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Efficacy of Thoracoscopic Surgery in Elderly Patients with Non-Small Cell Lung Cancer

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Abstract: *Non-small cell lung cancer is a common type of lung cancer, accounting for over 85% of cases. Current clinical approaches to this disease primarily involve surgery, combined with radiotherapy, chemotherapy, targeted therapy, and immunotherapy. In the past, open chest surgery was the primary method for lung cancer surgery, but it was associated with significant trauma and numerous complications, leading to a decrease in patients' quality of life and certain limitations. With the rapid development of modern surgical techniques, endoscopic technology has shown promising results in the surgical treatment of lung cancer. Video-assisted thoracoscopic surgery (VATS) for lung cancer offers the advantages of minimally invasive procedures, reduced bleeding, and faster recovery. In recent years, it has gained widespread clinical use and demonstrated high effectiveness and safety. This article primarily discusses the outcomes of VATS in the treatment of non-small cell lung cancer in elderly patients.*

Keywords: *Video-assisted thoracoscopic surgery; Non-small cell lung cancer; Short-term and long-term curative effects; Complications*

1. Introduction

In recent years, the incidence of lung cancer in China has been steadily increasing, attracting extensive attention from the field of clinical medicine. Statistical surveys have shown that in the Shanxi region, non-small cell lung cancer exhibited a rising trend from 2015 to 2019, imposing a significant burden on families and society [1]. In the clinical treatment of non-small cell lung cancer, surgical intervention is the preferred method for most patients. However, due to the advanced age of many patients at the time of diagnosis, surgery is associated with higher risks and an overall less favorable prognosis. Therefore, improving the efficacy of surgical treatment and enhancing the prognosis of patients are important subjects of clinical research. Video-assisted thoracic surgery (VATS) offers the advantages of minimal trauma, fewer postoperative complications, and excellent cosmetic results, and it has gained widespread use in recent years.

2. Overview of Non-Small Cell Lung Cancer

Non-small cell lung cancer is the most common type of lung cancer, characterized by large cells and abundant cytoplasm. It includes subtypes such as squamous cell carcinoma, adenocarcinoma, and large cell carcinoma. Currently, the precise mechanisms of the disease's occurrence remain unclear, but most scholars attribute it to factors such as smoking, occupational environments, air pollution, ionizing radiation, diet, physical activity, and genetics. At the same time, the clinical symptoms of non-small cell lung cancer are closely related to the progression of the disease. In the early stages, there are often no noticeable symptoms. However, as the disease advances, it can lead to symptoms such as coughing, hemoptysis, chest pain, shortness of breath, chest tightness, and fever. When the tumor affects surrounding tissues and organs, it can cause additional symptoms, such as upper right abdominal pain when liver metastases occur or localized bone pain with a characteristic pattern of progressive worsening.

In the clinical treatment of non-small cell lung cancer, individualized treatment plans are formulated based on the patient's physical condition, tumor pathology, and the extent of invasion. These treatment options include surgery, radiotherapy, chemotherapy, targeted therapy, immunotherapy, and interventional therapy. Among these treatment options, surgery is the preferred treatment method for non-small cell lung cancer patients. The lung cancer surgical procedures can be broadly categorized into extensive resection and local resection. The extensive resection procedures involve the removal of

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larger portions of the lung, including bi-lobectomy, sleeve resection of bronchi, one-sided lung removal, and total lung removal involving partial excision of the left atrium. And these surgeries are associated with high surgical risks. In contrast, local resection typically involves removing only one lobe of the lung, but it carries a higher risk of recurrence [2]. Lung cancer surgeries can be performed using either open chest surgery or VATS. The former allows direct visualization of lung tissues but is associated with more significant trauma and a higher rate of complications, which can impact postoperative prognosis. VATS, on the other hand, involves making small incisions and inserting a thoracoscope and surgical instruments to resect the tumor. This method offers the advantages of minimally invasive surgery, superior therapeutic efficacy, and faster recovery, and it has gained wide acceptance in clinical practice, as is shown in Figure 1.

Figure 1: Thoracoscopic surgery for lung cancer.

3. Thoracoscopic Surgery for the Treatment of Non-Small Cell Lung Cancer in Elderly Patients: Efficacy

3.1. Advantages of Video-Assisted Thoracoscopic Surgery (VATS)

The main advantages of video-assisted thoracoscopic surgery (VATS) for lung cancer are as follows: ① High Efficacy: Clinical research has shown that VATS for lung cancer offers clinical efficacy comparable to open-chest lung cancer surgery, with no significant differences in postoperative survival rates. Studies by Zhou Bin and colleagues have highlighted that VATS for lung cancer results in high clinical efficacy and fewer postoperative complications, contributing to improved patient prognoses [3]. Researchers have found that VATS enables the removal of lesions and lymph node dissection with the support of the thoracoscope, and the magnification capability of the thoracoscope allows even lymph nodes that are not clearly visible to be better identified, enhancing intraoperative clearance effectiveness [4]. Zhou Zhidong and colleagues' research indicates that video-assisted thoracoscopic sleeve resection of the lung yields treatment outcomes equivalent to open chest surgery, meeting clinical treatment requirements [5].

② Small Incisions: With changing patient attitudes and an emphasis on minimizing physical and psychological trauma while ensuring clinical efficacy, it is crucial to reduce surgical incisions to improve patients' quality of life. These traditional open chest surgeries often result in longer incisions that can lead to scarring, affecting the appearance of the chest and failing to meet aesthetic requirements, especially for female patients, who may experience postoperative anxiety and depression. Therefore, minimizing surgical trauma is essential. VATS for lung cancer involves smaller incisions compared to open chest surgery. Standard three-port VATS requires only two incisions measuring 1.5 cm in length and one incision measuring 3-4 cm. Furthermore, the development of double-port and single-port thoracoscopic surgeries has further improved the cosmetic outcomes of these procedures [6] (Figure 2).

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Figure 2: Single-port thoracoscopic radical surgery for lung cancer.

③ Reduced Postoperative Pain: VATS for lung cancer does not require extensive opening of the chest wall or spreading the ribs, resulting in minimal damage to normal tissues. Consequently, postoperative incisional pain is reduced, allowing for a decrease in the use of pain-relief medication. This facilitates early mobilization of patients, which can be particularly beneficial for elderly non-small cell lung cancer patients.

④ Rapid Recovery: VATS ensures the integrity of the chest wall, reducing the risk of postoperative bleeding and pleural adhesions. This, in turn, shortens the duration of chest tube placement, encouraging early patient recovery and discharge. Research suggests that both single-port and three-port VATS procedures result in shorter hospitalization periods, providing effective treatment options for patients who cannot tolerate open chest surgery [7].

3.2. Prognosis of Video-Assisted Thoracoscopic Surgery (VATS) for Lung Cancer

① Short-Term Outcomes: VATS for lung cancer allows for surgical procedures to be performed through small incisions. As this approach continues to improve, its applicability has expanded, ranging from stage I non-small cell lung cancer to stage II non-small cell lung cancer. The short-term outcomes are comparable to those of open-chest surgery, making it suitable for patients with poorer overall health. Researchers, including Zhou Xiaodong, have found that single-port VATS yields high treatment efficacy, with minimal postoperative pain and oxidative damage, and it has no significant impact on patient prognosis [8].

② Long-Term Outcomes: While VATS for lung cancer is highly effective, it does carry a risk of postoperative recurrence and metastasis. This risk is primarily attributed to the limited operating space, which can make dissection challenging when adhesions occur between the chest wall and lung tissue. Additionally, the limited operating angles may not be suitable for tumors with a diameter exceeding 6 cm. Research by Chen Jian and others indicates that high pathological staging, low differentiation, mediastinal lymph node metastasis, and positive resection margins of the trachea are high-risk factors for postoperative recurrence and metastasis in non-small cell lung cancer patients. Postoperative adjuvant chemotherapy is a protective factor and can be administered after VATS to help reduce the risk of recurrence and metastasis [9]. These studies suggest that VATS for lung segment resection provides high treatment efficacy and safety, contributing to improved survival rates in non-small cell lung cancer patients. However, the patient's age, body type, and clinical staging can have an influence on surgical outcomes [10].

3.3. Risks Associated with Video-Assisted Thoracoscopic Surgery (VATS) for Lung Cancer

Compared to open-chest surgery, VATS for lung cancer is generally considered to be safer, but it cannot completely eliminate the risk of surgical complications. This is primarily due to the following factors: ① Requirement for Surgical Experience: VATS is not performed under direct vision, and it demands a higher level of surgical expertise. Inexperienced surgeons, particularly those with less experience, may not be accustomed to working with the two-dimensional images transmitted by the camera. This lack of familiarity can lead to difficulties in identifying anatomical structures and impact the accuracy of the procedure. ② Limited Field of View: The surgical field visualized during VATS is relatively restricted, and some injuries may occur outside the field of vision during the procedure. For example, damage caused when using an electric scalpel to enter the thoracic cavity may lead to

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postoperative complications. ③ Suturing Challenges: Unlike open-chest surgery, VATS does not provide the same direct visualization for suturing. Problems may arise during the use of cutting and closure devices, potentially leading to various complications. Research utilizing predictive models has found that risk factors for postoperative complications following thoracoscopic lung resection include age over 65, male gender, abnormal postoperative albumin levels, larger tumor diameter, and low FEV1% levels [11]. A study by Yang Dongliang and colleagues has identified that risk factors for pulmonary complications after VATS include age over 65, a history of chronic obstructive pulmonary disease, a smoking history, and hypoalbuminemia. They emphasize the need for perioperative interventions for high-risk patients to reduce the risks associated with VATS and ensure patient safety [12].

4. Outlook

Video-assisted thoracoscopic surgery (VATS) provides a new surgical option for elderly patients with non-small cell lung cancer. Compared to traditional open-chest surgery, VATS offers a lot of advantages such as minimal trauma, reduced postoperative pain, and shorter hospital stays. This makes it possible for more elderly patients who cannot tolerate open-chest surgery to undergo surgical treatment. VATS has gained widespread recognition and acceptance among both medical professionals and patients.

However, it is important to acknowledge that VATS still carries the risk of postoperative recurrence and metastasis. Additionally, it requires highly skilled surgeons and can be associated with higher treatment costs. It is believed that as this surgical technique continues to evolve, such as with the introduction of robotic-assisted surgery using the da Vinci system, it will bring further benefits to elderly patients with non-small cell lung cancer.

5. Conclusion

This study has explored the efficacy of VATS for the treatment of non-small cell lung cancer in elderly patients, providing valuable insights and references for the researches in this field in the future. VATS has shown promising application in elderly non-small cell lung cancer patients, offering advantages that open-chest surgery cannot provide. It reduces surgical trauma, minimizes intraoperative bleeding, decreases the occurrence of complications, and promotes early postoperative recovery without increasing the risk of postoperative recurrence and metastasis. Therefore, it is expected to be a major development direction for surgical treatment in elderly non-small cell lung cancer patients in the future.

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