CASE REPORT

Superior Vena Cava Syndrome Caused by an Intravascular Thrombosis Due to Underlying Prostate Carcinoma

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Abstract

Superior vena cava (SVC) syndrome is usually caused by malignant tumors or their lymph node metastases pressing a SVC. However, we encountered a case of SVC syndrome that was caused by a thrombus in the SVC, which we considered as a manifestation of Trousseau’s syndrome triggered by underlying prostate cancer. A 60-year-old man patient complained of facial swelling. Physical examinations suggested SVC syndrome; enhanced CT and MRI demonstrated the presence of thrombus in the SVC accompanied by multiple mediastinal and axillary lymph node swelling. Histological examination of both percutaneous transluminally aspirated thrombus via a catheter through jugular vein and the axillary lymph nodes included metastatic prostate cancer. Although the ultrasonic and MR images were not compatible with the prostate cancer, needle biopsies from the prostate established the diagnosis. The SVC syndrome as an initial manifestation of underlying unknown malignancy and also due to intravascular thrombosis caused by cancer metastasis to the vascular wall is extremely uncommon.

Key words: superior vena cava (SVC) syndrome, intravascular thrombus, metastasis to vascular wall, Trousseau’s syndrome, prostate cancer

Introduction

Malignancy is the etiology in approximately 60% of superior vena cava (SVC) syndrome (1, 2). Most of the cases are due to the oppression of SVC by tumor (3), while the pure intravascular thrombosis is extremely uncommon and only 0.04% of hospitalized adults were diagnosed as cancer-related SVC thrombosis (4). This report clarifies the rare case of SVC syndrome by cancer-related thrombosis; the underlying cause was quite difficult to diagnose.

Case Report

A 60-year-old man patient consulted our department complaining of facial swelling, which he noticed eight days previously and it had gradually worsened. Chest X-ray (Fig. 1) showed widening of the upper mediastinum. Enhanced CT (Fig. 2) demonstrated a thrombus-like lesion inside of the SVC which obstructed the SVC accompanied by the engorgement of bilateral innominate vein, and swelling of multiple mediastinal and right axillary lymph nodes. Thrombosis in the SVC is quite rare and we conducted venography and MRI five days after CT scan. Venography demonstrated obstructions of bilateral subclavian veins with superficial collateral venous engorgement (Fig. 3-a). The MRI showed rapid development of the structure to a left innominate vein expressing high intensity on both T1- and T2-weighted images (Fig. 3-b), which was compatible with the subacute phase thrombus. Blood examinations were almost normal (WBC 7,200/mm$^3$, Hb 14.8 g/dL, Plt. 29.3×10$^4$/mm$^3$, AST 28 IU/L, ALT 32 IU/L, ALP 328 IU/L, LDH 145 IU/L, T-bil. 0.4 mg/dL, TP 7.1 g/dL, Alb. 4.2 g/dL, BUN 9.7 mg/dL, Cre. 0.78 mg/dL, UA 5.1 mg/dL, Na 139 mEq/L, K 3.7 mEq/L, Cl 107 mEq/L, Ca 8.7 mg/dL, IP 3.1 mg/dL, glucose 92 mg/dL) including those related to collagen vascular diseases (anti-nuclear antigen <40 fold, rheumatoid factor <3 U/mL), coagulation factors and anti-coagulation activities (PT 82% [80-100], APTT 29.8 sec. [Ref. 30.2 sec.], AT-III activity 80% [75-125], FDP 8.7 μg/mL [<10], Protein C...
82% [70-140], Protein S 72% [60-150]), except for a slightly elevated serum level of prostate-specific antigen (PSA) of 11.623 ng/mL and D-dimer 2.3 μg/mL [<1.0].

Thorough systemic investigation for cancer did not detect any significant lesion including gastrointestinal tract endoscopy, lung and abdominal CT scan, brain MR image, and bone scintigraphy, therefore percutaneous transluminal aspiration of thrombus via a catheter through the jugular vein was carried out in order to rule out angiosarcoma arising from SVC. Axillary lymph node sampling was also conducted. The pathological examination revealed adenocarcinoma cells in both the thrombus and lymph nodes. Further investigation into those specimens via immunohistochemical analyses including PAP (prostatic acid phosphatase) strongly suggested metastases of prostate cancer.

Needle biopsies were obtained from the prostate, although the prostate was not swollen and radiological findings of ultrasonic and MR images did not suggest prostate cancer.

**Figure 1.** Chest X-ray showed a widening of the right upper mediastinum, suggesting engorgement of the SVC.

**Figure 2.** Chest CT demonstrated a mass in the SVC at the level of innominate vein bifurcation (a: white arrow), while the left innominate vein was well enhanced. Many mediastinal lymph nodes were detected, however only the pre-tracheal lymph node was significantly swollen (b: white arrow). Note that this lymph node did not oppress the SVC and SVC was clear at this level (b: white arrowhead). Some axillary lymph nodes were detected (a: white arrowhead).

**Figure 3.** Bilateral venography showed obstruction of blood flow dramatically spreading along bilateral innominate veins and subclavian veins with superficial collateral venous engorgement (a). T2-weighted MR-image demonstrated high intensity mass occupying the left innominate vein (b: white arrow), suggesting the fast development of the thrombosis.
However, biopsy findings demonstrated prostate cancer (Adenocarcinoma, Gleason Score 8) as the final diagnosis and clinical stage was cT2cN0M1a. He received Maximal Androgen Blockade (MAB) therapy (Leuprolide and Bicalutamide) and warfarin to maintain PT-INR between 2.0 and 2.5, which reduced the size of intra-SVC thrombus, mediastinal lymph nodes and serum PSA level down to 1.249 ng/mL within three months. He is still alive 3 years after the introduction of hormonal therapy.

Discussion

The SVC syndrome is frequently caused by malignancy (1). It is induced by mechanical oppression of SVC by adjacent masses (either malignant or benign) in most cases. However, SVC syndrome caused by an intravascular venous thrombosis alone is extremely rare since the velocity of blood flow in the SVC is too fast to permit its development (1-5). Since intravascular thrombosis caused by collagen vascular diseases or coagulation disabilities rarely occurs in the SVC (1, 2, 4), thrombosis in the SVC should be fully investigated, including underlying malignancies.

Cancer-related thrombosis is well known as Trousseau’s syndrome, featuring recurrent thrombosis and occurrence in unusual areas such as jugular veins and SVC (3, 5). One report clearly demonstrated the scarcity value of the cancer-related thrombosis occurring in only 0.04% of hospitalized adults (4). Considering that this occurs in outpatient far less than hospitalized patients, the present case is quite rare and unique.

Reported varieties of underlying malignancies in patients with Trousseau’s syndrome include pancreatic cancers (32.5%), lung cancers (23.6%), gastrointestinal cancers (17.1%), and others (26.8%) (5). Therefore, in the case of Trousseau’s syndrome, numerous tests are required. Considering its convenience, positron emission tomography (PET) (6) could be useful.

There were three previous reports of prostate cancer leading to SVC syndrome (7-9). In these cases, the SVC syndrome was caused by metastatic prostate carcinoma localized to the chest. In the present case, the SVC syndrome was caused by an intra-SVC thrombosis which resulted from the undetected prostate cancer. As the thorough examination was not indicative, the histology of percutaneous transluminally aspirated thrombus and swelling axillary lymph nodes became the key to the accurate diagnosis of the prostate cancer, leading to an appropriate therapy. The major pathway of metastasis to the SVC vessel endothelium could have originated from lymphatic metastasis, considering the predominance of multiple lymph nodes metastasis, and drainage through the thoracic duct leading to left innominate vein via left jugulosubclavicular angle. And the attachment to the vessel endothelium might have triggered thrombus formation, since only a few malignant cells were observed in the thrombus predominant specimen.

The present case is quite rare in that the coagulopathy was the only symptom of the prostate cancer which was difficult to detect by ultrasonic and MR images. This indicates the importance of histological examination in surveying the underlying malignancies.

The mechanisms of the Trousseau’s syndrome are reported to be: 1) tumor cell interaction with the vascular endothelium followed by platelet aggregation, 2) hypercoagulability by the tumor-producing tissue factor, 3) platelet activation, and 4) consumption of antithrombin III and thrombomodulin (3, 5). In the present case, endothelial injury by the adhesion of cancer cells might have occurred considering the existence of malignant cells in the intra-SVC thrombus and the regression of the thrombus by hormonal and anti-coagulation therapy.

Conclusion

We encountered an extremely rare case of SVC syndrome caused by a thrombus in the SVC which we considered a manifestation of Trousseau’s syndrome triggered by underlying prostate cancer. SVC thrombosis is quite exceptional due to its high velocity blood flow and requires thorough investigation of underlying malignancies.

References