

## Comparison of short-term quality of life in patients undergoing video-assisted thoracoscopic surgery versus thoracotomy

*Video yardımlı torakoskopik cerrahi ile torakotomi yapılan hastaların erken dönem yaşam kalitelerinin karşılaştırılması*

Levent Cansever , Celal Buğra Sezen , Onur Volkan Yaran , Mehmet Ali Bedirhan 

Department of Thoracic Surgery, University of Health Sciences, Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital, Istanbul, Turkey

### ABSTRACT

**Background:** This study aims to compare the short-term quality of life of patients undergoing video-assisted thoracoscopic surgery versus thoracotomy.

**Methods:** A total of 96 patients (58 males, 38 females; mean age 58.4±11.7 years; range, 18 to 80 years) who underwent video-assisted thoracoscopic surgery or thoracotomy in our hospital between March 2018 and March 2019 were retrospectively analyzed. Demographic and clinical characteristics and comorbidities of the patients were recorded. Quality of life of the patients was evaluated using the Short Form-36 health survey at the first postoperative month.

**Results:** Of the patients, 43 (44.8%) were treated by video-assisted thoracoscopic surgery and 53 (55.2%) by thoracotomy. Complications occurred in nine (20.9%) patients following video-assisted thoracoscopic surgery and in 12 (22.6%) patients following thoracotomy (p=0.840). At one month postoperatively, the patients in the video-assisted thoracoscopic surgery group had a better quality of life than those in the thoracotomy group (p<0.05).

**Conclusion:** Our study results suggest that both recovery and short-term quality of life seem to be better in patients undergoing video-assisted thoracoscopic surgery than in those treated by thoracotomy.

**Keywords:** Quality of life, thoracic surgery, video-assisted thoracoscopic surgery.

### ÖZ

**Amaç:** Bu çalışmada torakotomiye kıyasla video yardımlı torakoskopik cerrahi yapılan hastaların erken dönem yaşam kaliteleri karşılaştırıldı.

**Çalışma planı:** Mart 2018 - Mart 2019 tarihleri arasında hastanemizde video yardımlı torakoskopik cerrahi veya torakotomi yapılan toplam 96 hasta (58 erkek, 38 kadın; ort. yaş 58.4±11.7 yıl; dağılım, 18-80 yıl) retrospektif olarak incelendi. Hastaların demografik ve klinik özellikleri ve eşlik eden hastalıkları kaydedildi. Cerrahi sonrası birinci ayda hastaların yaşam kalitesi Kısa Form-36 KF-36 sağlık anketi ile değerlendirildi.

**Bulgular:** Hastaların 43'ü (%44.8) video yardımlı torakoskopik cerrahi ve 53'ü (%55.2) torakotomi ile tedavi edildi. Video yardımlı torakoskopik cerrahi sonrasında dokuz (%20.9) hastada ve torakotomi sonrasında 12 (%22.6) hastada komplikasyon gelişti (p=0.840). Cerrahi sonrası birinci ayda, video yardımlı torakoskopik cerrahi grubundaki hastaların yaşam kalitesi, torakotomi grubundaki hastalara kıyasla, daha iyi idi (p<0.05).

**Sonuç:** Çalışma sonuçlarımız, torakotomi ile tedavi edilen hastalara kıyasla, video yardımlı torakoskopik cerrahi yapılan hastalarda hem iyileşmenin hem de erken dönem yaşam kalitesinin daha iyi olduğunu göstermektedir.

**Anahtar sözcükler:** Yaşam kalitesi, göğüs cerrahisi, video yardımlı torakoskopik cerrahi.

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**Correspondence:** Levent Cansever, MD. Sağlık Bilimleri Üniversitesi, Yedikule Göğüs Hastalıkları ve Göğüs Cerrahisi Eğitim ve Araştırma Hastanesi, Göğüs Cerrahisi Kliniği, 34020 Zeytinburnu, İstanbul, Türkiye. Tel: +90 532 - 277 08 88 e-mail: lcansever@yahoo.com

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Video-assisted thoracoscopic surgery (VATS) has been increasingly used since the early 1990s. With the technological advancements of the last two decades, VATS has been widely adopted worldwide.<sup>[1]</sup> Currently, it is used in diagnostic and therapeutic thoracic surgery procedures, owing to its advantages compared to open surgical methods.<sup>[2]</sup> These advantages include reduced postoperative pain, shorter inpatient duration, fewer complications, and greater ease of compliance with additional oncological treatments.<sup>[3]</sup> The benefits of VATS have been attributed to the minimal pain and muscle damage after with the procedure, such that patients have better lung function, muscle strength, and walking capacity.<sup>[2]</sup> In addition, reports in the literature suggest a better quality of life (QoL) in patients undergoing VATS, particularly in geriatric patients.<sup>[4-6]</sup> However, whether VATS results in a better patient QoL than conventional surgery is still controversial.<sup>[7-11]</sup>

In the present study, we aimed to compare the short-term results and QoL of patients undergoing lung resection by VATS versus thoracotomy.

## PATIENTS AND METHODS

This retrospective study was conducted at University of Health Sciences, Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital, between March 2018 and March 2019. A total of 112 patients who underwent VATS or thoracotomy were screened. After excluding eight patients who refused to participate, five patients who underwent re-thoracotomy, and three patients who underwent other operations, the medical data of 96 patients (58 males, 38 females; mean age 58.4±11.7 years; range, 18 to 80 years) were retrospectively analyzed using a prospective database. The patients were divided into two groups according to the operation type (VATS versus thoracotomy) and were, then, further divided into two subgroups according to their histopathology results (malignant versus benign pathology). Baseline demographic and clinical characteristics of the patients, morbidity, length of hospital stay, and histopathological findings were recorded. The study protocol was approved by the Istanbul Training and Research Hospital Ethics Committee (Date: 31.08.2019, No: 1406). A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

### Surgical procedure

Thoracic computed tomography (CT) was performed in patients with malignant tumors

to determine the location of the tumor and its relationship with the surrounding tissues. Positron emission tomography (PET)/CT was used to evaluate distant metastases. Fiberoptic bronchoscopy was performed in patients with malignant tumors and in those considered to have benign tumors requiring endobronchial evaluation. Mediastinal evaluations were performed via endobronchial ultrasound and/or mediastinoscopy in patients with malignant tumors. Pulmonary function tests, arterial blood gas analysis, and echocardiography were routinely performed to evaluate cardiopulmonary capacity. Patients with cardiac comorbidities were assessed with electrocardiography (ECG) in the cardiology department. Patients with a forced expiratory volume in 1 sec (FEV1) of ≤40% in the preoperative pulmonary function tests were subjected to further pulmonary assessment (i.e., diffusing capacity of the lung for carbon monoxide, pulmonary perfusion scintigraphy, and the 6-min walk test).

The comorbidity score was calculated using the 19-item Charlson Comorbidity Index (CCI) which was first introduced in 1987.<sup>[12]</sup> The CCI score is an independent predictor of both the surgical mortality and long-term survival of cancer patients. A higher CCI score indicates a larger number of comorbidities. A CCI score ≥2 in lung cancer patients is considered a cut-off value for distinguishing mortality from survival.<sup>[13,14]</sup> Therefore, patients with a CCI score of ≤2 versus >2 were evaluated separately. Complications which occurred during the first 30 days postoperatively or during hospitalization were also evaluated. The Short Form-36 (SF-36) Health Survey was used to evaluate QoL during the first month postoperatively. Comorbidities were defined as pneumonia, atelectasis, atrial fibrillation, and wound infections during hospitalization.

### Statistical analysis

Statistical analysis was performed using the IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). Continuous variables were expressed in mean ± standard deviation (SD), median (min-max), while categorical variables were expressed in number and percentage. Parametric test assumptions (normality and homogeneity of variance) were checked before the groups were compared in terms of the continuous variables. The difference between the pre- and postoperative QoL scores was examined using a t-test for independent groups. The difference in QoL between the two treatment groups was examined using the Kruskal-Wallis test. A *p* value of <0.05 was considered statistically significant.

**Table 1. Baseline demographic and clinical characteristics of patients**

| Variable              | VATS |      |           | Thoracotomy |      |           | <i>p</i> |
|-----------------------|------|------|-----------|-------------|------|-----------|----------|
|                       | n    | %    | Mean±SD   | n           | %    | Mean±SD   |          |
| Age (year)            |      |      | 56.3±12.6 |             |      | 60.0±10.8 | 0.116    |
| ≤65                   | 37   | 86   |           | 35          | 66   |           | 0.024    |
| >65                   | 6    | 14   |           | 18          | 34   |           |          |
| Sex                   |      |      |           |             |      |           | 0.003    |
| Male                  | 33   | 76.7 |           | 25          | 47.2 |           |          |
| Female                | 10   | 23.3 |           | 28          | 52.8 |           |          |
| Side                  |      |      |           |             |      |           | 0.634    |
| Right                 | 24   | 55.8 |           | 27          | 50.9 |           |          |
| Left                  | 19   | 44.2 |           | 26          | 49.1 |           |          |
| Histopathology        |      |      |           |             |      |           | 0.293    |
| Benign                | 5    | 11.6 |           | 3           | 5.7  |           |          |
| Malignant             | 38   | 88.4 |           | 50          | 94.3 |           |          |
| Smoke (pack/year)     |      |      | 29.5±12.7 |             |      | 30.9±15.7 | 0.830    |
| Operation             |      |      |           |             |      |           | <0.001   |
| Lobectomy             | 43   | 100  |           | 39          | 73.6 |           |          |
| Pneumonectomy         | 0    | 0    |           | 14          | 26.4 |           |          |
| CCI                   |      |      |           |             |      |           | 0.038    |
| 0-2                   | 12   | 27.9 |           | 6           | 11.3 |           |          |
| >2                    | 31   | 72.1 |           | 47          | 88.7 |           |          |
| Inpatient stay (days) |      |      | 4.7±3.3   |             |      | 6.5±3.9   | <0.001   |

VATS: Video-assisted thoroscopic surgery; SD: Standard deviation; CCI: Charlson Comorbidity Index.

## RESULTS

Of a total of 96 patients included in this study, 43 (44.8%) underwent VATS and 53 (55.2%) underwent thoracotomy. A lesion on the right and left side was detected in 51 (53.1%) patients and in 45 (46.9%) patients, respectively. The CCI score of 78 patients (81.3%) was ≤2, while 18 (18.8%) patients had a CCI score of >2. Lobectomy and pneumonectomy

were performed in 82 (85.4%) patients and in 14 (14.6%) patients respectively. Table 1 shows baseline demographic and clinical characteristics of the study groups.

Complications occurred in nine (20.9%) patients following VATS and in 12 (22.6%) patients following thoracotomy, indicating no statistically significant difference (*p*=0.840). However, the QoL of patients

**Table 2. Comparison of quality of life of patient groups**

| Variable                  | All patients | VATS      | Thoracotomy | <i>p</i> |
|---------------------------|--------------|-----------|-------------|----------|
|                           | Mean±SD      | Mean±SD   | Mean±SD     |          |
| Physical function         | 62.8±31.7    | 71.3±26.8 | 55.8±33.7   | 0.029    |
| Physical role difficulty  | 47.4±43.5    | 61.0±43.0 | 36.3±40.9   | 0.009    |
| Emotional role difficulty | 58.0±45.4    | 79.8±38.5 | 40.2±43.2   | <0.000   |
| Energy vitality           | 51.3±23.9    | 57.6±25.2 | 46.1±21.5   | 0.020    |
| Mental health             | 61.3±19.4    | 65.5±18.4 | 57.7±19.5   | 0.048    |
| Social functioning        | 62.2±31.5    | 77.3±27.0 | 50±29.7     | <0.001   |
| Pain                      | 65.6±30.8    | 85.2±49.6 | 49.6±29.2   | <0.001   |
| General health perception | 52.9±23.3    | 55.8±26.7 | 50.4±19.9   | 0.423    |

VATS: Video-assisted thoroscopic surgery; SD: Standard deviation.

**Table 3. Quality of life in VATS and thoracotomy patients with benign and malignant tumors**

| Variable                  | VATS      | Thoracotomy | p      |
|---------------------------|-----------|-------------|--------|
|                           | Mean±SD   | Mean±SD     |        |
| <b>Benign tumors</b>      |           |             |        |
| Physical function         | 93.0±13.0 | 45±20       | 0.036  |
| Physical role difficulty  | 100±0     | 25±25       | 0.036  |
| Emotional role difficulty | 100±0     | 22.2±19.2   | 0.036  |
| Energy vitality           | 83.0±4.5  | 45.0±13.2   | 0.036  |
| Mental health             | 84.8±8.7  | 58.6±18.9   | 0.033  |
| Social functioning        | 97.5±5.6  | 41.6±7.2    | 0.036  |
| Pain                      | 95.5±10.1 | 40.8±12.3   | 0.036  |
| General health perception | 87.0±10.4 | 55.0±17.3   | 0.036  |
| <b>Malign tumors</b>      |           |             |        |
| Physical function         | 68.5±27.0 | 55.0±17.4   | 0.137  |
| Physical role difficulty  | 55.9±43.3 | 37.1±41.8   | 0.057  |
| Emotional role difficulty | 77.2±40.3 | 41.4±43.9   | <0.001 |
| Energy vitality           | 54.3±25.0 | 46.2±22.1   | 0.126  |
| Mental health             | 63.1±18.0 | 57.7±19.8   | 0.193  |
| Social functioning        | 74.6±27.6 | 50.5±30.5   | <0.001 |
| Pain                      | 83.8±19.9 | 50.2±29.9   | <0.001 |
| General health perception | 51.7±25.6 | 50.2±20.2   | 0.993  |

VATS: Video-assisted thoracoscopic surgery; SD: Standard deviation.

undergoing VATS was significantly better than that of patients treated by thoracotomy. Table 2 shows the QoL of the patients undergoing the two procedures.

Subgroup analysis showed that, among patients with benign tumors, the QoL was better in the VATS group. However, in patients with malignant tumors, the VATS and thoracotomy groups did not significantly differ with respect to mental health, physical function, physical difficulty, energy vitality or the general perception of health. However, in patients with malignant tumors, the scores of emotional difficulty, social functioning, and pain were higher in the VATS group. The subgroup analysis of QoL is presented in Table 3.

## DISCUSSION

Open surgical techniques are frequently used in patients with advanced and central tumors, despite technical advancements that have expanded the range of surgical techniques. Although experience with VATS has been increasing, this automated approach still accounts for only 29.64% of the total number

of surgeries.<sup>[15]</sup> Posterolateral thoracotomy is a particularly painful operation for patients, and pain during the postoperative period is one of the most important factors affecting compliance to further treatment. By contrast, VATS results in minimal tissue damage, a weaker cytokine response, and less pain than thoracotomy.<sup>[15]</sup> Intense thoracic pain during the early postoperative stage leads to increased retention of lung secretions, difficulty in mobilization, and an increase in complications such as atelectasis and pneumonia, all of which affect patient QoL and delay the return to work.<sup>[16-18]</sup> Consequently, the postoperative QoL of lung cancer patients has been the focus of increasing interest during the last decade.<sup>[19,20]</sup>

The use of different questionnaires among studies assessing patient QoL makes it difficult to compare their results. However, randomized studies comparing VATS versus thoracotomy revealed that VATS patients had a better QoL during the first postoperative month, although the difference compared to thoracotomy patients gradually decreased after 26 weeks.<sup>[21]</sup> In the EuroQol-two dimension scale (EQ2D) study performed

by Bendixen *et al.*,<sup>[21]</sup> the QoL of patients undergoing VATS improved during the early postoperative period and was higher than that of patients who underwent thoracotomy during the first postoperative year. Zieren *et al.*<sup>[22]</sup> reported that the QoL of thoracoscopy patients reached a maximum at nine months. However, whether VATS leads to a better QoL still remains controversial. Some authors have suggested that the benefits of VATS are exaggerated and that the long-term postoperative results do not significantly differ from those of open surgery.<sup>[23]</sup> Hopkins *et al.*<sup>[24]</sup> found that the general status, mood, and pain of patients who underwent lung resection changed from the sixth postoperative month onwards. In the long-term, there was no significant difference in the QoL between patients undergoing VATS versus thoracotomy.

In our study, the SF-36 health survey results showed that the QoL after the first postoperative month was better in the VATS than in thoracotomy patients. In the subgroup analysis, patients with benign tumors who underwent VATS had also a better QoL, while treatment with VATS resulted in significantly better scores for emotional difficulty, social functioning, and pain in patients with malignant tumors. However, this difference may be due to the heterogeneity of the study groups. In the study of Aoki *et al.*,<sup>[25]</sup> QoL was significantly higher in the VATS group than the thoracotomy group during the first three months postoperatively, although this difference gradually decreased from 36 months onwards. In their prospective study, Dales *et al.*<sup>[26]</sup> also reported a decrease in the QoL during the first three months postoperatively, while there was a subsequent improvement in the QoL as of six to nine months of surgery, similar to the preoperative period.

Nonetheless, there are some limitations to this study. First, it used a retrospective design with a relatively small sample size. Second, the preoperative QoL of the patients was unknown. Third, symptoms of depression and anxiety were unable to be evaluated, and only the short-term postoperative QoL was assessed. Finally, this study did not take into account the heterogeneity between the two groups; the thoracotomy patients in our study had a higher number of comorbidities.

In conclusion, during the first postoperative month, the quality of life of patients who underwent video-assisted thoracoscopic surgery was better than that of patients treated by thoracotomy. The difference was particularly pronounced in the subgroups of patients with benign versus malignant tumors, as patients with benign tumors who underwent video-assisted thoracoscopic surgery had improved quality of life.

Based on these findings, we can suggest that short-term recovery is better following video-assisted thoracoscopic surgery than thoracotomy. However, further large-scale, long-term, prospective studies are warranted to confirm these findings.

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