Can the Melbourne Scoring Scale be used to assess postoperative pulmonary complications in high-risk patients following lung resection?

Brocki, Barbara C.; Westerdahl, Elisabeth; Andreasen, Jane; Andreasen, Jan Jesper

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

Can the **Melbourne Scoring Scale** be used to assess **postoperative pulmonary complications** in high-risk patients following lung resection?

Barbara C Brocki[1] • **Elisabeth Westerdahl**[2,3] • **Jane Andreasen**[1,4] • **Jan J Andreasen**[5,6]

1Department of Occupational Therapy and Physiotherapy, Aalborg University Hospital, Aalborg, Denmark
2 Department of Physiotherapy, Faculty of Medicine and Health, Örebro University, Örebro, Sweden
3 Department of Medical Sciences, Uppsala University, Uppsala, Sweden
4 Public Health and Epidemiology Group, Department of Health, Science and Technology, Aalborg University, Aalborg, Denmark
5 Department of Cardiothoracic Surgery, Aalborg University Hospital, Aalborg, Denmark
6 Department of Clinical Medicine, Aalborg University, Aalborg, Denmark

Objectives

Postoperative pulmonary complications (PPC) are common following lung resections, but there is no consensus in the literature on the definition of a clinically relevant PPC. This study aimed to use the Melbourne Scoring Scale (MGS) to determine the frequency and predictors of PPC in patients scheduled for lung resection on suspicion of or due to cancer.

Methods

In a prospective observational design, we assessed 87 consecutive patients following lung resections in Aalborg University Hospital, Denmark. Patients were preoperatively classified as being at high PPC-risk (n= 68) or low PPC-risk (n=19), based on the presence of one or more of the items: FEV1 or carbon monoxide diffusion capacity (DLCO) ≤70%, age ≥70 years or scheduled pneumonectomy. Data on PPC was collected daily during hospital stay and re-evaluated two weeks postoperatively. Multivariate regression analysis was used to evaluate variables associated with PPC.

Results

Table 1 shows demographics and surgical data. The actual frequency of PPC according to the MGS was 11% (n=10), all cases within the predefined high-risk group suggesting that the MGS is feasible to use. Pneumonia was diagnosed in nine patients (**Table 2**). In a multivariate regression analysis we found that a cut-off value for FEV1 and DL CO ≤ 60% was a better predictor for higher PPC risk (area under the ROC curve 0.851), 95% CI 2.2-56.6 and 1.1-36.8 for FEV1 and DLCO, respectively, when compared to the predefined cut-off value of ≤70% (**Figure 1**).

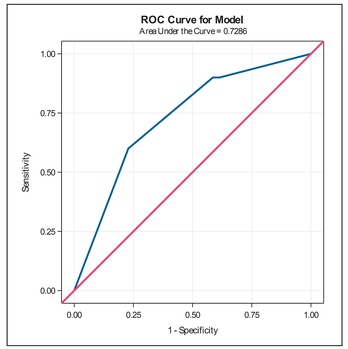

Figure 1: In a multivariate regression analysis, we found that a cut-off value for preoperative FEV1 ≤ 60% and DLCO ≤ 60% were better predictors of high PPC risk (area under the ROC curve of 0.8515; Wald Chi square test for FEV1: $r = 8.6775$, $p = 0.0032$ and for DLCO: $r = 4.3624$, $p = 0.0367$), when compared to the predefined cuff –off value of ≤ 70 (area under the ROC curve 0.7286).

Table 1: Baseline and surgical characteristics for the group presenting PPC and for the non-PPC group.

Variables	Value	Total (n= 87)	PPC (n=10)	Non-PPC (n=77)
Age (years)	Mean ± SD	67.4 ± 9.3	70.1 ± 7.9	67.0 ± 9.4
Gender, n%	Male	51 (59)	7 (70)	44 (57)
BMI	Mean ± SD	26.6 ± 5.0	27.9 ± 3.6	26.4 ± 5.2
ASA, n %	1	1 (1)	0	1 (1)
	2	69 (79)	7 (70)	62 (81)
	3	17 (20)	3 (30)	14 (18)
DLCO, % predicted	Mean ± SD	68.8 ± 17.3	54.7 ± 15.4	69.7 ± 16.8
FEV1 % expected	Mean ± SD	83.0 ± 21.1	64.9 ± 27.4	85.4 ± 19.1
COPD, n %	Yes	31 (36)	6 (60)	25 (33)
COPD severity,	Mild (>80)	8 (26)	1 (17)	7 (28)
	Moderate (50-80)	17 (55)	3 (50)	14 (56)
	Severe (30-50)	6 (19)	2 (33)	4 (16)
Smoking status, n %	Current/ex	25/53 (29/61)	5/4 (50/40)	20/49 (26/64)
	Never smoked	9 (10)	1 (10)	8 (10)
Pack/years	Mean ± SD	38.9 ± 28.3	44.2 ± 23.4	38.3 ± 29.0
6MWT, meter	Mean ± SD	506 ± 125	432 ± 142	516 ± 120
< 400 m, n %		15 (17)	3 (30)	12 (16)
Surgical procedure, n %	VATS	50 (58)	2 (20)	48 (62)
	Thoracotomy	37 (42)	8 (80)	29 (38)
Resection degree, n %	Segmentectomy/ wedge	28 (32)	3 (30)	25 (33)
	Lobectomy	49 (56)	7 (70)	42 (56)
	Bilobect/pneumonectomy	10 (12)	0	10 (12)
Length of hosp. stay	Mean ± SD	7.7 ± 5.2	13.4 ± 6.8	6.9 ± 4.5
Pathology, n %	NSCLC	60 (69)	8 (80)	52 (67)
	Metastatic	11 (13)	1 (10)	10 (13)
	Non-malignancy	16 (18)	1 (10)	15 (20)
Values are presented as mean (± SD), unless otherwise stated				

Abbreviations
PPC, Postoperative pulmonary complications; **BMI**, Body mass index; **IHD**, Ischemic heart disease; **AFLI**, atrial fibrillation; **ASA**, American Society of Anesthesiologists; **ECOG**, Eastern Cooperative Oncology Group performance status; **DLco**, carbon monoxide diffusion capacity; FEV1, forced expiratory volume in one second; **COPD**, chronic obstructive pulmonary disease; **6MWT**, six-minute walk test; **MIP**, Maximal inspiratory pressure; **VATS**: Video-assisted thoracoscopic surgery; **NSCLC**, Non-small cell lung cancer.

Table 2: Percentage of PPC according to each Melbourne Group Scoring Scale (MGS) item

Variables	High-risk	Low risk n= 68	p-value n= 19
MGS ≥ 4 items, n %	n=10 (14.7%)	n=0 (0.0%)	0.1092
Temperature >38oC	16 (29%)	3 (16%)	0.37
While cell count >11.2x109/L	16 (24%)	3 (16%)	0.71
Physician diagnosis of pneumonia	7 (10%)	0 (0%)	0.33
Chest X Ray (CXR) atelectasis/consolidation	12 (18%)	3 (16%)	1.00
Purulent sputum, different from preoperative status	8 (12%)	0 (0%)	0.25
Pneumonia (CXR + positive sputum microbiology)	2 (3%)	0 (0%)	1.00
Oxygen saturation <90% on room air, 2 consec days	26 (38%)	1 (5%)	0.0077
Respiratory failure	2 (3%)	0 (0%)	1.00

Categorical variables presented as: numbers and %; Statistics: Fisher´s exact test.
A clinically relevant PPC is defined as ≥ 4 items in the MGS.

Conclusions

The MGS can be used to identify patients at high risk of postoperative and clinically relevant PPC after lung resections. Patients with preoperative values of FEV1 ≤ 60% or DLCO ≤ 60% are in particular at high PPC-risk. Research is needed to evaluate the effects of preventable interventions targeting patients at high-risk of developing PPC.

AALBORG UNIVERSITY HOSPITAL
Denmark

Contact: Barbara C Brocki, Aalborg University Hospital;
e.mail: bcb@rn.dk