A strategy for management of intraoperative Addisonian crisis during coronary artery bypass grafting

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Abstract

Patients with Addison’s disease undergoing cardiac surgery are at risk of developing a crisis. There is no consensus on the preoperative and intraoperative management of this group of patients undergoing cardiac surgery so the recommendations for non-cardiac patients are often used. The consensus statement from the international task force of the American College of Critical Care medicine recommends 100 mg of intravenous hydrocortisone for patients with adrenal insufficiency in septic shock, but in patients undergoing surgery, especially with extracorporeal circulation, the dosage may even be higher. We report our management of a patient with well-controlled adrenal insufficiency for 30 years who developed intraoperative Addisonian crisis despite the recommended preoperative corticosteroid supplementation. The importance of adequate corticosteroid supplementation for cardiac surgery patients, adapting the surgical strategy to allow for optimal management of potential complications and close monitoring with heightened awareness are discussed.

Keywords: Myocardial protection • Coronary artery disease • Comorbidity (Addison’s disease) • Circulatory haemodynamics • Perioperative care

INTRODUCTION

Patients with Addison’s disease are at risk of developing a potentially fatal crisis in the perioperative period after cardiac surgery. The clinical presentation in this setting can masquerade as other complications associated with cardiac surgery such as severe inflammatory response during surgery or post-cardiectomy shock syndrome in the early postoperative period; hence patients with Addison’s disease should be closely monitored and the management strategy adapted to allow early identification of crises and consequently a successful management. Although there are few reports of successfully managed acute adrenal insufficiency in the postoperative period [1–3], no strategies have been described for intraoperative Addisonian crisis. We report a case of intraoperative crisis and our management approach.

CASE REPORT

A 57-year old male with symptomatic coronary artery disease and angiographically confirmed 50% left main coronary artery stenosis and 80% circumflex artery stenosis was referred for coronary artery bypass grafting (CABG). He had been diagnosed with Addison’s disease 30 years earlier, which has been well controlled with oral hydrocortisone 15 mg in the morning, 5 mg at mid-day and 5 mg in the evening along with Fludrocortisone 0.1 mg in the morning.

He had an athletic build with a body mass index of 22 kg/m², heart rate of 78 beats/min in sinus rhythm, blood pressure of 131/72 mmHg and oxygen saturation of 98% on room air. His haematological indices and biochemical profile were within normal limits. Specifically, his sodium was 137 mmol/l, potassium 4.3 mmol/l, urea 3.9 mmol/l, serum creatinine 68 mmol/l and glucose 7 mmol/l.

After discussions with the endocrinologist, he received 100 mg of hydrocortisone intravenously during induction of general anaesthesia.

We performed CABG via median sternotomy, using cardiopulmonary bypass (CPB) with mild hypothermia (systemic temperature of 34°C), mean arterial pressure of 60 mmHg, pulmonary artery vent and aortic cross-clamp with fibrillation. Three separate bypass grafts were constructed using long saphenous vein to the second obtuse marginal branch of the circumflex and diagonal arteries, and the left internal mammary artery to the left anterior descending artery. While carrying out the second distal anastomosis, the mean arterial blood pressure dropped suddenly to 30 mmHg and slowly recovered with repeat vasopressor boluses. The blood gases showed a sudden change characterized by hyperkalaemia (potassium 6.6 mmol/l) hyponatraemia (sodium 123 mmol/l) and hypoglycaemia (glucose 4.5 mmol/l) compared with normal levels 15 min earlier (sodium 137 mmol/l, potassium 4.8 mmol/l and glucose 8 mmol/l). The biochemical derangement did not improve with doses of frusemide and dextrose insulin boluses. A further 200 mg of intravenous hydrocortisone supplementation resolved the acute Addisonian crisis, which lasted approximately 45 min, resulting in stable haemodynamics and restoration of normal blood biochemistry for the rest of the procedure. The patient
was weaned off CPB without inotrope or vasopressor infusion. He was commenced on tapering intravenous steroid regime till the second postoperative day when he resumed his usual oral steroid dosage. The rest of the postoperative recovery was uneventful and patient was discharged on 5th postoperative day and is doing well 5 months after surgery.

DISCUSSION

Addisonian crisis can develop in patients with well-controlled adrenal insufficiency during cardiac surgery and present a management difficulty. This should be suspected when profound hypotension occurs and is unresponsive to unusually high doses of vasopressors. Henzen et al. [4] studied adrenal function in patients undergoing CABG and reported an inverse relationship between the magnitude of volume changes and the adequacy of adrenal function. In another similar study, Debono and his colleagues [5] observed a relative decrease in adrenal function in about 25% of patients after on-pump CABG, but the clinical relevance of this finding remains unclear. Theoretically therefore, the risk of Addisonian crisis is reduced with off-pump CABG because of the less likelihood of large volume changes that tend to occur with on-pump CABG. However, Addisonian crises have been observed after surgery not involving the use of CPB [6] and, without CPB, the capability to provide a robust supportive response to control the haemodynamic collapse and manage the biochemical derangement that attend Addisonian crises is diminished.

This case illustrates the risk of Addison’s crises in response to operative stress despite precautionary supplementation with steroids. When this occurs intraoperatively, the haemodynamic instability and severe derangement of biochemical profile can be challenging to manage especially if the surgical strategy does not provide a safety net to facilitate the mitigation of the potentially serious adverse effects. Our deliberate use of CPB enabled a safe and reliable control of patient haemodynamics, and the avoidance of cardioplegia decreased the fatal risk of exacerbating the hyperkalaemia that usually occurs in Addisonian crisis.

The importance of adequate corticosteroid supplementation in the prevention of Addisonian crises is highlighted by this case. It is traditional to use intramuscular corticosteroid supplementation therapy before non-cardiac surgery [7] but there is no consensus on the management of this small patient cohort during cardiac surgery. In our patient, the recommended dose of hydrocortisone was extrapolated from the management dose for non-cardiac patients and this proved to be insufficient. Perhaps, for patients undergoing surgery with CPB, a higher preoperative dose is required.

It is crucial to entertain the possibility of a crisis early in this group of patients and administer a further dose of corticosteroid rather than escalate vasopressor therapy to no avail. Again the optimal corticosteroid dosage when a crisis develops during on-pump cardiac surgery is not clear. The consensus statement from the international task force of the American College of Critical Care Medicine recommends 100 mg of intravenous hydrocortisone for patients with adrenal insufficiency in septic shock [8], but with extracorporeal circulation, the dosage may even be higher, as in our patient.

This case report supports the use of adequate preoperative corticosteroid supplementation for patients with adrenal insufficiency which may be higher than that recommended for non-cardiac patients. The surgical strategy in these patients should be adapted to facilitate robust resuscitation should a crisis occur, and during surgery, close monitoring with heightened awareness of early crisis signs should be maintained.

Conflict of interest: none declared.

REFERENCES