# Can phase angle be considered a marker of muscle strength in colorectal cancer patients?

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## INTRODUCTION

Phase angle (PA) is a well-known marker of muscle mass, but only recently it has been also considered a marker of muscle quality. Its applicability as a marker of muscle quality in patients with cancer has not yet been investigated.

## AIM

To investigate the association between muscle function with measures of skeletal muscle mass and muscle attenuation from computed tomography (CT) and PA in colorectal cancer patients.

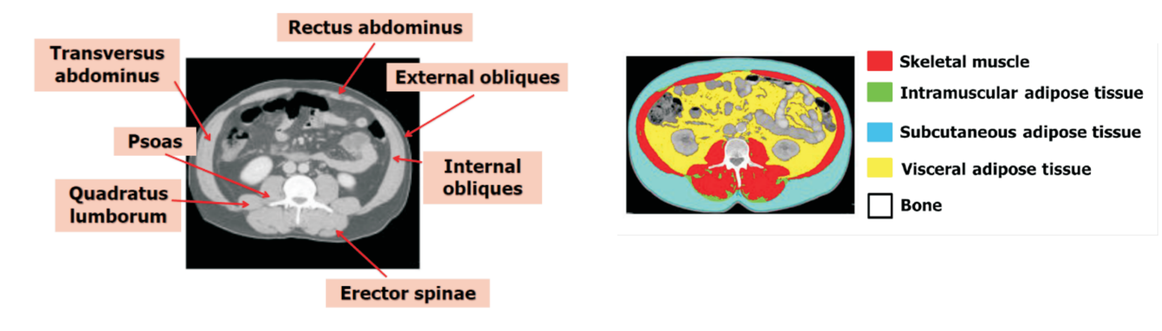
## SUBJECT AND METHODS

- Patients

  190 colorectal cancer patients.

- Methods

  Skeletal muscle index (SMI) and muscle attenuation (MA) were assessed by CT at the third lumbar vertebra using Software Slice-O-Matic (v. 5.0; Tomovision, Canada)[1].




Phase angle (PA) was assessed by Bioelectrical impedance analysis (RJL Systems Quantum II) with the equation: Arc-tangent (Xc/R) × (180/π) [2].

Muscle strength was evaluated as handgrip strength (HGS) using dynamometer.

Nutritional status was assessed by body mass index (BMI) and Patient-generated subjective global assessment (PG-SGA).

Multiple linear regression models were constructed to investigate the association between HGS and measures of skeletal muscle mass (SMI), muscle quality (MA and PA), BMI, age and sex using backwards stepwise regression.

## RESULTS

Table 1- Participant characteristics (N=190)

| | Men (N=109) | Women (N=81) | *P* value |
|---|---|---|---|
| **Age (years)** | 60.1 ± 12.1 | 60.9 ± 10.3 | 0.64* |
| **BMI (kg/m²)** | 27 (23.2 ; 29.3) | 26.9 (22.8 ; 32.9) | 0.21** |
| **PG-SGA n (%)** | | | |
| A | 73 (68%) | 57 (70%) | 0.86*** |
| B and C | 35 (32%) | 24 (30%) | |
| **Tumor Stage n (%)** | | | |
| 0-II | 21 (19%) | 21 (26%) | 0.3*** |
| III-IV | 88 (81%) | 60 (74%) | |
| **Phase angle (°)** | 5.8 ± 0.9 | 5.3 ± 0.8 | **<0.001*** |
| **Skeletal mass Index (cm²/m²)** | 49.1 (44.6 ; 56.7) | 43.1 (37.4 ; 47.6) | **<0.001**** |
| **Muscle attenuation (HU)** | 37.1 ± 7.2 | 30.6 ± 7.4 | **<0.001*** |
| **Handgrip strength (kg)** | 36 (30;41) | 22 (18;27) | **<0.001**** |

* t – Test; ** Mann-Whitney test; *** Chi-square test.

Table 2- Linear regression between handgrip strength (log) and clinical and body composition parameters (N=190)

| | $R^2$ ajust | *P* value |
|---|---|---|
| **HGS *vs* sex** | 0.51 | **< 0.001** |
| **HGS vs phase angle** | 0.25 | **< 0.001** |
| **HGS *vs* skeletal muscle index** | 0.22 | **< 0.001** |
| **HGS *vs* muscle attenuation** | 0.17 | **< 0.001** |
| **HGS *vs* age** | 0.05 | **0.001** |
| **HGS *vs* body mass index** | 0.002 | 0.458 |

HGS: Handgrip strength.

Table 3 – Multivariate linear regression between handgrip strength (log) and phase angle after adjustment for sex (N=190)

| | Handgrip strength (kg) | | | |
|---|---|---|---|---|
| | β | Exp (β) | 95% CI | *P* value |
| **Model 9** | | | | |
| **Sex** | 0.400 | 1.49 | 1.41; 1.58 | **<0.001** |
| **PA (°)** | 0.114 | 1.12 | 1.08; 1.15 | **<0.001** |
| **$R^2$ ajust** | | **0.62** | | |

Exp (β): Exponential beta; 95% CI: 95% Confidence interval; PA: Phase angle.

## CONCLUSION

After adjustment for sex, as a confounder variable, only phase angle stayed independently associated with handgrip strength.

Phase angle could be a marker of muscle quality and strength in this subset of patients.

## REFERENCES

1- 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.

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