



Editorial on minimalist thoracoscopic resection of thymoma associated with myasthenia gravis

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Introduction

It is imperative that the rapid development of surgical fields may benefit the patient, in particular, the healers and the medical system in general. In fact, there are undeclared achievements with the continued development of these technologies. The most important of these goals is to convince the primary supplier of patients “the neurologist” that the time has come to be more liberal in advising MG patients for surgical treatment. In the last two decades, thoracic surgery has been developing rapidly in VATS techniques. It is noteworthy that this development has begun to enter different areas, and we see the competition between new technologies so that each technique tries to prove its advantage and efficiency in providing optimal treatment for the patients, Whether by reducing the number and size of wounds “Uniportal VATS”, the use of precision technology may exceed the ability of the human’s hands “robot” or access to the chest cavity through nerveless places “Subxiphoid approach”. Over time, the number of surgeons who acquire experience and skill in minimally invasive techniques will increase. In the near future, thymectomy for MG patients via sternotomy or thoracotomy will be only part of the history. In this article, we review the stages of the evolution of the approach to thymectomies from the beginning to the present with regard to the article Pompeo and his colleagues (1) and our perception of the future of less invasive thymectomy.

Discussion

More than 75 years have passed since the scientists began to resect the thymus gland in order to treat or decrease the symptoms of Myasthenia Graves believing that the thymus to be the key to the pathogenesis of MG as a source of antibodies directed against acetylcholine receptors (2). Since then, surgeons have begun to develop surgical techniques to avoid sternotomy or thoracotomy because of the side effects and complications that may accompany these techniques. The beginning was from the full mid-sternotomy approach which remained the gold standard approach for a long period (3). Later, there were attempts to make it less invasive through the development of partial sternotomy (4). Then there were efforts to enter the mediastinal cavity through the neck without the need to incise any part of the sternum (5). However, because of some disadvantages such as limited exposure, incomplete excision of the thymus, and difficulty controlling some of the complications during the surgery such as bleeding, these techniques could not replace the sternotomy (4,5). With the development of endoscopic camera technology and the start of the utilization of thoracoscopic operations, minimally invasive techniques began to appear in the scene as techniques that support in traditional surgeries before starting to take the banner of lead and be the main agent in the procedure (6-9). Since the advent of thoracoscopic techniques as an alternative to conventional surgery, there has been near consensus that

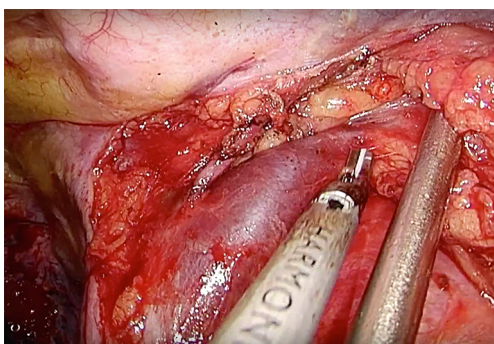


Figure 1 Right intercostal VATS Thymectomy (dissecting the area of the innominate-caval junction).

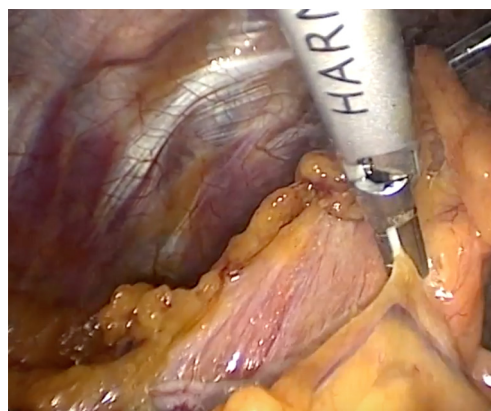


Figure 2 Left intercostal VATS thymectomy (dissecting the pericardial-phrenic and A-P window areas).

it is better for the patient and the surgeon. But debate and controversy is still on the approach (10-16). There have been many standpoints about the ideal place to enter the thoracic cavity, from the right side, left or both sides at the same time. It seems that access from the right side is the preferred technique for most surgeons because it provides excellent exposure for the Innominate-Caval junction (ICJ) (*Figure 1*), in addition to the presence of the heart in the left side, which may impede the instrumentation. Pompeo relies routinely on right side access in his technique side and many colleagues may agree on this. On the other hand, there are some surgeons who prefer to enter from the left side, and those believe that this access may provide better vision for the pericardial-phrenic and A-P window regions, these areas are considered to be one of the most common areas of ectopic thymic tissue (15) (*Figure 2*). There are those who believe that VATS thymectomy procedure should be performed bilaterally for the best results. However, these results were not proven as there was no difference in the rate of remission and the sample weight was not different between the unilateral or bilateral technique (16). Reducing the number of the surgical incisions and developing the VATS technique uniportal VATS approach for thymectomy has reduced surgical trauma, improved cosmetic appearance and reduced surgical pain, but has not resolved the dilemma of the approach (17,18). Is it better to enter the thorax from the right, left or both sides?

Parallel to the evolution of VATS, the robot (RATS) began to appear as a strong competitor and carried with it good results in terms of remission that may exceed the results of the VATS in addition to its surgical Endo wrist demonstrates and rotates 360 degrees with seven degrees of freedom, and the movement of the range with the vibration filtration system makes more precise maneuvers (19).

However, the robot is still not available in most of the centers and its high cost is a considerable obstacle to the progress of the RATS in addition to the fact that the robotic surgery is still multi-portal. With the beginning of the new millennium, another motivating technique began to emerge, approaching the anterior mediastinal space from below the sternum (subxiphoid approach). Initially, this technique was complementary to intercostal VATS technology or transcervical technique (20,21). As time passed and surgeons gained experience and skills, this technique began to evolve until it became applied through the single port (22,23). There is no doubt that the subxiphoid approach has many advantages and solutions to some of the dilemmas that were associated with other technologies. The most important advantages are (I) access to the thoracic cavity through a nerveless area, and thus avoid the destruction of the intercostal nerves. This may surpass this technique on the other techniques that rely on the entrance to the thoracic cavity through an opening (or openings) in the intercostal spaces. (II) Subxiphoid approach provides a panoramic view of the anterior mediastinal space which enables the surgeon to see both phrenic nerves easily, in addition to the possibility to explore the neck and both pleural cavities easily so that all the important landmarks could be seen and explored from the middle line unlike the other unilateral approaches (24) (*Figure 3A-D*). (III) The cost of this technology is significantly lower than its robotics rival, which makes it easier to adopt and practice in any center so that it is not exclusive to large centers who contain a robotic device. (IV) The possibility of performing dual operations through one incision as pulmonary resections in addition to thymectomy without

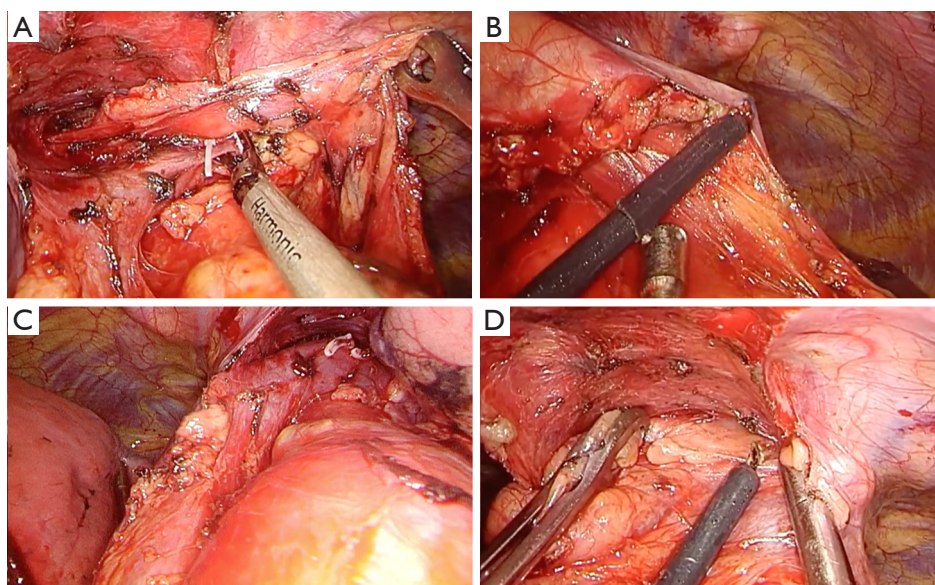


Figure 3 Uniportal subxiphoid VATS thymectomy. (A) Exposure of the Innominate-Caval junction); (B) exposure of the pericardial-phrenic and A-P window areas; (C) exposure of the neck during thymic horn dissection; (D) the panoramic view the anterior mediastinum and both pleural cavities.

the need for additional incisions (25). In spite of all that has been said, however, the subxiphoid technique also has its weak points. The surgeon must have a previous practice and a thorough knowledge of the intercostal VATS before he can learn this type of operations. In addition to the need for a skilled and expert assistant surgeon, the lack of experience of the assistant surgeon in these operations may lead to increase the technical difficulties or even conversion or failure of the procedure. Anesthesia is an inseparable part of the surgical process and the development of the surgery towards the minimally invasive techniques must develop in parallel with minimally invasive anesthesia. The adoption of Pompeo and his colleagues (1) of the less invasive methods of anesthesia (non-intubated technique) is necessarily part of the future of thymus surgery. However, once entering the thoracic cavity through the intercostal space, the injury of the intercostal nerve during the operation is imaginable. In conclusion, the development of minimally invasive techniques for thymectomy has begun to enter multiple parallel routes. Although these techniques, which have both negatives and positives, vary, they eventually have to converge in one technique closer to the ideal in order to meet the needs of the surgeons and patients. In addition to the minimally invasive techniques of anesthesia, which may reduce morbidity significantly, There is no doubt that the robot has a big role in the future of surgeries, which

has the advantages of the surgeon's hands may be unable to compete, but the robot has to find the way to be affordable. In addition, the robot must be developed to be uniportal (this does not seem impossible). The subxiphoid technique appears to be exciting and catchy to most surgeons, but it is not as easy as it looks. Where the learning curve and difficulty of instrumentation may be a serious obstacle for those wishing to practice this technique. What is required here is the development of equipment to be more friendly and compatible to the surgeons' hands, especially energy devices, which lack the angles required for this type of surgery. In order to reach the minimalist thoracoscopic resection of the thymus gland, a certain integration between robotics and subxiphoid techniques is necessary for the near future so that we can reach the optimum results.

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