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Preoperative physical endurance capacity and pulmonary function testing in patients with gastric and esophageal cancer

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Background

There are only few scientifically proven studies available focusing on the effect of physical activity for patients with gastric and esophageal cancer. Our study aims to analyse the physical endurance capacity and pulmonary function testing of patients before gastric or esophageal surgery. The aim of this study is to establish adequate preoperative training methods for patients with upper GI cancer to reduce perioperative complications as well as disease-related symptoms and to increase the quality of life.

Methods

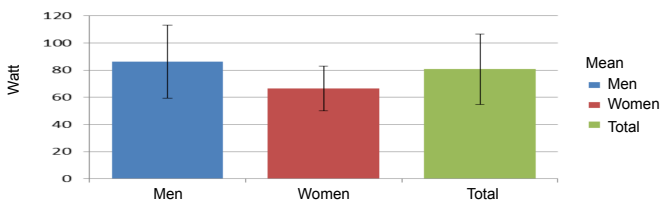
This prospective study comprises 50 patients (14 women, 36 men, median age 59.8 years) diagnosed with esophageal or gastric carcinoma (see table 1). Exercise testing took place between May 2013 to November 2013 and was used to determine the endurance capacity. The parameters watt, respiratory quotient, maximal oxygen uptake, and minute volume were examined using a modified WHO test. Strength diagnostics analysed the maximum power output capability of the subjects using the bench press and the leg-stretcher by an 8-repetition maximum test. Pulmonary function testing included spirometry to determine the parameters vital capacity and forced expiratory volume. All data were compared to an established age-adjusted control-group.

Results

Watt, maximum oxygen uptake and lung capacity of our patients are much below the standard values (see graph 1). Spirometry detected forced expiratory volume and vital capacity which is partially reduced and differs most significantly from the standard ($p<0.001$) (see graph 2).
Strength diagnostic provides significant differences between experimental and control groups. With values around 35 kilograms, they are well below the requirements for healthy individuals (see graph 3).

Graph 1: Results from spirometry

in Watt, n=50



Conclusions

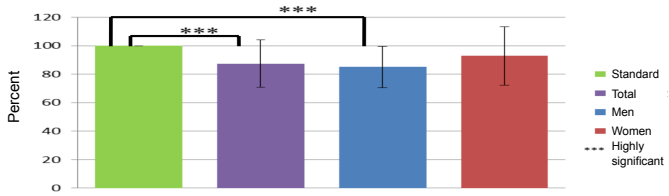
Physical performance of patients with esophageal and gastric cancer is significantly limited. Disease-related symptoms and side effects complicate the physical activity tremendously. Our findings help to develop effective training programs in cooperation with the German Sports University to improve pulmonary function and physical activity of our patients. This will finally benefit to reduce perioperative complications and improve medical outcome which is subject of ongoing studies.

Table 1: Study population

		Age (in years)	Weight (in kg)	Height (in cm)	BMI (kg/m^2)	Diagnosis
Study group (n=50)	Mean	59.8	73.7	174.5	24.3	50
	(±SD)	(10.6)	(13.9)	(8.7)	(3.8)	
	Min	27	40	150	17.5	
	Max	80	100	192	33	
Women (n=14)	Mean	64.4	63,7	165.6	22.9	OeC 11
	(±SD)	(9.1)	(11.5)	(7.5)	(3.8)	
	Min	47	40	150	17.5	GC 3
	Max	80	93	177	33	
Men (n=36)	Mean	57.9	77.6	178	24.75	OeC 33
	(±SD)	(10.8)	(12.2)	(6.5)	(3.7)	
	Min	27	56	160	18.1	GC 3
	Max	79	100	192	32	

Graph 2: Lung capacity compared with standard values

in percent, n=50



Graph 3: Strength diagnostic (8-RM test)

in kg, n=50

		Taylor & Fletcher (3)	Study population
Leg strecher	Mean SD	50,7kg +/- 5,8	34,6kg +/- 14,6
Bench press	Mean SD	57,5kg +/- 29,5	33,9kg +/- 16,3

Sources:
(1) Baumann , F. T., Jäger, E., Bloch, W. Springer Medizin Verlag (2012)
(2) Cooper et al. Health and fitness through physical activity (1978)
(3) Taylor, J. D., Fletcher, J. P Physiotherapy Theory and Practice (2006)