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AIM

To investigate whether sarcopenia, as defined by low muscle mass and function, is a predictor of mortality in patients with colorectal cancer.

SUBJECTS AND METHODS

• Cohort study with follow-up of 17 months (interquartile range 12-23) for mortality.

Patients

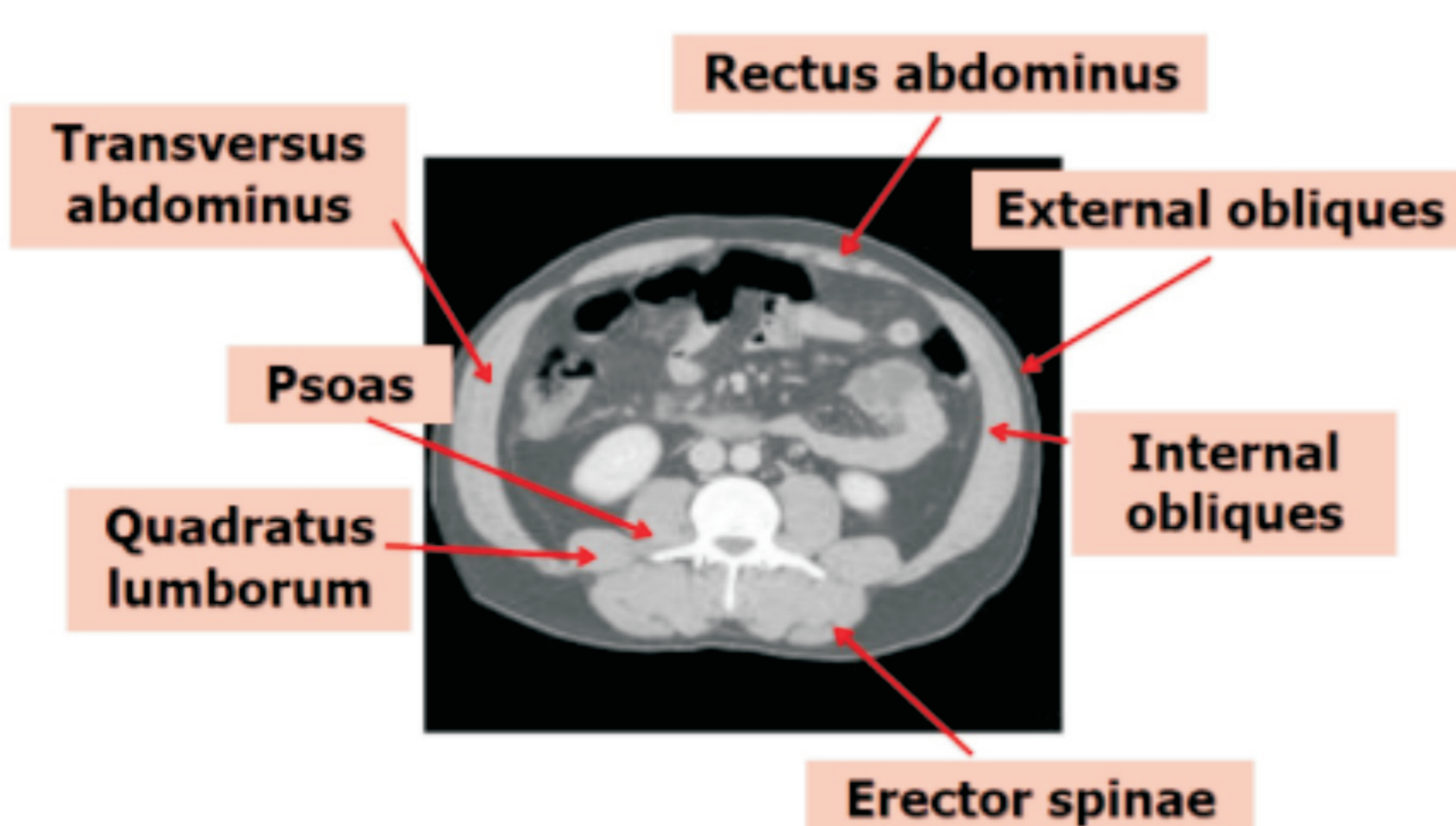
192 colorectal cancer patients (age: 61 ± 11 years; 58% men)

Methods

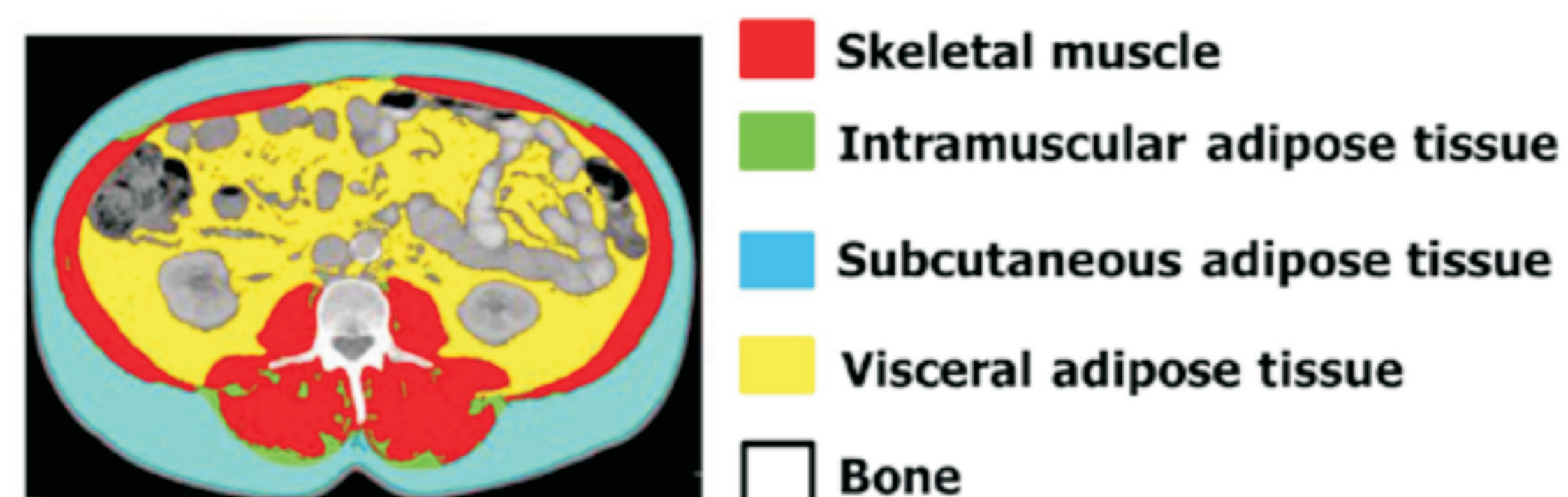
• Skeletal muscle index (SMI) was assessed by computed tomography at the third lumbar vertebra.

• Low muscle mass was defined according to Martin et al, 2013:

- Men: SMI < 43 cm²/m² (BMI < 25 kg/m²) and < 53 cm²/m² (BMI ≥ 25 kg/m²)
- Women: < 41 cm²/m²



• Software: Slice-O-Matic (v. 5.0; Tomovision, Canada)



• Low muscle function was defined according to Cruz-Jentoft et al, 2010:

- Handgrip strength (HGS): < 30 kg (male) and < 20 kg (female)
- Gait speed (GS): < 0.8 m/s.

The sample was divided in 4 groups according to the muscle mass and muscle function:

Group	Characteristics	n
Appropriate	Appropriate SMI, HGS and GS	88 (46%)
Low muscle function	low HGS or GS	19 (10%)
Low muscle mass	low SMI	56 (29%)
Sarcopenia	low SMI and low HGS or GS	29 (15%)

SMI: skeletal muscle index; HGS: handgrip strength; GS: gait speed

• Phase angle (PA) was assessed by Bioelectrical impedance (RJL Systems Quantum II) with the equation: $\text{Arc tan} (X_c/R) \times (180/\pi)$ (Baumgartner et al, 1988).

• Nutritional status was assessed by Patient-generated subjective global assessment (PG-SGA).

REFERENCES

- Mourtzakis M et al. A practical and precise approach to quantification of body composition in cancer patients using computed tomography images acquired during routine care. *Appl Physiol Nutr Metab* 2008;33(5):997-1006.
 Martin L et al. Cancer cachexia in the age of obesity: skeletal muscle depletion is a powerful prognostic factor, independent of body mass index. *J Clin Oncol* 2013;31(12):1539-47.
 Cruz-Jentoft AJ et al. Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. *Age Ageing* 2010;39(4):412-23.

RESULTS

Table 1 - Demographic, clinic, nutritional status and body composition parameters according to groups of muscle mass and muscle function (n=192)

	Appropriate (n=88)	Low muscle Function (n=19)	Low muscle mass (n=56)	Sarcopenia (n=29)	p
Age (years) ¹	56.6 ± 11.2 ^a	63.5 ± 12.7 ^{ab}	62.6 ± 9.6 ^b	66.7 ± 9.8 ^b	<0.001 [†]
Men [n (%)]	49 (56%)	8 (42%)	37 (66%)	5 (17%)	0.3 [*]
Tumor stage [n (%)]					
I-II	19 (22%)	6 (32%)	12 (21%)	5 (17%)	0.7 [*]
II-IV	69 (78%)	13 (68%)	44 (79%)	24 (83%)	
Phase Angle (°) ¹	6.1 ± 0.8 ^a	5.4 ± 0.7 ^b	5.3 ± 0.8 ^b	4.7 ± 0.6 ^c	<0.001 [†]
Muscle Attenuation (HU) ¹	36.0 ± 7.2 ^a	35.7 ± 10.9 ^a	33.7 ± 6.9 ^{ab}	29.5 ± 7.9 ^b	0.001 [†]
Body Mass Index (Kg/m ²) ¹	29.2 ± 5.1 ^a	27.0 ± 7.1 ^{ab}	25.7 ± 4.0 ^b	24.6 ± 4.9 ^b	<0.001 [†]
PG-SGA [n (%)]					
Well-nourished	75 (85%) ^a	12 (63%) ^a	33 (59%) ^a	10 (36%) ^b	<0.001 [*]
Malnourished	13 (15%)	7 (37%)	23 (41%)	18 (64%)	
PG-SGA score ²	2 (1-4) ^a	4 (2-8) ^a	3 (2-6) ^a	5 (3-11) ^b	<0.001 [#]
Albumin (g/dl) ¹	4.42 ± 0.40 ^a	4.13 ± 0.44 ^b	4.36 ± 0.37 ^{ab}	4.14 ± 0.33 ^b	<0.001 [†]
CRP (mg/dl) ²	0.38 (0.18-0.88)	0.53 (0.24-1.55)	0.51 (0.3-1.24)	0.49 (0.34-1.29)	0.14 [#]

PG-SGA: patient-generated subjective global assessment; CRP: high-sensitivity C reactive protein; 1 Mean and standard deviation; 2 Median and interquartile range; † ANOVA test; * Chi-square test; # Kruskal-Wallis test.
 Different letters (a,b,c) indicate statistically significant differences between groups (p<0.05).

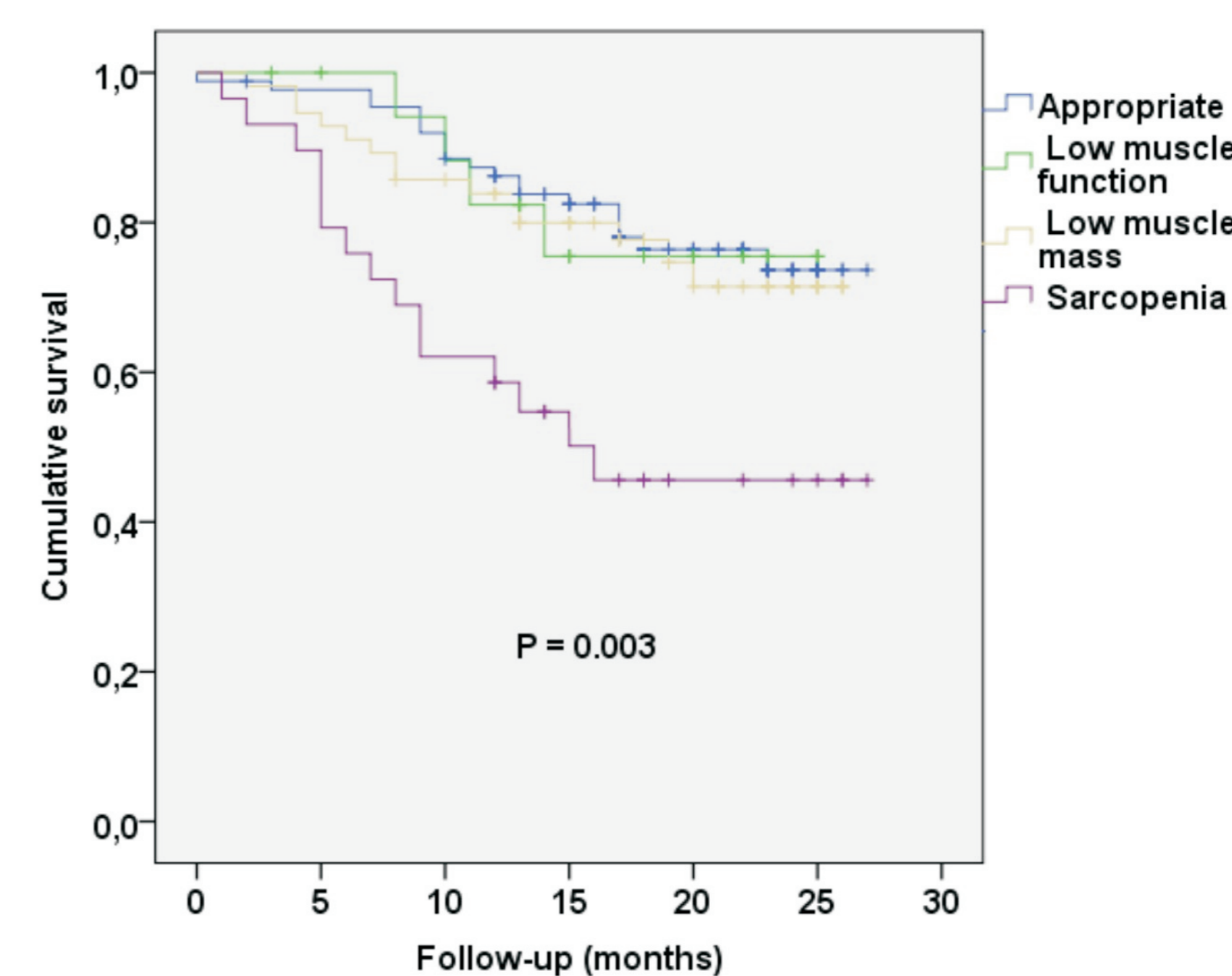


Figure 3. Kaplan Meier survival curves according to groups of muscle mass and muscle function (follow-up of 17 months (interquartile range 12-23)).

Appropriate (n=88); Low muscle function (n=19); Low muscle mass (n=56); Sarcopenia (n=29)

Table 2 - Cox regression model of mortality according to groups of muscle mass and function adjusted for sex, age and cancer stage (n=192)

	HR	95% CI	P
Groups			
Appropriate (reference)			
Low muscle function	1.2	0.4; 3.4	0.8
Low muscle mass	1.1	0.5; 2.2	0.8
Sarcopenia	3.1	1.5; 6.4	0.002
Sex (male)	1.4	0.8; 2.4	0.3
Age (y)	1.0	0.98; 1.03	0.7
Cancer stage (III-IV)	3.8	1.4; 10.8	0.01

HR: hazard ratio; 95% CI: 95% confidence interval.

CONCLUSIONS

- Colorectal cancer patients with sarcopenia were older, had worse nutritional status and lower PA.
- Sarcopenia was an independent predictor of mortality in this group of patients.