



# Insights in work rehabilitation after minimally invasive esophagectomy

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## Abstract

**Background** Little is known about work rehabilitation after totally minimally invasive esophagectomy. The goal of this study was to further objectify the postoperative work rehabilitation. Not only duration of sick leave, but also the extent of return to work will be assessed.

**Methods** This retrospective multicenter study was conveyed between January 2009 and April 2014. Eighty-six preoperatively employed patients were included. Data regarding patients' preoperative occupation, actual job status, and postoperative duration until return to work were retrieved. Potential prognostic factors for work rehabilitation were analyzed. Complaints that could impede rehabilitation were questioned (based on EORTC QLQ-C30 and QLQ-OES18). Work activity, defined as either partially or fully resumed professional activity as compared to the preoperative status, was measured at 3, 6, 12, and 18 months postoperatively.

**Results** At 6-month follow-up, 40.2% of patients reached partial and 14.6% had full professional recovery and after 12 months 28.2% and 40.8%, respectively. After 18 months, a stagnation was seen (19.0% partial; 43.1% full recovery). Median follow-up was 18 months (IQR 12–18). Self-employment was a significant predictor for full professional recovery ( $p=0.005$ , OR 2.45 95% CI 1.32–4.56). The median time to full professional recovery was shorter for this group. The most common complaint among all patients was fatigue. This complaint did not significantly differ between working (fully and partially) and non-working groups ( $p=0.727$ ).

**Conclusions** Only approximately 40% of patients reached full professional recovery 1 year after totally minimally invasive esophagectomy. Barely any progression toward return to work was seen after 1 year postoperatively. Roughly 30% of patients never returned to work. Self-employed workers had a higher percentage of restoration to full professional activity, as well as shorter duration to return. These findings highlight the importance of adequate counseling of patients in order to prepare them for the impact of this procedure on professional activities.

**Keywords** Work rehabilitation · Esophageal cancer · Minimally invasive esophagectomy

Over the past years, the incidence of esophageal cancer in the Western world has increased [1]. With 456 000 new patients in 2012, it is the eighth most common cancer in the world and ranks sixth in all cancer-related mortality [2].

Although an esophagectomy remains a complex procedure with a high risk of postoperative complications and persisting morbidity [3, 4], long-term survival has improved substantially due to multidisciplinary treatment [5–8]. This increased long-term survival has brought non-cancer-related issues to attention this past decade, such as work participation [9]. Studies have analyzed work disability, quality of life, and rehabilitation of patients surviving cancer treatment, but often use a heterogeneous, small population, as well as a wide variety of types of cancer [10–13]. Quality of life studies in patients with esophageal cancer suggests that patients return to their baseline functional status after 9–12 months [3, 14, 15]. Returning to work may increase

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the patient's quality of life and should be seen as a representation of functional recovery [16]. Reintegration in professional activity is of importance to both the patient and society. Patients experience return to work as a restoration of their general normal functioning [17], as permanent work disability has a profound financial impact and can lead to social isolation. From a societal point of view, return to the workforce is regarded as an economic and social obligation.

In patients with breast cancer and colorectal cancer, age, chemotherapy, and extensive preexistent comorbidities have been shown to be predictors for failure to return to work [18–21]. To the best of our knowledge, only one single-center study has specifically analyzed return to work after open esophagectomy in a small group of patients [22].

The first aim of this study is to investigate work rehabilitation after totally minimally invasive esophagectomy for cancer, defined as return to work and progress of return. Secondly, we will try to identify prognostic factors, both perioperative and late functional postoperative factors, that may influence the functional outcome of this return to work. We hope to gain insights into how patients should be informed on the time until and extent of work rehabilitation after surgery.

## Materials and methods

This was a multi-center retrospective study using prospectively collected data of three referral hospitals for esophageal cancer in the Netherlands (one university hospital and two teaching hospitals). All preoperatively employed patients who underwent a totally minimally invasive esophagectomy for esophageal cancer with curative intent between January 2009 and April 2014 were included. Patients with tumor recurrence or metastatic disease during follow-up were excluded. This retrospective study was part of an institutional review board-approved protocol for ongoing assessment of esophagectomy outcomes.

Patient variables collected from medical records included age, gender, ASA score, complications, neoadjuvant treatment, type of occupation, and occupational status preoperatively. All patients were personally invited to complete a questionnaire inquiring for extent of preoperative occupation (part-time or full-time); preoperative occupational status (employee or self-employed); duration until returning to work postoperatively; extent of postoperative occupation (part-time or full-time). In addition, the EORTC QLQ-C30 and QLQ-OES18 were included. Postoperative part-time activity was defined as partially regained function compared to the preoperative status (part- or full-time). Postoperative full-time activity was defined as restoration of preoperative extent of occupation (part- or full-time). The interval to return to work was defined as the time between

the first day of sick leave (before or after diagnosis) until the first day of job activity post-diagnosis, irrespective of the amount of hours of activity per week. Work activity was measured at regular follow-up consultations according to the Dutch national guidelines (3, 6, 12, and 18 months postoperatively). Postoperative complications were registered and graded according to the Clavien–Dindo classification [23]. Based upon the current data, patients were divided into two groups: patients with blue collar jobs (all jobs in construction, health care, and jobs with irregular hours) and patients with white collar jobs (administrative jobs, managing/leadership functions). All patients were asked which complaints were most debilitating.

All operations were performed in a totally minimally invasive manner: the McKeown technique (3 stage, cervical anastomosis), Ivor Lewis technique (2 stage, intrathoracic anastomosis), or Orringer technique (transhiatal, cervical anastomosis) was performed, according to surgeons' preferences and tumor characteristics.

Categorical variables are presented as number with corresponding percentages. Continuous variables are presented as mean with standard deviation, or in case of nonparametric data as median with interquartile range (IQR). A cox proportional hazards regression analysis was used to identify predictors for time to full professional recovery. Since the exact date of full professional recovery was not registered, time to event was calculated as the number of months between baseline and full professional recovery such as measured at the consultation after 3, 6, 12, or 18 months. For patients who did not reach full professional recovery (i.e., non-active state or partially recovered), the number of months between baseline and their last consultation was calculated. The following baseline characteristics were analyzed: age, gender, ASA classification, Clavien–Dindo classification, the occurrence of complications, neoadjuvant therapy, type of surgery, full-time job, self-employment, and physically demanding jobs. A Kaplan–Meier analysis was performed to investigate the median time to full professional recovery. Statistical significance was set at  $p$  values of  $<0.05$ . Analysis was performed using Statistical Package for the Social Sciences version 22 (SPSS Inc., Chicago, USA).

## Results

Eighty-six patients who had preoperative employment and no clinical evidence of recurrence were included. Baseline characteristics such as tumor type, patient, treatment and postoperative outcome characteristics of the study population are presented in Table 1. Of all patients, 72.1% ( $n=62$ ) were male and the mean age was 57 years ( $SD \pm 6.10$ ).

Neoadjuvant chemoradiation therapy was administered in 62.8% of the patients, 19.8% of patients received only

**Table 1** Demographics

Patients	
<i>Sex</i>	
Male	62 (72.1)
Female	24 (27.9)
<i>Tumor type</i>	
Squamous cell cancers	17 (19.8)
Adenocarcinoma	66 (76.7)
Other	3 (3.5)
<i>ASA score</i>	
1	21 (24.4)
2	54 (62.8)
3	11 (12.8)
4	0 (0)
<i>Neoadjuvant therapy</i>	
None	15 (17.4)
Chemotherapy	17 (19.8)
Chemoradiotherapy	54 (62.8)
<i>Minimally invasive procedure</i>	
McKeown	23 (26.8)
Ivor Lewis	45 (52.3)
Transhiatal	18 (20.9)
<i>ICU stay in days, median (IQR)</i>	
	1.0 (1–3)
<i>Hospital stay in days, median (IQR)</i>	
	12.0 (9–16)
<i>Complication grade (Clavien–Dindo)</i>	
Grade I	4 (4.7)
Grade II	23 (26.7)
Grade IIIa	7 (8.1)
Grade IIIb	3 (3.5)
Grade Iva	11 (12.8)
Grade IVb	4 (4.7)
<i>Types of complications</i>	
<i>Non-surgical</i>	
Cardiac (i.e., atrial fibrillation, heart failure)	9 (10.5)
Thromboembolism	1 (1.2)
Other	10 (11.6)
Pulmonary insufficiency	21 (24.4)
Pneumonia	30 (34.9)
ARDS	6 (7.0)
Pleural effusion	2 (2.3)
<i>Surgical</i>	
Anastomotic leakage	17 (19.8)
Chyle leakage (chylothorax)	10 (11.6)
Recurrent nerve dysfunction	5 (5.8)
Empyema	5 (5.8)
Anastomotic stenosis	4 (4.7)
Other	13 (15.1)
<i>Type of job</i>	
Blue collar job	43 (50.0)
White collar job	36 (41.9)
Missing data	7 (8.1)

Data are presented as *n* (%) unless stated otherwise

**Table 2** Work rehabilitation

Follow-up	<i>n</i>	Non-active <i>n</i> (%)	Partially recovered function <i>n</i> (%)	Fully recovered function <i>n</i> (%)
3 months	86	63 (73.3)	15 (17.4)	8 (9.3)
6 months	82	37 (45.1)	33 (40.2)	12 (14.6)
12 months	71	22 (31.0)	20 (28.2)	29 (40.8)
18 months	58	22 (37.9)	11 (19.0)	25 (43.1)

chemotherapy, and 17.4% of patients received no neoadjuvant therapy. Surgical technique was totally minimally invasive in all cases, and no conversions to open esophagectomy were registered. 26.8% of patients were treated with a minimally invasive McKeown procedure, 52.3% underwent a minimally invasive Ivor Lewis procedure, and in 20.9% of patients a transhiatal esophagectomy was performed. Median ICU stay was 1 day (IQR [1–3 days]). Median total hospital stay was 12 days (IQR [9–16 days]). A grade I Clavien–Dindo complication occurred in 4.7% of the patients, a grade II occurred in 26.7%, a grade IIIa occurred in 8.1%, a grade IIIb occurred in 3.5%, a grade IVa occurred in 12.8%, and a grade IVb occurred in 4.7% of all patients (Table 1). Median follow-up was 18 months (IQR 12–18). Fifty-nine patients had a follow-up of more than 18 months, 12 patients had a follow-up of 12 months, 11 patients had a follow-up of 6 months, and 4 patients only had 3 months of follow-up.

The postoperative non-active state, partially recovered, and fully professionally recovered functions per time point are shown in Table 2. At 3-month, 6-month, 12-month, and 18-month follow-up, part-time work rehabilitation was observed in 17.4%, 40.2%, 28.2%, and 19.0%, respectively. At these points in time, full professional recovery was observed in 9.3%, 14.6%, 40.8%, and 43.1%, respectively.

The following variables were not found to be independent predictors for work rehabilitation: age, gender, ASA score, complications, neoadjuvant therapy, operative procedure, occupational status preoperatively (Table 3) and white vs. blue collar job (3 months  $p=0.160$ , 6 months  $p=0.145$ , 12 months  $p=0.176$ , 18 months  $p=0.153$ ). The only significant predictor for a shorter time to full professional recovery was employment type (employee vs. self-employed). 80% of all self-employed patients ( $n=16/20$ ) return to full work status vs. only 33.33% of all employees ( $n=22/66$ ), regardless of the measured points in time. Patients who were self-employed had a higher probability of retaking full job potential compared to employed patients [hazard ratio (HR) 2.45, 95% CI 1.32–4.56,  $p=0.005$ ]. A self-employed worker fully returns to work significantly faster than an employee: median time to full professional recovery was 6.0 months [95% confidence interval (CI) 0.0–12.0 months] versus 18.0 months (95% CI 13.7–22.3 months), respectively. All other

**Table 3** Predictors

Variable	HR (95% CI)	<i>p</i> value
Age	1.02 (0.96–1.08)	0.552
<i>Gender</i>		
Female	1.00	
Male gender	1.18 (0.60–2.30)	0.631
<i>ASA score</i>		
ASA 0	1.00	
ASA II	1.04 (0.52–2.08)	0.922
ASA III	0.69 (0.22–2.17)	0.528
<i>Complications</i>		
No complications	1.00	
Complications in general	0.85 (0.46–1.56)	0.596
Complications Clavien–Dindo I+II	1.16 (0.60–2.25)	0.664
Complications Clavien–Dindo III+IV	0.53 (0.23–1.22)	0.136
<i>Neoadjuvant therapy</i>		
No neoadjuvant therapy	1.00	
CT/RCT	0.79 (0.39–1.59)	0.503
<i>Operative procedure</i>		
McKeown	1.00	
Ivor Lewis	1.36 (0.62–2.95)	0.443
Transhiatal	1.58 (0.67–3.77)	0.299
<i>Occupational status preoperatively</i>		
Part-time	1.00	
Full-time	0.92 (0.44–1.93)	0.834
<i>Type of occupation</i>		
Employee	1.00	
Self-employed	2.45 (1.32–4.56)	0.005

investigated baseline variables showed no significant difference in time to full professional recovery (Table 3).

In Table 4, the most frequently reported complaints for all three groups (regardless of the time in follow-up) that might impede rehabilitation are shown. Of the 86 patients, 55.8% ( $n = 48$ ) had one or more complaints. There was no significant difference in complaints between patients with full professional recovery, partial recovery, and the definitively non-active group (mental/physical fatigue  $p = 0.756$ , feeding/nutritional difficulties  $p = 0.132$ , dumping symptoms  $p = 0.589$ , anxiety/depression  $p = 0.441$ , regurgitation

$p = 0.342$ ). Furthermore, no significant difference was found between the number of complaints in general in the non-active group and in the fully and partially recovered group ( $p = 0.746$  and  $p = 0.439$ , respectively).

## Discussion

In this group of 86 patients treated for esophageal cancer in a curative setting, only 40.8% returned to full professional activity 1 year after minimally invasive esophagectomy; another 28.2% returned to partial professional activity. However, little progression toward returning to work is seen after 1 year. The proportion of partially recovered patients declines, as more patients become either fully recovered, or non-active or disabled. We hypothesize that part-time workers either progress toward working full-time, or that they could not maintain that level of functioning and had to quit their job. At 18 months of follow-up, 37.9% of the patients remained unable to perform any type of professional activity, with no future prospects of resuming their career.

In general, patients are officially declared disabled after a certain period of sick leave, e.g., in the Dutch social security legislation disability is defined as failure to rehabilitate after 104 weeks (2 years, taking preoperative sickness and neoadjuvant therapy in account, with approximately 18 months to recover after surgery). A stagnation was seen after 12-month follow-up to full work rehabilitation in our study group. De Boer et al. [10] found that cancer patients' work ability scores at 6, 12, and 18 months after the first day of sick leave improved significantly over time. They suggest that work ability scores in cancer patients may still improve 2 years after diagnosis, meaning that the official time for recovery would need to be extended before declaration of disability. Our study does not support this hypothesis, as the percentage of patients who continued on to full work rehabilitation showed a stagnation between the 12- and 18-month postoperative mark. This discrepancy could be explained by age at diagnosis and differences in type of cancer and their corresponding therapies [24].

Pinto et al. showed that almost two-thirds of the patients restarted their professional activity at 1 year [22]. If we

**Table 4** Complaints

Complaints ( <i>n</i> )	Fully recovered ( <i>n</i> = 37)	Partially recovered ( <i>n</i> = 19)	Definitively non-active group ( <i>n</i> = 30)	<i>p</i> value
Mental/physical fatigue	15	9	15	0.756
Feeding/nutritional difficulties	3	5	7	0.132
Dumping symptoms	4	3	6	0.589
Anxiety/depression	1	1	3	0.441
Regurgitation	3	1	0	0.342

One patient can have several complaints (based on EORTC questionnaires)

compare the current results with those of cancer survivors in general, a much higher percentage of patients (62% [25, 26] to 74% [27]) return to work. In patients with colorectal cancer, 61–89% [28, 29] regained their initial work status. More specifically, 47.6% [30] to 63% [31] of patients with rectal cancer resume their initial occupation. Rectal cancer shows similarities to esophageal cancer in terms of treatment, as patients with rectal cancer also receive bi- or trimodality treatment. Additionally, rectal surgery is associated with considerable morbidity, such as creation of a stoma, abnormal bowel function, and fecal incontinence [32]. These factors result in a lower probability of being productive or at work [30]. The reason for the lower numbers of full work rehabilitation in patients undergoing minimal invasive esophagectomy may lie in the fact that more than 60% of our patients receive trimodality treatment, in comparison with, for example, approximately 43% [33] of patients with rectal cancer. Furthermore, every type of cancer has disease-specific complaints that may impede work rehabilitation, e.g., swallowing dysfunction after esophagectomy (30.0%) [34], hormonal therapy in breast cancer [12], or presence of a stoma in rectal cancer [32].

Several predictors for full professional recovery have been described for cancer patients in general [25], but also for specific types of cancers [18–21]. Of all the investigated predictors for the interval to full professional recovery after esophagectomy, the only significant predictor in this study for duration of period to professional recovery as well as level of professional recovery was a self-employed status. These findings are in line with the results of Pinto et al. and have also been observed in breast cancer patients [9, 18]. Limited financial security is most likely the main reason that self-employed professionals return to work more often than employees, as work absence means loss of contracts, clients, and a professional network, thus leading to a decreased or absence of income. Another explanation might be that self-employed patients may be more driven or simply have a greater passion for their occupation at baseline and thus are more likely to return to continue that endeavor than patients in an employed situation.

Neither Pinto's study nor our study found a significant relation between work rehabilitation and blue/white collar jobs. However, an association between these two factors has been shown in other studies before [25]. Where this study only has 86 patients, Spelten et al. has a study population of 195 patients (at 18 months follow-up). Not finding an association in our group could be attributed to the relatively small population of our study. In addition, person-related factors might negatively influence the return to work, as most cancer survivors consider work to be less important in life, leading to decreased professional aspirations [26].

Therapy-related complaints could impede work rehabilitation. Cancer-related fatigue has been shown to affect

70–80% of all cancer patients and can affect a patient's ability to work [35]. In our population, this was also the most common complaint. However, no difference was seen in fatigue between the fully recovered, partially recovered, and the non-active patients. This could imply that fully recovered patients cope with fatigue in a different way [36]. The second most common complaint was feeding and nutritional difficulties. Again, these nutritional difficulties were not related to work rehabilitation in our group. Patients experience lower levels of quality of life after esophagectomy on many areas, with a slow recovery to preoperative levels [34]. However, these complaints have not been linked to work rehabilitation after esophagectomy.

Our study has some limitations. First, it is a retrospective study, though it is based on prospectively collected data. Second, all patients enrolled in this study showed no clinical signs of recurrence at regular follow-up intervals; however, no routine diagnostics like CT or PET were performed. Since recurrence of esophageal disease most commonly occurs in the first and second year after surgery [37], return to work activity might have been hampered by undiagnosed recurrence. Third, the exact date of full professional recovery was not registered. Fourth, the identification of additional significant predictors for work return is likely limited due to the sample size. Despite the above, our study is the largest multi-center study giving insights into work rehabilitation after esophagectomy.

Work rehabilitation after totally minimally invasive esophagectomy is an important factor to take into account. After 6 months, approximately half of the patients has resumed any level of professional activity, and only 40.8% of the patients has reached full professional recovery within a year. After 1 year, these trends stagnate. These findings emphasize the importance of adequately preparing patients for the impact of minimally invasive esophagectomy on their professional capacities.

## Compliance with ethical standards

**Disclosures** Melissa Geeraerts, Luis Carlos Silva Corten, Marc van Det, Misha Luyer, Grard Nieuwenhuijzen, Marloes Vermeer, Jelle Ruurda, Richard van Hillegersberg, and Ewout Kouwenhoven have no conflict of interest or financial ties to disclose.

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