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Clinical Case

Renovascular Hypertension due to a Paradoxical Reaction in an Immunocompetent Patient: A Clinical Case Report

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Abstract

Renovascular hypertension (RVH), resulting from arterial narrowing that compromises renal blood flow, poses significant clinical challenges due to its association with severe complications like refractory hypertension and renal insufficiency. This case report documents a 27-year-old immunocompetent woman who developed RVH and Posterior Reversible Encephalopathy Syndrome (PRES) as a paradoxical reaction to anti-tuberculous therapy (ATT) for disseminated tuberculosis (TB). Despite standard ATT, the patient exhibited persistent hypertension and neurological symptoms, including headache. Imaging revealed necrotic lymph nodes compressing the right renal artery, leading to RVH, and MRI confirmed PRES. Management involved high-dose corticosteroids to mitigate the inflammatory response, resulting in symptom resolution and normalization of blood pressure over an 18-month period. This case underscores the need for a multidisciplinary approach in managing complex interactions between TB treatment, paradoxical reactions, and hypertensive complications, even in immunocompetent patients. The report highlights the importance of vigilant monitoring and timely intervention to prevent long-term complications, emphasizing the unpredictable nature of TB and its treatment outcomes.

Keywords: ***renovascular hypertension; paradoxical reaction; disseminated tuberculosis; posterior reversible encephalopathy syndrome; immunocompetent adult.***

Introduction

Renovascular hypertension (RVH), a condition characterized by elevated blood pressure due to the narrowing of the arteries that supply the kidneys, is a significant clinical concern due to its potential for severe complications. This condition is often caused by atherosclerosis or fibromuscular dysplasia and can lead to refractory hypertension, renal insufficiency, and increased cardiovascular risk [1]. The pathophysiology involves reduced renal perfusion, which activates the renin-angiotensin-aldosterone system (RAAS), leading to vasoconstriction, sodium retention, and hypertension [2]. In rare instances, RVH may intersect with Posterior Reversible Encephalopathy Syndrome (PRES), a disorder marked by a rapid onset of neurological symptoms and imaging findings indicative of vasogenic oedema in the posterior cerebral hemispheres [3]. The co-occurrence of these conditions in the context of a paradoxical reaction to tuberculosis (TB) treatment in an immunocompetent host is notably unusual and presents a complex clinical challenge.

Tuberculosis, caused by Mycobacterium tuberculosis, remains a global health threat, particularly in regions with high prevalence rates. Standard anti-tuberculous therapy (ATT), while generally effective, can sometimes elicit paradoxical reactions, especially in immunocompromised individuals [4]. Paradoxical reactions, characterized by the worsening of pre-existing lesions or the emergence of new lesions despite appropriate therapy, can complicate the clinical course and management of TB. However, their occurrence in immunocompetent hosts, although documented, is less common and underscores the unpredictable nature of TB and its treatment [5].

Renovascular hypertension as a result of TB infection is rare but has been documented in cases involving TB-associated aortitis or renal artery stenosis due to tuberculous lymphadenitis [6,7]. This condition exacerbates the difficulty in managing blood pressure, often necessitating invasive interventions such as angioplasty or surgery. PRES, on the other hand, can be precipitated by severe hypertension and is characterized by symptoms such as headache, seizures, visual disturbances, and altered mental status. Imaging studies, particularly magnetic resonance imaging (MRI), reveal characteristic findings of vasogenic oedema predominantly in the parieto-occipital regions of the brain [3].

This case report aims to elucidate the clinical presentation, diagnostic challenges, and therapeutic interventions in an

immunocompetent patient who developed renovascular hypertension and PRES as part of a paradoxical reaction to ATT. The patient's clinical course, marked by the interplay of TB, severe hypertension, and neurological compromise, provides valuable insights into the management of complex cases involving multiple overlapping pathologies. The report underscores the importance of a multidisciplinary approach to mitigate severe complications and improve clinical outcomes.

Clinical Case

A 27-years old Nepalese woman living in Portugal for the past 4 years, was admitted into the emergency department (ER) with complaints of right temporo-occipital pulsatile continuous headache, nausea and vomiting. The symptoms started insidiously in the previous month, with the patient having two previous ER visits in the same time interval. In the previous two visits, nothing abnormal was found in the physical exam, except for grade I-II hypertension, which was assumed as a reaction to pain. Blood work and head CT-Scan was performed in the previous visit, without any abnormal results. The patient had no previous medical history except for Disseminated Tuberculosis (TB) diagnosed three months earlier, with pulmonary, lymphatic and splenic involvement, having taken isoniazid, rifampicin, pyrazinamide and ethambutol for two months, followed by the maintenance scheme with isoniazid and rifampicin, which she was still taking. Review of systems was unremarkable except for high blood pressure of 195/93 mmHg. A blood work and head CT and Veno-CT was performed, having found no abnormalities besides mild hyponatremia (135 mEq/L). Influenza infection was also excluded. A lumbar puncture was performed, with the following results: 166 leukocytes/uL with polymorphonuclear predominance, multiple erythrocytes, 52mg/dL of glucose and 484 mg/dL of proteins - in the context of a traumatic puncture. She was admitted for inpatient treatment, assuming meningoencephalitis of unknown aetiology.

During the hospital stay the patient had persistent high blood pressure values with headache, albeit on 20mg of lisinopril, 10mg of amlodipine and 50 mg of spironolactone daily. The bacteriologic and viral search on the liquor yielded no positive results. A cranial MRI was performed that documented signs of Posterior Reversible Encephalopathy (PRES). The patient was also subjected to a thoraco-abdomino-pelvic CT scan where the following abnormalities were found: multiple adenopathic conglomerates, ranging from 1,3 to 2,6cm with necrotic centre were found in the mediastinum (**Figure 1**), peri-hilar bilaterally, around the abdominal vena cava and aorta and around the right renal artery, leading to external compression (**Figure 2**); multiple splenic abscesses and asymmetric kidneys - with the right kidney having only 7cm of bipolar axis, an abnormal pallor on the nephrogram (**Figure 3**) and almost imperceptible right renal artery with filiform shape. The patient had done a full-body CT scan three months prior when the initial TB diagnosis was made with normal sized kidneys and multiple adenopathies in the above regions but all of them infracentimetric. A follow-up kidney ultrasound with doppler was performed which confirmed the above renal abnormalities. The patient also presented mild to moderate hypokalaemia (minimum 2,9 mEq/L) during her admission, high serum noradrenaline (1128 pg/mL) and active renin (278,7 µUI/mL). The diagnosis of Renovascular Hypertension and hypertension-induced PRES due to a paradoxical reaction to disseminated tuberculosis treatment in an immunocompetent adult was made.

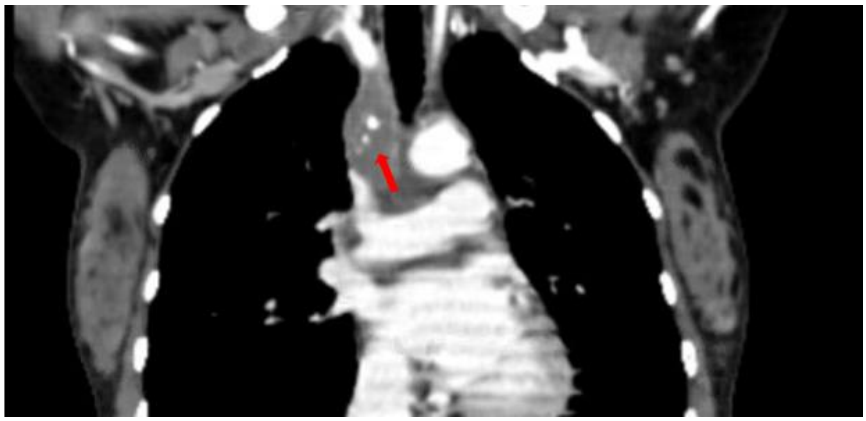

Figure 1: CT-Scan of Thorax, coronal view. Adenopathic conglomerate in the mediastinum, red arrow.

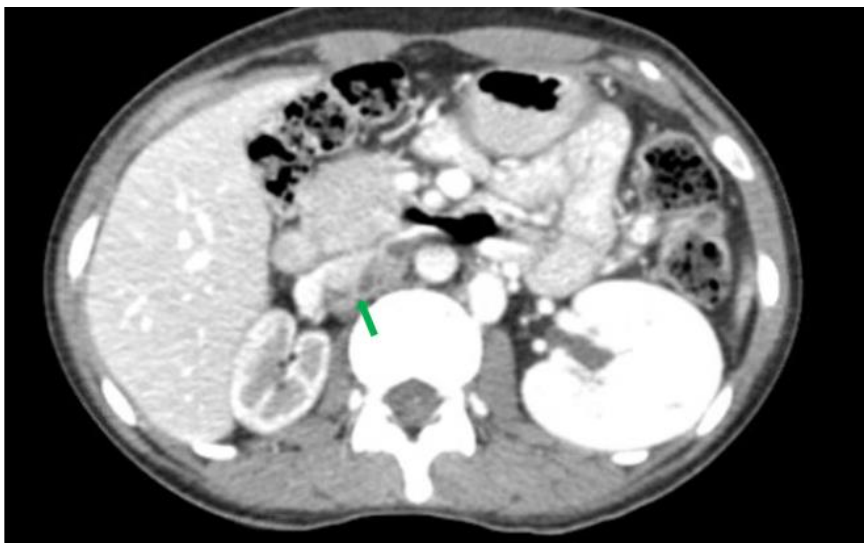

Figure 2: CT-Scan of abdomen, axial view. Adenopathic conglomerates around the abdominal aorta and right renal artery, green arrow.

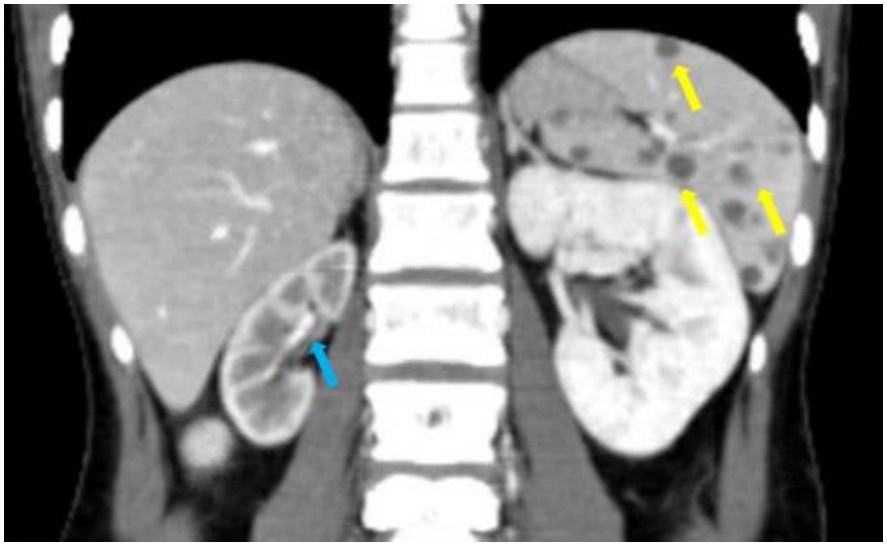

Figure 3: CT-scan of abdomen, axial view. Right kidney (blue arrow), smaller in size and more pallor on nephrogram compared to contralateral kidney; splenic abscesses (yellow arrows).

The patient was started on 60mg/day of oral prednisolone for 7 days with a long weaning period - three months total - and discharged after 18 days, asymptomatic and with normal blood pressure values, with the above anti-hypertensive medication, corticosteroid and isoniazid, rifabutin, pyridoxine as maintenance treatment for TB. The anti-hypertensive medication was slowly and totally weaned off in the following 8 months and the duration of anti-TB treatment was 12 months. A new full-body CT scan was performed 18 months after the hospital stay where some adenomegalies still persisted, in the hepatic hilum and inter-porto-cava topography but with reduced dimensions. There were no signs of TB reactivation and no hypertension recurrence in the following 2-year period.

Discussion

This clinical case details a 27-year-old Nepalese woman living in Portugal who developed renovascular hypertension and posterior reversible encephalopathy syndrome (PRES) due to a paradoxical reaction to disseminated tuberculosis (TB) treatment, despite being immunocompetent. This case underscores the complex interactions between TB treatment, paradoxical reactions, and hypertensive complications.

Renovascular Hypertension

Renovascular hypertension (RVH) is a form of secondary hypertension caused by the narrowing of renal arteries, leading to reduced blood flow to the kidneys and activation of the renin-angiotensin-aldosterone system (RAAS). This patient's CT scan showed multiple necrotic lymph nodes compressing the right renal artery, resulting in renal hypoperfusion and a shrunken right kidney (7 cm in bipolar axis). This compression caused her persistent hypertension, despite the use of multiple antihypertensive drugs [1].

RVH secondary to TB is rare but can occur due to lymphadenopathy-induced external compression of the renal arteries [7]. Elevated serum noradrenaline (1128 pg/mL) and active renin levels (278.7 µUI/mL) in this patient further support the RVH diagnosis, indicating increased RAAS activity due to renal artery stenosis [8]. Management of RVH in TB requires addressing both the underlying infection and the hypertension [7].

Paradoxical Reaction to TB Treatment

The patient was on standard anti-TB therapy with isoniazid, rifampicin, pyrazinamide, and ethambutol for disseminated TB involving the lungs, lymphatic system, and spleen. Paradoxical reactions in TB treatment refer to the clinical or radiological worsening of pre-existing lesions or the appearance of new lesions despite appropriate therapy. This phenomenon is believed to result from an exaggerated immune response to mycobacterial antigens released during effective treatment [4].

Disseminated TB and severe paradoxical reactions are more commonly associated with immunocompromised states which was not the case of our patient. There has been an increasing number of reports in clinical literature of paradoxical reaction in immunocompetent adults, with mostly positive outcomes [5,9].

In this case, the paradoxical reaction manifested as enlargement of necrotic lymph nodes compressing the right renal artery, leading to RVH. This highlights the importance of monitoring for paradoxical reactions during TB treatment, even in immunocompetent individuals.

PRES and Hypertension

PRES is a neurotoxic state characterized by headache, seizures, altered mental status, and visual disturbances, associated with vasogenic oedema primarily in the posterior regions of the brain. The pathogenesis of PRES involves endothelial dysfunction and breakdown of the blood-brain barrier, often triggered by acute hypertension. In this patient, persistent severe hypertension led to the development of PRES, as confirmed by cranial MRI findings[3,10].

Management of PRES involves controlling the underlying cause of hypertension. In this case, addressing the renovascular hypertension through anti-TB treatment and corticosteroids was crucial to treat the cause. The patient's blood pressure eventually normalized, and antihypertensive medication was weaned off over eight months, indicating successful management of both PRES and RVH.

Management and Outcome

High-dose corticosteroids are often used to manage severe paradoxical reactions, as they help to reduce the inflammatory response [9]. Initiating the patient on 60 mg/day of prednisolone, followed by a gradual taper over three months, resulted in symptom resolution and normalization of blood pressure. The successful resolution of symptoms and normalization of blood pressure were achieved through a multidisciplinary approach. The follow-up CT scan at 18 months showed reduced lymphadenopathy, and there was no recurrence of hypertension or TB reactivation over a two-year period, illustrating the effectiveness of the treatment strategy.

Conclusion

This case highlights the complexities and potential complications associated with TB treatment, even in immunocompetent patients. It underscores the importance of recognizing and managing paradoxical reactions and secondary conditions such as renovascular hypertension and PRES. Effective management requires a comprehensive, multidisciplinary approach, including vigilant monitoring, appropriate imaging, and timely intervention to prevent long-term complications.

List of Abbreviations

ATT: Anti-Tuberculous Therapy
CT: Computed Tomography
ER: Emergency Department
MRI: Magnetic Resonance Imaging
PRES: Posterior Reversible Encephalopathy Syndrome
RAAS: Renin-angiotensin-aldosterone System
RVH: Renovascular Hypertension
TB: Tuberculosis

Ethics Approval and Consent to Participate

All the procedures and medical exams that the patient was subjected to diagnose and treat the above condition was consented by the patient.
Consent to report the case and all clinical data in medical journals and scientific meetings was obtained by the patient.
Due to the nature of the article, the approval of the Hospital's Ethical Committee was deemed not applicable.

Data Availability

All the data is available on hospital records and can be obtained by contacting the corresponding author.

Funding Statement

No funding was received.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Authors' contributions

AG, CC, IF, IFMR, SC and RB analysed and interpreted the patient data regarding case presentation and the literature of the case report. AG was a major contributor in writing the manuscript. RNL was the major contributor in reviewing the medical accuracy and literature relevance of the manuscript. All authors read and approved the final manuscript.

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