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CASE REPORT

Simultaneous lateral and subxiphoid access methods for safe and accurate resection of a superior vena cava aneurysm: A case report

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Abstract

BACKGROUND

Superior vena cava (SVC) aneurysms are a relatively uncommon disease that has not been widely reported. The conventional surgical approach for treating SVC aneurysms includes open thoracotomy and mid-sternotomy. However, in this case, the aneurysm could be safely resected by thoracoscopic simultaneous lateral and subxiphoid access methods.

CASE SUMMARY

A 58-year-old male presented with intermittent chest pain and persistent discomfort in the chest area. A chest computed tomography scan revealed a 6.2 cm aneurysm in the left innominate vein and SVC junction. For surgical resection, simultaneous lateral and subxiphoid access were planned to achieve optimal proximal and distal aneurysm control. The approach site was 1 cm below the xiphoid process, the fifth mid-axillary line and the seventh anterior axillary line on the right side. The aneurysm was resected using a stapler. The patient was discharged on the third day after chest tube removal on the second postoperative day with no particular issues.

CONCLUSION

Aneurysms located within the mediastinum can be accessed through thoracoscopic approach without open surgery and safely resected using vascular staples.

Key Words: Aneurysm; Cardiopulmonary bypass; Superior vena cava; Minimal invasive surgery; Video assisted thoracic surgery; Case report

Core Tip: Superior vena cava (SVC) aneurysms, which are relatively rare, may be symptomatic or cause thrombotic events if large in size, often necessitating surgical intervention. The conventional surgical approach for treating SVC aneurysms includes open thoracotomy and mid-sternotomy. However, in this case, the aneurysm could be safely resected by thoracoscopic simultaneous lateral and subxiphoid access methods. The approach site was 1 cm below the xiphoid process, the fifth mid-axillary line and the seventh anterior axillary line on the right side. To facilitate surgery, CO_2 insufflation was used. The aneurysm was safely resected with the use of a vascular staple.

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INTRODUCTION

Superior vena cava (SVC) aneurysms are a relatively uncommon disease that has not been widely reported. In some instances, where the aneurysm is large, they may cause discomfort or bleeding-related symptoms. In such cases, surgical intervention is often considered when symptoms are present, and the possibility of a thrombotic event exists. The conventional surgical approach primarily utilizes open surgery with the application of cardiopulmonary bypass (CPB) as necessary[1,2]. Herein, we present a case in which we adopted a minimally invasive approach to treat an SVC aneurysm. In addition, we successfully performed a safe and accurate procedure using simultaneous lateral and subxiphoid access methods to ensure safe access to the SVC.

CASE PRESENTATION

Chief complaints

A 58-year-old male presented with intermittent chest pain and persistent discomfort in the chest area.

History of present illness

Symptoms started several months ago and there was no other present illness.

History of past illness

The patient had no any History of past illness.

Personal and family history

The patient had no any family history of venous aneurysm.

Physical examination

On physical examination, no abnormal findings were observed.

Laboratory examinations

On laboratory testing, no abnormal findings were observed.

Imaging examinations

A chest computed tomography (CT) scan revealed a 6.2 cm aneurysm in the left innominate vein and SVC junction (Figure 1). The aneurysm had a saccular appearance with no evidence of a thrombus. In cases of venous aneurysms, the rupture risk is not high, but given the patient's symptoms and the large size of the aneurysm, which raised concerns regarding a potential thrombotic event, surgical resection was deemed necessary after obtaining patient consent.

FINAL DIAGNOSIS

The final diagnosis was a 6.2 cm aneurysm in the left innominate vein and SVC junction.

TREATMENT

Simultaneous lateral and subxiphoid access were planned to achieve optimal proximal and distal aneurysm control. The

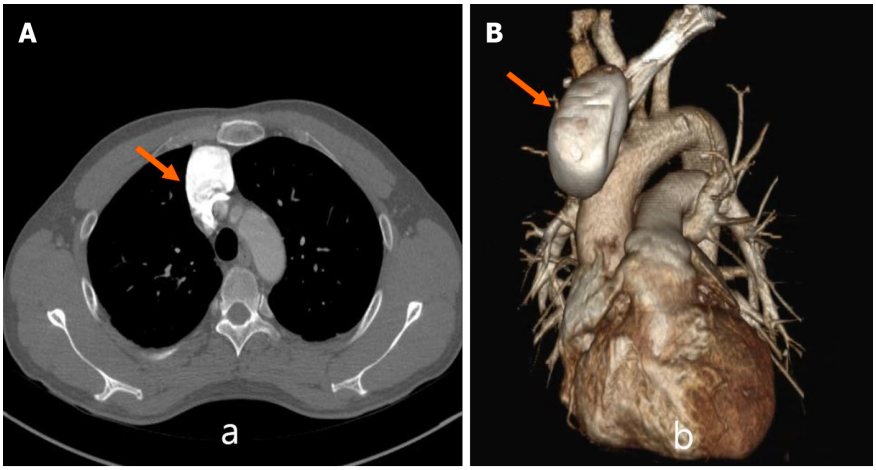

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Figure 1 A chest computed tomography scan revealed a 6.2 cm aneurysm in the left innominate vein and superior vena cava junction. A: Superior vena cava aneurysm of about 6.2 cm in size seen on chest computed tomography in the axial view; B: Three-dimensional reconstruction image.

patient was intubated and placed in the left semi-lateral position. A 3-cm longitudinal skin incision was made approximately 1 cm below the xiphoid process. After making the skin incision, a wound protector was inserted, and a 10 mm port was formed at the fifth mid-axillary line and the seventh anterior axillary line on the right side. Once the port was inserted, CO_2 insufflation at 10 mmHg was performed to retract the pericardium and create sufficient substernal space for surgery.

First, the camera was inserted on the right side to secure the substernal space, and mediastinal dissection was performed through the right side. Next, the camera was removed from the right side and inserted into the subxiphoid site, and the surgery continued. The thymus, innominate vein, and SVC were dissected to secure Aneurysm of distal and proximal site. After umbilical tape encircling, clipping was performed to reduce venous blood flow from the left side. After this procedure, the stalk of the SVC was confirmed and partially resected using a vascular stapler (Covidien, Mansfield, MA, United States) for safe resection of the aneurysm stock, after which its size was reduced by stapling. The remaining aneurysm was resected from the stalk portion using a stapler (see Video 1).

OUTCOME AND FOLLOW-UP

The patient was discharged on the third day after chest tube removal on the second postoperative day with no particular issues. The patient was under follow-up, and no specific findings were observed on CT 1 year after surgery (Figure 2).

DISCUSSION

Surgical approaches for treating SVC aneurysms include open thoracotomy and mid-sternotomy. In particular, a right thoracotomy has been attempted for aneurysm resection. However, exposing the left innominate vein behind the aneurysm, securing the clamping site, or encircling the vessel's roof site can be challenging. Moreover, bleeding control is problematic in cases of injury to the opposite innominate vein during dissection. Additionally, thoracotomy increases the chance of changing positions to mid-sternotomy to control bleeding. For these reasons, thoracotomy is not a commonly used approach today.

In contrast, mid-sternotomy allows for the exposure of both jugular veins to the SVC, making it easier to create a clamping site around the aneurysm or perform vessel roof encircling. CPB can be performed at any time during surgery. Currently, mid-sternotomy is widely used in most SVC aneurysm surgeries[1,3].

Surgical visibility is essential for safe SVC aneurysm resection using video-assisted thoracic surgery (VATS). The most significant complication during surgery is the rupture of the innominate vein, which can be lethal. Compared with the right approach, the subxiphoid approach can provide a clear view of the SVC and innominate vein, making it easy to secure the vascular clamp site and promptly address innominate vein rupture. The advantages of the subxiphoid approach have already been demonstrated in VATS thymectomy[4]. Moreover, the subxiphoid approach is essential for the success of minimally invasive approaches. In the present case, since the SVC is on the right side, we believed it would be safer to approach the right side simultaneously with the subxiphoid approach, rather than using the subxiphoid approach alone. There is another consideration for VATS resection. In surgery under CPB, aneurysm resection is performed using superior and inferior SVC and innominate vein clamping, followed by resection and simple suturing. However, this procedure is not possible with minimally invasive approaches. Therefore, we modified the procedure using a vascular stapler to enable aneurysmal resection using a minimally invasive approach. In addition, the vascular stapler is relatively safe for use in the pulmonary area, which has fragile blood vessels. Therefore, the authors concluded

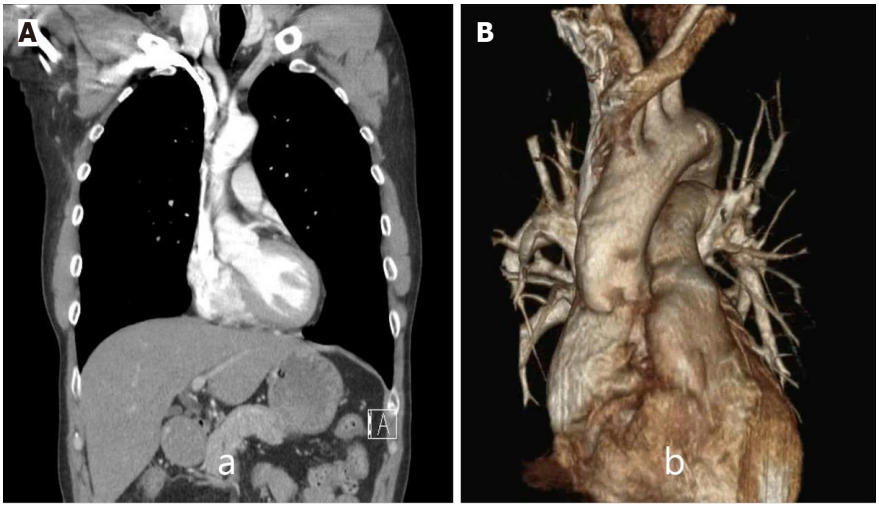

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Figure 2 The patient was under follow-up, and no specific findings were observed on computed tomography 1 year after surgery. A: Computed tomography image 1 year after surgery in the coronal view; B: Three-dimensional reconstruction image.

that a vascular stapler could be used for aneurysm resection.

CONCLUSION

Aneurysms located within the mediastinum can be accessed through thoracoscopic approach without open surgery and safely resected using vascular staples.

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FOOTNOTES

Author contributions: Son J contributed to manuscript writing; Kim SP contributed to manuscript and figure editing; all authors have read and approved the final manuscript.

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