

## Surgical Aortic Valve Replacement (SAVR) and Unexpected Complication: Critical Illness Related Corticoid Insufficiency (CIRCI). Case Report

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### ABSTRACT

Cardiac surgery, particularly surgical aortic valve replacement (SAVR), presents high morbidity risks. This case report describes a 62-year-old male with severe aortic stenosis who developed critical illness-related corticosteroid insufficiency (CIRCI) following SAVR. Postoperatively, the patient exhibited persistent hypotension despite vasopressors, fever, and respiratory complications, along with metabolic disturbances and rapid atrial fibrillation. Adrenal insufficiency was confirmed by low cortisol levels, and hydrocortisone therapy led to clinical improvement. CIRCI remains a diagnostic challenge due to its subtle presentation, yet timely recognition is crucial in high-risk surgical contexts to prevent adverse outcomes.

**KEYWORDS:** surgical aortic valve replacement, critical illness, corticoid insufficiency, severe aortic stenosis.

### ARTICLE DETAILS

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### I. INTRODUCTION

Cardiac surgery is inherently considered a complex intervention with a high risk of morbidity and mortality, necessitating a skilled multidisciplinary team, as well as infrastructure and equipment available in only a limited number of institutions.

Among the essential tools for cardiac surgery is the extracorporeal circulation pump, which provides oxygenation and substitute's heart function during the procedure. By attempting to simulate hemodynamic responses according to the body's needs, it can lead to endothelial injury and cytokine release, resulting in a systemic inflammatory response syndrome (SIRS) that exacerbates the metabolic response to trauma, causing organ damage and increasing postoperative morbidity (1)(6).

The procedure itself is associated with multiple perioperative complications, including low cardiac output syndrome characterized by decreased preload (hypovolemia) and increased afterload (outflow tract obstruction). Rhythm and frequency abnormalities (arrhythmias) as well as reduced contractility (myocardial dysfunction) are also common (7). In contrast, exceptional complications in this context include adrenal insufficiency.

A key distinction should be made between primary adrenal insufficiency, which is defined by symptoms associated with low cortisol levels confirmed by validated tests, and critical illness-related corticosteroid insufficiency (CIRCI). CIRCI is defined by reduced adrenal steroid production due to failure at any level of the hypothalamic-pituitary-adrenal (HPA) axis or tissue resistance to glucocorticoids, without anatomical abnormalities in the HPA axis. CIRCI predominantly affects patients admitted to intensive care units and subjected to severe physical stress, such as sepsis, major trauma, intracranial hemorrhage, cardiac surgery, and systemic inflammatory syndromes (2).

Few cases of adrenal insufficiency are reported in the literature, with limited statistical data available both domestically and internationally, suggesting an incidence of 34.7% in the existing literature (5).

This case report documents a male patient who underwent surgical aortic valve replacement (SAVR) and developed multiple postoperative complications, culminating in a critical health status and subsequent development of CIRCI, representing a diagnostic challenge.

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## II. CLINICAL CASE

A 62-year-old male with a history of hypertension and dyslipidemia presented to our unit due to an episode of syncope of unknown etiology, with a one-month history and no new events. Physical examination revealed the following findings: a diamond-shaped systolic murmur graded IV/VI with a peak in late systole, suggestive of severe aortic stenosis, along with Gallavardin phenomenon and a parvus et tardus pulse.

During the evaluation, the patient experienced a heart failure episode, which was managed in the hospital with an adequate response to treatment.

### Complementary Studies:

A transthoracic echocardiogram showed severe concentric hypertrophy, left ventricular ejection fraction (LVEF) of 60%, normal global and segmental wall motion, a peak velocity of 4.3 m/s, a mean gradient of 52 mmHg, and an indexed valve area of 0.36 cm<sup>2</sup>/m<sup>2</sup>. Coronary angiography showed:

- A short, ectatic, bifurcated left main coronary artery.
- Proximal left anterior descending artery with Gensini score of 3, proximal ectasia (MARKIS 3) without angiographic lesions, and TIMI 3 flow.
- Nondominant circumflex artery with TIMI 3 flow and no angiographic lesions.
- Dominant right coronary artery with a proximal AHA/ACC Type A lesion of 60% and an FFR of 1.2.

The patient was scheduled for surgical aortic valve replacement with a 23 mm St. Jude mechanical valve. (Fig1) Postoperatively, he required high doses of vasopressors, with no significant bleeding beyond usual levels. After 48 hours in the coronary care unit, the patient continued to experience blood pressure lability despite vasopressor support, with lactate levels within normal range and no clinical signs of hypoperfusion.

On the third day in the coronary care unit, he developed a fever of 39°C, leukocytosis, and increased respiratory parameters with evidence of right lung consolidation. (Fig2) Empiric antibiotic therapy was initiated, requiring double vasopressor support.

*K. pneumoniae* was isolated from aspirate cultures, with negative blood cultures for endocarditis, leading to targeted antibiotic therapy. During hospitalization, he experienced an episode of atrial fibrillation with rapid ventricular response and hemodynamic instability, requiring electrical cardioversion, with successful restoration to sinus rhythm without complications.

Notably, the patient displayed hyperactive delirium, hypoglycemia, and electrolyte disturbances (hyponatremia, mild hypercalcemia, and hyperkalemia) without renal impairment.

After ten days of broad-spectrum antibiotic therapy with no evident improvement, multiple differential diagnoses were considered, emphasizing adrenal insufficiency in the context of a critically ill patient. Cortisol levels were measured, yielding a result of 1.8 mcg/dL, confirming adrenal insufficiency.

Treatment with hydrocortisone was initiated at 200 mg per 24 hours, divided into four doses, followed by gradual withdrawal of vasopressors, leading to improved respiratory function in subsequent days.

## III. DISCUSSION

Glucocorticoids are essential for managing stress states; this was demonstrated in animals subjected to adrenalectomy, which exhibited high mortality following surgery (2).

The term “critical illness-related corticosteroid insufficiency” (CIRCI) was introduced in 2008 by the American College of Critical Care Medicine to address the diagnostic complexity of this entity (3).

Patients in critical comorbid states, as seen in this case, require extensive clinical expertise to differentiate among various complications and differential diagnoses.

Diagnosing CIRCI is challenging due to its often subtle signs and symptoms, which can be masked by the patient's critical condition. Typical manifestations include: Neurological alterations, such as altered mental state (delirium or encephalopathy); cardiovascular signs, such as high and prolonged vasopressor requirements; metabolic abnormalities, including electrolyte imbalances like hyponatremia, hyperkalemia, and mild hypercalcemia. Hematologic abnormalities may also be present, often with eosinophilia and anemia (2).

The diagnosis is made in critically ill patients with an extended hospital stay and a poor clinical course, with laboratory values showing random serum cortisol <10 mcg/dL or ACTH-stimulated serum cortisol <9 mcg/dL (4).

Imaging studies are not routine but may be useful to rule out rare complications like adrenal hemorrhage (2). Treatment involves exogenous hormone replacement, with guidelines suggesting stress-period administration not exceeding 400 mg per 24 hours (8). This is followed by a transition to oral therapy for gradual dose reduction and long-term follow-up by endocrinology (2). Most survivors experience recovery of adrenal function.

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## IV. IMAGE

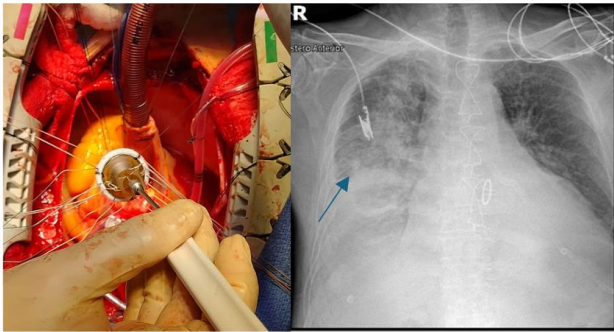


FIG 1

FIG 2

Figure 1 shows the implantation of the aortic valve. Figure 2 Shows lung infection.

## CONCLUSIONS

CIRCI is often underestimated in most cases, which may contribute to its underreporting. Its diagnosis is challenging, even for trained clinicians. With this knowledge, we aim to encourage professionals to recognize rare complications, such as adrenal insufficiency, that can progress to CIRCI during large-scale, stress-inducing procedures like cardiac surgery. Early diagnosis of CIRCI is critical, as it can be life-threatening if not promptly identified.

## REFERENCES

- I. Chaney, M. A. (2002). Corticosteroids and cardiopulmonary bypass: A review of clinical investigations. *Chest*, 121(3 SUPPL.), 921–931. <https://doi.org/10.1378/chest.121.3.921>
- II. Boonen, E., Gunst, J., & van den Berghe, G. (2022). Critical illness-induced corticosteroid insufficiency: What it is not and what it could be. *Journal of Clinical Endocrinology and Metabolism*, 107(7), 2057–2064. <https://doi.org/10.1210/clinem/dgac201>
- III. Marik, P. E., Pastores, S. M., Annane, D., Meduri, G. U., Sprung, C. L., Arlt, W., Keh, D., Briegel, J., Beishuizen, A., Dimopoulou, I., Tsagarakis, S., Singer, M., Chrousos, G. P., Zaloga, G., Bokhari, F., & Vogeser, M. (2008). Recommendations for the diagnosis and management of corticosteroid insufficiency in critically ill adult patients: Consensus statements from an international task force by the American College of Critical Care Medicine. *Critical Care Medicine*, 36(6), 1937–1949. <https://doi.org/10.1097/CCM.0b013e31817603ba>
- IV. Annane, D., Pastores, S. M., Rochweg, B., Arlt, W., Balk, R. A., Beishuizen, A., Briegel, J., Carcillo, J., Christ-Crain, M., Cooper, M. S., Marik, P. E., Meduri, G. U., Olsen, K. M., Rodgers, S., Russell, J. A., & van den Berghe, G. (2017). Guidelines for the diagnosis and management of critical illness-related corticosteroid insufficiency (CIRCI) in critically ill patients (Part I): Society of Critical Care Medicine (SCCM) and European Society of Intensive Care Medicine (ESICM) 2017. *Intensive Care Medicine*, 43(12), 1751–1763. <https://doi.org/10.1007/s00134-017-4919-5>
- V. Manosroi, W., & Atthakomol, P. (2023). Is preoperative adrenal insufficiency screening necessary for cardiovascular thoracic surgery patients? *Medicina (Lithuania)*, 59(1). <https://doi.org/10.3390/medicina59010152>
- VI. Pasero, D., Berton, A. M., Motta, G., Raffaldi, R., Fornaro, G., Costamagna, A., Toscano, A., Filippini, C., Mengozzi, G., Prencipe, N., Zavattaro, M., Settanni, F., Ghigo, E., Brazzi, L., & Benso, A. S. (2021). Neuroendocrine predictors of vasoplegia after cardiopulmonary bypass. *Journal of Endocrinological Investigation*, 44(7), 1533–1541. <https://doi.org/10.1007/s40618-020-01465-5>
- VII. Síndrome de baja gasto cardíaco en el posoperatorio de cirugía cardíaca. (2020). *Revista Uruguaya de Cardiología*, 35(5). <https://doi.org/10.29277/cardio.35.3.18>
- VIII. Pastores, S. M., Annane, D., & Rochweg, B. (2018). Guidelines for the diagnosis and management of critical illness-related corticosteroid insufficiency (CIRCI) in critically ill patients (Part II): Society of Critical Care Medicine (SCCM) and European Society of Intensive Care Medicine (ESICM) 2017. *Critical Care Medicine*, 46(1), 146–148. <https://doi.org/10.1097/CCM.0000000000002840>