

Cushing syndrome and the anesthesiologist, two case reports

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ABSTRACT

Cushing's syndrome (CS) is associated with reduced life quality and increased mortality, mostly due to cardiovascular disease. The features of this syndrome are central obesity, moon facies, facial plethora, supraclavicular fat pads, buffalo hump, and purple striae. Other complications include hyperglycemia, hypertension, proximal muscle weakness, skin thinning, menstrual irregularities, amenorrhea and osteopenia. These make perioperative and anesthetic management difficult and present a challenge to the operating team, especially the anaesthesiologist. In this paper, we present two such cases of CS, which were treated with adrenalectomy. We aim to highlight the special care and precautions that need to be taken while administering anesthesia, and in the post operative period. Anaesthesia induction in the two cases of CS was done prior to the adrenalectomy procedure and special pre and post operative care was taken. Continuous intra operative monitoring of vitals and checking for the stability of the haemodynamics was performed. With adequate care and using advanced anesthetic techniques, the patients showed uneventful post operative recovery. Though the anesthetic management of patients with CS is difficult, desired results can be achieved with continuous monitoring and special precautions.

Key words: Adrenalectomy, anaesthesia, blood glucose levels, blood cortisol levels, Cushing syndrome, electrolyte monitoring

INTRODUCTION

Cushing's syndrome (CS) is a fairly common disease entity in endocrine outdoor and indoor departments. The clinical symptoms and signs of CS are well known to physicians and endocrinologists. However, these features may not be well understood by surgeons and anaesthetists, who face many challenges while dealing with patients of CS. Though CS may have multiple etiological factors, some cases need to be managed surgically. Hence, anaesthetists and surgeons should be made aware of the unique factors in CS which may impact perioperative health. This case report reviews

two such cases, while highlighting the anaesthesia related aspects of CS

CASE REPORTS

Case 1

A 38 year old woman (body weight 90 kg, height 165 cm, BMI 33, American Association of Anaesthetists classification- ASA I), consulted an endocrinologist because of hyperglycemia, hypertension, menstrual irregularities, and hirsutism. CS was suspected. She underwent a computed tomography angiography (angio CT), ultrasound examination, and blood level testing of cortisol and adrenocorticotrophic hormone (ACTH): during which left adrenal hyperplasia was revealed [Figure 1]. The cortisol and ACTH blood levels were 929 ng/ml (normal range: 28-120 ng/ml) and 21.6pg/ml (normal range: 20-113 pg/ml), respectively. Clinical assessment, chest X-ray and electrolyte findings were normal. Preoperative hypertension was treated with metoprolol and valsartan, whereas hyperglycemia (168 to 173 mg/dl of blood glucose) was

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Figure 1: Computed tomography angiographic scan of first patient (Case 1) which revealed left adrenal hyperplasia

treated with insulin regimen. The evaluation of possible difficult intubation or ventilation was performed.

The patient was pre medicated with oral diazepam 10 mg the night before the surgery and morphine sulfate 10 mg intramuscularly 30 minutes before the induction of anesthesia. The preoperative treatment included ketoconazole 800 mg per day (for three consecutive days) which was continued until the morning of the surgery. Preoperative period was uneventful.

In the operating room after the peripheral venous cannula was inserted, right radial artery and right internal jugular vein were cannulated with 20 G venous catheter and 7.5 F central venous catheter, respectively. Anesthesia was induced with fentanyl 5 mcg/kg⁻¹, propofol 2 mg/kg⁻¹, cisatracurium 0.15 mg/kg⁻¹. Patient monitoring was done by checking the central venous pressure, electrocardiogram (ECG), temperature, urine output, end-tidal carbon dioxide, cortisol level, sugar blood level, electrolyte levels and invasive arterial monitoring. The anesthesia was maintained with sevoflurane, propofol infusion, fentanyl and cisatracurium as needed. An open radical left adrenalectomy [Figure 2] was performed. 100 mg intravenous hydrocortisone was administered after the procedure was completed.

Postoperatively, the hyperglycemia had improved, and no more insulin was needed. Ketoconazole was discontinued. Blood pressure also stabilized, and only a small dose of metoprolol was necessary. Post-operatively, cortisol level was maintained at 98 ng/ml (normal range: 28-120 ng/ml), under oral hydrocortisone. There was no electrolyte disturbance. The surgery and postoperative period were uneventful and the patient was discharged on the 5th post operative day, and referred to an endocrinologist for further care.

Case 2

A 22 year old woman (body weight 45 kg, height 160 cm, BMI 18, ASA I), without significant previous medical history (except menstrual irregularities), consulted an orthopedic surgeon because of pelvic bone fracture, not associated with any history of trauma. The patient was treated conservatively; however, no efforts were made to diagnose the etiology of the fracture. Physical examination was unremarkable and she was discharged. However, she soon went on to manifest the features of buffalo hump [Figure 3], moon facies [Figure 4], striae [Figure 5] and hirsutism. Mild hypertension and glucose intolerance also were diagnosed and reported. The endocrinologist suspected CS. Right adrenal hyperplasia was confirmed by angio CT [Figure 6] and ultrasound examination, and blood levels of cortisol and ACTH. The cortisol and ACTH blood levels were 219 ng/ml (normal range: 28-120 ng/ml) and 23.7 pg/ml (normal range: 20-113 pg/ml), respectively. The other examinations were normal. Pre operative hypertension was treated with spironolactone. The evaluation of possible difficult intubation or ventilation was performed.

The patient was pre medicated with oral diazepam 10 mg. The preoperative treatment included ketoconazole 800 mg per day, which was started 3 days before the surgery, and continued until the morning of the intervention day. Preoperative period was uneventful. In the operating room, after peripheral, venous cannula was inserted, right radial artery and left internal jugular vein were cannulated. Anesthesia was induced with fentanyl 3 mcg/kg⁻¹, propofol 2 mg/kg⁻¹, cisatracurium 0.15 mg/kg⁻¹. Patient monitoring was done by checking the central venous pressure, electrocardiogram (ECG), temperature, urine output, end-tidal carbon dioxide, cortisol level, sugar blood level, electrolyte levels and invasive arterial monitoring. The anesthesia was maintained with sevoflurane, propofol infusion, fentanyl and cisatracurium as needed. An open radical right adrenalectomy [Figure 2] was performed. 100 mg intravenous hydrocortisone was administered after the procedure was completed. Post-operatively, cortisol level was maintained at 98 ng/ml (normal range: 28-120 ng/ml), under oral hydrocortisone. There was no electrolyte disturbance. The surgery and postoperative period were uneventful, and the patient was discharged on the 4th postoperative day and referred to an endocrinologist for further care.

DISCUSSION

Cushing's syndrome (CS) has a multifactorial etiology. Administration of exogenous steroids may lead to the development of CS. Symptoms of glucocorticoid excess



Figure 2: The removed adrenal gland in the first patient (Case 1) after the open radical left adrenalectomy procedure



Figure 3: Buffalo hump in the second patient (Case 2) which is a typical feature of Cushing syndrome



Figure 4: Moon facies in the second patient (Case 2) which is a typical feature of Cushing syndrome



Figure 5: The purple striae in the second patient (Case 2) which is a typical feature of Cushing syndrome

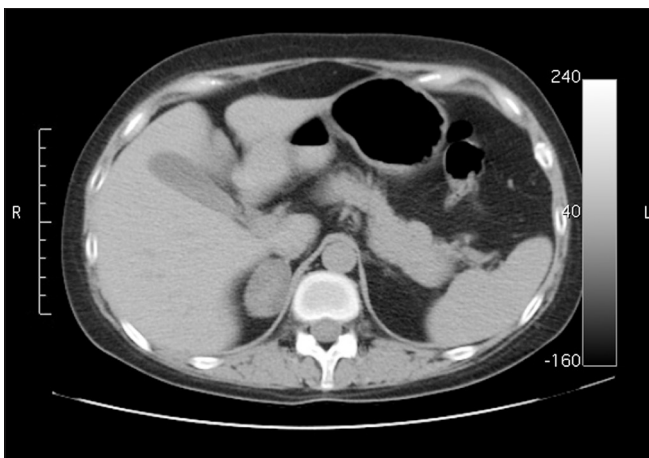


Figure 6: Computed tomography angiographic scan of second patient (Case 2) which revealed left adrenal hyperplasia

generally occur with the administration of oral steroids, injections of steroids, inhalers and unguents.^[1] Patients

with diseases that respond to steroid therapy are especially likely to develop CS. Other causes are unilateral or bilateral adrenal hyperplasia, pituitary adenoma (Cushing Disease), and ectopic ACTH production.

There are similarities between Cushing's syndrome and the metabolic syndrome as both are characterized by central obesity, hypertension, insulin resistance, glucose intolerance, and dyslipidemia. There is a study that supports the view that unknown CS is not rare among patients with diabetes mellitus.^[2] This is the first demonstration that screening for CS may be feasible at the clinical onset of diabetes in an unselected cohort of patients. Therefore, early diagnosis and treatment of CS may provide the opportunity to improve the prognosis of diabetes.

Several studies have demonstrated the concomitance of CS and a number of tumor diseases. These are reported in literature and include conditions like pheochromocytoma,^[3,4]

sarcoidosis,^[5] pancreatic acinar cell carcinoma,^[6] pre-eclamptic findings,^[7] malignant gastrinoma,^[8] bronchial carcinoid lung tumor,^[9] pancreatic neuroendocrine tumor,^[10] Hippel-Lindau disease,^[10] and mesenteric neuroendocrine carcinoma.^[11]

Our patients had unilateral adrenal hyperplasia with all the clinical features of CS, however, none of the above associations were seen. J.S. had presented with fracture of the pelvic bone with no history of trauma. She visited many physicians, however, no one suspected CS. After discharge, she went on to develop the signs of CS as explained above. In cases of such unexplained fractures and osteopenia, CS must be considered as a possible cause. M.B. presented with all the typical clinical features, and hence here, the diagnosis was comparatively easier. After testing the serum cortisol and ACTH, and the dexamethasone suppression test, the diagnosis was confirmed. Angio CT and ultrasound examinations were also sought for further confirmation.

It is well known that the patients with CS tend to suffer from volume overload, hypertension, glucose intolerance, hyperglycemia and hypokalemic metabolic alkalosis. In both patients, intervention had to be geared to solve these problems. The blood pressure was controlled by using metoprolol, valsartan, and spironolactone. Oral anti diabetic drugs were preoperatively discontinued and substituted by insulin regimen to maintain the blood sugar levels below 120 mg/dl.

Standard and invasive monitoring was performed. The anesthesia induction was unremarkable. The use of etomidate while administering anaesthesia was avoided, as it has a suppression effect on the cortisol levels. We took care to use a minimum dose of muscle relaxants, choosing cisatracurium, a short acting plasma degradation drug. Special importance was given to patient positioning, in order to avoid fractures and/or skin damage.

In the case 1 several possible complications, like hypoventilation, could have occurred due to obesity and proximal muscle weakness, contributing to hypoxia and hypercarbia. The mask ventilation was difficult due to obesity, and hence preoxygenation was done before endotracheal intubation.

There was no difficulty in the airway management of both patients. Several blood gases were examined during the surgery, and showed normal results. There were no significant changes in the electrolytes and glucose blood level, as well as in the intra operatory acid-basic status.

Patients undergoing adrenalectomy may require intra operative glucocorticoid replacement, and hence 100 mg hydrocortisone succinate was administered intra operatively. The replacement continued even in the postoperative period through oral cortisone, guided by blood cortisol level monitoring. None of the patients showed cortisol deficiency.

Special post operative care needs to be taken to avoid cortisol deficiency, and to mobilize and activate the patient, and prevent atelectasis through respiratory exercises. Though we performed open adrenalectomy procedures, the laparoscopic approach remains the gold standard. Even with the recent advances in anaesthetic care, CS is associated with longer hospitalizations and frequent major complications, especially for bilateral adrenalectomy cases, thus warranting special and advanced care.^[12]

CONCLUSION

Thus, through our case studies, we concluded that CS presents a challenge to the anesthesiologist, who needs to deal with the volume overload, hyperglycemia, hypokalemia, difficult airway and ventilation. Postoperatively, we must take care to supplement the cortisol (guided by cortisol blood level), correct electrolyte level disturbances to maintain the hemodynamics, and keep the sugar blood levels in the normal range.

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