



# The subxiphoid approach could become an important minimally invasive technique in thoracic surgery

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*Comment on:* Yano M, Moriyama S, Haneda H, *et al.* The Subxiphoid Approach Leads to Less Invasive Thoracoscopic Thymectomy Than the Lateral Approach. *World J Surg* 2017;41:763-70.

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This paper by Yano *et al.* reports on the initial outcomes of video-assisted thoracoscopic surgery using lateral thoracic and subxiphoid approaches (1). The authors conclude that the subxiphoid approach is less invasive than the traditionally adopted lateral thoracic approach. Demonstrating the utility of thymectomy using the subxiphoid approach, this paper shows the potential for the subxiphoid approach to become an important technique in thoracoscopic thymectomy.

There are three main approaches for thoracoscopic thymectomy. In 1998, Cooper *et al.* described transcervical thymectomy, in which thymectomy was performed through an incision in the neck (2). This method has the benefit of reducing postoperative pain because no intercostal space is crossed. However, existing challenges, including the cosmetic drawback of the incisional neck wound, difficulty in observing the entire thymus from the vantage point of the neck, and tricky surgical manipulations involved, have prevented this approach from becoming widely accepted. In 1992, Landreneau *et al.* described thoracoscopic thymectomy performed by incisions in the lateral thoracic region to access anterior mediastinal tumors (3). Sugarbaker *et al.* also described thoracoscopic thymectomy using the lateral thoracic approach for the treatment of myasthenia gravis in 1993 (4). This lateral thoracic approach is currently the most widely accepted global approach for thoracoscopic thymectomy. The lateral thoracic approach offers an excellent cosmetic outcome because the wound is hidden in the armpit; however, this technique requires an intercostal space to be crossed, which inevitably results in intercostal neuralgia-induced pain and numbness and lifetime pain

and numbness in the form of post-thoracotomy pain syndrome in 10% of cases (5). In 1999, Kido *et al.* described thymectomy from below the xiphoid process (6); using this approach, surgery was performed by inserting an endoscope behind the sternum via two incisions to the solar plexus. This method does not require an intercostal space to be crossed, which means that there is no intercostal neuralgia and minimal pain. However, the surgical field of view is just as difficult to secure as it is in transcervical thymectomy. Kido *et al.* managed to improve the field of view by lifting the sternum, but even this did not secure a sufficiently good surgical field of view. Furthermore, additional limitations to surgical maneuverability prevented this approach from being widely adopted.

In 2012, we described the process of single-port thymectomy using the subxiphoid approach with CO<sub>2</sub> insufflation (7). With this method, the drawback of the subxiphoid approach, namely the difficulty securing the field of view, was greatly improved by using CO<sub>2</sub> insufflation inside the mediastinum to retract both lungs and the pericardium. This single-port subxiphoid approach, which is performed via a single 3-cm incision, does not cross any intercostal spaces, making it the least invasive surgical approach currently available. However, the drawback of limited maneuverability remains. To be able to perform all surgical maneuvers via a single incision, tools for single-port surgery and forceps operation, which are specific to single-port surgery, are needed. Surgeons therefore require appropriate training to master this technique. Suturing is also difficult in single-port approaches. At our facility, a single-port subxiphoid approach is the standard approach

for thymectomy. However, we recommend the use of dual-port subxiphoid thymectomy (8), with an additional port in an intercostal space in the lateral thoracic region, for facilities that are not familiar with single-port surgery or for patients who require suturing to close pericardial patches and other structures. The presence of an additional port greatly improves surgical maneuverability by reducing interference between surgical tools, which can become a problem in single-port surgery.

In this paper, the authors compare the lateral thoracic approach with the subxiphoid approach. The authors' subxiphoid approach involves the use of one or two additional ports in intercostal spaces in the right thoracic region, with the exception of one case in which a single-port approach was used. While intercostal neuralgia still unfortunately occurs, neuralgia caused by inserting ports through one or two intercostal spaces is lesser than that caused by the generally used method of inserting ports through three or more intercostal spaces in the lateral thoracic region. Furthermore, as the authors report, the subxiphoid approach offers the same field of view as median sternotomy because the camera is inserted from the midline of the body. This helps to secure the field of view of the neck and confirms the locations of the bilateral phrenic nerves. When performing thymectomy to treat myasthenia gravis, it is best to perform extended thymectomy, in which the thymus is resected inclusive of the adipose tissue in front of the phrenic nerves (9,10). Confirming the locations of the bilateral phrenic nerves is vital when performing extended thymectomy. In accordance with the authors' technique, extended thymectomy using the lateral thoracic approach requires a bilateral thoracic approach to confirm the locations of the bilateral phrenic nerves and to resect the adipose tissue in front of these nerves. Some facilities even consider inserting six or more ports in total into the bilateral thoracic regions. Such cases naturally result in intercostal neuralgia in the bilateral thoracic regions. In this paper, partial thymectomy was common in lateral thoracic approaches, whereas total thymectomy was common in subxiphoid approaches. In lateral thoracic approaches from one side, it is difficult to confirm the contralateral phrenic nerve, which raises concern over phrenic nerve injury and may explain why surgeons stop at partial thymectomy. If extended thymectomy is to be performed, the subxiphoid approach that facilitates confirmation of the locations of the bilateral phrenic nerves could allow for less invasive and more complete resection of the thymus and surrounding adipose tissue than a lateral thoracic approach, even if this approach is a dual-port approach.

We previously described how single-port thymectomy using the subxiphoid approach takes less time to complete, has a shorter drain placement period, results in a shorter hospital stay, and requires lower doses and shorter dosing periods of postoperative analgesics than the lateral thoracic approach (11). However, despite being less invasive to patients, subxiphoid approaches are not yet widely adopted. This is probably because they are difficult for thoracic surgeons to master. I believe that thoracic surgeons have an obligation to learn about subxiphoid approaches because of the benefits offered to patients.

In terms of study limitations, no randomization was performed for the work described in this paper and the lateral thoracic approach group described was a historical group. The differing surgical times between groups and a combination of the lateral thoracic intercostal approach and subxiphoid approach in the groups further limit the generalizability of this study. However, this study is of great importance because it demonstrates the utility of the subxiphoid + intercostal approach that is not confined by the norms of single-port surgery, which requires familiarity with surgical maneuvers.

In recent years, there have been reports of subxiphoid robotic thymectomy combining the subxiphoid and intercostal approaches (12), single-port bilateral lung wedge resection using the subxiphoid approach (13), and single-port lobectomy (14). The subxiphoid approach, which incurs minimal physical burden to the patient, has the potential to become an important minimally invasive surgical technique in the field of thoracic surgery.

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aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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