

Mediastinal Diseases Surgery México Experiences

Mediastinal Hastalıklar Cerrahisi Meksika Deneyimleri

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ÖZET

Çeşitli uluslararası gruplardan elde edilen deneyim ve kanıtlar bu teknikleri kullanarak morbidite ve mortalite açısından avantajlar gösterdiğinden, son 20 yılda mediastinal patolojiyi tedavi etmek için minimal invaziv cerrahi teknikler uygulanmıştır. Meksika'da, göğüs cerrahisi ile tedavi edilen en sık mediastinal patolojiler mediastinal tümörler, nekrotizan inen mediastinit ve perikardiyal efüzyondur. Bildirilen küçük kanıtlar, tarihsel olarak açık cerrahinin (sternotomi ve torakotomi) ana cerrahi yaklaşım olduğunu göstermektedir. Özellikle ülkenin başkentinde son beş yılda invaziv mediastinal cerrahide artmış izlenmiştir. Bu yazıda, dünyadaki ve Meksika'daki mediastinal patolojinin mevcut yönetimini gözden geçireceğiz. Meksika'daki torasik cerrahların mediastinal cerrahi geliştirmek için karşılaştıkları zorlukları, Meksika'daki hastalar için kaliteli torasik cerrahiye sınırlı erişimi, ekibimizin mediastinal patolojilerdeki yönetimini ve batı Meksika'daki çalışma düzeni yapısını ve pratik yaklaşımımızı özetleyeceğiz.

Anahtar Kelimeler: Mediasten, toraks, patoloji, göğüs cerrahisi, VATS, Meksika.

SUMMARY

Since the experience and evidence from various international groups have shown advantages in terms of morbidity and mortality using these techniques, in the last 20 years, minimally invasive surgical techniques have been implemented to treat mediastinal pathology. In Mexico, the most frequent mediastinal pathologies treated by thoracic surgery are mediastinal tumors, necrotizing descending mediastinitis and pericardial effusion. The little evidence reported denotes that historically open surgery (sternotomy and thoracotomy) has been the main surgical approach, although in the last 5 years, reports of invasive mediastinal surgery have increased, especially in the country's capital. In this paper we will review the current management of mediastinal pathology in the world and Mexico, outline the difficulties faced by thoracic surgeons in Mexico to develop mediastinal surgery and the limited access to quality thoracic surgical for patients in almost all México, and describe our practice and experience in the management of mediastinal pathology detailing our team and working setup structure in western Mexico.

Keywords: Mediastinum, thorax, pathology, thoracic surgery, VATS, Mexico.

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INTRODUCTION

In Mexico, the most frequent mediastinal pathologies treated by thoracic surgery are mediastinal tumors, necrotizing descending mediastinitis and pericardial effusion. Historically, medial sternotomy and different types of thoracotomy have been the main surgical approach reported by various public institutions to treat mediastinal pathology⁽¹⁾. However, in the last 20 years, minimally invasive surgical techniques have been implemented, since the experience and evidence from various international groups have shown that minimally invasive mediastinal surgery has advantages in terms of morbidity and mortality, which are; less pain in the early postoperative period, less damage to lung function, and the risk of infection and dehiscence of the sternotomy is avoided⁽²⁾. Thoracic surgery institutional services are centralized in the country's capital, so few hospitals throughout the country have a sub-specialized thoracic surgery department with minimally invasive thoracic surgery program. For these reasons, evidence-based mediastinal surgery is limited⁽³⁾. Through a private initiative of thoracic surgery service (Thorax Uniport®) in western Mexico, specifically in the city of Colima and Guadalajara, we will describe our experience in the management of mediastinal pathology. Mediastinal diagnostic methods are out of focus for this manuscript.

International Surgical Management of Mediastinal Pathology

Median sternotomy and thoracotomy remain the approaches of choice for resection of mediastinal lesions (anterior and posterior) because the mediastinum is a narrow cavity containing vital structures, which can be better exposed with a wide incision. However, since the first mediastinal resection by video thoracoscopy, different minimally invasive techniques have been adopted in mediastinal surgery, which have been multi-portal, single port, subxiphoid, robotic, and recently awake patient procedures^(2,4,5). The results reported by different thoracic surgery centers using minimally invasive techniques have favored a worldwide spread of performing mediastinal surgeries as less invasively as possible. However, it has been described that studies are still needed to evaluate the long-term oncological results of minimally invasive mediastinal surgery^(2,6). In Mexico it is important to mention that thoracic surgery is in development and not in all cities there is an optimal service for minimally invasive thoracic surgery; Therefore, there are very few reported studies of mediastinal surgery^(2,3).

Surgical Management of Mediastinal Pathology in Western Mexico

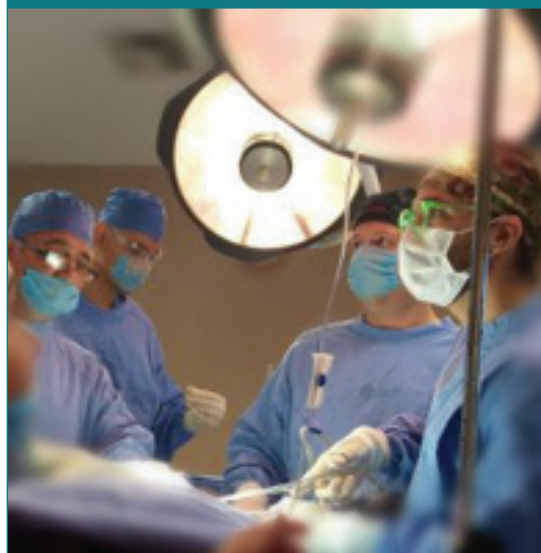
Hospital infrastructure: Our practice of thoracic surgery is performed in private certified hospitals that have and comply with the necessary technology, that guarantees the safety of both medical team and patients (blood bank, intensive therapy unit, etc.). Our focus is mainly on minimally invasive thoracic surgery. 99% of our procedures are performed by single port video thoracoscopy, and mediastinal surgery is not the exception.

Structure of the surgical medical team: Our multidisciplinary medical team is board certificated.

1. Thoracic surgeons,
2. Pulmonologists,
3. Pathologist,
5. Anesthesiologist,
6. Oncologist,
7. Cardiologist,
8. Physical and pulmonary rehabilitation equipment.

Our surgical practice is focused on single port video thoracoscopy procedures. Our surgical team (Picture 1) have Mexican board certifications in general surgery and thoracic surgery granted by the national normative committee of councils of medical specialties (CONACEM). Also, they have complied with training programs for minimally invasive surgery techniques (thoracic and laparoscopic surgery), and

Picture 1. Thorax Uniport® thoracic surgery team.



have attended Uniportal video thoracoscopy training programs, mainly at the Shanghai Lung Hospital, the largest lung hospital in the world. They also have training in vascular surgery, so they can handle trauma and thoracic vascular reconstructions. In addition, our group have national and international academic contributions on thoracic surgery topics.

Our Practice

Currently most of our procedures are carried out by single-port (uniportal) video thoracoscopy (VATS) with general anesthesia or in an awake patient. The decision to select uniportal VATS for mediastinal surgery in our practice was based is on the experiences obtained with this technique in lung surgery and literature results showing that uniportal VATS is a viable option to perform mediastinal surgery.

The mediastinal surgeries performed by our group in order of frequency are Pericardial window, necrotizing descending mediastinitis surgery, and mediastinal mass resections. In our group, all patient to undergo mediastinal surgery, a multidisciplinary evaluation is carried out to determine the patient's operability and safety. For this reason, our motto is "safety comes first."

Perioperative Management Preoperative Workup

Most of our patients arrive with us referred by other medical services with a presumptive diagnosis of mediastinal pathology. In a multidisciplinary way we

evaluate these patients to decide the most optimal treatment. First, we evaluate the corresponding studies and consider the need to perform a biopsy to confirm the mediastinal pathology (Figure 1). Once the diagnosis has been confirmed, it is determined if mediastinal pathology meets the criteria for surgical treatment (Figure 2), especially for a single-port video thoracoscopy approach. To carry out the surgery, patient operability and surgical risk are evaluated (Figure 3).

Instruments and Material

Our group uses high definition video towers with 10mm 30-degree lens (Stryker® and Karl Storz®). We use long double-jointed instruments for VATS (Hangzhou Kangsheng Medical Equipment's Co). For tissue dissection, vascular control, and resections, we use HARMONIC® scalpel, endoscopic staplers (Covidien®), and Hem-o-lok® clips. To protect the working port, we use small Alexis® separator. The pleural and mediastinal drainage systems used in our practice are kardiaspiral® pleural probes and Redax® wet drains.

Operative Setup

For anterior mediastinal masses and pericardial effusions, The patient is positioned in semi-supine position at 30 degrees with the ipsilateral arm abducted in L, and a pad under the shoulder, The working port is 3-5 cm above the line anterior axillary (Figure 4). The posterior mediastinal masses are addressed with the patient in the lateral decubitus position. Lung collapse is performed through selective intubation

Figure 1. Flow diagram representing the first step to reach the diagnostic confirmation of the mediastinal pathology used by Thorax Uniport®. Original modified from figure from its publication⁽¹⁰⁾.

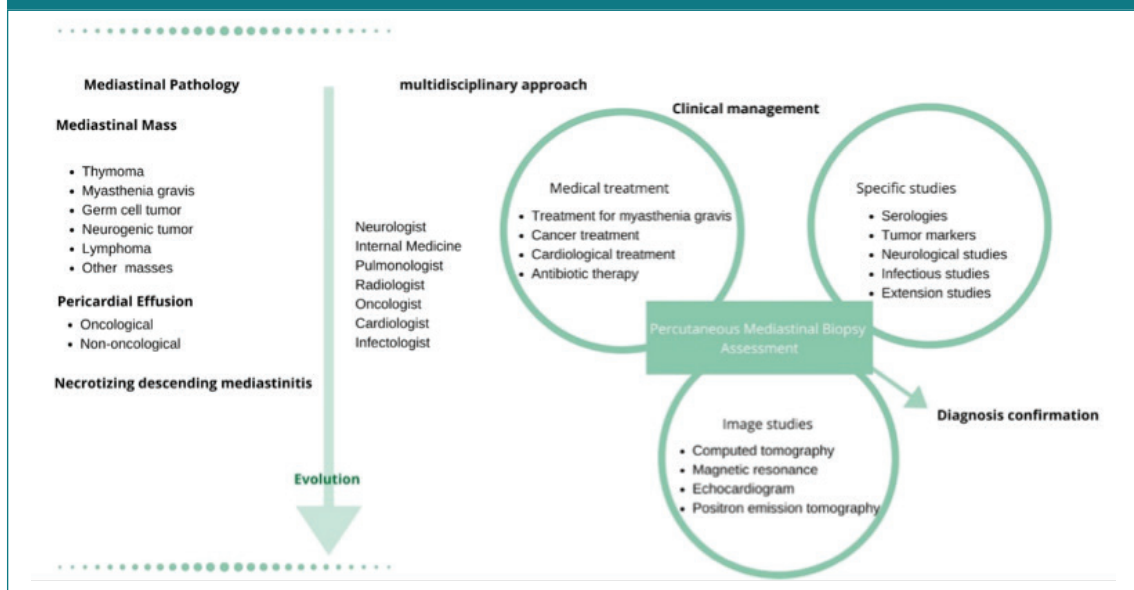


Figure 2. Flow diagram representing steps to assess whether the mediastinal pathology meets the criteria for surgical indication, especially for a single-port video thoracoscopy approach used by Thorax Uniport®. Original modified from figure from its publication^(2,10,11).

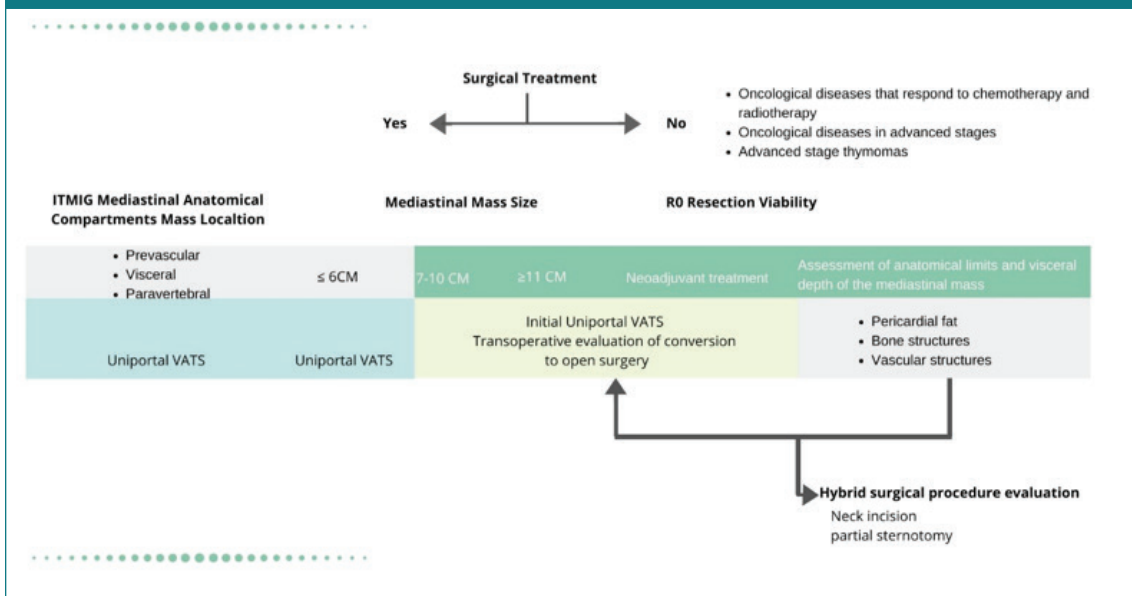
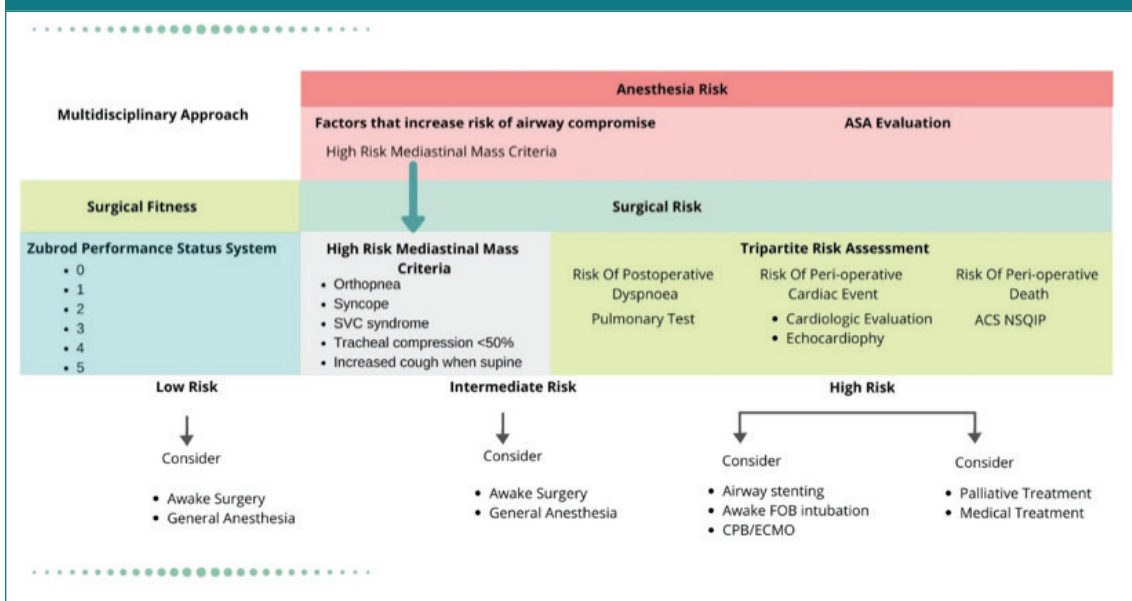


Figure 3. Flow chart representing steps to assess the fitness and perioperative risk used by Thorax Uniport®. Original modified from figure from its publication^(10,11,13).



and general anesthesia, however, currently we prefer awake VATS technique when possible.

Intraoperative Anesthesia Monitoring

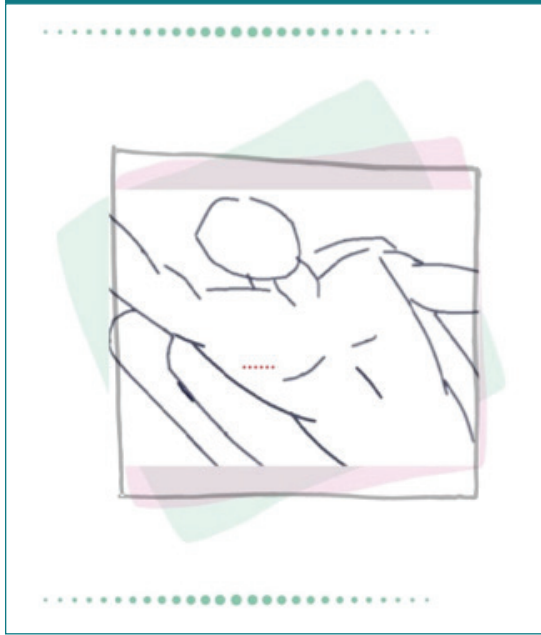
Routine standard anesthetic monitoring of our patients regardless of the type of surgery (not intubated and intubated) is carried out by; Invasive blood pressure, central venous pressure, heart and respiratory

rate, capnography, oximetry, bispectral index (BIS), and fluid control by urinary catheter.

Technical Details

Utility port is performed depending on the topographic characteristics of the mediastinal pathology (Figure 5). We always infiltrate with local anesthetic at the site of the work port before making

Figure 4. Uniportal video-assisted thoracoscopy approach representation of pre-vascular mediastinum compartment, Patient in semi-supine position at 30 degrees with the ipsilateral arm abducted in L and a roll-pad under the shoulder, the working port is 3-5 cm above the anterior axillary line.



the incision. A surgical glove is used to remove a resected mass.

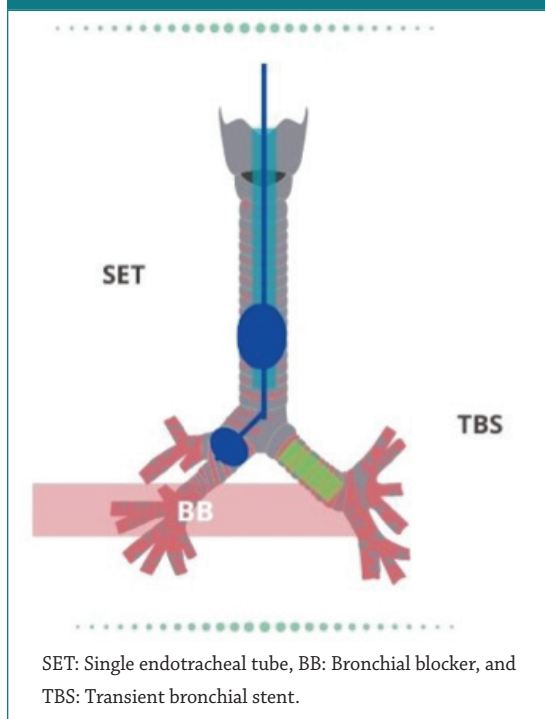
In one lung ventilation (OLV) procedures, a double lumen tube (DLT) is placed under direct vision using flexible bronchoscopy. When the anatomy of the airway is distorted, in our experience, we use single tube intubation and a bronchial blocker or consider the need to use a transient bronchial stent (Figure 6). In awake patient VATS we use epidural thoracic anesthesia (ETA) and local anesthesia (ropivacaine 7.5 mg/mL) on the posterior axillary line in the intercostal space of the approach and 2 intercostal spaces above and below, for patient sedation we use dexmedetomidine, thus enables patient's spontaneous breathing allowing a surgical pneumothorax with adequate surgical exposition. In our experience, we have controlled the cough and nauseous visceral reflex caused by surgical manipulation with topical anesthetic irrigation on the thoracic cavity. The kardiaspiral® pleural probes are placed with counter-opening, this decision has been made due to the fact that in our experience, the exit of the probe over the utility port incision has generated local complications such as subcutaneous emphysema, and recurrent pneumothorax.

Figure 5. ITMIG Mediastinal Anatomical Compartments Mass Location. Original modified from figure from its publication⁽¹²⁾.

ITMIG Mediastinal Anatomical Compartments Mass Location		
Compartment	Boundaries	Major Contents
Prevascular	Superior: Thoracic inlet Inferior: Diaphragm Anterior: Sternum Lateral: Parietal mediastinal pleura Posterior: Anterior aspect of the pericardium as it wraps around the heart in a curvilinear fashion	Thymus Fat Lymph nodes Left brachiocephalic vein
Visceral	Superior: Thoracic inlet Inferior: Diaphragm Anterior: Posterior boundaries of prevascular compartment Posterior: Vertical line connecting a point on each thoracic vertebral body 1 cm posterior to its anterior margin	Nonvascular: Trachea, carina, esophagus, lymph nodes Vascular: Heart, ascending thoracic aorta, superior vena cava, intrapericardial pulmonary arteries, thoracic duct
Paravertebral	Superior: Thoracic inlet Inferior: Diaphragm Anterior: Posterior boundaries of visceral compartment Posterior: Vertical line against the posterior margin of the chest wall at lateral margin of the transverse process of thoracic spine	Thoracic spine Paravertebral soft tissues

ITMIG: International Thymic Malignancy Interest Group.

Figure 6. Representative scheme used by our surgical team to control the distorted airway in mediastinal surgery with a simple endotracheal tube and right bronchial blocker +/- transient bronchial stent.



Surgical tray for sternotomy or thoracotomy, vascular surgery, flexible and rigid bronchoscope are always available in case we need to switch for emergent open mediastinal surgery.

Postoperative Care

Our patient's post-operative management is based on surgical APGAR surgical score (ASC). Patients with ASC score ≥ 6 go to routine room with monitoring. Our postoperative management protocol is focused on achieving fast track surgery by implementing adequate analgesic control, pulmonary toilet, and early patient mobilization. Chest drains are connected to external suction system and removed with serous fluid output ≤ 150 mL/day. We start enteral nutrition 6 hours after surgery. The average length of stay is 3 days.

Cases Demonstration

Case 1: Pericardial window by uniportal video thoracoscopy: Malignant pericardial effusion (Picture 2).

Case 2: Resection of visceral mediastinal tumor by uniportal VATS: Bronchogenic cyst (Picture 3).

Case 3: Surgical mediastinoscopy and Vacuum-assisted closure therapy of Necrotizing descending mediastinitis (Picture 4).

Difficulties

Almost in all Mexico, institutional cardiac, general thoracic and vascular surgery are practiced by the same individuals, although currently throughout the world each three mayor disciplines have evolved into sub-specialization with specific training programs, clinical and academic departments. This is the main problem faced by thoracic surgeons in Mexico, because even though there is a board certification in non-cardiac thoracic surgery there are few specific thoracic surgery services with minimally invasive thoracic surgery departments in the country, the only exception is Mexico City and surroundings; that means that institutional thoracic surgery service is centralized, so patients in all country have limited access to quality thoracic surgical care and evidence-based thoracic surgery is underrated^(3,7).

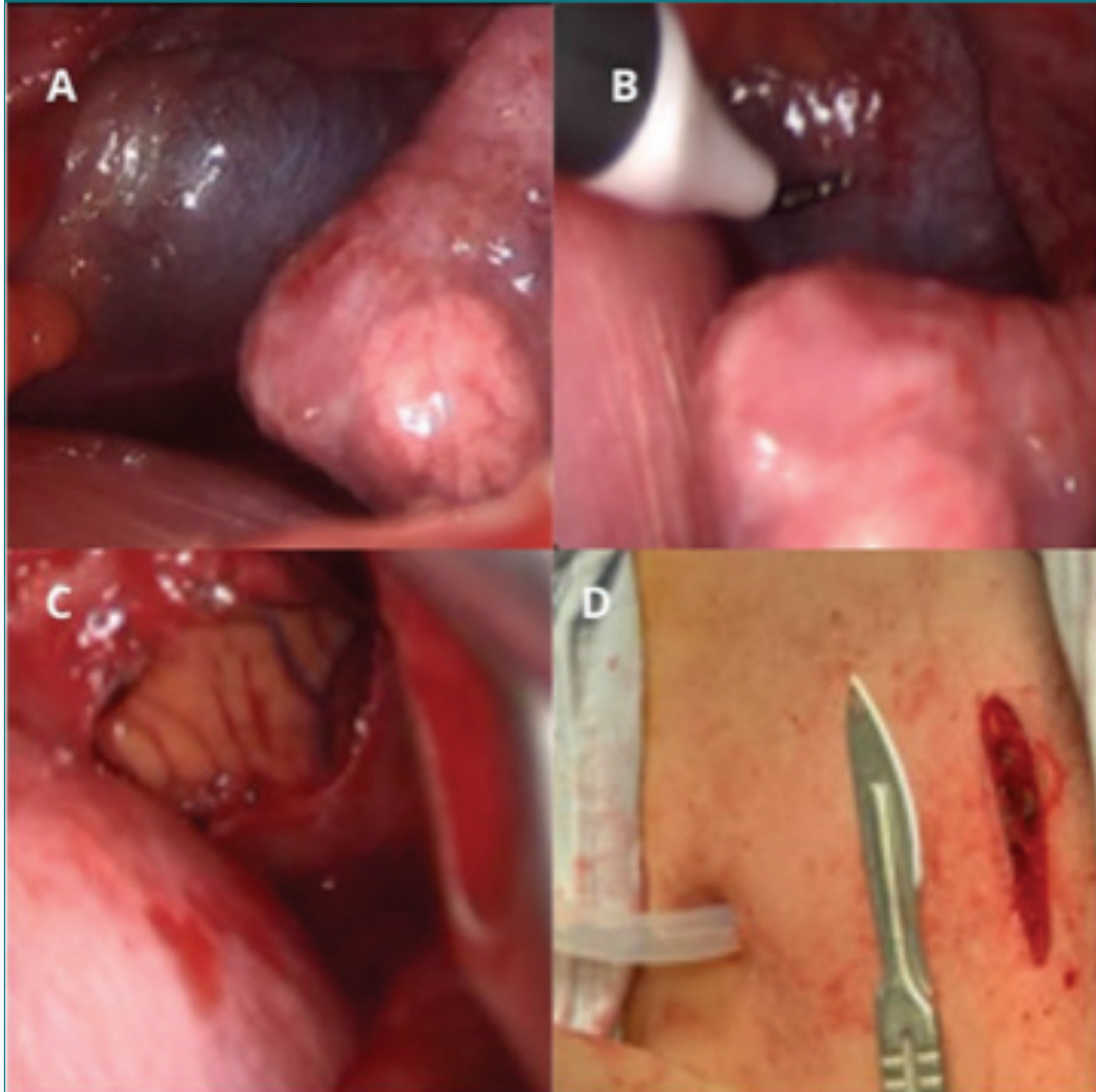
In our private thoracic surgery experience (Thorax Uniport®) in western Mexico (Guadalajara and Colima cities), cases of mediastinal pathology were successfully treated with uniportal VATS approach, however, we need to have a greater number of cases to report significant results.

CONCLUSION

Internationally, in the last two decades, minimally invasive approaches have been used to perform mediastinal surgery, because it promotes postoperative morbidity reduction, and shortens the average length of stay compared to open surgical approaches. Detractors of minimally invasive mediastinal surgery argue that this technique has some limitations, as; intraoperative flat vision, and loss of depth perception, in addition to that, in the case of resection of mediastinal masses, these can only be resected if they are less than 5 cm in diameter. However, mediastinal uniportal VATS surgery has shown that a significant improvement in multiplanar vision and allows mediastinal resections no larger than 10 centimeters in diameter^(2,4).

In Mexico, the most frequent mediastinal pathologies treated by thoracic surgery are mediastinal tumors, necrotizing descending mediastinitis and pericardial effusion. The little evidence reported denotes that historically open surgery (sternotomy and thoracotomy) has been the main surgical approach, although in the last 5 years, reports of invasive me-

Picture 2. Malignant pericardial effusion case due to lung cancer, which resulted in cardiac tamponade treated with a pericardial window by uniportal video-assisted thoracoscopy. A. Pericardium distended by malignant pericardial effusion, B. Surgical field opening with electrocautery to perform a pericardial window, C. Left pericardial window of 3 CM x CM, and D. Incision of utility port and exit by counter opening of a tunneling kardiaspiral® pleural tube.

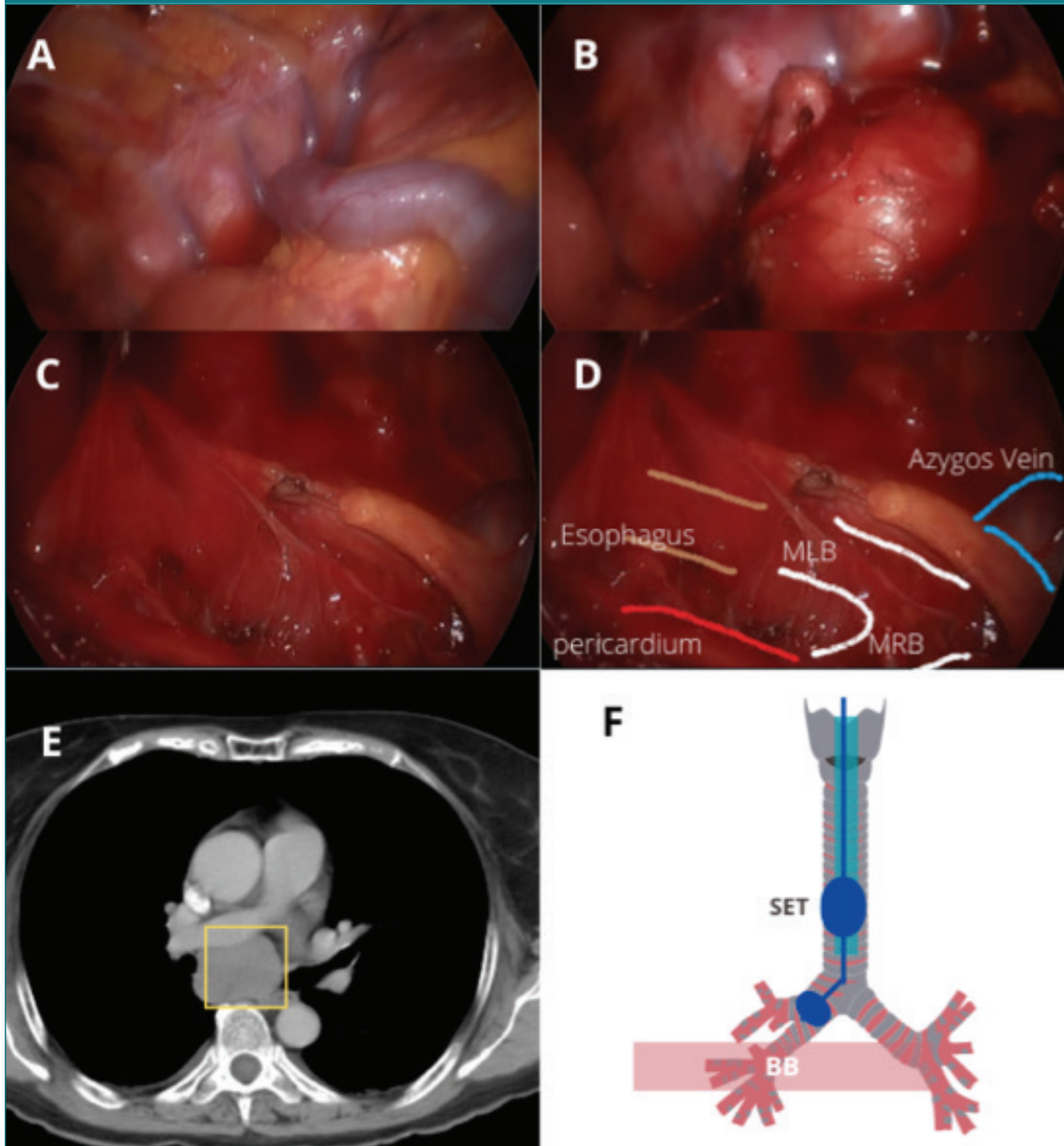


diastinal surgery have increased, especially in the country's capital^(1,3,7-9).

In conclusion, In western Mexico, under our experience as a minimally invasive thoracic service (Thorax Uniport®), the practice of mediastinal surgery with

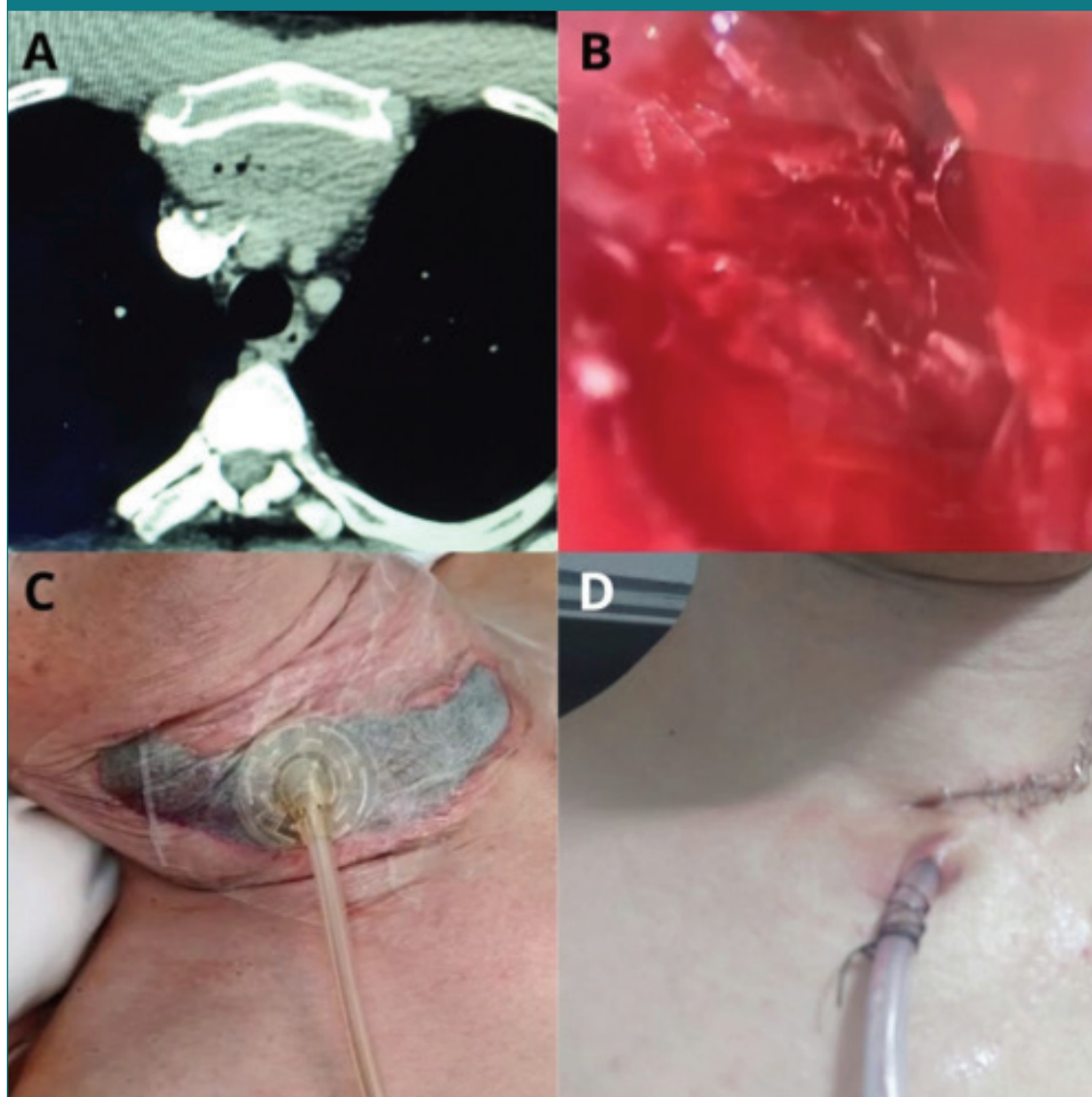
uniportal VATS approach is viable when the patient is correctly selected and if the surgical team has the experience Minimally invasive surgical techniques in the mediastinum represent a safe and effective option, even similar compared to robotic surgery⁽²⁾.

Picture 3. Mediastinal bronchogenic cyst case resected by single-port video thoracoscopy. A. Image of visceral mediastinum where bronchogenic cyst is covered by mediastinal pleura, B. Dissected bronchogenic cyst by single-port video thoracoscopy, C. Free mediastinal visceral compartment after resection of bronchogenic cyst, D. Anatomical description of the visceral mediastinal compartment, brown: esophagus, red: pericardium, white: main bronchi, and blue: azygos vein, E. Computed thoracic tomography showing the bronchogenic cyst in the subcarinal region (marked with a yellow box), and F. Representative diagram of airway control with a single endotracheal tube and right bronchial blocker.



MLB: Main left bronchus, MRB: Main right bronchus, SET: single endotracheal tube, and BB: Bronchial blocker.

Figure 4. Uniportal video-assisted thoracoscopy approach representation of pre-vascular mediastinum compartment, Patient in semi-supine position at 30 degrees with the ipsilateral arm abducted in L and a roll-pad under the shoulder, the working port is 3-5 cm above the anterior axillary line.



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