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Ischemic Stroke Caused by Secondary Polycythemia and Incidentally-Found Renal Cell Carcinoma: A Case Report

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest: None declared

Patient: Male, 51
Final Diagnosis: Renal cell carcinoma
Symptoms: Facial droop • headache • slurred speech • weakness
Medication: —
Clinical Procedure: —
Specialty: Hematology

Objective: Unusual clinical course

Background: Secondary polycythemia is a potential complication of an erythropoietin-secreting renal cell carcinoma. Increased red blood cell mass can elevate blood viscosity, which can impair blood flow, making individuals susceptible to vaso-occlusive events. One of the serious potential complications of a hyper-viscous state is ischemic stroke.

Case Report: We present the case of a patient who was brought to the Emergency Department with right-sided extremity weakness and slurred speech consistent with acute ischemic stroke. MRI showed acute infarct involving the left corona radiata and posterior limb of the left internal capsule. On admission, he was found to have increased hemoglobin and hematocrit. An ultrasound of his abdomen found a heterogeneous mass of the right kidney, which was confirmed with CT scan. The patient remained in the hospital for 6 days. His hospital course was complicated by the incidental findings of polycythemia and a renal mass consistent with renal cell carcinoma. His hemoglobin and hematocrit remained elevated throughout his hospital course, and his erythropoietin level was found to be elevated as well.

Conclusions: High blood viscosity is associated with increased incidence of cardiovascular complications, including reduced cerebral blood flow. This case report suggests that polycythemia secondary to an erythropoietin-secreting renal cell carcinoma can lead to ischemic stroke. After surgery to remove the carcinoma, the secondary polycythemia may resolve.

MeSH Keywords: Carcinoma, Renal Cell • Erythropoietin • Polycythemia • Stroke

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/909322

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Background

Polycythemia vera and secondary polycythemia have been implicated in focal cerebral ischemia [1,2]. Although secondary polycythemia is usually caused by adaptation to chronic obstructive pulmonary disease, high altitude, or erythropoiesis-stimulating agents, it is a potential paraneoplastic complication of renal cell carcinoma (RCC) [3]. One to five percent of human RCCs have erythropoietin (Epo)-producing cells. Epo-induced erythrocytosis increases whole-blood viscosity and decreases cerebral blood flow [4,5].

Case Report

Case presentation

A 51-year-old man with no past medical history presented to the Emergency Department for sudden onset of right-sided body weakness together with slurred speech. He also reported a brief headache, for which he took an Excedrin tablet (250 mg aspirin, 250 mg acetaminophen, 65 mg of caffeine). The patient was not prescribed any medications and he did not take any medications regularly. He denied any chest pain, shortness of breath, palpitations, recent illness, fevers, chills, cough, or neck pain. He was an ex-smoker, having quit 11 years ago, with a 20 pack-year history.

Physical exam findings

On arrival, his heart rate was 69, blood pressure was 127/74, respiratory rate was 16, and oxygen saturation was 97% on 2 liters oxygen via nasal cannula. His NIH stroke score was 12. A right facial droop was appreciated. Motor strength was 0/5 in right upper extremity, 2/5 in right lower extremity, and 5/5 in left upper and lower extremities. Sensation was intact in all extremities.

Diagnostic studies

All electrolytes and lipids were within reference ranges. His total cholesterol was 167 mg/dl. His red blood cells were 7.08 m/cumm (normal range: 4.00–5.70 m/cumm), hemoglobin was 20.4 g/dl (normal range: 13.5–17.0 g/dl), and hematocrit was 62.0% (normal range: 37.0–50.0%).

CT scan of the head without contrast and intracranial CT angiogram were normal. Brain MRI without contrast (Figure 1) showed an acute infarct involving the left corona radiata, the posterior limb of the internal capsule, and the posterior left putamen. A hematology consult suggested a urinalysis be performed, and if positive, an abdominal ultrasound should be done to evaluate evidence of a renal mass, which can be associated with secondary polycythemia. Urinalysis showed 1+ blood and 3–9 red blood cells. Abdominal ultrasound done on hospital day 1 showed a 5.1-cm heterogeneous solid mass in the lower pole of the right kidney, suspicious for neoplasm. A CT scan of the abdomen (Figure 2) was performed on hospital day 4, showing an enhancing mass measuring 5.7×4.3×5.5 cm, consistent with RCC. An echocardiogram performed on hospital day 4 showed left ventricular hypertrophy. Numerous laboratory studies were ordered to evaluate the polycythemia and hypercoagulability. JAK2 PCR, hemoglobin electrophoresis, prothrombin gene mutation, antiphospholipid antibody, factor V Leiden, BCR ABL, antithrombin III, and ACL IgM, and ACL IgG tests all were negative, undetectable, or within normal limits. Epo level was 20.9 mIU/ml (normal range: 2.6–18.5 mIU/ml).

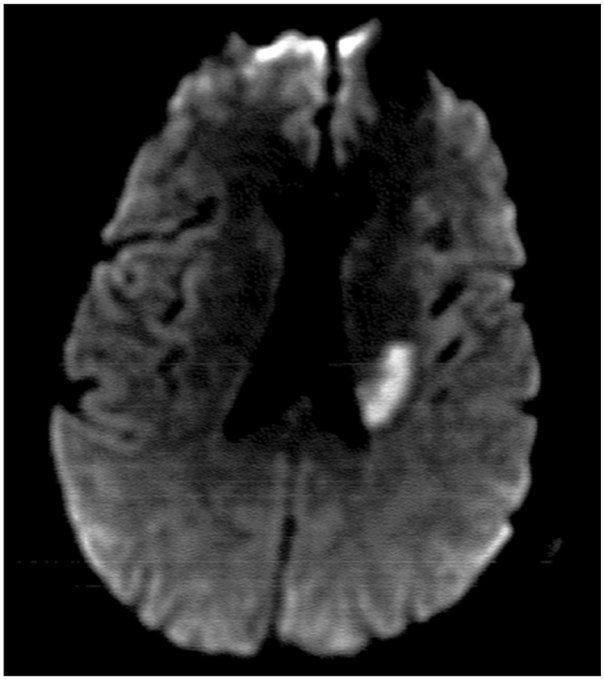

Figure 1. MRI brain without contrast. This image was acquired with a 1.5-tesla MRI without the use of gadolinium contrast. There is a curvilinear focus of restricted diffusion and signal abnormality that involves the left corona radiata, the posterior limb of the left internal capsule, and the posterior left putamen. The findings are consistent with an acute/subacute infarction.

Therapeutic intervention

Upon admission, the patient received tissue plasminogen activator (tPA) for the treatment of the acute ischemic cerebrovascular accident, as recommended by the neurology consult. Physical therapy and occupational therapy worked with the patient each day of his hospital admission. Assessment of speech and swallowing abilities cleared him for a regular diet. Neurology recommended the patient begin 81 mg aspirin

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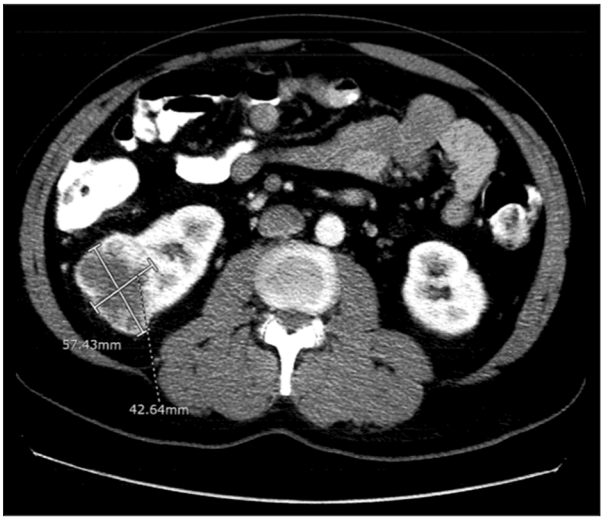

Figure 2. CT abdomen with contrast. Helical CT images of the abdomen and pelvis were obtained with axial reconstructions at 5 mm and coronal and sagittal reconstructions at 3 mm, after the intravenous administration of 100 mL nonionic Omnipaque 350 and oral dilute Gastrografin contrast. There is an enhancing mass arising from the lower pole of the right kidney measuring 5.7×4.3×5.5 cm with peripheral enhancement and central low density, which may be secondary to necrosis. The finding is consistent with renal cell carcinoma.

daily, starting 24 hours status post tPA, and atorvastatin 80 mg daily. Hematology recommended therapeutic phlebotomy for treatment of the secondary polycythemia.

Follow-up and outcomes

Upon discharge from the hospital, the patient's NIH stroke score was reduced from 12 to 8. He went to an acute rehabilitation program, where his estimated length of stay was 2 weeks. Physical therapy and occupational therapy were ordered for 1 hour, 5 days/week, and speech therapy for half an hour, 5 days/week. The goals of his rehabilitation included balance, gait training, activities of daily living (ADL) training, and oral motor and speech services. Urology recommended that upon discharge from a rehabilitation facility, the patient should follow up within 1 month for the renal mass, for which he would likely need a right partial or radical nephrectomy.

Discussion

One to five percent of RCCs are associated with polycythemia [3]. To the best of our knowledge, there have been no reports on the occurrence of ischemic stroke due to secondary polycythemia from an Epo-secreting RCC. One large retrospective analysis of outcomes of patients with RCC and paraneoplastic syndromes, including polycythemia, found that patients who had incidentally-found tumors had better outcomes than those presenting with paraneoplastic syndromes or sequelae (such as stroke, in this case) [6]. Although it is well-established that cancer can contribute to hypercoagulable states, acute events are not often directly correlated with elevated Epo [7]. There have been reports on transient ischemic attacks due to paraneoplastic erythrocytosis, and ischemic stroke due to secondary polycythemia of other etiologies [2,8–10]. Polycythemia vera, a myeloproliferative disease resulting in an elevated absolute red blood cell mass in the absence of elevated Epo, has been shown to present with acute embolic cerebral ischemia [11].

Conclusions

Erythropoiesis due to an Epo-secreting neoplasm can significantly increase the viscosity of blood, increasing the risk of vaso-occlusive events. Ischemic stroke in a previously healthy individual with minimal risk factors should raise suspicion for polycythemias, prompting further hematologic workup. Like many of the paraneoplastic syndromes associated with RCC, the hope would be that once the patient has a nephrectomy, his secondary polycythemia will resolve, reducing the need for treatment of the secondary polycythemia itself.

Acknowledgements

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