

Current Indications for Videothoracoscopy

Indicações Atuais da Videotoracosopia

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ABSTRACT

Videosurgery was without a doubt, the highpoint with which the surgery closed the millennium. Although nothing more than a new approach to surgical access, there is no doubt that it significantly changed surgical practice. Nor is there any doubt as to the potential that the future of videosurgery holds such as the use of three-dimensional images, the development of more compact and efficient tools and equipment, and the integration with other technologies of the digital age for medical education and treatment. Concomitant with the technical development there has always been, in the course of the history of Medicine, a concern with minimizing human suffering and the prevention of complications associated with the new therapeutic options. The constant pursuit of more effective and more efficient diagnostic and therapeutic modalities, with fewer side effects, transformed minimally invasive videosurgery approaches, into the substantive hope of performing surgical procedures with minimal discomfort for patients when compared to those employing traditional access. Sixteen years after of its introduction, there are now several well-established indications for videothoracoscopy, and others still controversial, that remain investigational.

Key words: Videothoracoscopy. Indications. Complications.

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THORACIC VIDEOSURGERY ESTABLISHED INDICATIONS (TABLE 1)

Pleural mass and effusion of unknown origin

An excellent diagnostic option which offers direct visualization of the lesion, guides the biopsy of the parietal and visceral pleura, and enables the collection of large samples of tissue, videothoracoscopy should be indicated early as a means of diagnosis when previous investigation failed to achieve results.

Malignant and/or recurrent pleural effusion

In addition to diagnostic videothoracoscopy, therapeutic videothoracoscopy enables both pleurodesis by talc insufflation and by parietal

pleurectomy, which enables the obliteration of the pleural space, before a lung incarceration due to progression or extension of the tumor. In cases of hepatic hydrothorax, videothoracosopic findings of diaphragmatic defects can be repaired with small surgical intervention.

Parapneumonic or loculated inflammatory pleural effusion and pleural empyema

Early intervention is recommended in cases of loculated parapneumonic pleural effusion, as well as in the fibrinopurulent phase of pleural empyema, with debridement of pleural adhesions and multiloculated collections. These measures seek to remove fibrinous membranes that cover the visceral and parietal pleural surfaces and necrotic debris in order to clean and unify the pleural cavity

Table 1 - Videothoracoscopy: the established indications.

Pleural mass and effusion of unknown origin
Malignant and/or recurrent pleural effusion
Parapneumonic or loculated inflammatory pleural effusion and pleural empyema
Post-operative and post-traumatic intrapleural clot
Evaluation of diffuse pulmonary infiltrates and pulmonary mass
Spontaneous pneumothorax and bullous emphysema
Severe Pulmonary Emphysema
Evaluation of Pulmonary Nodule
Mediastinal masses and cysts
Thymic hyperplasia in Myasthenia Gravis
Pre-resection intrathoracic cancer staging
Pericardial effusion
Hyperhidrosis, vascular disease, long QT syndrome and reflex sympathetic dystrophy
Diseases of the thoracic spinal cord
Diseases of the esophagus
Thoracic trauma
Children

allowing complete re-expansion of the lung. Even for organizing empyemas evolving for 60 to 90 days with incarcerated lung, videothoracoscopy is still useful.

Postoperative intrapleural clot

Videothoracoscopy enables the surgeon to suction and wash the pleural cavity, to locate bleeding, and to treat hemothorax occurring postoperatively or secondary to intrathoracic diseases. Clot trapped in the pleural cavity points to the occurrence of prolonged hemorrhagic effusions, especially when there is a high concentration of fibrinolytic factors: These effusions can even become infected. The association of videothoracoscopy with intrapleural streptokinase facilitates the hygiene of the pleural cavity.

Chylothorax

The invasive control of postoperative chylothorax following thoracic interventions for trauma or secondary to intrathoracic diseases is achieved by videothoracoscopy through the direct identification of the thoracic duct and its ligation.

Pulmonary infiltrates and pulmonary mass of unknown origin

Videothoracoscopic diagnostic access is of value in cases of pulmonary infiltrates by permitting that several fragments of different areas of the lung

be obtained under direct vision and guided by computed tomography, with minimal tissue manipulation. Fragments of the middle lobe and lingula are considered representative specimens for the different analyses. Patients undergoing lung transplantation or immunosuppressed with increased risk of infections or malignancies may benefit from minimally invasive diagnostic access. For localized masses, like those in the posterior segments of upper lobes and superior segments of lower lobes, videothoracoscopic access permits biopsy of the lesion.

Spontaneous pneumothorax and bullous emphysema

Minimally invasive access allows treatment of lung disease (resection of pulmonary blebs and bullae) and the prevention of recurrence by abrasive chemical pleurodesis or apical parietal pleurectomy. Videothoracoscopy is also useful to identify and treat complications such as prolonged air leak, incomplete lung re-expansion, and hydro-, pio- or hemo-thorax. The procedure can be performed bilaterally in one operative time. The indication for the procedure should be early, within three to four days of an unfavorable course after closed pleural drainage. There is, however, no consensus regarding when one treats first-time uncomplicated primary spontaneous pneumothorax. Individuals with bilateral lesions,

divers, aviators, and those in the military, or those with secondary or bilateral synchronous pneumothorax should be treated with the first episode. The rate of long-term complications and recurrence with videothoracoscopy is equivalent to more invasive procedures such as axilotomy and limited thoracotomy.

Severe pulmonary emphysema

The National Emphysema Treatment Trial demonstrated that for the surgical treatment of severe pulmonary emphysema videothoracoscopy offers a quicker functional recovery with costs 17% lower than thoracotomy. When ideal clinical indications – emphysema concentrated in the upper lobes with poor exercise capacity and emphysema concentrated in the upper lobes with high exercise capacity – are respected, the functional results obtained, the intra- and post-operative morbidity, and mortality are similar in the two modes of surgical access.

Pulmonary nodule of unknown etiology

Videothoracoscopy has changed the diagnostic approach of peripheral pulmonary nodules. Clinical criteria such as age, smoking, professional activity, personal history; and radiographic criteria for risk of malignancy such as size larger than three centimeters in diameter, the time of growth between 21 and 400 days; bosselated, spiculated, lobulated, ill-defined borders; density less than 185 UH, presence of irregular calcification, presence or absence of a cavity, are not superior to histopathological study of a lesion to define the diagnosis of solitary nodule or multiple lung nodules. Videothoracoscopy allows the resection of pulmonary nodules of up to three centimeters in diameter, located on the periphery of the lungs, for diagnosis and possible therapy.

Mediastinal masses and cysts

For mediastinal masses, videothoracoscopy is used as a diagnostic method in patients in whom less invasive access such as CT-guided percutaneous puncture, transtracheal puncture, transesophageal puncture guided by ultrasound or access via the cervical were contraindicated or inconclusive. It has therapeutic value in benign diseases, of small size and exhibiting non-infiltrating and non-invasive behavior. On the other hand, with malignant disease surgical access is only useful for diagnosis and should not be used to treat, because the diseases are usually

infiltrative, locally invasive, and require complete resection by a wide surgical approach.

Pre-resection intrathoracic cancer staging

The finding of unsuspected ipsilateral pleural metastases without associated pleural effusion is not a rare occurrence in patients with lung cancer (even early stage disease) with indication for curative surgical treatment, as one might suppose. Videothoracoscopy is useful in diagnosing patients with hilar or mediastinal involvement unable to undergo biopsy cervical or anterior mediastinoscopy. Its use does not imply an increase in cost or of surgical morbidity, avoids unnecessary thoracotomies, and confirms resectability in patients previously considered inoperable. Nevertheless, in most situations it is inappropriate to characterize non-resectability, because even during thoracotomies, only after extensive dissection can one make conclusions regarding the resectability (or not) of a centrally located tumor. The evaluation of clinical treatments using induction chemotherapy requires invasive preoperative staging. Videothoracoscopy and complementary videomediastinoscopy determine accurately the presence or absence of N2 and N3 and identify T3, T4 and M1.

Thymic hyperplasia in myasthenia gravis

Videothoracoscopy thymectomy in Myasthenia Gravis has been shown to be reliable, fast, and safe in the resection of thymic tissue and mediastinal fat, without deterioration of myasthenic state and with long-term results equivalent to those obtained by sternotomy in terms of control and remission of the disease. The operative access selected is the surgeon's choice.

Pericardial effusion

A pericardial window can be made quickly and safely by videothoracoscopy, with complete visualization of the phrenic nerves and with the placement of a window of any size.

Hyperhidrosis, vascular diseases, long QT syndrome, and reflex sympathetic dystrophy

Videothoracoscopy is now the standard of care for operations on the thoracic sympathetic trunk, is indicated for resection or neurolysis of the stellate

ganglion and/or part of the thoracic sympathetic chain in patients with causalgia, hyperhidrosis and/or ischemic vascular phenomena of the upper limb. It is simple procedure, not infrequently performed bilaterally, and with a very acceptable cosmetic result.

Diseases of the thoracic spine

Videothoroscopic anterior access to the thoracic spine, while minimizing the iatrogenic injury to the integrity of the chest, permits the execution of procedures such as drainage of vertebral abscesses, spinal discectomy, rib resection, intervertebral fusion, correction of scoliosis (<70 degrees), placement of implants, among others, with decreased morbidity.

Diseases of the Esophagus

The excision of benign tumors of the esophagus of small size, and the performance of minimally invasive esophagectomy can be safely performed in selected cases with functional benefits.

Thoracic trauma

In hemodynamically stable patients, when used early, videothoracoscopy allows you to empty the hemothorax, diagnose and treat slow and continuous bleeding originating from the chest wall and lung parenchyma, treat lung lacerations with air leaks, evaluate mediastinal lesions, diagnose and treat limited diaphragmatic injuries avoiding unnecessary operations in many patients. Pericardial exploration, identification of cardiac lesions and placing a window in the pericardium to control cardiac tamponade are procedures performed safely in stable patients. Currently, videothoracoscopy appears as a new diagnostic and therapeutic access for many situations

of thoracic trauma with results comparable to open operations when performed by experienced surgeons.

Children

Indicated for children six months and older with pleural diseases, in children between two and eight years for the pleural and mediastinal disorders. For children over eight years, the indications are practically the same as for adults.

CONTROVERSIAL INDICATIONS (TABLE 2)

Controversial indications

At the same time, the functional concept of minimal discomfort and low morbidity of videosurgery spread so that, to many, it seemed possible to consider that there wouldn't be great risks of accidents or of developing intra- and post-operative complications.

Unfortunately, the advantages gained do not include zero surgical risk. Physiological changes occur in the postoperative period and there are remain a considerable number of controversies about surgical access.

Pectus excavatum

The videothoroscopic correction of pectus excavatum by the Nuss technique (and its variants), safe in children, is limited in adolescents and adults due to the higher incidence of complications. There is a risk of cardiac and the internal thoracic arteries lesions, perforation of thoracic viscera, breaking or mobilization of the support bar, pleural effusion, pneumothorax, and pericarditis. The aesthetic results are dependent on the selection of the ideal candidate for the surgery by videothoracoscopy.

Table 2 - Videothoracoscopy: the controversial indications.

Pectus escavatum
Cancer
Lobectomy
Sparing or limited resection of lung tissue
Extended pulmonary segmentectomy
Metastasectomy
Systematic lymph node dissection
Intra-operative mapping and sentinel lymph node biopsy
Re-staging
Thymomas
Robotics

Cancer Surgeries

Controversies in the use of videothoracoscopy in oncology are: optimal patient selection, the definition of the initial cancer stage, the ability to ensure results, inadequate identification of the intrathoracic extent of disease and the tumor margins, the risk of incomplete resection of the lesion, the great variety of techniques used that have not been standardized, the potential risk of local implant site or systemic dissemination of tumor cells related to extensive manipulation of the tumor because of limited access, the possibility of tumor recurrence, the undefined degree of immunosuppression and surgical invasion, the non-existence of extensive series of prospective randomized trials and the lack of knowledge about long-term survival rates. There are, therefore, doubts with regard to guarantees about complete resection.

Lobectomy/Pulmonary lobectomy

Pulmonary lobectomy is still considered an investigational procedure due to questions not fully answered, to technical difficulties and the risk of complications. Nevertheless, videothoracoscopy is routinely used for lung resections, such as lobectomy or pneumonectomy, at centers of excellence worldwide, in selected patients with lung cancer in stage Ia and Ib or in individuals with benign diseases, with morbidity and mortality rates similar to those achieved with conventional approaches and oncological outcomes comparable to those obtained with conventional surgical access. There is, however, the possibility of an unfavorable anatomy, adhesions, or pleural thickening, absence of fissures, thick hilar areolar tissue, hilar lymph node enlargement, inadequate exposure of blood vessels and bronchi, and hemorrhagic accidents, instrument failure which contraindicate this minimally invasive route. Technical variations have been described such as simultaneous stapling of hilar elements. With this type of surgical procedure there is a risk of air leakage, bleeding, bronchopleural, arteriovenous, or bronchovascular fistula, and instrument failure. The experience with videothoracoscopy is limited to a few thoracic surgery centers around the world.

Sparing or limited resection of lung tissue

Lung cancer patients without functional reserve or high-risk patients with recommendations for limited pulmonary and lung tissue-sparing resections find in videothoracoscopy an excellent

means of access, because they attain favorable functional outcome more quickly in the post-operative period.

Extended pulmonary segmentectomy

This is a surgical technique that poses difficulties for the videothoracoscopic procedure, specifically in the individualized treatment of elements of the hilum of the lung segment and in the identification of the anatomical limits of the segment, for its resection. Initial experience has been presented about selected cases of stage I lung cancer in the apex of the left upper lobe. Trisegmentectomy of the left upper lobe in selected cases of early lung cancer has been described with promising results. The experience is limited to just a few thoracic surgery centers around the world.

Metastasectomy

When contemplating videothoracoscopy as a path of therapeutic access, individuals with multiple pulmonary nodules constitute a special group of patients. In theory, modern helical CT scanners – which can identify lesions as small as two millimeters in diameter – should be able to identify virtually all existing metastases. Nevertheless, concerns about not identifying all lung metastases intraoperatively, leading to the risk of an incomplete tumor resection, makes metastasectomy via videothoracoscopy controversial.

Systematic lymph node dissection

Serious controversy surrounds the systematic lymph node dissection of the mediastinum in lung cancer resections with curative aim. The quality of radical dissection cannot be guaranteed because there are no real anatomical limits in the different mediastinal regions, except the right upper mediastinum. Incomplete resection is not oncologically correct, and at the moment should not be recommended. There is a trend toward the use of sentinel lymph node sampling instead of systematic dissection in cases of non-small lung cancer in initial stages. Long-term prospective randomized trials are needed to define the best surgical conduct.

Intraoperative mapping and sentinel node biopsy

Mediastinal lymph node mapping poses technical challenges and limitations in the injection of the marker into the tumor, in the mapping and

identification of the sentinel lymph node level, and with the excision of sentinel lymph nodes when using videothoroscopic access. The experience to date is preliminary.

Re-staging

Although a major contribution has been achieved by immediate pre-operative staging videothoracoscopy, there is controversy regarding the quality of the re-staging in patients who have undergone induction chemotherapy or chemoradiotherapy.

Thymomas

Surgical resection has been the gold standard treatment of thymomas and those with early stage disease have high cure rates. There is still no consensus on the applicability of videothoracoscopy because of the risk of thymus gland remnants, perithymic adipose tissue, and ectopic thymus, rupture of the capsule in thymomas larger than two centimeters, the risk of vascular and mediastinal nerve lesions, the lack of long-term confirmation of satisfactory results and the need for re-thymectomy. However, it is an alternative in situations in which sternotomy is not recommended. The recommended approach is bilateral videothoracoscopy, combined with a small neck incision, when you want to get an extended resection, as achieved with total sternotomy and a neck incision.

Robotics

Instruments in development, inadequate for thoracic operations because of loss of tactile sensation. Limited initial experience.

COMPLICATIONS (TABLE 3)

The incidence of intraoperative accidents and complications is low when performed by thoracic surgeons and when established principles for thoracic surgery are followed. Major complications, those that

may endanger the life of the patient include bleeding and prolonged air loss. Minor complications occur with small incidence and most of them have no clinical significance.

Bleeding

Bleeding is the most serious of the postoperative complications. Minor bleeding may result from the instrument penetrating the extrapleural plane, injury to the intercostal or mammary neurovascular bundle, section of pleural adhesions, and lesions of the lung tissue. Major bleeding may occur after lobectomy, pneumonectomy, and mediastinal interventions because of vascular accidents or malfunction of endoscopic instrument.

Prolonged air loss

Air loss commonly occurs in the postoperative period of pulmonary interventions, through the suture of the bronchial stump, the suture of the lung parenchyma or even through the surgical dissection of segmental surfaces. Technical advances such as the use of bovine pericardium to reinforce the suture line mechanics, argon gas, biological glues, absorbable mesh applied over the area of air loss, parietal pleurectomy, pleurodesis and the pleural mantle are alternatives that have contributed as complementary measures in the control of prolonged air loss.

Tumoral implants and dissemination

The tumoral implant in chest incisions has been described in the literature. The mandatory preventive measure is the placement of malignant, infected or suspicious specimens inside of plastic bags prior to removing them from the pleural cavity.

Intercostal injury

Intercostal neuralgia is a common problem resulting from the manipulation of surgical instruments through holes in the intercostal spaces. Choosing the

Table 3 - Videopleuroscopy: complications.

Bleeding
Prolonged Air Loss
Tumoral implant of the incision and dissemination
Injury of intercostal nerve
Infection

most appropriate intercostal spaces, the use of small diameter tools, and great care in handling them is absolutely fundamental to minimizing postoperative chest pain.

Infection

Wall abscesses occur occasionally. Pleural empyema is a rare complication whose resolution is difficult and time-consuming.

RESUMO

A videocirurgia foi sem sombra de dúvidas, a chave-de-ouro com a qual a Cirurgia encerrou o milênio. Embora ela nada mais seja do que um novo acesso para abordagem operatória, não há dúvidas de que ela modificou, de forma significativa, a prática cirúrgica. Tampouco há dúvidas quando às potencialidades que o futuro da videocirurgia nos reserva como o uso de imagens tridimensionais, o desenvolvimento de instrumentos e equipamentos mais compactos e mais eficientes e, ainda, a integração com outros métodos da era digital para a educação e tratamentos médicos. Concomitante ao desenvolvimento técnico sempre houve, no transcorrer da história da Medicina, a preocupação com a minimização do sofrimento humano e a prevenção de complicações inerentes às novas alternativas terapêuticas. A busca constante de modalidades de diagnóstico e tratamento mais eficientes, mais eficazes, com menos efeitos colaterais, transformou as abordagens minimamente invasivas por videocirurgia, na esperança concreta de realizar procedimentos cirúrgicos com o mínimo de desconforto para os doentes quando comparadas aos acessos tradicionais. Passados 16 anos de sua introdução, há atualmente algumas indicações bem estabelecidas para a videotoracoscopia e outras ainda controversas, em caráter investigacional.

Descritores: Videotoracoscopia. Indicações. Complicações.

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