



CASE PRESENTATION

Arterial embolization prior to nephrectomy in Wunderlich syndrome: a case report

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ABSTRACT

Introduction: wunderlich syndrome, or spontaneous renal hemorrhage, is an uncommon entity that usually presents as an urgent situation.

Objective: to present a case highlighting the importance of imaging techniques in achieving timely diagnosis and minimally invasive therapeutic management to control complications, particularly hypovolemic shock.

Case report: a 28-year-old female with no reported comorbidities, maternal pathological history of sudden death due to acute abdominal pain 15 years ago, suspected retroperitoneal hematoma. She presented with a clinical picture of approximately three months' evolution consisting of intermittent hematuria and right lumbar pain. Later, she developed exacerbation of symptoms associated with nausea and vomiting. Physical examination revealed cutaneous-mucosal pallor, globular abdomen, tenderness on superficial palpation in the epigastrium and right iliac fossa, with a palpable mass extending from the epigastrium to the right flank. Imaging studies reported retroperitoneal hematoma; urgent selective arterial embolization was performed, achieving consequent hemodynamic stability. Right nephrectomy was decided due to the presence of a renal tumor.

Conclusion: wunderlich syndrome is a rare entity that represents a diagnostic challenge. Treatment depends on the patient's hemodynamic condition. Selective arterial embolization appears as a safe and effective way to address the emergency prior to definitive nephrectomy.

Keywords: Aged; Medication Adherence; Treatment Adherence and Compliance; Hypertension.

INTRODUCTION

Wunderlich syndrome (WS) was first described by Carl Reinhold August Wunderlich in 1856. It is an uncommon, potentially fatal condition of spontaneous onset, characterized by renal hemorrhage that extends from the subcapsular space into the perirenal compartments.⁽¹⁾ It may present with Lenk's classic triad: acute flank or abdominal pain, a palpable mass, and fulminant hypovolemic shock.^(2,3) Etiologies are diverse, including idiopathic causes, vascular diseases, infections, coagulation disorders, and renal tumors.⁽⁴⁾ Among these, renal tumors are the most frequent cause of spontaneous renal hemorrhage in most case series, with angiomyolipoma being the most common.^(5,6,7,8,9)

Contrast-enhanced computed tomography angiography (CTA) is the optimal imaging modality for diagnosing WS and is considered the gold standard. It should always be performed when WS or retroperitoneal hemorrhage is suspected, as it provides precise information on etiology and accurately identifies retroperitoneal masses or bleeding, with a sensitivity ranging from 92 % to 100 %.^(10,11,12,13)

When spontaneous renal hemorrhage is diagnosed, treatment choice depends on the patient's clinical status, laboratory findings, degree of renal rupture, and retroperitoneal mass size. Many authors argue that WS can be managed conservatively if the hemorrhage is self-limited and the patient responds to fluid resuscitation.⁽¹⁴⁾ Conservative management is acceptable in hemodynamically stable patients, unless malignancy is confirmed. In unstable patients, surgery—typically nephrectomy—is the first option, though it carries high morbidity due to loss of renal function and hemodialysis-related complications. Therefore, nephron-sparing approaches—via open or minimally invasive surgery—are encouraged.

Transcatheter arterial embolization (TAE) is currently the treatment of choice, as it can avoid emergency surgery and has prophylactic effects against future intraparenchymal hemorrhage. TAE for WS with hypovolemic shock secondary to spontaneous rupture is particularly challenging due to the urgency of the condition. Embolic agents commonly used include gelatin sponge particles (GSP), polyvinyl alcohol (PVA), microparticles, microspheres, microcoils, and liquid agents (absolute alcohol, ethiodol, ethylene vinyl alcohol copolymer, etc.).^(3, 15,16,17,18)

Given the severity of presentation and the critical need for prompt, appropriate management, this case is presented to emphasize the role of imaging in achieving timely diagnosis and enabling minimally invasive therapeutic intervention—particularly for controlling hypovolemic shock.

CASE REPORT

A 28-year-old woman with no known comorbidities and a maternal history of sudden death 15 years earlier due to acute abdominal pain (suspected retroperitoneal hematoma) presented with a 3-month history of intermittent hematuria and mild-to-moderate right lumbar pain that improved with rest. Her condition later worsened, with nausea and vomiting.

She was initially evaluated at her provincial hospital. Physical examination revealed mucocutaneous pallor, asthenia, a distended abdomen, superficial tenderness in the epigastrium and right iliac fossa, and a palpable mass extending from the epigastrium to the right flank. Abdominal ultrasound identified a complex retroperitoneal abdominal mass, prompting referral to the Oncology Service at "Hermanos Ameijeiras" Clinical and Surgical Hospital. On admission, physical findings were confirmed. The patient was afebrile, with blood pressure of 100/60 mmHg and heart rate of 110 bpm. Laboratory results showed:

- Total leukocytes: 7,900
- Polymorphonuclear cells: 76,6 %
- Lymphocytes: 17,2 %
- Hemoglobin: 6,7 g/dL
- Hematocrit: 22 %
- Platelets: 411,000
- Creatinine: 41,3 μ mol/L
- AST: 82,6 U/L
- ALT: 56,5 U/L
- Alkaline phosphatase: 216 U/L
- Total proteins: 66,0 g/L
- Albumin: 34 g/L
- Glucose: 4,15 mmol/L
- Coagulation profile: normal

Non-contrast CT of the chest, abdomen, and pelvis revealed:

- Significant right pleural effusion with basal atelectasis
- A heterogeneous right renal expansive process with areas of higher density suggestive of blood
- Foci of renal capsule rupture projecting into the upper half of the right kidney (13×12 cm transversely, 14 cm longitudinally)
- Thickened lower renal pole parenchyma
- Mass effect on adjacent structures
- A 12-mm lithiasis in the left kidney's lower caliceal group (density 470 HU)
- No other abdominal organ abnormalities or secondary bone lesions

The lesion characteristics were consistent with an intraparenchymal renal hematoma (Fig. 1 and 2).



Fig. 1 Right renal expansive process with internal hemorrhagic foci.

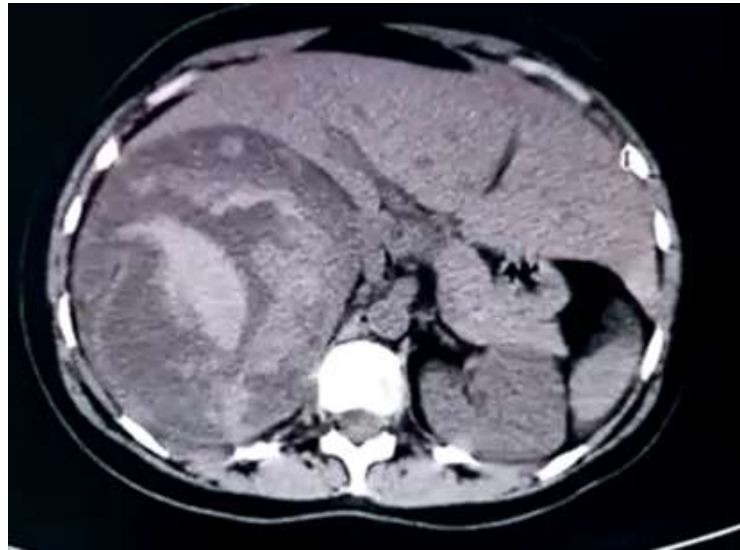


Fig. 2 Mass effect on adjacent structures.

Urology consultation was requested. The patient was in compensated hypovolemic shock: BP 100/70 mmHg, HR 120 bpm, respiratory rate 25 breaths/min, temperature 35°C. Based on clinical, laboratory, and imaging findings, a bleeding renal tumor causing Wunderlich syndrome was suspected.

Given the patient's hemodynamic instability, large retroperitoneal hematoma, and active bleeding, immediate nephrectomy was deemed too high-risk. Instead, contrast-enhanced CT angiography followed by selective embolization of the right renal artery was performed. Transcatheter arterial embolization was carried out (Fig. 3 and 4).

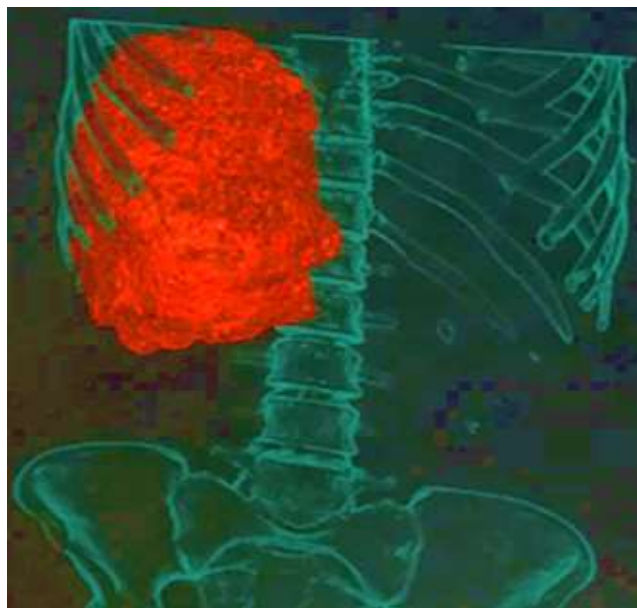
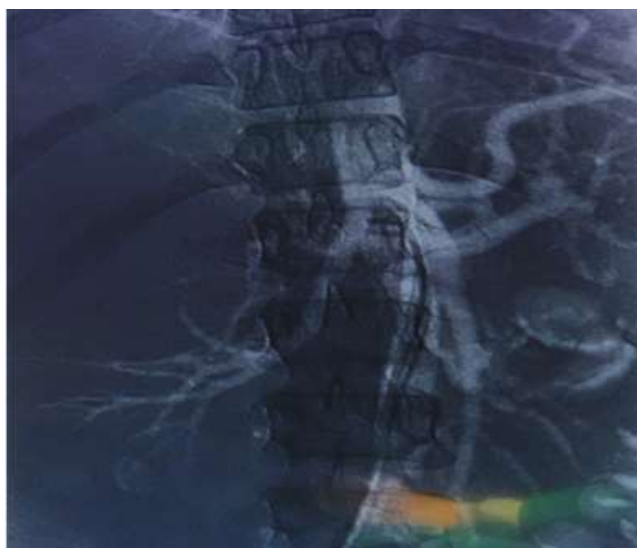


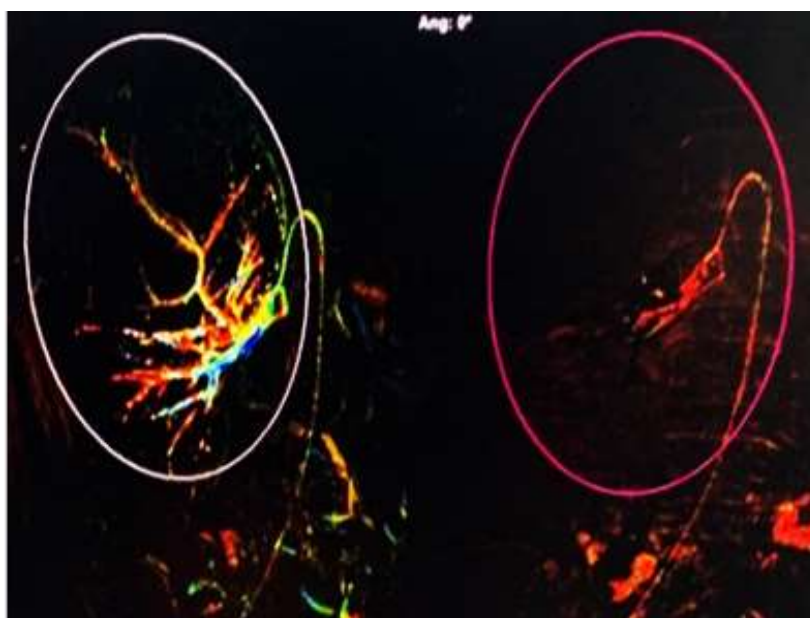
Fig. 3 3D reconstruction of the large hematoma secondary to renal tumor rupture.



Note: Right renal hilum displaced caudally due to the large hematoma from intraparenchymal renal hemorrhage.

Fig. 4 Digital subtraction angiography.

Post-procedure, the patient was transferred to the intensive care unit (ICU) for monitoring and hemodynamic stabilization in preparation for definitive right nephrectomy with retroperitoneal hematoma evacuation. This surgery was performed 72 hours after embolization, per interventional radiology recommendations regarding the necessary interval between procedures. The nephrectomy and hematoma evacuation were completed without complications (Fig. 5 and 6).



Note: Renal vascularizations before and after right renal artery embolization.

Fig. 5 2D tissue perfusion study.



Fig. 6 Surgical specimen: right kidney.

The patient remained in the ICU for 2 additional days. Given her clinical and laboratory improvement, she was transferred to the Urology ward and discharged 3 days later. At the 14-day postoperative follow-up, she was in good general condition with mild right hypochondrial and flank pain. Follow-up chest X-ray and ultrasound showed no abnormalities, and outpatient monitoring was continued.

Histopathology results

Right total nephrectomy specimen measured 17.5×10×5 cm. Chromophobe renal cell carcinoma was identified in the upper and mid-pole, with a tumor bulk of 12.5×10×10 cm. Approximately 90 % necrosis was observed, secondary to therapeutic embolization. No lymphovascular invasion was present. No extension to perirenal tissue; hilar and radial surgical margins were tumor-free. Perirenal fat showed necrosis, hemorrhage, and chronic inflammatory and fibrotic reaction. Staging: pT3 NX MX; immunohistochemistry: RCC+, AMACR-, CK7+, CK20-, CD117+, CD10-, HMB45-, CD65-.

DISCUSSION

Wunderlich syndrome is a low-incidence condition that, as in this case, predominantly affects women. The most common etiologies are renal tumors—specifically renal angiomyolipoma and renal cell carcinoma—which together account for nearly 70 % of cases. Other known causes include vasculitides (e.g., systemic lupus erythematosus, polyarteritis nodosa), renal abscesses, cysts, hydronephrosis, coagulation disorders, hematologic dyscrasias, and abdominal aortic aneurysms.⁽¹³⁾

The classic clinical presentation includes insidious-onset flank or abdominal pain, a palpable mass, and signs of internal hemorrhage (Lenk's triad), though this triad is not always present. Additional symptoms may include nausea, vomiting, hematuria, anemia, hemodynamic instability, and hypovolemic shock—making WS potentially life-threatening. Tumor size (>4 cm) is the main bleeding risk factor, as it increases blood flow, leading to vessel dilation, pseudoaneurysm formation, and higher rupture risk.^(17,19)

Initial imaging typically begins with abdominal ultrasound, but contrast-enhanced abdominal CT has a sensitivity of 100 %, ⁽²⁰⁾ and was crucial in this case for assessing clinical severity. Arterial angiography is necessary to identify the bleeding vessel and perform renal artery occlusion, thereby controlling hemorrhage. Embolization plays an extremely important therapeutic role; it is widely cited in the literature for its effectiveness in reversing hypovolemic shock and as a definitive, nephron-sparing treatment that preserves long-term renal function when conservative management is sufficient. ^(1,3,14,21)

Initial management of this condition depends on the patient's hemodynamic stability; therefore, initial measures must focus on maintaining stability. ⁽¹⁵⁾ In cases where the patient presents refractory hemodynamic instability despite medical treatment, selective arterial embolization of the active bleeding site—if locatable—is required, or else emergency surgery must be performed. Definitive treatment depends on the underlying cause and includes the following therapeutic options: expectant management, endovascular management via embolization of the bleeding vessel, nephron-sparing surgery, and radical nephrectomy. There are no guidelines that recommend one treatment over another; rather, the choice must be individualized based on the specific characteristics of each case. ^(3,20,22-25)

CONCLUSION

Wunderlich syndrome is a rare entity that poses a diagnostic challenge. Treatment depends on the patient's hemodynamic status. Selective arterial embolization is a safe and effective approach for managing the acute emergency prior to definitive nephrectomy.

Conflicts of interest

The authors report no conflicts of interest.

Author contributions

IGM: Conceptualization, Formal analysis, Investigation, Project administration, Resources, Supervision, Validation.

JJSM: Conceptualization, Investigation, Methodology, Writing – review and editing.

BLTC: Data curation, Validation, Visualization, Writing – original draft.

AGG: Data curation, Formal analysis, Supervision, Writing – original draft, Writing – review and editing.

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