Quality of life assessment six months after lobectomy for lung cancer: video-assisted thoracoscopic surgery versus thoracotomy

Akciğer kanseri nedeniyle lobektomi yapılan hastaların altı ay sonraki yaşam kalitesinin değerlendirilmesi: Video-yardımlı torakoskopik cerrahiye karşı torakotomi

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Background: This study aims to assess the quality of life scores of patients who had undergone lobectomy by video-assisted thoracoscopic surgery.

Methods: Both the "Medical Outcomes Study Short Form 36 (SF-36) Health Survey" and "European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire-C30" with "lung cancer specific module LC-13", the subtype of EORTC developed for lung cancer, were used to assess the health-related quality of life. Two groups were created on a cross-sectional basis. The questionnaires were performed in both groups at the outpatient clinic follow-up six months after the surgery. Group 1 consisted of patients (n=18) with stage 1 non-small-cell lung carcinoma who had undergone lobectomy by video-assisted thoracoscopic surgery, while group 2 consisted of patients (n=20) at the same stage who had undergone lobectomy via thoracotomy.

Results: There were no significant differences between the two groups in the preoperative patient characteristics. No local recurrence or distant metastasis was observed in any of the patients during the assessments who has completed the survey. Patients in group 1 had higher scores in physical functioning and emotional role in SF-36 questionnaire. Moreover, the results for chest pain, arm/shoulder pain and peripheral neuropathy scores were better preserved in the video-assisted thoracoscopic lobectomy group.

Conclusion: This study shows that the patients who have undergone lobectomy by video-assisted thoracoscopic surgery for non-small-cell lung carcinoma have better preserved quality of life scores than thoracotomy patients six months after the surgery with reduced postoperative pain in chest and peripheral neuropathy.

Key words: Lobectomy; lung cancer surgery; quality of life; toracotomy; video-assisted thoracoscopic surgery.

Amaç: Bu çalışmada video-yardımlı torakoskopik cerrahi ile lobektomi uygulanan hastalarda yaşam kalitesi skorları değerlendirildi.

Çalışma planı: Sağlıkla ilişkili yaşam kalitesinin değerlendirilmesi amacıyla "Tıbbi Sonuçlar Çalışması Kısa Form 36 (SF-36) Sağlık Taraması" ve "Avrupa Kanser Araştırması ve Tedavisi Organizasyonu (EORTC) Yaşam Kalitesi Anketi-C30" ile bu formun akciğer kanseri için oluşturulmuş alt tipi "Akciğer Kanseri Spesifik Formu LC-13" kullanıldı. Kesitsel temele dayanılarak iki grup oluşturuldu. Anketler iki grupta da ameliyattan altı ay sonraki poliklinik kontrolünde uygulandı. Grup 1 (n=18) video-yardımlı torakoskopik lobektomi uygulanan evre 1 küçük hücreli dışı akciğer kanserli hastalardan oluşmakta iken, grup 2 (n=20) torakotomi ile lobektomi uygulanan aynı evredeki hastalardan oluşmakta idi.

Bulgular: İki grup arasında ameliyat öncesi hasta karakteristikleri açısından anlamlı fark yok idi. Ölçümler sırasında anketi tamamlayan hastaların hiçbirinde lokal nüks veya uzak metastaz gözlenmedi. Grup 1'deki hastalar SF-36 anketinde daha yüksek fiziksel işlevsellik ve duygusal rol skorlarına sahip idi. Bunun yanında göğüs ağrısı, omuz ve kol ağrısı ile periferik nöropati sonuçlarının video-yardımlı torakoskopik lobektomi grubunda daha iyi korunduğu tespit edildi.

Sonuç: Çalışmamız, video-yardımlı torakoskopik lobektomi ile ameliyat edilen küçük hücreli dışı akciğer kanserli hastalarda elde edilen yaşam kalitesi skorlarının ameliyattan altı ay sonra, azalmış ameliyat sonrası ağrısı ve periferik nöropati açısından torakotomi uygulanmış hastalara göre daha iyi sonuçlar elde edildiğini göstermiştir.

Anahtar sözcükler: Lobektomi; akciğer kanseri cerrahisi; yaşam kalitesi; torakotomi; video-yardımlı torakoskopik cerrahi.

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An increasing number of thoracic surgeons worldwide prefer to use video-assisted thoracoscopic lobectomies for malignant or benign pathologies. It is commonly accepted that video-assisted thoracoscopic lobectomy (VATS-L) in early stage lung cancer is feasible.[1] Several video-assisted thoracoscopy (VATS) series reported excellent outcomes in terms of safety,[2] oncological concerns,[3,4] reduced postoperative pain, and duration of hospital stay.[5]

The aim of this study is to evaluate the health related quality of life (QOL) measures in thoracic surgical perspective with validated instruments in VATS-L, which provides a minimally invasive alternative for the management of early stage non-small cell lung cancer by comparing the scores with conventional lobectomy in patients with the same oncological stage.

PATIENTS AND METHODS

Operative data of patients who underwent thoracotomy and VATS-L between January 2007 and January 2009 were collected. Written informed consent was obtained form each patient and the study were approved by the local ethical committee. Group 1 consisted patients with pathological stage I non-small-cell lung carcinoma (NSCLC) who underwent pulmonary lobectomy via VATS (group 1, n=18) were compared with the group of patients who were in the same stage and underwent conventional lobectomy via muscle sparing posterolateral thoracotomy during the period of when VATS-L was not being performed (group 2, n=20).

Surgical technique

Thoracotomy group: After intubation with a double-lumen endotracheal tube, the patients were positioned in the lateral thoracotomy position; thereafter, taking care to preserve the serratus anterior muscle, a thoracotomy was achieved through the 5th intercostal space and two thoracic retractors were placed to enable better exploration during surgery. Standard thoracotomy incisions were 8 to 10 cm. Mediastinal nodal dissection was performed after completion of lobectomy in all patients. The chest incision was closed routinely by placing a single chest tube. The thoracotomies were closed with three rib closure stitches in all cases.

VATS group: The patients were positioned in the lateral decubitus position. Through the 8th intercostal space, a camera port was placed at the anterior axillary line in the right or at the mid axillary line in the left side. The second 1 to 2 cm incision was performed in the posterior axillary line or sometimes a few centimeter more posterior through the 7th or 8th intercostal space. A 4 to 6 cm utility thoracotomy incision was performed just across the vein of the lobe that was to be resected. Bundles of serratus anterior muscle were divided without cutting and the chest was entered. Rib retractors were never used; however, subcutaneous tissue and muscle bundles were retracted to enable the easy entrance of surgical instruments. Hilar dissection was performed using standard instruments that were used for open thoracic surgery. Resection was continued with mediastinal nodal dissection. A single chest tube was placed through the camera port and the chest incisions were closed without rib closure stiches.

The postoperative period was standard for all patients in both groups. All patients were admitted to the intensive care unit on the night of operation. On the subsequent day after surgery they were transferred to the thoracic unit if there was no contraindication. Chest X-rays were acquired daily, and the amount of chest tube drainage was recorded. The chest tubes were removed when no air leak and no hemorrhagic drainage was evident. If there were no contraindications, the patients were discharged on the next day.

Quality of life evaluation

All the patients were asked to answer the test after six months of surgery in the clinic. The validated Turkish Edition of Medical Outcomes Study Short Form-36 (SF-36) Health Survey and European Organization for Research and Treatment of Cancer (EORTC) QOL Questionnaire-C30 with lung cancer specific module LC-13 were used to assess the health related QOL. Patients answered the questionnaires alone in the outpatient clinic. Two groups were set on cross-sectional basis. Questionnaire responses were recorded for both groups. Operating surgeons were not involved in the assessment of QOL questionnaires. The average time required to complete both the questionnaires was approximately 14 min. The understanding of the questions was perfect and no additional help to explain questions was required.

Short Form-36 is one of the most commonly used questionnaires in QOL assessment without any association between sexes, age, and the type of disease or treatment. Short Form-36 has been previously assessed as a suitable instrument that could be employed in cancer research in Turkey.[6] It is a general questionnaire, which has eight health related concepts: physical functioning, role limitations, bodily pain, general health, vitality, social functioning, role limitation, and mental health. The scores are standardized and range from 0 (worst health status) to 100 (best health status).[7]

EORTC QLQ-C30 (version 3.0) is a self-relating cancer-specific questionnaire that incorporates 30 questions; nine multi-item scales, five functional scales (physical, role, cognitive, emotional, and social); three symptom scales (fatigue, pain, nausea/vomiting); a global health

QOL scale; and several single items commonly reported by cancer patients (dyspnea, insomnia, constipation, diarrhea, and loss of appetite). A final item evaluates perceived financial impact of the disease. EORTC QLQ-LC13 is a supplementary module, which is primarily designed for lung cancer patients. Thirteen questions assess lung cancer related symptoms (cough, hemoptysis, dyspnea, and site-specific pain), chemotherapy/radiotherapy-related side effects (sore mouth, dysphagia, peripheral neuropathy, and alopecia), and thoracic pain. The dyspnea scale was aggregated into a 4-item scale by including the single item of the EORTC QLQ-C30 core questionnaire. The Turkish version of the test is reported as a reliable and valid instrument for measuring the QOL in cancer patients that can be used in clinical studies in Turkey.[8,9] The scoring of QOL-C30 version 3.0 was calculated as previously published.[10]

Statistical analysis

Statistical analysis was performed using statistical software SPSS, for Windows version 11.0 (SPSS Inc., Chicago, Illinois, USA). Demographics were reported as mean ± standard deviation (SD) and frequency. In accordance with procedure recommended by the EORTC, scores were linearly converted to a scale ranging from 0 to 100 for each patient. For the global health/QOL and functional scales, high scores represent a high level of functioning. For the symptom scales, high scores represent a greater symptom burden. Results are reported as mean ± SD. Quality of life data was compared using Mann-Whitney U-test. A p-value of less than 0.05 was considered as statistically significant for all analyses.

The raw scores in the SF-36 were calculated and converted to a 0-100 scale using a previously published formula.[8] The results were presented as mean ± SD. The Mann-Whitney U-test was used to compare mean SF-36 scores between groups.

RESULTS

All the patients in both groups that were asked to answer completed the questionnaires. The total number of patients who underwent lobectomy for NSCLC in the study period was 81. Twenty pathological stage I NSCLC patients who underwent thoracotomy (34%) were included in the study. The VATS group consisted of 18 patients who were successfully treated via VATS approach only.

Table 1. Patient demographics and tumor characteristics in both groups

	VATS lobectomy (n=18)		Thoracotomy (n=20)		*p*
	n	Mean±SD	n	Mean±SD	
Age, (years)		63.2±7.4		58.6±8.1	0.07
Sex					
Male	14		16		0.86
Female	4		4		
Marital status					
Married	15		16		
Divorced	–		1		0.62
Widowed	3		3		
Education level					
Primary school	14		13		
Secondary school	3		7		0.30
University	1		–		
Respiratory function					
FEV1%					0.40
Co-morbid factors*					
(yes/no)	4/14		5/15		0.84
Tumor size (mm)		76.5±10.2		81.0±20.3	
Histology					
Squamous carcinoma	6		12		
Adenocarcinoma	10		8		0.12
Others	2		–		
Stage					
$T_1N_0M_0$	10		8		0.51
$T_2N_0M_0$	8		12		
Complications					
(yes/no)	1/17		1/19		0.93

VATS: Video-assisted thoracoscopic surgery; SD: Standard deviation; *: Co-morbid factors including each of hypertension, diabetes mellitus, coronary artery disease, chronic obstructive disease.

The two groups had similar preoperative characteristics of age, sex, marital status, education level, pulmonary functions, co-morbid factors, tumor histology, pathological stage, and complication rates (Table 1). However, the length of hospital stay was significantly shorter in the VATS group (5.8±2.9 days) compared to the thoracotomy group (6.7±1.5 days) (p=0.016).

No local recurrence or distant metastasis was present in any patient who completed the survey. No mortality was observed in both groups at any time related either to surgery or non surgical reasons.

Outcome of SF-36

Patients in the VATS group had improved scores after six months of lung resection in two dimensions; physical functioning (p<0.001) and emotional role (p=0.006) in SF-36 questionnaire. Others including physical role, bodily pain, general health, vitality, social function, and mental health were not significantly different (Table 2).

Outcome of EORTC QLQ-C30 and LC-13

Cognitive functioning from functional scales was statistically better preserved in the VATS group (p=0.014). According to symptom scales which are primarily associated with lung cancer-specific symptoms, coughing (p<0.001), peripheral neuropathy (p<0.001), dysphagia (p=0.01), pain in the chest (p=0.004), and arm/shoulder pain (p<0.001) had significantly better scores (Table 3) in the VATS group compared to the thoracotomy group after six months of surgery.

DISCUSSION

This study showed that the patients who have undergone VATS lobectomy for NSCLC have better preserved QOL scores than thoracotomy patients after six months of surgery with respect to reduced postoperative pain in the chest and peripheral neuropathy from QLQ-C30 and QLQ-LC13 questionnaires. Additionally, on the basis of SF-36, patients in the VATS lobectomy group have better physical and emotional scores.

There are few studies addressing the effect of minimally invasive procedures on QOL. Most of the literature has documented a substantial reduction in pain control measures and better physical recovery documented by earlier return to work or other equivalents of preoperative functioning favorable VATS resections. The prevalence of chronic pain after one year is almost 60% and 40% of these patients the pain limits their daily normal activities. However, the term "normal activity" was never defined in detail in the literature.[11,12] On the basis of the QOL, the major finding of our comparative study is that pain is reduced to a greater extent after VATS lobectomy compared to thoracotomy.

The advantages of VATS lobectomy over open procedures have been studied in various series. Randomized control trials are set to evaluate complication rates[1] and the length of hospital stay,[5] which favors VATS lobectomy. This study also shows that the length of hospital stay in patients undergoing VATS lobectomy is significantly shortened. There are also case control studies[5,13] and long term studies[14] that show reduced early pain and the decreased prevalence of chronic pain, better pulmonary function preservation,[5] reduced morbidity,[2,15] and decreased average time to return of full activity or work.[11] Due to less pain and better preserved muscle function, the patients in the VATS group can be mobilized earlier and can perform respiratory exercises more efficiently, leading to the early removal of the chest tube and an early discharge from hospital.

Apart from objective measurements that mostly favor VATS-L there are also subjective measures of QOL after VATS-L. Patients are generally wondering about their QOL after surgery more than complication rates. Beginning from the videothoracoscopic perspective, Balduyck et al.[16] reported favoring results in a prospective nonrandomized trial of patients who underwent VATS for pneumothorax using EORTC QOL-C30 and LC13 questionnaire. Emotional functioning and global QOL scores approximated preoperative values only one month after surgery in the VATS group. Both pain in

Table 2. Mean (95% CI) SF-36 scores for both groups after six months

SF-36 dimension	VATS lobectomy (n=18)	Thoracotomy (n=20)	*p*
	Mean±SD	Mean±SD	
Physical function	77.7±16.6	49.5±29.0	<0.001
Role physical§	76.3±63.8	56.2±65.3	NS
Bodily pain	74.2±23.1	64.2±18.9	NS
General health	60.8±13.9	54.2±20.6	NS
Vitality	60.0±19.5	60.2±20.9	NS
Social function	76.3±22.6	63.7±26.2	NS
Role emotional*	79.6±30.5	48.3±43.8	0.006
Mental health	63.7±11.0	64.0±17.9	NS

CI: Confidence interval; §: Role limitations because of physical problems; *: Role limitations because of emotional problems; NS: No significance; VATS: Video-assisted thoracoscopic surgery; SD: Standard deviation.

Table 3. Mean (95% CI) EORTC QLQ-C30 and LC13 scores for both groups after six months

EORTC QLQ-C30 and LC13	VATS lobectomy (n=18)	Thoracotomy (n=20)	*p*
	Mean±SD	Mean±SD	
Functioning scales			
Physical§	79.6±11.5	69.3±24.1	NS
Role	91.6±13.0	81.6±24.1	NS
Emotional*	74.0±26.4	80.0±20.8	NS
Cognitive	89.8±10.1	73.3±26.1	0.014
Social	85.1±15.0	82.5±20.5	NS
Global health status	79.1±18.3	71.2±26.2	NS
Symptom scales			
Fatique	37.03±30.24	36.11±24.14	NS
Nausea and vomiting	3.7±15.71	9.16±17.50	NS
Pain	20.37±18.57	30.0±23.93	NS
Dyspnea	25.92±24.4	31.66±27.51	NS
Insomnia	29.62±45.57	23.33±32.62	NS
Appetite loss	1.85±7.85	3.33±10.25	NS
Constipation	27.77±23.57	26.66± 35.21	NS
Diarrhea	12.96±20.25	15.0±20.16	NS
Financial difficulties	12.96±25,91	16.66±29.61	NS
QLQ-LC13			
Dyspnea	26.5±26.4	32.7±28.0	NS
Coughing	11.1±25.5	41.6±23.8	0.001
Hemoptysis	5.5±12.7	5±22.0	NS
Sore mouth	0	8.3± 26.0	NS
Dysphagia	25.9±43.6	1.6±7.4	0.01
Peripheral neuropathy/paresthesia	0	23.3±19.0	<0.001
Alopecia	1.8±7.8	6.0±17.0	NS
Chest pain	10.6±28.5	40.0±29.8	0.004
Arm or shoulder pain	11.1±19.8	51.6±27.5	<0.001

QLQ-C30: Quality of life questionnaire-C30; CI: Confidence interval; §: Role limitations because of physical problems; *: Role limitations because of emotional problems; NS: No significance; VATS: Video-assisted thoracoscopic surgery; SD: Standard deviation.

general and thoracic pain were significantly reduced one month after surgery in the VATS group.

According to general QOL assessment by SF-36, patients generally have lower scores in physical and mental composite scales after surgery. Scores remain reduced at least three months after surgery and continue to deteriorate even further six months. Significant decline was found in physical functioning, role limitations, body pain, social functioning, and mental health when compared with preoperative levels.[17,18] Lower scores in role limitation because of emotional problems and physical functional scores have been addressed before.[19] Especially after thoracotomy those subscales are closely related to pain. Significantly better scores may be attributed to reduced pain achieved with VATS-L in the present study. However, statistical significance detected on emotional role is an inquiry that has to be analyzed in a larger population.

Neuropathic pain after either VATS or thoracotomy affects a considerable percent of patients. Thus, pain is the commonest and worst post thoracotomy problem which is hard to manage. In contrast to Li et al.,[19] in the present study patients had significantly worse chest pain, shoulder pain, and peripheral neuropathy such as paresthesia in thoracotomy group than the VATS-L.

Major studies related to the present paper have been published. Sugiura et al.[15] compared VATS versus thoracotomy using a self-developed questionnaire in 44 patients. Reduced pain and return to work with cosmetic issues were significantly better in the VATS group. Another study conducted by Li et al.[19] using EORTC QLQ-C30 and LC13 questionnaires among 51 patients also favor VATS over thoracotomy. Another prospective study using EORTC QLQ-C30 and LC13 questionnaire had 100 patients who all underwent major pulmonary surgery for lung cancer. Several surgical procedures from limited resection to pneumonectomy were compared to each other. Pneumonectomy patients experienced the worst physical functioning, role functioning, pain, shoulder functioning, and dyspnea levels in a 12-month follow-up period. Compared to thoracotomy, patients who underwent VATS had significantly better physical functioning QOL and pain in the thorax.[20]

There are some limitations to the present study. Firstly, following its general release in 1993, the QLQ-C30 has been used in a wide range of cancer clinical trials; however, the validity of the questionnaire is limited to advanced stage lung cancer. Secondly, the preoperative scores of both questionnaires cannot be obtained; therefore, only late period scores are compared. Thirdly, it is obvious that the numbers of enrolled patients in groups are limited. Quality of life scores are likely affected by several external factors. To identify and standardize those dynamics are another undiscovered area.

Several undiscovered factors affect health related QOL. The increasing number of papers investigates the short and long term effect of thoracotomy and pulmonary resection on QOL using different questionnaire instruments. VATS lobectomy for early stage lung carcinoma has been studied and proven to be feasible in oncological perspective and patient comfort. Major advantages of minimally invasive surgery are mainly limited to the early postoperative period. However, health related QOL scores after six months of surgery represent reduced specific pain scores and increased physical functioning measurements that favor the minimally invasive technique in this study. Quality of life is a longitudinal situation which has related as well as unrelated factors affecting physical and mental status. At that point, from the thoracic surgical perspective interpreting the QOL scores from comparative studies into daily practice may help patient satisfaction in the long-term. Larger studies with long-term follow-up are needed to clarify both the timing of evaluation and type of questionnaires. So far, information on QOL is limited and the interpretation of the results is not direct.

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