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How static lung compliance was measured

First, the FRC level was determined by plethysmography. Measurement of $C_{L,st}$ was the last pulmonary function test performed. All $C_{L,st}$ measurements were performed in a sitting upright position. After local topical anesthesia using lidocaine gel, a 130 cm long catheter tipped with a 10 cm empty balloon (8.6 mm wide) was gently and carefully introduced through the nose and nasopharynx. The patient was asked to swallow small amounts of water, helping to advance the catheter to the target position (lower 1/3 of the esophagus).

The balloon was then inflated with 1-2 mL of air (to restore balloon recoil to zero) using a three-way stopcock. Small peaks on the pressure curve indicated that the balloon was placed behind the heart. In such cases, the balloon was moved slightly higher to minimize cardiac pressure artifacts and was then fixed in location using clips on the nose to prevent airflow and movements of the catheter. The patient was then connected to the mouthpiece, and the catheter was connected to the pressure port of the equipment.

The measurement started with tidal breathing for adapting the patient to the system and checking drifts. The patient was then asked to perform a deep inspiration (to total lung capacity level) and immediately thereafter (without any stopping at the TLC level) a very slow expiration (airflow maintained at the level of 0.3 L/s) to the RV level.

We did not use a mouth shutter. In our experience, it is better to perform several "training" slow expirations (performed anyway for standardizing volume history) than to use a shutter, which is irritating for patients. Some patients with more advanced disease are unable to perform such prolonged expirations (6 interruptions for 2 seconds account for 12 seconds only for shutter breaks) because of an increased respiratory drive (hypoxemia, alteration of mechanoreceptors).

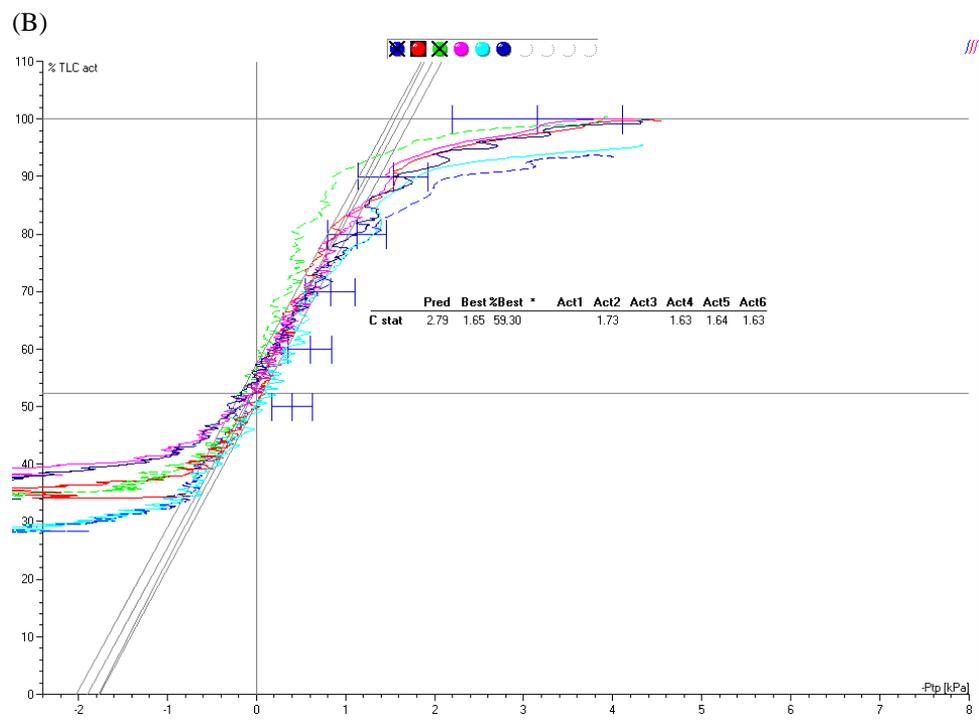
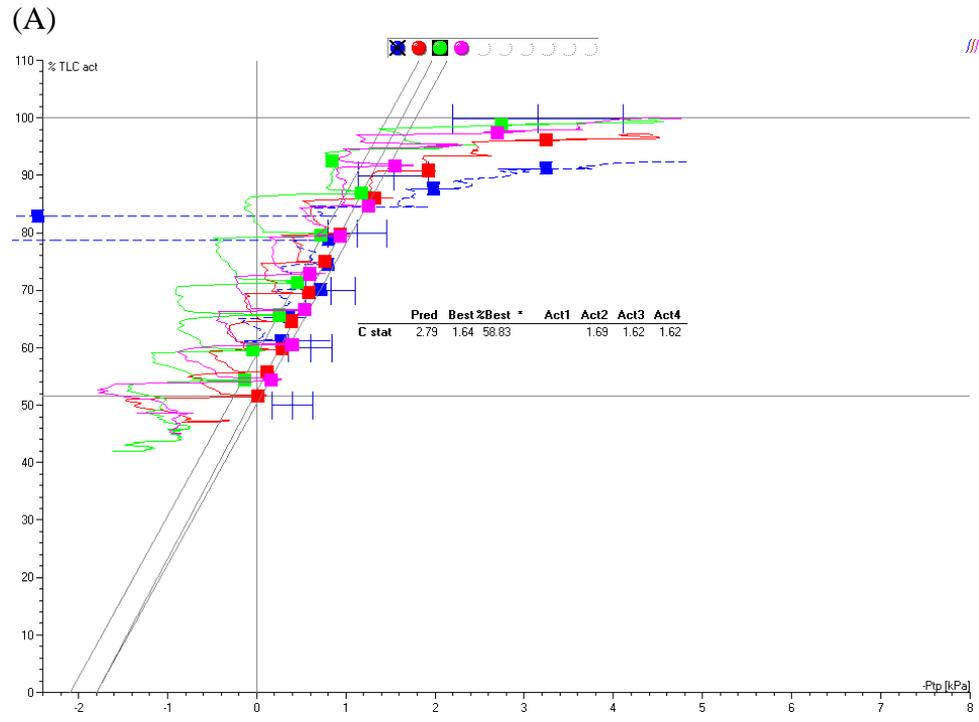
We therefore compared both methods (slow expiration and shutter). During these trials these two methods gave very similar results (results of the individual with a borderline FEV_1/FVC ratio are presented in figure 1). Six to eight pressure-volume curves were recorded for each patient. $C_{L,st}$ was manually corrected and calculated as the mean of 5 or 6 technically satisfactory curves (closed curves with no pressure artifacts, such as caused by cardiac action, sudden drops, glottic closure, or swallowing). Results were obtained from maneuvers with the vital capacity repeatable within 10%.

$C_{L,st}$ was determined from each maneuver by plotting a straight tangent line representing the direction of the pressure-volume curve at the level of FRC + tidal volume.

The equipment was calibrated every morning before starting any measurements. Linearity checks of all sensors were performed at least once a month. The quality assurance program included biologic control tests and permanent surveillance of technicians' work and regular reviews of the quality of tests performed. Our PFT laboratory was certified for several clinical trials during the collection of the data for this study of sarcoidosis.

Figure 1.

Example of $C_{L,st}$ measurement in a sarcoidosis patient, performed with shutter (part A) and without shutter (part B). Part (C) shows other PFT results (borderline TLC and FEV₁/VC ratio, $D_{L,CO}$ was low, but within the normal range) in this patient.



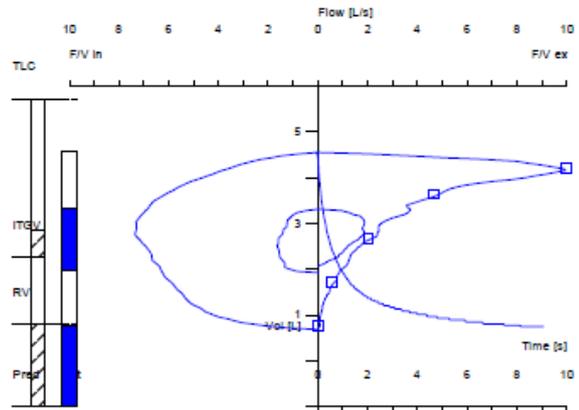
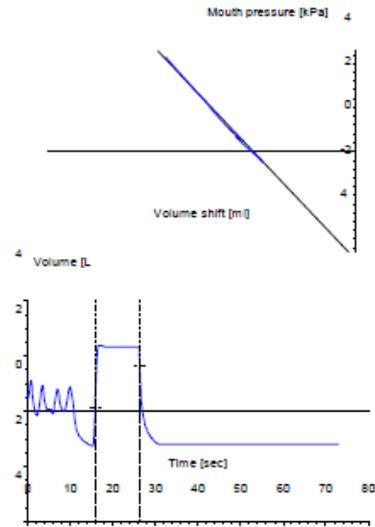
(C)

Id number: 730728xxxx **Ward:** PP
Name: xxxxxxxxxxxx **First name:** xxxxxxxx
Birth date: 1973-07-28 **Age:** 35 Years
Weight: 85,0 kg **Height:** 173,0 cm
Diagnosis: BBS 2 **Sex:** ma
Operator: PB

SR:	
percentyl:	
-2.33	1
-2.05	2
-1.64	5
0	50
1.64	95

		Pred	Act1	%Pred	SR
Date		09-07-07			
Time		11:42:23			
FEV 1 % VC MAX	[%]	80.91	69.35	85.7	-1.62
FEV 1 % FVC	[%]		69.62		
VC MAX	[L]	4.92	3.85	78.2	-1.92
FVC	[L]	4.71	3.84	81.3	-1.45
FEV 1	[L]	3.93	2.67	67.9	-2.49
MMEF 75/25	[L/s]	4.55	1.57	34.5	-2.88
PEF	[L/s]	9.27	9.95	107.3	0.56
FET	[s]		9.00		
V backextrapolation ex	[L]		0.12		
R tot	[kPa*s/L]	0.30	0.25	83.7	
ITGV	[L]	3.27	2.98	91.0	-0.49
RV	[L]	1.81	1.75	97.1	-0.13
TLC	[L]	6.74	5.60	83.1	-1.63
RV % TLC	[%]	27.61	31.30	113.4	0.68
DLCOc SB	[mmol/min/kPa]	10.88	9.11	83.8	-1.26
VIN	[L]	4.92	3.65	74.2	-2.27
VA	[L]	6.59	4.63	70.3	

Predicted acc. to ERS (1993)



Results

Figure 2. Percentages of sarcoidosis patients with low $C_{L,st}$ and/or low $D_{L,CO}$ according to stage in all (A) and nonrestrictives (B).

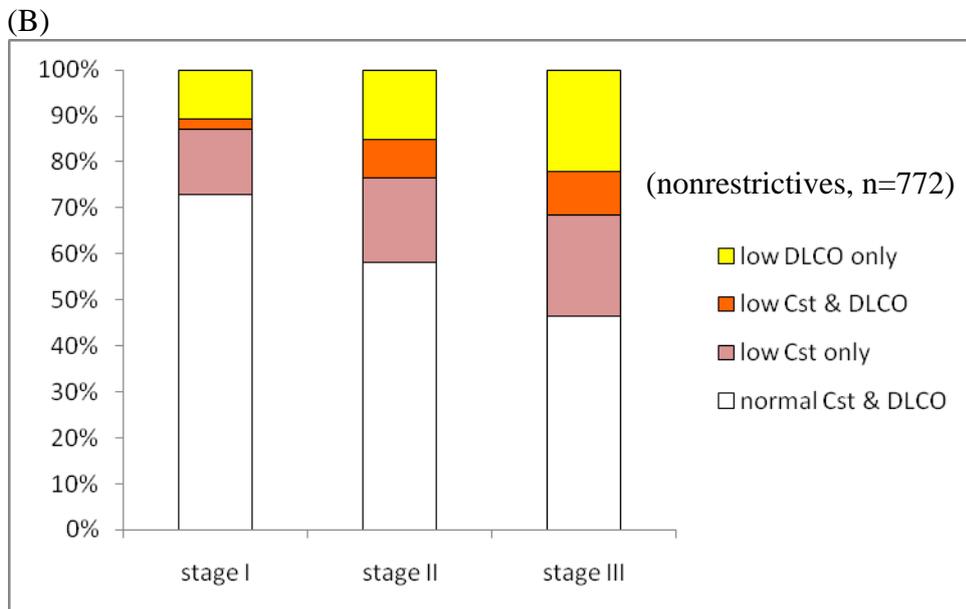
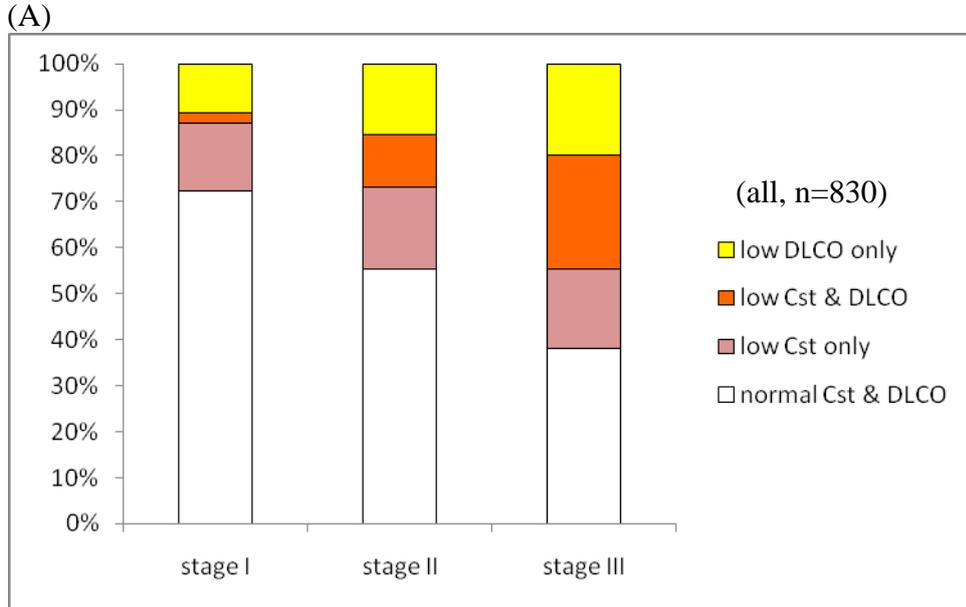


Table 5. Pulmonary function results stratified by smoking status in all 830 consecutive patients with sarcoidosis (all stages). P-values indicate the significance of differences between ever and never smokers.

	ever-smokers n=354	never-smokers n=476	p - value
FVC (% pred.)	96.9 ± 14.0	99 ± 14.1	<0.05
% with low FVC	9.0	8.6	
FEV1 (% pred.)	94.8 ± 15.0	96.6 ± 15.2	ns
% with low FEV1	17.2	13.6	
FEV1/FVC (%)	80.1 ± 6.8	79.6 ± 6.8	ns
% with obstruction	11.9	11.6	
MMEF (% pred.)	83.2 ± 28.2	81.6 ± 27.6	ns
% with low MMEF	22.9	20.2	
TLC (% pred.)	101.6 ± 13.7	105.2 ± 14.2	<0.001
% with low TLC	9.3	5.2	
VC (% pred.)	104.3 ± 16.0	109.5 ± 16.7	<0.001
% with low VC	6.8	3.8	
RV/TLC (% pred.)	94.7 ± 17.4	95.7 ± 17.7	ns
% with low RV/TLC	5.1	6.3	
% with high RV/TLC	1.7	3.8	
DLCO (% pred.)	85.2 ± 14.2	88.6 ± 15.4	<0.01
% with low DLCO	31.1	21.7	
Cst (% pred.)	78.4 ± 21.6	79.5 ± 21.3	ns
% with low Cst	32.2	32.1	