

## CASE REPORT

# Robot-assisted thoracic surgery for intercostal cavernous hemangioma

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**Abstract**

Intercostal cavernous hemangioma is extremely rare among benign vascular tumors. Achieving a definitive diagnosis preoperatively by radiographic examination alone is difficult; surgical resection is usually needed. Occasional cases are found as giant tumors, and some grow substantially during observation without treatment. Such tumors require extended surgical resection; however, small tumors can be completely resected by tumor extirpation alone. Thus, immediate surgical resection while the tumor is small might help to avoid invasive surgery. We herein describe cases of intercostal cavernous hemangioma with no invasion to the surrounding tissues, successfully treated by complete tumor resection using robot-assisted thoracic surgery.

**KEYWORDS**

intercostal cavernous hemangioma, robot-assisted thoracic surgery, tumor extirpation

## INTRODUCTION

A cavernous hemangioma is considered a congenital venous malformation and can develop in any part of the body. Among all benign hemangiomas, intercostal cavernous hemangioma is extremely rare, accounting for only about 0.01% of such tumors.<sup>1</sup> Not only is this rare disease very difficult to diagnose preoperatively, but invasive surgery is occasionally needed to achieve complete resection when the tumor invades surrounding tissues, including the chest wall. Therefore, early surgical resection is necessary to achieve a definitive diagnosis and avoid invasive surgery such as combined resection and reconstruction of the chest wall.

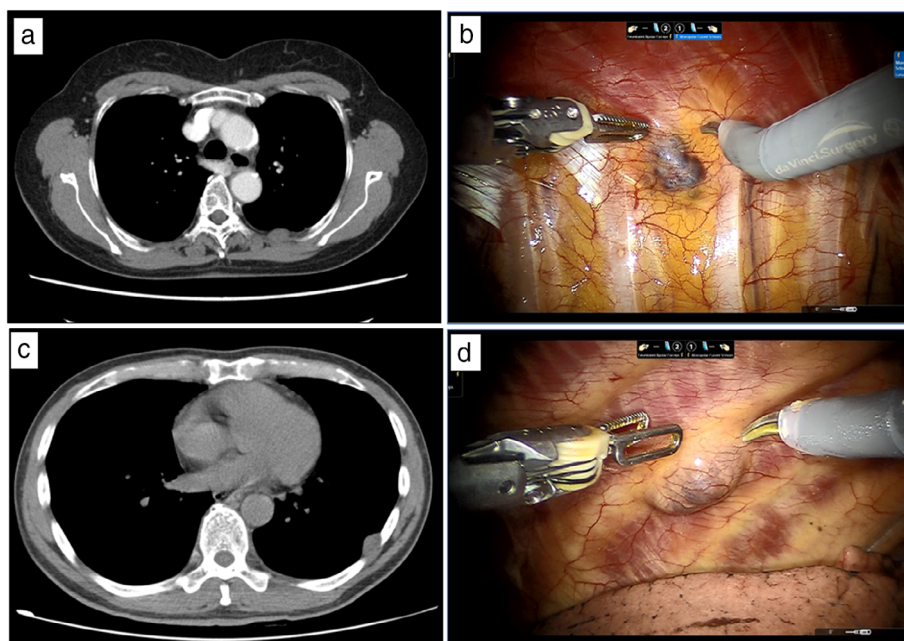
We herein describe two asymptomatic intercostal cavernous hemangiomas that were resected using robot-assisted thoracic surgery (RATS).

## CASE REPORT

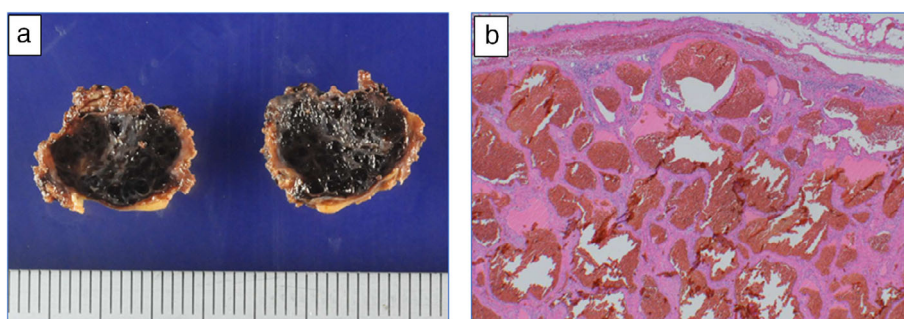
### Case 1

A 65-year-old woman was admitted to our hospital because of incidental detection of an intercostal mass on chest

computed tomography (CT). Enhanced CT showed a localized smooth-walled, nonenhanced, homogenous tumor with no tissue invasion measuring 24 × 13 mm at the posterolateral area of the left fifth intercostal space (Figure 1a). Based on the CT findings, we suspected a neurogenic tumor, and RATS was performed. The patient was placed in the right lateral position. Three incisions were created, and the da Vinci Si system (Intuitive Surgical) was then docked to the patient. The camera was introduced through the fourth intercostal space on the left anterior axillary line. Arms 1 and 2 were introduced through the sixth intercostal space on the middle axillary line and the third intercostal space on the axillary line, respectively. Intraoperative examination revealed a blackish tumor covered with normal parietal pleura at the intercostal space with no invasion of the ribs (Figure 1b); therefore, tumor extirpation was performed (Figure 2a). The console time was 21 min and the blood loss was minimal. Microscopic examination showed that the tumor was composed of a homogeneous conglomerate of thin fibrotic-walled blood vessels with dilating channels and no evidence of malignancy (Figure 2b). The surgical margin was free of tumor cells. The final pathological diagnosis was an intercostal cavernous hemangioma. The patient was



**FIGURE 1** (a) Chest computed tomography (CT) showed a tumor in the left fifth intercostal space in case 1. (b) Intraoperative finding of tumor location in case 1. (c) Chest CT showed a tumor in the left eighth intercostal space in case 2. (d) Intraoperative finding of tumor location in case 2



**FIGURE 2** (a) Macroscopic appearance of the tumor in case 1. (b) Pathological examination in case 1 showed that the tumor consisted of thin-walled blood vessels with single-layer endothelial cell lining containing red blood cells (hematoxylin and eosin staining, 100 $\times$ )

discharged 3 days postoperatively and showed no evidence of tumor recurrence at follow-up.

## Case 2

A 65-year-old man was referred to our hospital because an intercostal mass had been incidentally discovered on chest roentgenography and CT. Plain chest CT showed a well-demarcated homogenous tumor with no tissue invasion measuring 20  $\times$  10 mm at the posterolateral area of the left seventh intercostal space (Figure 1c). Based on the CT findings, we suspected a neurogenic tumor, and RATS was performed. The patient was placed in the right lateral position, and three ports were created. The da Vinci Si system was then docked to the patient. The camera was introduced through the fourth intercostal space on the left anterior axillary line. Arms 1 and 2 were introduced through the sixth intercostal space on the middle axillary line and the third intercostal space on the axillary line, respectively. Intraoperative examination revealed a blackish-reddish tumor covered with normal parietal pleura at the intercostal

space with no invasion of the ribs, and the tumor seemed to be continuous with the intercostal vessels (Figure 1d). Therefore, resection of the tumor with the intercostal vessels was performed. The console time was 24 min, and blood loss was minimal. Microscopic examination showed that the tumor was composed of dilated blood vessels with no evidence of malignancy and was continuous with the intercostal vessel wall. The surgical margin was free of tumor cells. The final pathological diagnosis was an intercostal cavernous hemangioma. The patient was discharged 5 days postoperatively and followed up with no evidence of tumor recurrence.

## DISCUSSION

Intercostal cavernous hemangioma is extremely rare among benign blood vessel neoplasms. Most cases are asymptomatic and are therefore incidentally detected. Cavernous hemangiomas consist of dilated vessels lined by a single layer of endothelial cells surrounded by a fibrous stroma. Definitive diagnosis is very difficult by radiographic examinations

alone, including CT, magnetic resonance imaging, or F18-fluorodeoxyglucose positron emission tomography; instead, surgical resection and pathological definition are usually needed.

Several surgical cases of large intercostal cavernous hemangiomas measuring >4 cm have been reported since the year 2000. Such cases require combined rib resection or chest wall reconstruction.<sup>2</sup> In addition, Shimizu et al.<sup>3</sup> reported an intercostal cavernous hemangioma that grew from 1.8 to 6.0 cm during a 3-year follow-up period. In contrast, Hashimoto et al.<sup>4</sup> reported no recurrence of a small intercostal cavernous hemangioma of 1.2 cm after tumor extirpation using video-assisted thoracic surgery (VATS). In both of our cases, the tumors were also incidentally discovered when they were about 2 cm in size, and immediate surgical resection was performed; as a result, complete resection without combined rib resection was possible. Therefore, immediate surgery might be considered to minimize the invasiveness of treatment.

Robotic surgery has recently been developed even in the thoracic field, and its operability is remarkable. RATS allows for a more precise thoracic operation. In particular, the da Vinci robotic surgical system (Intuitive Surgical) facilitates highly accurate and minimally invasive surgical procedures. The three-dimensional imaging and multijointed forceps of the da Vinci system enable RATS to be performed in the thorax more easily than VATS.<sup>5</sup> In the present cases, RATS allowed us to visually judge whether the tumors were invading the ribs, and curative resection was achieved. The superiority of RATS for chest wall tumors including intercostal cavernous hemangiomas is still not evidenced. However, the robotic approach offers advantages over the VATS system such as three-dimensional vision or movement of instruments within a confined thoracic space. Thus, RATS might be useful to completely remove this tumor, although a prospective study to evaluate the superiority of RATS approach

for chest wall tumors including intercostal cavernous hemangiomas compared with VATS approach is warranted.

In conclusion, intercostal cavernous hemangioma is rare. Thoracic surgeons should be aware of this disease and consider early surgical resection because of the possibility of rapid growth despite the fact that this tumor is benign. RATS is a safe and acceptable procedure for intercostal cavernous hemangioma.

## CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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