafting. At certain predetermined stages of anaesthesia (fig. 1), blood samples were drawn from the radial artery, for the determination of plasma prolactin concentrations by radioimmunoassay [6] and for the analysis of plasma fentanyl/alfentanil concentrations by capillary gas chromatography [5].

Analysis of variance with repeated measures design was used for statistical evaluation of intra-group changes. Dunnett’s corrections were used for subsequent multiple comparisons by the paired t test. The t test for two independent samples was used to compare changes between the groups. The linear regression analysis was used to assess the interrelationship between prolactin and fentanyl or alfentanil concentrations. Because women are known to have higher baseline concentra-
tions of prolactin and more pronounced responses to noxious stimulation than men [2], we separated the sexes when analysing the prolactin concentrations to assure that the distributions of the prolactin data were normal.

The plasma prolactin concentrations of the 16 men (eight in either group) of our 19 patients are shown in figure 1. In both groups of men, plasma prolactin had increased significantly 30 min after the start of induction of anaesthesia. Thereafter, prolactin concentrations remained almost unchanged during surgery until the commencement of cardiopulmonary bypass (CPB). During CPB, plasma prolactin concentrations were 10–15 ng ml\(^{-1}\) smaller than those immediately before CPB, but differences from the awake control value were still statistically significant. During recovery from anaesthesia (60 min after discontinuation of the infusion of opioid and at awakening from anaesthesia) plasma prolactin concentrations decreased further and no longer differed significantly from the control values. No significant differences were observed between the two study groups at any stage of the study. The pattern of the responses with the three women subjects were more pronounced (peak concentrations, 100–194 ng ml\(^{-1}\), were measured at 130 or \(St_{\text{max}}\)) than with men.

Statistically significant correlations were observed between plasma prolactin and fentanyl concentrations \((n = 64, r = 0.68, P < 0.001)\) and between plasma prolactin and alfentanil concentrations \((n = 64, r = 0.58, P < 0.001)\) in the male patients.

The pattern of increase in prolactin concentration found in the present study was consistent with that in the previous studies in cardiac surgical patients under fentanyl [7] or sufentanil [8] anaesthesia. Thus, the prolactin response was most prominent during the induction of anaesthesia and early surgery and less pronounced during and after CPB. We found a significant correlation between plasma prolactin and fentanyl or alfentanil concentrations. Thus, the present study seems to provide further evidence of the stimulatory action of the opioids on prolactin secretion [3]. On the other hand, because increased plasma prolactin concentrations have been measured under halothane anaesthesia [7], neuroendocrine mechanisms in the regulation of prolactin release unaffected by opioid regulation may also be involved in anaesthetized patients [9].

The behaviour of prolactin in our patients differed totally from that of other stress indicators (cortisol, \(\beta\)-endorphin immunoreactivity and arginine vasopressin) as published in our previous study [4]. Prolactin appeared to be a hormone which does not indicate the degree of stress during cardiac surgery.

Our results suggest that the changes in plasma concentrations of prolactin during high-dose opioid anaesthesia for cardiac surgery reflect changes in the plasma concentrations of opioid anaesthetics rather than changes in the degree of stress. The major conclusion from this study is that plasma prolactin concentration cannot be regarded as an indicator of stress during cardiac surgery under high-dose opioid anaesthesia.

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