

Exercise intolerance, muscle strength impairment and fatigue in sarcoidosis patients

Rik Marcellis ^{1,2}, Ton Lenssen ¹, Marjon Elfferich ^{1,2}, Jolanda de Vries ^{2,3}, George Roox ¹ and Marjolein Drent ^{2,4}

Dept. of Physical Therapy ¹, ild care center ², Maastricht University Medical Centre (MUMC), Dept. of Medical Psychology ³, Tilburg University, Dept. of Respiratory Medicine ⁴, MUMC, The Netherlands

Background & Aim

Sarcoidosis patients often present with non-specific symptoms, such as reduced exercise capacity, general weakness and fatigue. These complaints are underestimated and very disabling. Studies about the prevalence of physical impairments in sarcoidosis are scarce. Besides, those study populations were rather small or the studies only included patients with specific health complaints.^{1, 2}

The aim of the study was to evaluate the prevalence of exercise intolerance, muscle strength impairment and fatigue in sarcoidosis patients. Additionally, we evaluated whether fatigue was explained by exercise capacity and muscle strength.

Methods

Design: Cross sectional study with 124 sarcoidosis patients referred to the ild care team of the MUMC.

Exercise capacity: Six-Minute Walk Test. **Muscle Strength:** handgrip force, elbow flexor muscle strength, isokinetic peak torques of the hamstrings and quadriceps were measured with the Jamar, MicroFET hand-held and Biodex System 3 Pro dynamometer. **Questionnaire:** Fatigue Assessment Scale (FAS).

Statistical analysis: Existing reference values were used to evaluate the test results (<80% of predicted values indicate physical impairments).

Table 1. Clinical characteristics of the total sarcoidosis population, and subdivided by normal and reduced muscle strength.

		Total group	Normal muscle strength	Reduced muscle strength
Demographic	number; female, %; age, yrs	124; 35.5; 47 (10)	56; 37.5; 45 (10)	68; 33.8; 48 (10)
	time since diagnosis, yrs	6.1 (6.2)	6.0 (6.4)	6.2 (6.0)
	prednisone use, yes/no	48/76	18/38	30/38
Lung function tests	DLCO, % of predicted	75.7 (17.6)	80.3 (16.9)	71.7 (17.3)*
	FVC, % of predicted	98.3 (20.8)	104.5 (20.9)	93.2 (19.5)*
Inspiratory muscle strength	PI-max, % of predicted	82.5 (28.5)	91.9 (26.9)	73.6 (27.4)*
Exercise capacity	6MWD, % of predicted	81.7 (15.7)	89.5 (12.2)	75.3 (15.5)*
Chest radiographic stages	0/I/II/III/IV	28/18/32/14/32	10/8/18/8/12	18/10/14/6/20
Inflammatory markers	C-Reactive Protein (<10 mg/l)	8.6 (15.4)	8.1 (16.4)	8.9 (14.6)
	soluble interleukin-2-receptor (240-3154 pg/ml)	3282 (2331)	3125 (2043)	3418 (2565)
Body composition	Body mass index, kg/m ²	28.2 (4.6)	28.5 (3.9)	27.8 (5.2)
Fatigue	Fatigue Assessment Scale	28.3 (7.7)	27.2 (7.1)	29.2 (8.1)
WHOQOL-Bref	Facet Overall QOL	5.9 (1.6)	6.2 (1.3)	5.6 (1.7)*
	Domain Physical health	12.3 (2.8)	13.1 (2.5)	11.7 (3.0)*

*p<0.01 between the group with reduced and the group with normal muscle strength. WHOQOL-Bref: World Health Organization Quality of Life assessment instrument-Bref. All values are expressed as mean (SD) unless otherwise specified.

Results

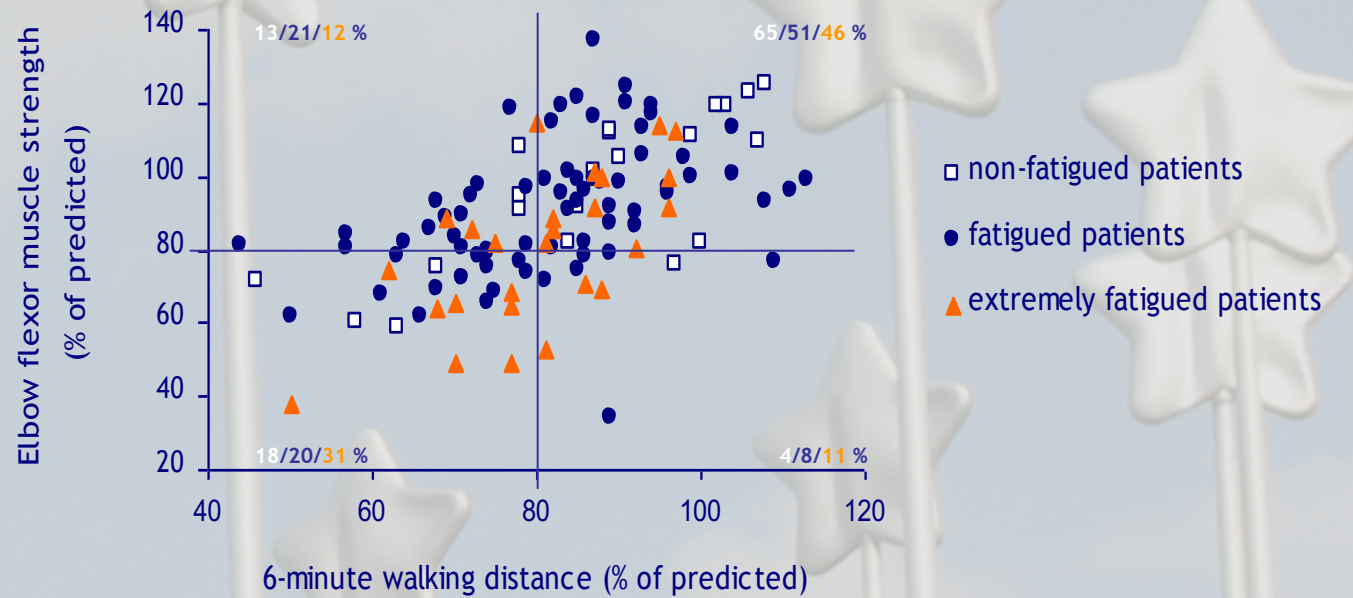
Patients characteristics are summarized in Table 1. Fatigue was reported by 101 patients (81%), and 26% of these fatigued patients were extremely tired. Fatigue was neither related to exercise capacity, nor to muscle strength. The six-minute walking distance was reduced in 41%, the peripheral muscle impairment is shown in Table 2. A substantial part of the fatigued and non-fatigued patients showed a reduction in 6MWD (respectively 44% and 30%), handgrip force (28% and 13%), elbow flexor muscle strength (33% and 22%), quadriceps peak torque (23% and 26%), hamstrings peak torque (44% and 26%) and PI-max (47% and 26%). None of these tests showed a significant difference between fatigued and non-fatigued patients (Figure 1). Various clinical parameters differed between patients with reduced peripheral muscle strength of either upper or lower extremity muscles (n=68) and patients without peripheral muscle strength impairment (n=56, Table 1).

Table 2. Relevant physical characteristics of the sarcoidosis population.

	Total group (n=124)	Men (n=80)	Women (n=44)
Six-minute walking distance (6MWD), m	575.8 (123.9)	607.4 (117.8)	518.4 (114.7)
6MWD, % of predicted / % with reduced 6MWD	81.7 (15.7) / 41.1	82.9 (15.2) / 38.8	79.5 (16.6) / 45.5
Handgrip force (HGF), pounds	94.4 (33.3)	110.7 (25.9)	64.1 (22.4)
HGF, % of predicted / % with reduced HGF	92.6 (24.8) / 25.2	94.6 (21.5) / 18.8	88.8 (29.9) / 37.2
Elbow flexor muscle strength (EFMS), Newton	219.5 (72.2)	255.8 (58.8)	150.4 (35.8)
EFMS, % of predicted / % with reduced EFMS	89.4 (20.3) / 31.1	89.5 (18.8) / 31.3	89.1 (23.1) / 31.0
Quadriceps peak torque (QPT), Nm	80.9 (36.1)	95.6 (34.0)	53.9 (21.1)
QPT, % of predicted / % with reduced QPT	98.1 (34.0) / 23.8	95.6 (32.2) / 25.3	102.6 (37.2) / 20.9
Hamstrings peak torque (HPT), Nm	61.5 (26.6)	71.4 (26.0)	43.2 (16.2)
HPT, % of predicted / % with reduced HPT	89.9 (31.5) / 41.0	88.1 (30.8) / 44.3	93.2 (33.0) / 34.9
PI-max, cmH ₂ O	-82.5 (29.5)	-90.7 (30.7)	-67.7 (20.1)
PI-max, % of predicted / % with reduced PI-max	82.5 (28.5) / 43.1	80.2 (25.9) / 44.3	86.6 (32.8) / 41.0
Body mass index, kg/m ²	28.2 (4.6)	28.0 (4.2)	28.4 (5.4)

All values are expressed as mean (SD) unless otherwise specified.

Figure 1. Heterogeneity of exercise capacity and muscle strength in fatigued and non-fatigued sarcoidosis patients. FAS scores: <22 indicates non-fatigued, 22-34 fatigued and ≥35 extremely fatigued patients.



Conclusions

- Exercise intolerance, muscle weakness and fatigue are a substantial problem in sarcoidosis
- Exercise intolerance and muscle weakness occur in both fatigued and non-fatigued patients
- Fatigue is not explained by exercise intolerance and muscle weakness
- Patients with peripheral muscle strength impairment showed more impaired 6MWD, PI-max, lung function, and reduced QOL compared with those without peripheral muscle strength impairment
- Physical tests are recommended in the management of sarcoidosis patients, even in the absence of fatigue

References

1. Spruit MA, et al. Skeletal muscle weakness in patients with sarcoidosis. *Thorax* 2005;60:32-38.
2. Wirnsberger RM, et al. Relationship between respiratory muscle function and quality of life in sarcoidosis. *Eur Respir J* 1997;10:1450-55.