

Is video-assisted thoracoscopic surgery sufficient for lymph node dissection in pulmonary metastasectomy?

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Abstract

Aim: We evaluated the results of patients undergoing pulmonary metastasectomy with video-assisted thoracoscopic surgery (VATS) and aimed to investigate postoperative lymph node positivity after lymph node dissection (PM-LND).

Material and methods: Patients who underwent pulmonary metastasectomy and mediastinal lymph node dissection with VATS between March 2015 and March 2020 in our clinic were included in the study.

Results: The mean age of 58 patients who underwent pulmonary metastasectomy and mediastinal lymph node dissection with VATS was 56.5. Thirty-four of the patients were female and 24 were male. A total of 61 surgical procedures, 3 of which were bilateral, were performed in 58 patients. The mean number of resected pulmonary metastases was 1.72. The total number of dissected lymph nodes was 191, with an average of 3.1 per surgical procedure. Colon carcinoma (20 patients) and breast carcinoma (16 patients) were the most common primary tumor origin. Others were thyroid, sarcoma, renal cell carcinoma and melanoma. Unexpected lymph node positivity was present in 9 of 58 patients.

Conclusions: Video-assisted thoracoscopic surgery is a technique that can be applied in pulmonary metastasectomy with its advantages such as a low complication rate and rapid recovery. In these patients, lymph node dissection, which is one of the determining factors of prognosis, can be performed effectively with VATS. Mediastinal and hilar lymph node dissection combined with pulmonary metastasectomy is effective in detecting unexpected lymph node positivity.

Key words: pulmonary metastasectomy, video-assisted thoracoscopic surgery, lymph node dissection.

Introduction

Among the primary features of malignant tumors are metastases that form in distant organs. It is reported that approximately 30% of patients receiving oncological treatment develop primary tumor-induced pulmonary metas-

Streszczenie

Cel pracy: Efekty leczenia pacjentów poddanych metastazektomii płucnej metodą wideotorakoskopii (VATS) poddano ocenie, analizując pooperacyjne dodatnie wyniki badania węzłów po dysekcji (PM-LND).

Materiał i metody: Do badania włączono pacjentów, u których od marca 2015 do marca 2020 r. w naszej klinice wykonano zabieg metastazektomii płucnej i dysekcji węzłów chłonnych śródpiersia metodą VATS.

Wyniki: Średnia wieku u 58 pacjentów, których poddano metastazektomii płucnej i dysekcji węzłów chłonnych śródpiersia, wynosiła 56,5 roku. Grupa obejmowała 34 kobiety i 24 mężczyzn. Łącznie wykonano 61 zabiegów chirurgicznych, w tym 3 zabiegi obustronne. Średnia liczba wyciętych przerzutów do płuc wyniosła 1,72. Dokonano dysekcji 191 węzłów chłonnych (średnio 3,1 na zabieg). Guz pierwotny był najczęściej umiejscowiony w obrębie okrężnicy (20 pacjentów) i piersi (16 pacjentów). Inne guzy pierwotne obejmowały guz tarczycy, mięsaka, raka nerkowokomórkowego i czerniaka. Niespodziewane dodatnie wyniki badania węzłów stwierdzono u 9 spośród 58 pacjentów.

Wnioski: Wideotorakoskopia jest techniką, która może być stosowana w zabiegach metastazektomii płucnej ze względu na niski odsetek występowania powikłań i krótki okres rekonwalescencji. U tych pacjentów VATS umożliwia skuteczną dysekcję węzłów chłonnych, które stanowią jeden z decydujących czynników rokowania. Dysekcja węzłów chłonnych śródpiersia i wnęk w połączeniu z metastazektomią płucną pozwala na skuteczne wykrywanie dodatniego wyniku pooperacyjnego badania węzłów.

Słowa kluczowe: metastazektomia płucna, wideotorakoskopia, dysekcja węzłów chłonnych.

tasis [1]. Pulmonary metastasectomy is considered part of the treatment in these patients and has become recommended in many types of tumors. Thus, it has been shown that there is an increase in overall survival and disease-free survival times [2]. On the other hand, presence of mediastinal or hilar lymph node metastasis is also important

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Table I. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
1. Resectable single or multiple pulmonary metastasis	1. Unresectable pulmonary metastasis
2. Patients whose respiratory capacity is suitable for lung resection	2. Patients whose respiratory capacity is not suitable for surgery
3. The presence of lymph node under 1 cm in thorax CT and with benign appearance	3. Presence of non-lung distant metastasis in abdomen and pelvic CT
4. Lymph node SUVmax uptake value < 2.5 in PET-CT	4. Lymph node SUVmax uptake value \geq 2.5 in PET-CT
5. Negative result in invasive staging of the lymph node	5. Tumor positivity in invasive staging of the lymph node
6. Cases operated with VATS	6. Cases operated by thoracotomy

in terms of prognosis especially in tumors of epithelial origin [3]. However, controversy continues about the mediastinal and hilar lymph node dissection application with pulmonary metastasectomy. There are publications reporting that mediastinal lymph node sampling is sufficient, as well as studies reporting that lymph node dissection should be performed [4, 5]. Performing lymph node dissection or sampling enables the detection of unexpected lymph node involvement and is useful in the postoperative therapeutic decision making process [6].

Presence of mediastinal and hilar lymph nodes can be detected by preoperative imaging methods such as computed tomography (CT) or positron emission tomography (PET)-CT prior to pulmonary metastasectomy [7]. Especially the findings suggesting the presence of malignant lymph node in preoperative PET-CT are guiding in terms of lymph node dissection [8]. In the preoperative evaluation, lymph node sampling or dissection may not be performed in patients without lymph node presence. However, although there are negative findings in PET-CT, there are publications reporting that unexpected lymph node positivity has been detected [9]. For this reason, mediastinal lymph node sampling or dissection is recommended during pulmonary metastasectomy.

Aim

It is known that microscopic disease in the mediastinal or hilar lymph nodes may be overlooked in imaging methods in patients undergoing pulmonary metastasectomy. In this study, we evaluated the results of patients undergoing pulmonary metastasectomy with video-assisted thoracoscopic surgery (VATS) and aimed to investigate postoperative lymph node positivity after lymph node dissection (PM-LND).

Material and methods

Patients who underwent pulmonary metastasectomy and mediastinal lymph node dissection with VATS between March 2015 and March 2020 in our clinic were included in the study. Presence of mediastinal and hilar lymph node metastases was evaluated in patients with planned pulmonary metastasectomy by CT. The lymph nodes with a short axis over 1 cm and a long axis over 2 cm were considered positive in the mediastinum, and these patients underwent PET-CT staging, thus scanning for distant metastases. Intraabdominal organ metastases were investigated with abdominal CT and pelvic CT. Patients with a suspi-

cious appearance below 1 cm in thorax CT were referred to metastasectomy. Patients with the maximum standard uptake value (SUVmax) of 2.5 and above involvement in lymph node in PET-CT were excluded from the study. These patients were directed to an interventional procedure for mediastinal sampling.

Invasive staging was performed by video-mediastinoscopy or mediastinotomy. In our hospital, these procedures were not used for staging since endobronchial ultrasound and endoscopic ultrasound biopsy could not be performed. Metastasectomy was planned for patients with lymph node involvement in PET-CT with an SUVmax below 2.5 or negative in the lymph node staging biopsy. Inclusion and exclusion criteria are given in Table I.

Results

As a result of the preoperative evaluation, the procedure was performed with VATS in all patients who were eligible for VATS. Patients who underwent PM-LND with thoracotomy were not included in the study. The mean age of 58 patients who underwent pulmonary metastasectomy and mediastinal lymph node dissection with VATS was 56.5 ± 10.7 (40–74). Thirty-four of the patients were female (58.6%) and 24 were male (41.4%). A total of 61 surgical procedures, 3 of which were bilateral, were performed in 58 patients. The procedure was performed in the same session in 3 patients who underwent bilateral pulmonary metastasectomy and lymph node dissection.

The number of patients who underwent invasive mediastinal lymph node biopsy due to suspicious lymph node positivity in the preoperative period was 13, of which 11 were video-mediastinoscopy and 2 were left anterior mediastinotomy. Anatomical resection (lobectomy: 1, segmentectomy: 3) was performed in 4 (6.6%) of 61 surgical procedures, and wedge resection was performed in 57 (93.4%) patients (Table II).

The mean number of resected pulmonary metastases was 1.72 ± 1.01 (1–5). The total number of dissected lymph nodes was 191, with an average of 3.1 ± 0.97 (2–6) per surgical procedure (Table III). Colon ca (20 patients, 34.4%) and breast ca (16 patients 27.6%) were the most common primary tumor origin. Others were thyroid ($n = 9$, 15.5%), sarcoma ($n = 9$, 15.5%), renal cell ca ($n = 3$, 5.2%) and melanoma ($n = 1$, 1.8%). Unexpected lymph node positivity was present in 9 of 58 patients (15.5%). Five of these patients were followed by breast ca and 4 were due to colon ca (Table IV). There were no patients who had positive postopera-

tive lymph node after PM-LND in the preoperative period with mediastinotomy or video-mediastinoscopy.

The average length of hospital stay of the patients was 3.1 ± 0.83 (2–5) days. No mortality was observed in the patients within the first 30 days in the postoperative period. Postoperatively 6 (10.3%) patients had complications, atelectasis ($n = 3$, 5.1%), prolonged air leak ($n = 2$, 3.4%) and arrhythmia ($n = 1$, 1.8%) (Table V).

Discussion

Video-assisted thoracoscopic surgery has been used safely in lung surgery for many years [10]. Many complex lung procedures, including sleeve resections, have been performed with this technique in recent years [11, 12]. There were various drawbacks in the application of adequate lymph node dissection in patients undergoing VATS for lung cancer surgery. However, studies have shown that mediastinal lymph node dissection can be performed as effectively as thoracotomy with VATS [13, 14]. With videothoracoscopy being so usable, its rate in pulmonary metastasectomy has also increased gradually. The most important point in terms of pulmonary metastasectomy is the detection of the localization of the pulmonary nodules during VATS surgery. It was reported that this limitation of VATS was resolved by opening incisions suitable for the localization of metastatic nodules [15]. Kheraba *et al.* [16] showed that it is useful in detecting intrathoracic lung ultrasonography (US) nodule localization during VATS. In these patients, there was a significant improvement in the rate of transition from VATS to thoracotomy with the use of intrathoracic US.

In our study, patients who underwent pulmonary metastasectomy and lymph node dissection with VATS were evaluated. Triportal VATS was used in all patients and incisions were opened in localizations to allow palpation of the nodule with a finger. All patients were evaluated by thorax CT in the preoperative period and metastasectomy was decided accordingly. PET-CT and invasive staging methods were used for staging purposes. Metastasectomy was not performed in patients with mediastinal lymph node positivity.

In our patient series, contrary to the literature, the rate of female patients was 58.6%. We think that, this is due to the fact that the patients with primary diagnosis of breast carcinoma were higher in our study compared to other studies in the literature. In many studies in the literature, male patients are the majority [17–19]. As another feature of our study, when the primary origin of patients is examined, we see that the most common cases are colorectal carcinoma (34.4%). This rate is also seen to be compatible with the literature [20]. In second place is breast carcinoma; others were thyroid, sarcoma, renal cell ca and melanoma. In our series, there were no patients with primary gynecological carcinoma and head and neck carcinoma. In our hospital, gynecological oncology and oncological surgery of the head and neck region are not actively performed, so we think that we do not have any patients with these cell types.

It is known that lymph node dissection is a prognostic factor in terms of disease-free survival and overall survival

Table II. Patients' demographics

Parameter	N	%	
Age	56.5 ±10.7		
Gender	Male	24	41.4
	Female	34	58.6
Surgery side	Right	30	51.7
	Left	25	43.1
	Bilateral	3	5.2
Resection type ($n = 61$)	Anatomic	4	6.6
	Non-anatomic (Wedge resection)	57	93.4
Number of resected metastases	1.72 ±1.01		
Number of dissected lymph nodes	3.1 ±0.97		

Table III. Number of dissected lymph nodes and pathologic positive lymph nodes

Origin of primary tumor	Dissected LN	Pathologic positive LN		%
		N1	N2	
Colorectal	55	4	2	11
Breast	49	4	5	18.3
Thyroid	35	–	–	–
Sarcoma	37	–	–	–
Renal cell	11	–	–	–
Melanoma	4	–	–	–

Table IV. Origin of pulmonary metastases

Origin of primary tumor	Number of patients	%	LN positive patients	%
Colorectal	20	34.4	4	20
Breast	16	27.6	5	31.2
Thyroid	9	15.5	–	–
Sarcoma	9	15.5	–	–
Renal cell	3	5.2	–	–
Melanoma	1	1.8	–	–

Table V. Postoperative complications

Complications	N	%
Atelectasis	3	5.1
Prolonged air leak	2	3.4
Arrhythmia	1	1.8

rates in patients undergoing pulmonary metastasectomy. In meta-analyses of 4363 patients, Shiono *et al.* [21] showed that mediastinal lymph node positivity is a poor prognosis criterion. They reported that mediastinal lymph node sampling or dissection should be performed in their studies in which patients underwent lobectomy for pulmonary metastases. In patients who underwent pulmonary metastasectomy, the unpredictable lymph node positivity in the preoperative period is reported to be around 17% [22]. In

our series, the mean number of resected metastases in our patients was 1.72, and the average number of lymph nodes dissected from the same patients was 3.1. Mediastinal or hilar lymph node positivity was detected in 9 of these patients. An unexpected lymph node positivity in 15.5% of 58 patients who underwent pulmonary metastasectomy and mediastinal lymph node dissection with VATS shows the importance of lymph node dissection in these patients. In this way, an effective oncological treatment plan can be made for the patients in the postoperative period. As a limitation of our study, the number of patients could not be evaluated in terms of survival between patients with negative lymph node and patients who were negative. There is also a need for randomized controlled trials to determine if there is any difference between lymph node dissection or sampling.

Conclusions

Video-assisted thoracoscopic surgery is a technique that can be applied in pulmonary metastasectomy with its advantages such as low complication rate and rapid recovery. During VATS, there will be no problem in palpating and detecting the nodule through incisions suitable for pulmonary nodule localization. In these patients, lymph node dissection, which is one of the determining factors of prognosis, can be performed effectively with VATS. Mediastinal and hilar lymph node dissection combined with pulmonary metastasectomy is effective in detecting unexpected lymph node positivity. Therefore, we think that lymph node dissection should be performed.

Disclosure

Author reports no conflict of interest.

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