

Uniport video-assisted thoracoscopic surgery for thoracic Eden type IV dumbbell tumor



Ya-Fu Cheng, MD,^a Bing-Yen Wang, MD, PhD,^a Xavier T. J. Hsu, MD,^b and Chia-Chuan Liu, MD, PhD,^c Changhua and Taipei, Taiwan

From the ^aDivision of Thoracic Surgery, Department of Surgery, Changhua Christian Hospital, Changhua; and Divisions of ^bNeurosurgery and ^cThoracic Surgery, Department of Surgery, Koo Foundation Sun Yat-Sen Cancer Center, Taipei, Taiwan.

Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

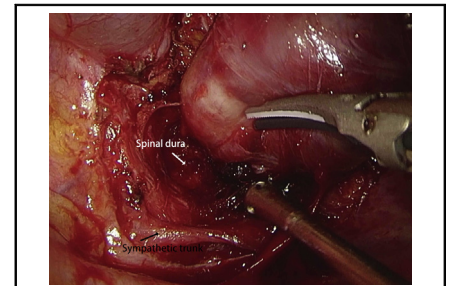
Received for publication April 30, 2022; revisions received May 13, 2022; accepted for publication June 27, 2022; available ahead of print July 8, 2022.

Address for reprints: Chia-Chuan Liu, MD, PhD, Division of Thoracic Surgery, Department of Surgery, Koo Foundation Sun Yat-Sen Cancer Center, No. 150, Lide Rd, Beitou Dist, Taipei City 11259, Taiwan (E-mail: thomas21917@hotmail.com).

JTCVS Techniques 2022;15:168-70
2666-2507

Copyright © 2022 The Author(s). Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.jxjc.2022.06.016>



A T2 Eden type IV dumbbell tumor was removed via uniport VATS. Dural traction was avoided.

CENTRAL MESSAGE

Uniport VATS for type IV dumbbell tumor resection is a safe, feasible procedure providing less tissue trauma and better recovery. The key for success is to avoid spinal cord traction.

Video clip is available online.

Dumbbell tumors contain intraspinal and paraspinal components that are connected through an intervertebral foramen. Most dumbbell tumors are located in the thoracic spine. Eden classified them into 4 types, and the fourth type lies in the spinal foraminal and paravertebral space. Complete surgical removal is the treatment of choice. Most related literature reports a combined approach of posterior laminectomy and facetectomy with video-assisted thoracic surgery (VATS).¹ However, if the intraspinal component is confined within a neuroforamen, it is reasonable to remove the tumor through VATS without unnecessary manipulation of the spinal cord. In the quest to minimize surgical wounding, surgical trauma, and bony resection, we present our experience of a thoracic Eden IV dumbbell tumor resection with uniport VATS. This approach facilitated a rapid recovery with reduced postoperative pain and shortened hospital stay.

PATIENT AND METHODS

A 27-year-old woman without any significant history was referred to our clinic for a well-defined soft-tissue lesion in the left apical thorax. The patient was asymptomatic. T-spine magnetic resonance imaging revealed a dumbbell tumor 31 mm in length and 25 mm in width extending into the left T2-T3 intervertebral foramen with T2 hyperintensity. The left pedicle of T2 was

eroded by the tumor, so the width of its neuroforamen was 3 times wider than the normal side (Figure 1). A multidisciplinary surgical team consisting of a thoracic surgeon, a neurosurgeon, and a neurologist discussed the surgical principle. The patient provided written informed consent for publication of the case, and institutional review board approval was not required.

SURGICAL TECHNIQUE AND PATIENT RESULTS

Under general anesthesia, the patient was intubated with a double-lumen endotracheal tube and placed in the prone position for the possible contingency of laminectomy via a posterior approach. A 3-cm incision was made over the left mid-axillary line at the fourth intercostal space level (Figure 2, A). The key point of this skin incision for uniport VATS was to incise along the line of tumor, aortic arch, and wound to avoid intense jamming and interference with instruments. The parietal pleura around the tumor's posterior mediastinal area was carefully excised using an ultrasonic scalpel. There was an intact arachnoid membrane between the sympathetic trunk and tumor capsule. The intercostal vessels were separated and clamped safely. Once the tumor sufficiently mobilized and dissected into neuroforamen, we changed to both blunt dissection and the use of a bipolar device to minimize energy spreading and reduce potential damage to the dura and spinal cord. The other key for uniport VATS was

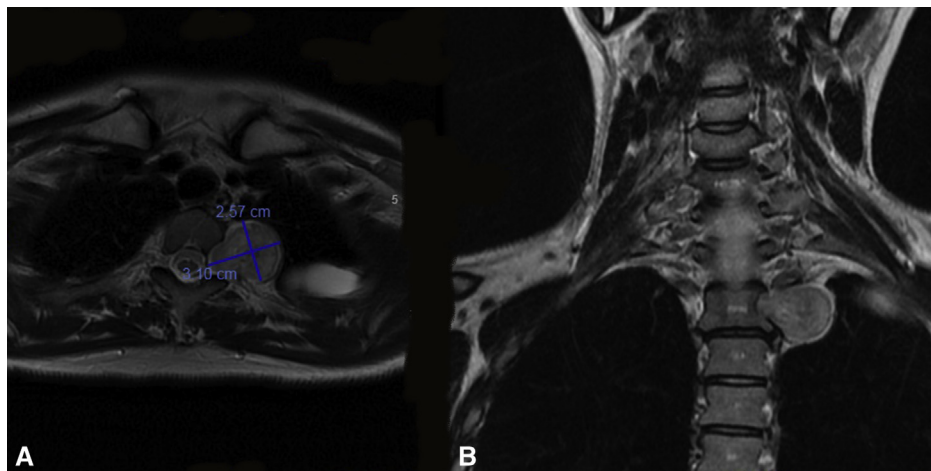


FIGURE 1. Preoperative T2-weighted magnetic resonance imaging demonstrating an Eden type IV paraspinous dumbbell tumor in the left hemithorax at the T2-T3 level extending into the intervertebral foramen. A, axial section; B, coronal section.

to minimize excessive traction of the tumor to avoid spinal cord injury and bleeding. Blunt dissection was applied between the tumor and spinal dura to avoid tearing of the spinal dura. A hemoclip was applied at the tumor base and dura to avoid cerebrospinal fluid leakage (Figure 2, B and Video 1). A 14-Fr pigtail drain was inserted. The surgical time was 80 minutes, and total blood loss was 100 mL. We removed the pigtail drainage on postoperative day 1, and the patient was discharged on postoperative day 2 without neurologic deterioration. Pathology showed schwannoma with a well-demarcated capsule without rupture.

DISCUSSION

A dumbbell tumor was reported to be treated with wide posterolateral thoracotomy and concomitant laminectomy in 1983.² The complications included excessive operative time, blood loss, and tissue damage. As instruments and

surgical technology improved over time, complex uniport VATS intervention became viable and resulted in reduced tissue damage. Gonzalez-Rivas and colleagues³ introduced the use of uniport thoracoscopic lobectomy in 2011. To the best of our knowledge, there has been no previous surgical report on uniport VATS dumbbell tumor resection.

Most dumbbell tumors are well capsulated with benign origin, and more than 60% are schwannomas.⁴ Eden type IV dumbbell tumors involve foraminal and mediastinal components; consequently, a posterior approach is a challenging task and not necessarily needed. In the past, it was the standard treatment. Uniport VATS can provide clear exposure and preserve facet joints, lamina, and ligaments.

Some scholars have suggested it is unsafe to remove a tumor without first separating the tumor from its attachment to the spinal cord. Percutaneous spinal endoscopy

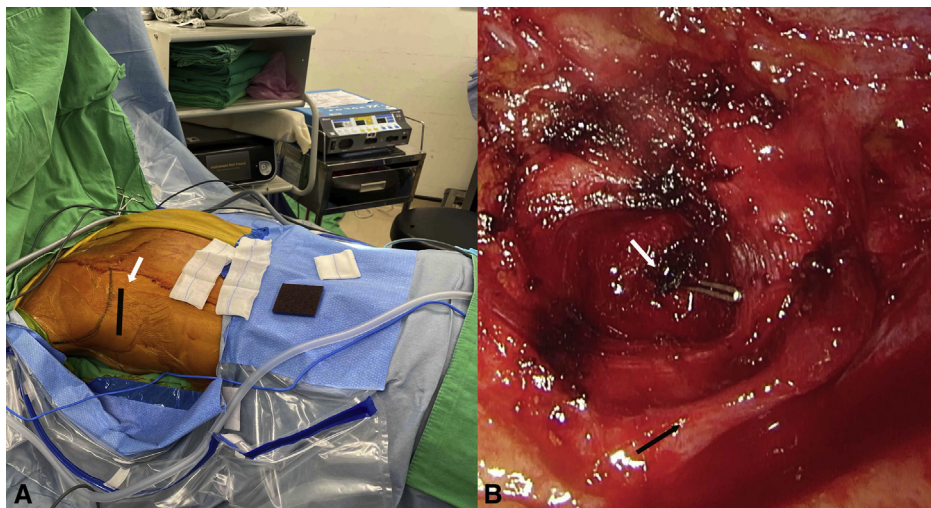
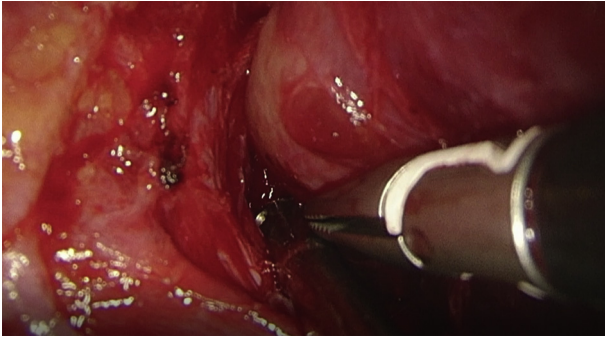


FIGURE 2. A, The patient lies in prone position with a 3-cm incision (white arrow) created over the left fourth posterior axillary line of intercostal space. B, Sympathetic trunk (black arrow) and dura of spinal cord (white arrow) were preserved.



VIDEO 1. The uniport video-assisted thoroscopic surgery technique for Eden type IV dumbbell tumor resection. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00370-4/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00370-4/fulltext).

combined with thoracoscopy has been reported.⁵ However, type IV dumbbell tumors do not invade the spinal canal and do not closely adhere to the spinal dura. Intraoperative nerve monitoring is not necessary as well. We demonstrated

that the attachment to the spinal cord of a type IV dumbbell tumor can be identified clearly and cut off under uniport VATS. We suggest that uniport VATS for type IV dumbbell tumor resection is a safe, feasible procedure. It provides clear exposure, less bony resection, less tissue trauma, and better recovery.

References

1. Chen X, Ma Q, Wang S, Zhang H, Huang D. Surgical treatment of thoracic dumbbell tumors. *Eur J Surg Oncol.* 2019;45:851-6.
2. Grillo HC, Ojemann RG, Scannell JG, Zervas NT. Combined approach to “dumbbell” intrathoracic and intraspinal neurogenic tumors. *Ann Thorac Surg.* 1983;36:402-7.
3. Gonzalez-Rivas D, de la Torre M, Fernandez R, Mosquera VX. Single-port video-assisted thoracoscopic left upper lobectomy. *Interact Cardiovasc Thorac Surg.* 2011;13:539-41.
4. Ozawa H, Kokubun S, Aizawa T, Hoshikawa T, Kawahara C. Spinal dumbbell tumors: an analysis of a series of 118 cases. *J Neurosurg Spine.* 2007;7:587-93.
5. Yang K, Ji C, Luo D, Li K, Pang L, Xu D, et al. Percutaneous spinal endoscopic combined with thoracoscopic surgery for treatment of thoracic Eden IV dumbbell tumors. *World Neurosurg.* 2022;157:e492-6.