Frailty is associated with intramuscular fat infiltration in patients with colorectal cancer

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INTRODUCTION

Emerging evidence suggests that intramuscular fat infiltration is associated with muscle weakness and poor function.

AIM

To investigate whether intramuscular fat infiltration is associated with frailty in patients with colorectal cancer.

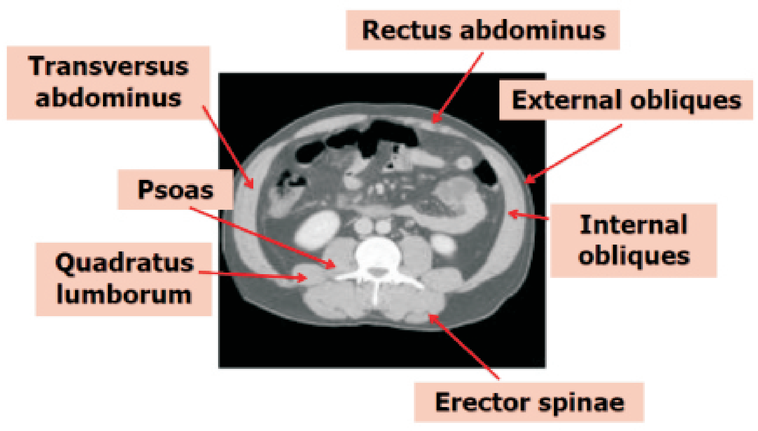
SUBJECTS AND METHODS

Patients

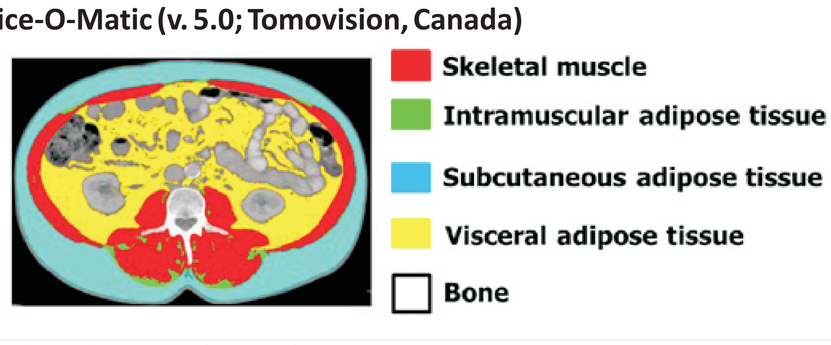
188 colorectal cancer patients.

Methods

Intramuscular adipose tissue (IAT) and skeletal muscle mass (SMM) was assessed by computed tomography at the third lumbar vertebra.



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



- Intramuscular fat infiltration (IMFI%) was calculated as:

$$IMFI\% = IAT(cm^2)/[IAT(cm^2) + SMM(cm^2)] \times 100$$

Frailty

It was defined by Fried et al (2001) as the presence of ≥ 3 of the following criteria:

- Unintentional weight loss (>3 kg in past year)
- Self-reported exhaustion
- Weakness (low handgrip strength)
- Slow walking speed (gait speed)
- Low physical activity (short version of IPAQ questionnaire).

Body fat (BF%)

It was assessed by bioelectrical impedance analysis.

Obesity

It was defined according to sex-and-age-specific BF% cutoff points for the healthy population (Heo et al, 2012):

	Men	Women
18-29y	> 29.8%	> 41.8%
30-49y	> 30%	> 42.2%
50-84y	> 32.3%	> 44.1%

RESULTS

Table 1. Demographic, clinic, nutritional status, body composition and muscle function parameters according to sex (n=188).

		P
Age (years) [1]	60±11	-
Male [n (%)]	110 (58%)	-
Cancer stage [n (%)]		
0-II	42 (22%)	-
III-IV	146 (78%)	
Lumbar skeletal muscle index (cm^2/m^2) [1]		
Male	49.9±10.2	**<0.001** ¶
Female	42.4±8.5	
Muscle attenuation (HU) [1]		
Male	37±7.2	**<0.001** ¶
Female	30.8±7.4 [a]	
Intramuscular fat infiltration (%)		
Male	4 (2.5-8.1)	**<0.001** #
Female	7.7 (4.9-13.1)	
Body fat (BIA) [%] [2]		
Male	30 (24.3-35.1)	**<0.001** #
Female	41.4 (35.5-49.4)	
Obesity [n (%)]		
Male	41 (37%)	0.4 *
Female	34 (44%)	
Handgrip strength (Kg) [2]		
Male	36 (30-41)	**<0.001** #
Female	22 (18-27)	
Gait speed (m/s) [1]		
Male	1.14±0.3	**<0.001** ¶
Female	0.99±0.2	
Frailty [n (%)]		
Male	30 (27%)	0.3 *
Female	26 (33%)	

BIA: Bioelectrical impedance analysis; [1] Mean and standard deviation; [2] Median and interquartile range; ¶ t test; * Chi-square test; # Mann-Whitney test; male: n=110; female: n=78.

The sample was divided in 4 groups according to the number of Frailty criteria:

Criteria of frailty	n	IMFI%
0-1	35	4 (2-7%)
2	97	5 (3-9%)
3	44	7 (5-13%)
4-5	12	8 (4-17%)

IMFI%: intramuscular fat infiltration

Table 2. Correlation between intramuscular fat infiltration (IMFI%) and age, body fat, handgrip strength, gait speed, skeletal muscle mass and muscle attenuation according to sex (n=188)*

	Male (n=110)	Female (n=78)
	r; *P*	r; *P*
IMFI% x age	**0.44; <0.001**	**0.33; < 0.001**
IMFI% x Body fat (%)	**0.41; <0.001**	**0.52; <0.001**
IMFI% x Handgrip Strength	-0.16; 0.1	-0.008; 0.9
IMFI% x Gait speed	**-0.24; 0.01**	-0.06; 0.6
IMFI% x Skeletal muscle mass	**-0.19; 0.04**	-0.10; 0.4
IMFI% x Muscle attenuation	**-0.82; <0.001**	**-0.70; <0.001**

* Spearman's test.

Table 3. Association between muscle fat infiltration percentage and frailty phenotype adjusted for sex, age and obesity (n=188)*

	β	95% CI	*P*
Number of frailty components			
0-1 (reference)			
2	0.7	-0.8; 2.3	0.3
3	1.7	-0.1; 3.6	0.7
4-5	3.5	0.8; 6.2	**0.01**
Sex (male)	-3.5	-4.7; -2.3	**<0.001**
Age (y)	0.1	0.08; 0.2	**<0.001**
Obesity	2.9	1.7; 4.2	**<0.001**

*Multiple regression analysis; β: beta; 95% CI: 95% confidence interval

CONCLUSIONS

❖Obesity, age and sex were determinants of intramuscular fat infiltration in colorectal cancer patients.

❖Presenting 4-5 criteria of frailty was positively associated with intramuscular fat infiltration, even after adjusting the model for sex, age and obesity.

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Projeto Gráfico: Área de Edição e Produção de Materiais Técnico-Científicos / INCA