Endovascular Repair of SVC Occlusion Caused by Mediastinal Tumor (Recurrent Thymoma)

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Abstract: Purpose: Superior vena cava syndrome (SVCS) is the clinical manifestation of superior vena cava (SVC) obstruction or stenosis. Although thymoma is a common cause of SVCS, there are very few reports in the medical literature. Endovascular treatment has emerged as a palliative approach for these patients. We present such a case, caused by invasive thymoma, which was successfully treated by stenting of the SVC.

Case Report: A 73-year-old male diagnosed with invasive thymoma, presented with typical signs and symptoms of SVCS. MRI venography showed bilateral occlusion of innominate veins and of the SVC. He was treated by endovascular means with stenting of the left innominate vein resulting in restoration of blood flow and immediate symptom relief.

Conclusion: Immediate and early results after endovascular treatment of SVC syndrome (angioplasty with stenting) are excellent. Considering the severity of the symptoms, the above option is fully recommended for palliative therapy of these patients.

Keywords: Thymoma, Superior Vena Cava Syndrome, Percutaneous transluminal angioplasty.

1. INTRODUCTION

Superior vena cava (SVC) syndrome is a common clinical manifestation of benign and malignant tumors of upper mediastinum. These tumors can cause obstruction of the SVC [1]. Thymoma is the most common tumor of the anterior-superior mediastinum [2], that can cause SVC syndrome by extrinsic compression or less common by invasion. Endovascular treatment is an accepted option for palliative treatment of these cases [3,4].

2. CASE REPORT

A 73-year-old man, diagnosed with invasive thymoma, was admitted to our department with a three days history of oedema and cyanosis of his face and upper extremities, hemoptysis and severe headache. He had three operations for resection of the tumor followed by repeated chemotherapy and radiotherapy sessions. Two years post his last surgical procedure, he was diagnosed with recurrence of the tumor and was treated with chemotherapy only as he had exceeded the recommended maximum radiation dose. One year later, his disease was generalized, with lung metastases.

He was an ex-smoker. Otherwise, his overall condition was good. Clinical examination revealed dilated neck veins and marked oedema in the upper trunk and extremities. No superficial lymphadenopathy was found. On lung auscultation diffuse crackles could be heard. The cardiac examination was normal; there were regular heart sounds with no arrhythmia and no extra sounds or murmurs. His abdomen was nontender, with no distention, ascites or organomegaly. His neurological assessment showed neither cranial nerve dysfunction nor focal symptoms. There was prominent cyanosis and oedema in his upper extremities. The patient never complained about dyspnea. On admission, his blood pressure was 100/70 mmHg, pulse rate 90/min, O2 saturation 91% and he was afebrile. Admission blood results showed a hemoglobin (Hb) value of 11.7 g/dL, the white-cell count was 4140, (77.4% neutrophils). Liver and renal function markers were all within normal limits. He was clinically diagnosed as having SVCS.

His chest X-Ray revealed enlargement of the superior mediastinum, pleural effusion and diffuse opacities (Figure 1). A contrast enhanced MRI was performed which showed occlusion of the left and right innominate veins and SVC with multiple collaterals (Figure 2). The patient was informed about treatment options and percutaneous stenting of the SVC was decided in order to restore SVC patency and alleviate the patient’s symptoms.

Intraluminal access was obtained through a 7-F guiding catheter after preparation of the left cephalic vein under local anesthesia. Access could not be obtained from a more distal point of the upper extremity.
due to profound oedema. A venogram was performed, which demonstrated complete blockage of the left innominate vein and presence of multiple collaterals (Figure 3a). Crossing of the obstruction with a guide-wire was laborious and an angiography catheter (Headhunter) was advanced over it. A new venogram was performed to confirm catheter’s right position (Figure 3b). Two overlapping self-expandable stents (14- x 60-mm and 14- x 40-mm, Protegé™, EV3, UK) were deployed in the SVC and dilated up to 14-16 atm (Figure 3c).

A subsequent venogram revealed residual stenosis of the SVC. A balloon-expandable stent graft 12- x 40-mm (Advanta™, Atrium.UK) was deployed at 16-18 atm pressure and the residual stenosis was significantly reduced (Figure 3d). Postoperatively, the patient re-

Figure 1: Chest X-Ray showing enlargement of the superior mediastinum, pleural effusion and diffuse opacities.

Figure 2: (A) Massive thrombosis in the left and right brachiocephalic vein, extending into superior vena cava, is observed in the MRI of thorax, (B) Schematic presentation of the tumor, compressing left and right brachiocephalic vein and superior vena cava.
covered uneventfully and showed a dramatic and prompt relief of his symptoms (cyanosis) (Figure 4). He was discharged two days after the procedure on dual-antiplatelet therapy and booked for chemotherapy. His 30-day follow-up showed no complications or recurrence of SVCS symptoms.

3. DISCUSSION

Thymomas are relatively rare, comprising 10-20% of all primary mediastinal tumors. Around 30-40% of thymomas are malignant. Prognosis is dependent upon the stage of the tumor at the time of diagnosis, and upon the histological cell type. In a series of 200 patients reported by Verley et al. [5], 5- and 10-year survival rates were 85% and 80%, respectively. These fell to 50% and 35%, respectively, for invasive disease. The best prognosis is achieved by radical resection, with adjuvant radiotherapy.

The SVC syndrome is the result of several different causes, the most common being malignant tumors. Thymoma is believed to be responsible for less than 1% of the cases. The most common symptoms include facial, neck and bilateral upper extremity oedema, dyspnea, headache, and cough [1]. SVCS is often diagnosed clinically, as patients usually present with signs and symptoms related to venous congestion. That was the case with our patient, although he never developed dyspnea. Chest X-Ray, contrast-enhanced

![Figure 3: Stent deployment in the superior vena cava (SVC) (A) Initial venogram obtained with the catheter tip placed in the left innominate vein, showing SVC occlusion, retrograde filling of the left innominate vein and collateral circulation. (B) Venogram after crossing of the SVC lesion (C) Venogram with residual stenosis and after deployment of 2 overlapping self-expandable stents (D) Final venogram with reduced residual stenosis and increased return of venous blood to the SVC after deployment of a balloon expandable stent. Pulmonary artery filling can be seen (arrowhead).](image)

![Figure 4: Prompt relief of symptoms after successful treatment (A) before (B) after.](image)
computed tomography and magnetic resonance imaging can be useful, especially when detailed technical information is required to determine surgical treatment option [6,7].

Transluminal angioplasty and stenting has been used in the treatment of SVCS for the last 15 years. In our case, crossing of the occlusion was difficult due to the invasion of SVC by the tumor. We had to adopt the “step by step technique”, using a selective catheter and a hydrophilic guidewire to traverse the lesion, finally with success. Technical success is approximately 90% and >90% of patients have relief of the symptoms in the first 48 hours [8-10]. High success rates followed by nearly complete and immediate relief of symptoms, made endovascular treatment a safe, consistent, and cost effective treatment for patients with SVCS. In cases where the underline condition is a malignant tumor, endovascular treatment with stenting has become the primary choice of treatment [3,4,11].

Patient attended his annual postoperative follow up, where clinical assessment and imaging (CT Angiogram) showed that the stent remained patent and there was no recurrence of his symptoms. The recurrence rate is about 10% but a high proportion of these patients can be treated with endovascular re-intervention [12].

Our patient recovered uneventfully without any complications. Periprocedural complications rates of endovascular management of SVCS are low, occurring in 6% of the patients while mortality rate is around 3% [8,13-15]. The most common complication is in-stent stenosis and thrombosis, which can be successfully treated with thrombolysis and re-stenting [16]. Some researchers suggest the use of covered stents to avoid the tumor ingrowth through the mesh of the stent [17]. Other severe complications such as stent fracture or migration and SVC rupture with pericardial tamponade have also been reported in earlier studies. Fortunately, these mechanical complications are uncommon, and in more recent series no perioperative deaths have been reported [8,18].

4. CONCLUSION

In conclusion, stenting has become widely accepted in the management of malignant obstruction of SVC and innominate vein. Immediate and early results are excellent and provide dramatic immediate relief of the symptoms. It might be considered as the first line treatment in patients with SVCS and poor prognosis due to malignant disease.

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