REVIEW

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The differences in quality of life between open thoracotomy and video-assisted thoracoscopic surgery (VATS): a literature review

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ABSTRACT

Introduction: Thoracotomy is considered one of the most common surgical procedures related to pain. Patients may consider postoperative complications (such as pain) in the hospital as an acceptable risk, but patients are not ready to accept long-term disability that can affect the patient's daily life.
Methods: This article was conducted by analysis and synthesis from various references. The author uses "video-assisted thoracoscopic surgery-VATS" AND "Open Thoracotomy" AND "Quality of Life" as keywords to explore the literature from PubMed, Google Scholar, ProQuest, and Clinical Key. The related papers published in the last fifteen years were included and non-full-text papers were excluded. These papers were analyzed subsequently to answer the aim of this study.
Results: We obtained a total of four articles that met our review criteria. Up to six journals were extracted from PubMed, Google Scholar, ProQuest, and Clinical Key. According to our review method considerations, many articles excluded by the year of publication criteria are out of date.
Conclusions: Most studies still show VATS's superiority over thoracotomy. There is a difference in the quality-of-life scores of patients after VATS compared to thoracotomy. VATS shows an improvement in quality of life after the procedure. VATS revealed significantly better results in physical function, physical role, bodily pain, and general health than open thoracotomy.

Keywords: thoracotomy, video, quality of life.
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INTRODUCTION

Open thoracotomy is a surgical procedure performed by making an incision in the chest wall to gain access to the organs in the chest cavity by cutting or removing a part of the ribs. Thoracotomy can be performed in emergency or elective conditions. Thoracotomy is considered one of the most difficult postoperative surgical procedures to treat, because it is very painful and the pain can prevent the patient from breathing effectively, causing atelectasis or pneumonia.[1] Over time, namely around 1990, thoracoscopic minimally invasive surgery began to be widely used and has been proven to improve quality of life (QOL) in patients who require invasive procedures in the chest cavity. Currently, thoracoscopic surgery and robotic surgery are the main procedures for lung cancer patients, so the thoracotomy procedure is being abandoned.[2]

Currently, thoracoscopy with video or video-assisted thoracoscopic surgery (VATS) is the main choice for invasive procedures in the chest cavity compared to open thoracotomy.[3-4] Both minor procedures such as wedge resection, pleural biopsy, or surgery for pneumothorax or major resection performed with VATS are associated with fewer postoperative complications, less pain, better postoperative quality of life, and an equivalent oncological prognosis with surgery and open thoracotomy.[3]

Some patients may consider postoperative complications (such as pain) in the hospital as an acceptable risk, but patients are not ready to accept long-term disability that can affect the patient's daily life. Quality of life assessment in patients undergoing treatment has recently become the new standard. Some patients may consider postoperative complications (such as pain) in the hospital as an acceptable risk, but patients are not ready to accept long-term disability that can affect the patient's daily life.[5]

METHODS

A literature review was conducted for this study using PubMed, Google Scholar, ProQuest, and Clinical Key. The search was conducted in English, using keywords related association between VATS, Open Thoracotomy and Quality of Life, with the keywords used were "VATS" AND "Open Thoracotomy" AND "Quality of Life". The related papers published in the last fifteen years were included and non-full-text papers were excluded. These papers were analyzed subsequently to answer the aim of this study.

RESULTS

We obtained a total of four articles that met our review criteria. Up to six journals were extracted from PubMed, Google Scholar, ProQuest, and Clinical Key. According to our review method considerations, many articles excluded by the year of publication criteria are out of date. The results are shown in Table 1.

DISCUSSION

Open thoracotomy is a major surgical maneuver that requires general anesthesia and the use of an endotracheal tube (single or double lumen), with the patient under mechanical ventilation throughout the procedure. One important aspect to consider is pain management, which requires systemic and often epidural analgesia.[1]

In supra-mammary anterolateral thoracotomy, the patient should be placed with the ipsilateral side elevated approximately 30 to 45 degrees. The ipsilateral arm is positioned at the patient's side. A thoracotomy incision is made between the second and third ribs

Table 1. Four Articles That Met Our Review Criteria

Article	Design	Objective	Population	Results
Ville R. et al.	Retrospective Cohort	To assess the long-term HRQoL minimum 2 years after the operation among patients who underwent surgery for local NSCLC in our clinic between the years 2006 and 2013	Patients who underwent lobectomy for the treatment of NSCLC from January 2006 to January 2013 at a single institution	The HRQoL scores of the 2 groups. No differences were identified on the dimensions of mobility, vision, hearing, sleeping, eating, excretion, discomfort and symptoms, depression, distress, and sexual activity (P > .05). The VATS group scored both statistically and clinically significantly lower on the dimensions of breathing (0.637 vs. 0.719, P ¼ .030), speaking (0.942 vs. 0.973, P ¼ .046), usual activities (0.746 vs. 0.821, P ¼ .030), mental function (0.818 vs. 0.917, P ¼ .001), vitality (0.767 vs. 0.824, P ¼ .049), and in the total 15D score (0.809 vs. 0.851, P ¼ .028)
Morten B. Et al.	Randomized controlled trial	To assess VATS results in lower pain scores and better quality of life and to investigate the cost-effectiveness of VATS	Patients who underwent VATS and thoracotomy for lobectomy of stage 1 lung cancer for 6 years (2008–2014)	The difference in (Quality-adjusted life years) QALYs gained over the 52 weeks of follow-up was 0.021 (95% CI -0.04 to -0.00015). This gives an ICER of 1 516 048 Dkr/QALY, which is best illustrated in the cost-effectiveness plan (CE-plan)
Morten B. et al.	Randomized controlled trial	to investigate postoperative pain and quality of life in a randomized trial of patients with early-stage non-small-cell lung cancer undergoing VATS versus open surgery.	Patients who were scheduled for lobectomy for stage I non-small-cell lung cancer. By use of a web-based randomization system, we assigned patients (1:1) to lobectomy via four-port VATS or anterolateral thoracotomy	During 52 weeks of follow-up, episodes of moderate-to-severe pain were significantly less frequent after VATS than after anterolateral thoracotomy (p<0·0001) and self-reported quality of life according to EQ5D was significantly better after VATS (p=0·014)
Handy JR. et al.	Retrospective Cohort	to answer the question about the functional recovery of VATS lobectomy for non-small-cell lung cancer (NSCLC) superior to the OPEN approach	All patients were enrolled in a long-standing, prospective observational lung cancer surgery outcomes study (LCSOS)	Comparison of the amount of functional change pre- and postop between groups demonstrated significantly better outcomes in 4 of 8 SF36 axes for the VATS group
Shi Q, et al. 2016	Retrospective Cohort	to assess functional recovery postsurgery for early-stage non-small cell lung cancer (NSCLC) who underwent either open thoracotomy vs video-assisted thoracoscopic surgery (VATS)	patients with Stage I or II NSCLC who were scheduled for thoracic surgery (either open thoracotomy or VATS) at The University of Texas MD Anderson Cancer Center in Houston, Texas. Eligible patients were required to be at least 18 years old	Compared with the open-thoracotomy group, the VATS group returned more quickly to baseline interference levels for walking (18 vs. 43 days), mood (8 vs. 19 days), relations with others (4 vs. 16 days), and enjoyment of life (15 vs. 41 days) (all P < 0.05)

Article	Design	Objective	Population	Results
Schwartz RM, et al 2016	Prospective Cohort	to further understand the differences between VATS and thoracotomy patients on baseline QoL, post-surgical QoL, and change in QoL from baseline to post-surgery in a sample of screening-detected early stage (IA) lung cancer patients	patients diagnosed with their first primary pathologic stage IA non-small-cell lung cancer who underwent surgery and provided follow-up information 1 year later (7–18 months) were included in the present analysis.	Multivariate analyses indicated no differences in QoL change between the two groups from pre- to post-surgery. Physical and emotional role functioning significantly improved among VATS patients and worsened among thoracotomy patients. Among thoracotomy patients, a significant decrease in post-surgical physical QoL was observed only in those who underwent lobectomy (-3.3; 95% CI: -5.1,-1.5)

along the upper border of the third rib. The pectoralis major and minor muscles were separated with electrocautery. The intercostal muscles are divided along the superior border of the rib to prevent damage to the neurovascular bundle along the lower border of the rib. At this stage, the third rib can be removed from the sternum with an oscillating saw and moved to better view the surgical field.[6]

In a submammary anterolateral thoracotomy, the patient needs to be positioned similarly to a supra mammary thoracotomy position with the ipsilateral side elevated between 30 and 45 degrees and the ipsilateral arm at the patient's side. A scalpel incises the skin along the inframammary crease covering the fifth rib. Electrocautery is then used to separate the pectoralis major and serratus anterior muscles. Proper visualization of the surgical field can be achieved by maintaining the position and retraction of the latissimus dorsi, so retracting rather than separating this muscle is preferable. Then a thoracotomy can be inserted between the fourth or fifth intercostal spaces after division of the intercostal muscles above the ribs to ensure survival of the neurovascular bundle.[6]

When performing a posterolateral thoracotomy, the patient must be positioned in the lateral decubitus position. The incision begins along the inframammary crease and extends posterolaterally below the tip of the scapula. It is then extended superiorly between the vertebra and the edge of the scapula a short distance. The trapezius muscle and subcutaneous tissue were separated with electrocautery, while the anterior serratus muscle and latissimus dorsi were identified and retraction was performed. The intercostal muscles are then divided along the upper border of the rib cage, allowing access to the thoracic cavity. A vertical midaxillary incision is made just below the axillary hairline to reach the ninth intercostal space, dissection of the subcutaneous space continues to the posterior border of the serratus anterior, and the posterior border of the latissimus dorsi is visualized. Retractors are used to pull the latissimus dorsi backward. The serratus anterior muscle rib attachment is removed until the corresponding intercostal space has adequate exposure. The intercostal muscles are then divided along the superior border of the inferior rib.[6]

Video-assisted Thoracoscopic Surgery (VATS) requires most patients to be in a lateral decubitus position which is accompanied by arching the table to help separate the ribs for better surgical access. This action also helps reduce pressure on the intercostal nerves. The lateral decubitus position provides adequate access to most thoracic structures including the lungs, pleura, esophagus, pericardium, and other mediastinal structures.[7]

The standard VATS procedure involves the use of 3 to 4 incisions made in a triangular configuration for scope and instrument insertion. VATS with a single port has also been described.[7] The patient is administered anesthesia in the supine position. A double-lumen tube (DLT) is the airway device of choice for most procedures. After DLT placement, tube position is confirmed with a fiberoptic bronchoscope through the DLT lumen. Management is taken to ensure adequate cuff position. After ensuring sufficient tube placement and cuff placement, the patient is positioned in the lateral decubitus position with the arm above the head. Curving the table is performed to allow adequate surgical exposure. The DLT position was then rechecked after the final positioning for the procedure. Three incisions are made for the anterior approach. Together the patient forms a triangular configuration with the utility incision at the apex of the triangle. The camera is inserted through this incision to allow for safe entry of the other port. A port is created to accommodate the camera in the auscultation triangle. The third port is created in the mid-axillary line. Actions are created at the utility port incision level. After the creation of 3 ports, assessment is carried out using a video thoracoscope. The next steps of surgery are usually guided by the specific procedure to be performed.[7,8]

Expected postoperative changes in patient QOL during recovery are an important component of preoperative evaluation and play an important role in patient counseling and patient acceptance of the risks of surgery.[9] The VATS procedure for the treatment of lung cancer has demonstrated its superiority in terms of postoperative recovery and tolerability postoperative therapy compared to open thoracotomy. Large studies also report comparable 5-year survival and minor postoperative complication rates after VATS lobectomy. However, the few reports that have been published so far report significant differences in terms of QoL between VATS and open thoracotomy for cancer.[5]

A retrospective analysis of the prospective study showed improved functional outcomes for minimally invasive VATS versus open thoracotomy for cure of lung cancer after 6 months post-surgery. A study by Handy et al. used SF36 as the instrument and found significant differences in physical function, physical role, bodily pain, and general health were

better after VATS than open thoracotomy. Conversely, there were no differences in role emotionality, social function, or mental health.[10] Other studies by Shi et al. showed lower functional impairment in patients after VATS lobectomy than after open thoracotomy.[11] In open thoracotomy, some procedures may insult lower quality outcomes such as rib retraction, resection, or fracture, costovertebral joint dislocation, intercostal nerve injury, and/or irritation of the pleura by chest tubes.[12] A randomized control study by Morten et al. explained that VATS is associated with higher quality of life and lower postoperative pain than anterolateral thoracotomy for the first year after surgery evaluation. Their study used a numeric rating scale for postoperative pain scoring. The quality of life was measured with a 30-item Quality of Life (QLQ-C30).[13] The latest study by Morten et al. assessed the quality of life and quality-adjusted life years using the EuroQol questionnaire (EQ-5D-3I), which refers to various dimensions of health-related quality of life. The study showed that VAST had a better quality of life compared to open thoracotomy.[14] In contrast, a retrospective study by Ville et al. showed long-term quality-of-life measures were better among patients who underwent thoracotomy compared to VATS. Nevertheless, the study has some limitations such as retrospective design and lack of baseline data.[15] On the other side, a study by Shwartz et al. revealed that there are some differences between QoL perioperative and postoperative. The study found improvement in QoL after the VATS procedure while worsening of QoL after open thoracotomy.[16] Some studies reported benefits of VATS such as decreased postoperative inflammatory response, decreased operative blood loss, decreased postoperative pain, and fewer complications.[17-18]

CONCLUSION

The majority of studies still show the superiority of VATS over thoracotomy. There is a difference in the quality-of-life scores of patients after VATS compared to thoracotomy. VATS shows an improvement in quality of life after the procedure. VATS revealed significantly better results in physical function, physical role, bodily pain, and general health than open thoracotomy.

AUTHOR'S CONTRIBUTION

M Hanafie Heluth was primarily responsible for writing the manuscript and co-coordinated study design, data analysis, data interpretation and data collection. Dhihintia Jiwangga Suta Winarno contributed to data analysis, data interpretation, critical revision of the article for intellectual purposes and final approval of the article. Yan Efrata Sembiring contributed to providing the article's material, expertise and writing for important intellectual content. All authors have reviewed and approved the final version of the manuscript for submission.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance is not mandatory for review article.

COMPETING INTEREST

The authors declare that they have no competing interests.

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