**CASE REPORT**

### Acute Pulmonary Thromboembolism in a Patient with Nutcracker Syndrome and Antiphospholipid Syndrome

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**Summary**

Nutcracker syndrome (NCS), which is defined as compression of the left renal vein between the aorta and the superior mesenteric artery, is usually benign and self-limiting. Long-term renal venous retention increases the risk of renal vein thrombosis. However, NCS rarely develops into isolated thrombosis of the left renal vein; the reason for this process remains unknown. We describe a young man with antiphospholipid syndrome, who developed overt pulmonary thromboembolism due to an isolated thrombus in the left renal vein. Complicating antiphospholipid syndrome might trigger acute pulmonary thromboembolism (APTE) in patients with NCS. To the best of our knowledge, this is the first report of APTE arising due to isolated left renal vein thrombosis in patients with NCS.

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**Key words:** Compression of the left renal vein, Renal vein thrombosis, Systemic lupus erythematosus

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**Nutcracker syndrome (NCS)** is defined as compression of the left renal vein, which usually lies between the superior mesenteric artery and the aorta. If the angle between these two arteries is $<35^\circ$, symptoms, such as hematuria, proteinuria, flank pain, pelvic congestion in females, and varicoceles in males, can arise. Long-term renal venous retention increases the risk of renal vein thrombosis. However, NCS rarely develops into isolated thrombosis of the left renal vein; the reason for this process remains unknown. We describe a patient with NCS, who developed acute pulmonary thromboembolism complicated by antiphospholipid syndrome (APS) and systemic lupus erythematosus (SLE). To the best of our knowledge, this is the first description of acute pulmonary thromboembolism (APTE) and isolated left renal vein thrombus complicating NCS.

**Case Report**

A 23-year-old man presented with a two-month history of Raynaud phenomenon, left wrist and foot joint pain, and proteinuria. A consult with a rheumatologist resulted in his being treated with 5 mg prednisolone to control his symptoms under a diagnosis of SLE. Upon admission, he had pain in the left hand and ankle. Laboratory findings were positive for antinuclear and double-stranded DNA antibodies, and urinalysis showed proteinuria. His vital signs were stable, and electrocardiography (ECG) showed normal sinus rhythm (Figure A); however, hypoxic changes were evident in his fingers and toes (Figure B). Contrast computed tomography (CT) showed left renal vein thrombosis and a minor APTE in the right lower lung field (Figure C), but there was no evidence of thrombus in the right and left heart chambers. Venous ultrasonography and CT venography did not reveal cardiac shunt disease or deep vein thrombosis. The dilute Russell viper venom time (dRVVT) was elevated to 1.95 (normal $<1.3$), indicating lupus anticoagulant. Thus, APS was diagnosed based on clinical features and laboratory findings. He had no other risk factors of VTE and thrombophilia including protein C or S deficiency and malignancy diseases. Intravenous heparin was started for APTE and isolated left renal vein thrombosis, and the dose of prednisolone was increased from 5 to 20 mg to control SLE, as a renal biopsy confirmed active lupus nephritis. Abdominal CT and ultrasonography showed a left renal vein, which was compressed between the aorta and the superior mesenteric artery, as well as left renal vein thrombosis (Figure C and D). Doppler echography revealed increased velocity of turbulent left renal blood flow (Figure E). These findings indicated a final diagnosis of NCS and isolated left renal vein thrombosis complicated with APS.

The patient abruptly developed right chest pain and exertional dyspnea on hospital day 7. Electrocardiography revealed a SIQIITIII profile, deep S in lead I, deep Q in lead III, and inverted T in lead III (SIQIITIII profile), which is an established sign of pulmonary embolism (Figure A). Contrast CT showed exacerbated APTE and the
almost complete absence of the thrombus in the left renal vein (Figure C).

He was stabilized with heparin to maintain a relatively high activated partial thromboplastin time and then switched to warfarin. Thereafter, neither thrombus nor APTE recurred in the left renal vein. He was discharged without complications and has remained free of thrombus and symptoms of NCS for over one year of follow-up.

Discussion

The nutcracker phenomenon results from compression of the left renal vein between the abdominal aorta and the superior mesenteric artery, and it clinically manifests as left flank pain, gross hematuria, and postural proteinuria. The left renal vein usually lies between the superior mesenteric artery and the aorta, and NCS can occur when the angle between these arteries is < 35°. This angle in our patient was 30°. Thus, when patients present with or develop left flank pain and/or hematuria of unknown cause, NCS should be ruled out by measuring the angle in sagittal CT views of the aortomesenteric region. Although NCS can cause venous retention, patients with NCS rarely develop thrombus in the left renal vein or VTE, and when they do, the cause is usually indeterminant. In contrast, compression by the overlying right common iliac artery can often result in thrombosis of the left common iliac vein; this is known as May-Thurner syndrome. An association between APS and thrombotic events arising in arteries and veins in the absence of other risk factors for thrombotic diseases has been established. Therefore, the possibility that APS caused the isolated left renal vein thrombus in our patient independently of NCS cannot be excluded. However, we suggest that APS is a risk factor for APTE due to the development of thrombus in the left renal vein in patients with NCS. To the best of our knowledge, this is the first report of APTE arising due to isolated left renal vein thrombosis complicated with NCS. Additional investigation is necessary to determine risk factors of the development of APTE in patients with NCS.

VTE is caused by triad of endothelial dysfunction, thrombophilia, and venous retention. Thrombophilia including APS and protein C or S deficiency are well-known risk factor for VTE. Although there are no data about NCS with these thrombophilia, the relative risk from a retrospective systematic review shows 3.69 in APS and 10.58 in deficiencies of protein C, protein S, and antithrombin. Therefore, the relative risk is considered to be very high in patients with venous retention such as NCS and thrombophilia such as APS as the present case.
Treatment for NCS is determined by the symptom severity. Conservative therapy can often result in freedom from symptoms.\textsuperscript{11} NCS patients are rarely complicated with VTE; however, when VTE symptoms recur in patients with NCS, surgical or endovascular intervention might be considered as general NCS guidelines.\textsuperscript{8} Surgical procedures include transposition of the left renal vein and renal autotransplantation. The effectiveness of catheter-directed thrombolysis or surgical thrombectomy is unclear. We managed our patient conservatively, because the presence of NCS symptoms before admission was unclear and symptoms did not recur.

In conclusion, we described the favorable outcome of conservatively treating a young adult male with NCS and APS complicated by APTE due to the development of isolated left renal vein thrombosis. When patients present with APTE and isolated thrombus in the left renal vein, the possibility of NCS should be considered, and effort should be directed toward preventing recurrence. It may also be beneficial to screen regularly isolated thrombus in the left renal vein in patients with NCS.

Disclosure

Conflicts of interest: None.

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