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Evaluation of different tools for body composition assessment in colorectal cancer – a systematic review

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ABSTRACT – Background – The nutritional status of patients with colorectal cancer (CRC) impacts on treatment response and morbidity. An effective evaluation of the body composition includes the measurements of fat and visceral fat-free mass and is currently being used in the diagnosis of the nutritional status. The better understanding regarding nutritional tools for body composition evaluation in CRC patients may impact on the outcome. **Methods –** Systematic review conducted according to Preferred Items of Reports for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. A literature search was performed using the BVS (LILACS), PubMed, Embase, Cochrane, Scopus, and Web of Science databases. **Results –** For the initial search, 97 studies were selected and 51 duplicate manuscripts were excluded. Thus, 46 were reviewed and seven studies included with a total of 4,549 patients. Among them were one clinical trial, one prospective study (cohort), two retrospective cohort and two cross-sectional studies. All studies included body composition evaluated by computed tomography, one with bioelectrical impedance, one with handgrip strength, and two employed mid-arm muscle circumference and body mass index. **Conclusion –** Current evidence suggests that computed tomography has better accuracy in the diagnosis of sarcopenia, visceral fat, and myopenia among individuals with CRC. Further studies are needed to identify cutoff points for these changes aggravated by CRC.

Keywords – Colorectal neoplasms; body composition; sarcopenia; computed tomography; nutritional assessment.

INTRODUCTION

Colorectal cancer (CRC) is the third most common among all types of cancer, with the highest rates in European countries[1].

In Brazil, between 2020–2022 it is estimated that there will be 20,520 cases of CRC in men and 20,470 in women, being the second most prevalent type of cancer, excluding non-melanoma skin tumors[2].

The Western lifestyle seems to increase the risk of CRC, including smoking, obesity, high consumption of alcoholic beverages, red and processed meats, low dietary fiber intake, and sedentary lifestyle[3,4]. Previous studies have shown that the diagnosis of cancer was related to malnutrition with clinical and physiological implications[5]. Currently, it is observed that overweight and obesity are increased in cancer patients, including those with CRC[5,6]. Thus, both conditions, sarcopenia and obesity, are considered malnutrition conditions with consequences on diagnosis and evolution[5,6].

The assessment of nutritional status identifies nutritional risks[7], since the body composition (fat, muscle, and bone) of patients with CRC may be compromised both in obesity and malnutrition, causing edema, dehydration, and sarcopenia[8,9].

The effective evaluation of the body composition includes the measurements of fat and visceral fat-free mass. These parameters can influence the response to surgical and (or) chemotherapy treatment, quality of life, risk of comorbidities, and overall survival[8,10,11].

Computed tomography (CT) is routinely used to evaluate CRC patients. Although it is considered the gold standard for the diagnosis of visceral fat and fat-free mass[8,10,11] it is not frequently employed in the assessment of body composition in the staging of CRC patients.

Through CT it is possible to calculate the areas of visceral and subcutaneous fat, skeletal muscle, and total fat adjusted for the individual's height in cm^2/m[2,5,6,11-14]. This review aims to analyze studies that evaluated the nutritional tools for body composition in CRC patients.

METHODS

The present systematic review was performed following the recommendations of the Preferred Items of Reports for Systematic Reviews and Meta-Analysis guidelines (PRISMA)[15] and registered in Prospero, CRD42021227218[16]. All English publications were searched.

The inclusion criteria were all types of clinical studies with nutritional assessment parameters in CRC patients. Experimental studies, letters, guidelines, manuals, and reviews were excluded.

Search strategy

A literature search was performed using the BVS (LILACS), PubMed, Embase, Cochrane, Scopus, and Web of Science databases. Keywords were selected using Medical Subject Headings (Mesh) and expert opinions. The search period considered was until October 19, 2020, using the terms:

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"Colorectal neoplasms" OR "neoplasms, colorectal" OR "colorectal neoplasm" OR "neoplasm, colorectal" OR "colorectal tumors" OR "colorectal tumor" OR "tumor, colorectal" OR "tumors, colorectal" OR "colorectal carcinoma" OR "carcinoma, colorectal" OR "carcinomas, colorectal" OR "colorectal carcinomas" OR "colorectal cancer" OR "cancer, colorectal" OR "cancers, colorectal" OR "colorectal cancers" "abdominal circumference" OR "abdominal diameter, sagittal" OR "abdominal diameters, sagittal" OR "diameter, sagittal abdominal" OR "diameters, sagittal abdominal" OR "sagittal abdominal diameters" OR "abdominal height" OR "height, abdominal" OR "supine abdominal height" OR "abdominal height, supine" OR "height, supine abdominal" OR "abdominal diameter index" OR "index, abdominal diameter" "waist circumference" OR "circumference, waist" OR "circumferences, waist" OR "waist circumferences" "Intra-abdominal fat" OR "fats, intra-abdominal" OR "intra-abdominal fat" OR "intra-abdominal fats" OR "fat, intra-abdominal" OR "fat, intra-abdominal" OR "intra-abdominal adipose tissue" OR "adipose tissue, intra-abdominal" OR "intra-abdominal adipose tissue" OR "retroperitoneal fat" OR "fat, retroperitoneal" OR "fats, retroperitoneal" OR "retroperitoneal fats" OR "retroperitoneal adipose tissue" OR "adipose tissue, retroperitoneal" OR "visceral fat" OR "fat, visceral" OR "fats, visceral" OR "visceral fats" OR "abdominal visceral fat" OR "abdominal visceral fats" OR "fat, abdominal visceral" OR "fats, abdominal visceral" OR "visceral adipose tissue" OR "adipose tissue, visceral" "electric impedance" OR "impedance, electric" OR "electrical impedance" OR "impedance, electrical" OR "impedance" OR "ohmic resistance" OR "ohmic resistances" OR "resistance, ohmic" OR "resistances, ohmic" OR "bioelectrical impedance" OR "impedance, bioelectrical" OR "bioelectric impedance" OR "impedance, bioelectric" OR "electric resistance" OR "resistance, electric" OR "electrical resistance" OR "resistance, electrical" "sagittal abdominal diameter" OR "abdominal diameter, sagittal" OR "abdominal diameters, sagittal" OR "diameter, sagittal abdominal" OR "diameters, sagittal abdominal" OR "sagittal abdominal diameters" OR "abdominal height" OR "height, abdominal" OR "supine abdominal height" OR "abdominal height, supine" OR "height, supine abdominal" OR "abdominal diameter index" OR "index, abdominal diameter".

Data collection

Two independent reviewers (DVMF and DOM) analyzed the titles and abstracts of the articles obtained from the databases. In sequence, full texts were reviewed, and inclusion criteria applied. First author, publication year, location, study design, age and gender, characteristics of the patients, nutritional assessment method, the outcome, and tool used were collected. Disagreements between researchers were solved through discussion with a third researcher (CSRC).

Ethical considerations

As it is a systematic review, this article was waived from the medical ethics board.

RESULTS

Characteristics of the studies

In the initial search, 97 articles were selected. After exclusion of 51 duplicated manuscripts, 46 were revised and seven studies were included[17-23]. One was conducted in Canada, two in the United Kingdom, one in Sweden, one in the United States of America, one in Germany, and one in the Netherlands. According to the type of study, one was a clinical trial, one a prospective study (cohort), two retrospective cohort, and two cross-sectional studies. Overall the studies included 4,549 patients, (mean [SD], median [range]; age years) and gender ratio – male / female (TABLE 1). The age of the participants ranged between 18 and 84 years. FIGURE 1 summarizes the study selection process according to the Prisma flow chart.

Computed tomography and body composition

Body composition by CT were employed in all seven studies[17-23]. Different software programs were employed for body composition analyses, such as FatSeg®, OsirixX®, Image J®, and sliceOmatic®. A total of 50 abdominal CT scans were conducted to investigate the agreement of these four different software packages for the assessment of skeletal muscle and subcutaneous and visceral adipose tissue. The Bland-Altman and intraclass correlation coefficient (ICC) indicated that the skeletal muscle area, subcutaneous adipose tissue area, and visceral adipose tissue area (cm^2) measurements between the software were highly comparable (ICC 0.979–1000, P<0.0001) and all were adequate for distinguishing the presence of sarcopenia (k=0.88–0.96 for one observer and k=1.00 for all comparisons of the other observer) and visceral obesity (all k=1.00)[17].

Jones et al.[18], conducted a comparative study to determine the relationship between body composition measurements using CT, bioelectrical impedance analysis (BIA), and mid-arm muscle circumference (MAMC). A moderate correlation for muscle mass was demonstrated (Spearman's correlation coefficient =0.540, P<0.01 and 0.450, P<0.001, respectively). For the measurement of low muscle mass, BIA had high sensitivity and low specificity and correctly identified 60% of participants compared to CT. However, MAMC had low sensitivity and high specificity. In the classification of sarcopenia, 77% of participants were correctly classified by BIA, although some participants were not identified while others were incorrectly categorized as sarcopenic. For the identification of sarcopenia, MAMC had low sensitivity and high specificity[18].

Van Roekel et al.[19] demonstrated that body mass index (BMI) in CRC diagnosis had a low to moderate correlation with the CT-derived parameters for body composition (Pearson's r ranging from – 0.25 to a.57)[19].

Sarcopenia, myosteatosis, and myopenia

Sarcopenia is defined as the depletion of skeletal muscle[9], or else muscle failure which is characterized by low muscle strength, low muscle quantity or quality, and low physical performance[18]. It is measured using the skeletal muscle index (SMI), i.e., the muscle area in an anatomically predefined single CT, normalized for height [muscle area (cm^2) / $height^2$ (m^2)] = SMI[20].

Sabel et al.[21] demonstrated that the single best predictor of wound infection following cancer colon surgery was subcutaneous fat distance (average distance between the linea alba and the anterior skin along T-12 to L-4) [odds ratio (OR) 1.05 (1.02,1.08)]. The analytic morphometric analysis was better than commonly used variables (age, BMI) for stratified complications among patients with CRC[21].

Recently Jones et al.[18] identified 29% of sarcopenia in CRC patients[18] and Van Roekel et al.[19] observed 32% of sarcopenia with worse clinical results and short-term survival.

Myosteatosis is the infiltration of fat within the muscle and can be quantified by the skeletal muscle radiodensity (SMR) measured

TABLE 1. Characteristics of the included studies.

First author; year; country	Study design	Sample size	Mean [SD] Median (range) Age (years)	Gender ratio (M:F)	Patient characteristics	Nutritional assessment method used	Nutritional outcomes
Jones et al. 2020; UK[18]	Clinical trial	100	69.6±11.5	67:23	Primary colorectal tumor	CT scans, BIA, MAMC, handgrip	BIA and MAMC are woefully inadequate to detect reduced muscle mass in patients with CRC, when compared with the measurements of CT-derived muscle mass at L3
Shirdel et al. 2020; Sweden[20]	Retrospective cohort	974	67.7 (37.8–89.6)	462:512	CRC	Computed tomography	Sarcopenia measured by CT may thus have potential clinical utility, for prognostication, therapeutic decision making and the identification of patients in need of early nutritional or pharmacological anti-sarcopenic intervention
Martin et al. 2018; Canada[23]	Cohorts	2100	66.6±11.9	1270:830	Primary CRC with preoperative CT	Computed tomography	CT-defined multidimensional body habitus is independently associated with length of hospital stay and hospital readmission
Sabel et al. 2013; USA[21]	Retrospective cohort	302	67.9±12.4	157:145	Resection for colon cancer	CT scans, BMI	Analytic morphometric analysis provided objective data that stratified both complications of treatment and outcome better than commonly used variable (age, BMI, co-morbidities) among patients with colorectal cancer
Malietzis et al. 2016; UK[22]	Prospective database	805	69 (61–77)	472:333	Colorectal resection	Computed tomography	Myopenia may have an independent prognostic effect on cancer survival for patients with colorectal cancer. Muscle depletion may represent a modifiable risk. factor in patients with colorectal cancer and needs to be targeted as a relevant endpoint of heath recommendations
Van Vugt et al. 2017; Germany[17]	Cross-sectional	50	62 (33–81)	29:21	Rectal cancer resection	Abdominal CT scans and comparison of four software progs for assessment of body composition	Four different software progs. have an excellent agreement to measure VAT and SAT, and CSMA in abdominal CT scans
Van Roekel et al. 2017; Netherlands[19]	Cross-sectional	218	67.8±11.9	127:91	CRC survivors recruited 2–10 years post-diagnosis	Abdominal CT scans, visceral adiposity, muscle wasting, sarcopenia, BMI	Visceral obesity and sarcopenia are relatively common in CRC diagnosis; we found no significant associations of these parameters with long-term HRQoL in stage I-III CRC survivors

BIA: bioelectrical impedance; HRQoL: lifestyle factors with HRQol questionnaire; MAMC: mid-arm muscle circumference; VAT: Visceral adipose tissue; SAT: subcutaneous adipose tissue area; CT: computed tomography; CSMA: cross-sectional muscle area; BMI: body mass index; CRC: colorectal cancer.

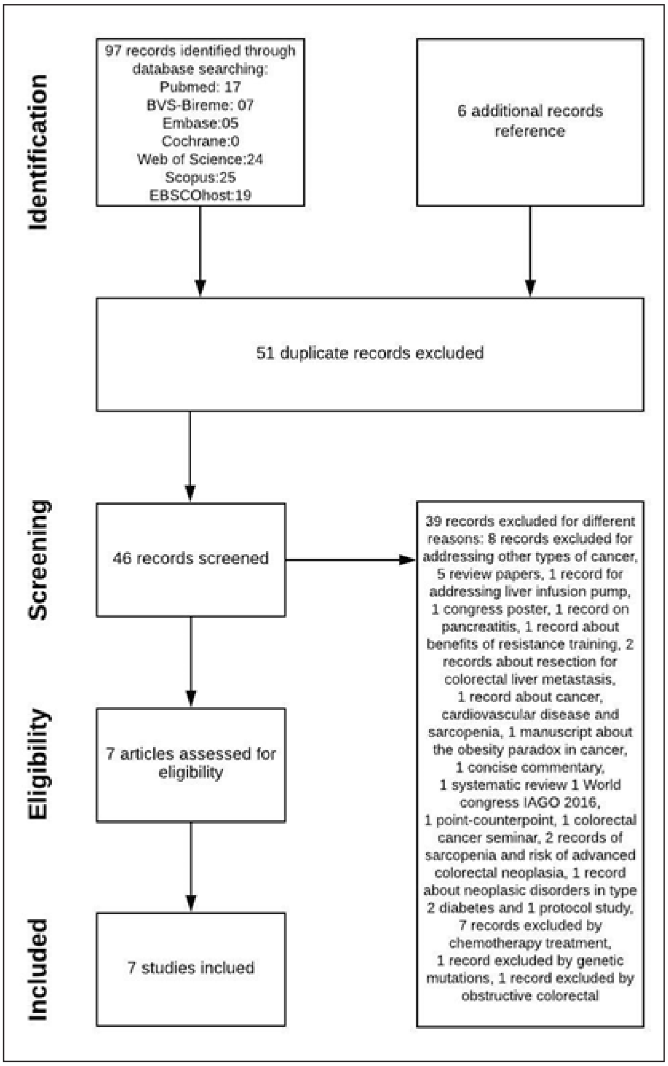

FIGURE 1. PRISMA Flow chart diagram – Systematic Review.

in Hounsfield units (HU) in CT. Studies have shown that the lower the SMR the higher mortality due to CRC, independent of muscle mass or adiposity[20,22,23], and also an increase in hospitalization time and worse recovery[22].

Additionally, myosteatosis and sarcopenia prolong the hospital stay (RR, 1.27; 95 % confidence interval (CI) 1.12–1.43)[20,22-23] and SMI was associated with both cancer-specific survival (lowest versus highest tertile hazard ratio (HR) 1.67 [95%CI: 1.08–2.58]), and overall survival (lowest versus highest tertile HR 1.54 [95%CI: 1.10–2.15]). SMR was associated with both cancer-specific survival (lowest versus highest tertile HR 2.03 [95%CI: 1.20–3.44]), and not significantly with overall survival (lowest versus highest tertile HR 1.36 [95%CI: 0.92–1.99])[20].

Myopenia is the term proposed by Fearon et al., 2011[24] and is a clinically relevant muscle wasting associated with either impaired functional capacity and/or increased morbidity or mortality risk[22]. Myopenia was an independent prognostic factor for disease-free survival (HR 1.53 [95%CI 1.06–2.39; P=0.041)] and overall survival (HR 1.70 [95%CI 1.25–2.31; P<0.001)] in a study with 805 patients with CRC followed for 47 months[22].

Visceral fat is considered pro-inflammatory and pro-neoplasic[9]. Increased visceral adipose tissue has been associated with a higher rate of postoperative infections and complications in CRC[19,22,23]. Van Roekel et al.[19] observed that 47.0% of the CRC patients had increased visceral fat and Malietz et al.[22] identified that patients with myopenic obesity had more postoperative complications (P=0.019) and higher mortality (P<0.001). Similar results were described by Martin et al., 2018[23], with high rates of postoperative readmission (OR 2.66 [95%CI 1.18–6.00, P=0.018]).

Classification of measures by computed tomography

The criteria used to calculate the area of fat and muscle tissue considers the measurements of the transversal area of skeletal muscle and visceral fat, at the level of the third middle lumbar vertebra (L3), since these measurements have a high correlation with total muscle mass and visceral fat volume[17-20,22,23].

To analyze tissues through CT images, considering the anatomical characteristics and the attenuation differences presented, the experts suggest the following HU ranges for application in the measurement of body composition[17-20,22,23]: visceral adipose tissue (-150 to -50 HU); subcutaneous adipose tissue (-190 to -30 HU); intermuscular adipose tissue (-190 to -30 HU); and skeletal muscle (-29 to +150 HU).

The cut-off point for the visceral fat area and visceral obesity classification in patients with CRC has not yet been standardized or validated. Some researchers use the classification proposed by Doyle et al., 2013[25], for the visceral fat area (≥163.8 for men and ≥80.1 for women)[17,19,22]. Martin et al., 2018[23], used the z-score value below 0.5 to define visceral obesity and Shirdel et al., 2020[20] considered total fat tissue, calculated from the sum of three fat compartments (visceral, intramuscular, and subcutaneous).

Different patterns were used to define sarcopenia, myopenia, visceral obesity, and myosteatosis considering specific population variables (TABLE 2).

Bioelectrical impedance

Only one study with 100 patients compared BIA (Bodystat 1500®) with CT. Jones et al.[18] analyzed the anthropometric parameters to measure lean mass and identify sarcopenia by BIA, compared to the measurements obtained by CT in patients with CRC. This study demonstrates that BIA is not accurate in detecting reduced muscle mass in patients with CRC, when compared with CT and only 60% of the participants were correctly classified (AUC 0.619, sensitivity 80%, specificity 52%, kappa 0.241, P=0.009)[18].

Body mass index

Weight is an important measure used for the evaluation of patients with CRC, and BMI is a parameter related to nutritional diagnosis, defined by the World Health Organization, calculated as the weight in kg divided by the square of the height in meters[26]. BMI presents limitations regarding the assessment of body composition, considering that fat-free mass, total fat mass, and body distribution varies greatly in CRC[17,19].

In a cross-sectional study on quality-of-life assessment in CRC diagnosis, BMI was used to evaluate the nutritional status, and 49% of patients were overweight, and 25% obese, with low to moderate correlation with CT parameters (Pearson's r, ranging from -0.25 to 0.57)[19]. However, Sabel et al.[21] demonstrated that BMI was significantly associated with all the morphometric measurements analyzed such as core muscle size, body composition, and bone mineral density[21].

TABLE 2. Cut-off point classification for sarcopenia, myosteatosis, visceral obesity, and myopia in patients with CRC, by CT-scans.

CT- scan	Cut-off points Men	Women	References
Sarcopenic			
SMI cm^2/m^2	≤52.4	≤38.5	Van Vugt, 2017[17]
SMI cm^2/m^2	<43.0 if BMI <25 and <53.0 if BMI ≥25	<41.0 any BMI	Roekel, 2017[19]
SMI cm^2/m^2	≤52.4	≤38.5	Malietzis, 2016[22]
SMI cm^2/m^2	<52.4	<38.5	Jones, 2019[18]
SMI cm^2/m^2	z-score below – 0.5	z-score below – 0.5	Martin, 2018[23]
SMI cm^2/m^2	Tertile cutoffs 43.1 to 49.2	Tertile cutoffs 32.9 to 38.1	Shirdel, 2020[20]
Myosteatosis			
SMR cm^2/m^2	z-score below 0	z-score 0	Martin, 2018[23]
SMR cm^2/m^2	Tertile cutoffs 38.5 to 46.1	Tertile cutoffs 36.1 to 43.6	Shirdel, 2020[20]
Visceral obesity			
Area of visceral fat (cm^2)	≥163.8	≥80.0	Van Vugt, 2017[17]
Area of visceral fat (cm^2)	≥160	≥80.0	Roekel, 2017[19]
Area of visceral fat (cm^2)	≥163.8	≥80.1	Malietzis, 2016[22]
VATI (cm^2/m^2)	z-score above 0.5	z-score above 0.5	Martin, 2018[23]
VAT (cm^2)	Tertile cut-offs 133.4 to 233	Tertile cut-offs 63.2 to 120.0	Shirdel, 2020[20]
SAT (cm^2)	Tertile cut-off 117.7 to 166.6	Tertile cut-offs 155.2 to 232.8	Shirdel, 2020[20]
Myopenia			
Myopenic obesity	Myopenia* + BMI >30 kg/m^2	Myopenia* + BMI >30 kg/m^2	Malietzis, 2016[22]

SMI: skeletal muscle index; SMR: skeletal muscle radiodensity; VAT: visceral adipose tissue; VATI: visceral adipose tissue index; SAT: subcutaneous adipose tissue. *Myopenia: SMI reduced; BMI: body mass index

Handgrip strength

Two studies[18,19] employed handgrip strength with a dynamometer, which has excellent validity for evaluating physical function, muscle function, and diagnosis of sarcopenia[18,19].

Jones et al.[18] showed that the mean handgrip strength, measured in 96 participants, was 25.11 kg (SD ±10.05). From these data, 62.5% of participants were classified as sarcopenic by low handgrip strength compared with other nutritional parameters[18].

Van Roekel et al.[19] assessed the isometric handgrip strength of the dominant hand associated with visceral adiposity, muscle fat infiltration, muscle mass, and sarcopenia in CRC diagnosis. There was no correlation of these parameters with long-term health-related quality of life, 2–10 years post-diagnosis ($P \geq 0.05$).

Mid-arm muscle circumference

A recent study considered the limitations of MAMC compared to CT to evaluate the body composition of patients with CRC[18].

The measurements of MAMC were calculated using mid-arm circumference and triceps skinfold thickness (TSF) (measured at the mid-point of the upper arm, with Harpenden calipers (British Indicators, Weybridge, UK). In the sequence, MAMC was calculated using the formula: (MAMC (cm) = MAC (cm) – [TSF (mm) x 0.314]). Low muscle mass in the upper arm was defined as a muscle circumference <23.8 cm^2 in men and <18.4 cm^2 in women[18] MAMC underestimated the low muscle mass by up to 30% when compared to CT[18].

DISCUSSION

The current systematic review discusses the methods of body composition assessment in the diagnoses of sarcopenia, myopenia, and visceral obesity in patients with CRC.

Diagnosis of nutritional status is relevant for both the identification of risk and in the nutritional action strategies for the treatment of CRC[8,27]. Muscle mass evaluation in the early phases of treatment is a relevant factor in oncological outcomes[6,27] and muscle depletion can be considered a modifiable risk factor in patients with CRC[22,27]. The body composition assessment by CT enables a more accurate diagnosis of sarcopenia, myopenia, and visceral fat obesity as well as changes in body composition and is considered the gold standard for nutritional screening of patients with CRC[5,6,8,10-14,17,19,20,22,23].

CT is performed for diagnosis and staging of the disease and can also be used to assess body composition of patients with CRC[8,10-14,17-20,23], although is seldom used. The examiners must have experience in anatomical radiology and be trained to select tissues for the correct analysis[11,12,17,20,28].

Sarcopenia is associated with increased postoperative complications, impaired survival, poorer prognosis, and increased risk of toxicity during neoadjuvant treatment in CRC[17,19].

Sarcopenia and visceral obesity were more frequent in males; mean age was higher in sarcopenic and visceral obese patients. There were no significant differences in in the risk of complications according to sarcopenia and visceral obesity[6]. For Charette et al.[5], visceral adipose tissue density is an important prognostic factor even when well-known oncologic prognostic variables such as performance status and length of disease are considered[5].

There is controversy in the classification of skeletal muscle mass loss, which depends on different criteria and distinct cut-off points, as well as the population studied, the methodology employed, and the outcomes of the studies[17-20,22,23,27]. This is a subject for which there is no consensus yet in the literature.

Visceral obesity is a risk factor for the development of CRC[19]. Obese patients with sarcopenia or depletion of skeletal muscle mass and myopenic obesity, have a higher mortality risk and more complications with surgical treatment[5,20-23].

The use of CT to assess body composition in oncology is recent[27], therefore in health services where it is not possible to assess body composition by CT, it is necessary to use other less complex diagnostic methods in monitoring the nutritional status of patients with CRC.

Body composition assessment by BIA is considered an economically feasible and safely used tool for skeletal muscle mass assessment, as a validated measure for sarcopenia assessment in patients with CRC[29]; however only one study[18] used this parameter in this review.

The expert conference in 2011, which considered several parameters for the definition of sarcopenia by BIA, established values of <14.6 kg/m^2 for men and <11.4 kg/m^2 for women, referring to body mass free of fat and bone[24]. However, Jones et al.[18], used the cut-off point values to define low muscle mass higher than those established by experts for detecting reduced muscle mass in patients with CRC[18].

Hong et al.[29], used bioimpedance in 14,024 patients screened for CRC and observed that sarcopenia and its severity was associated with the risk of advanced CRC. Similar results were found by Park et al.[30] when investigating whether the development of colorectal neoplasia has an association with sarcopenia and found a positive correlation.

The methods to evaluate body composition present limitations related to cost, feasibility, accuracy, and qualified training. Even so, the nutritional diagnosis of patients with CRC is necessary at the beginning of oncologic treatment[6,31].

Waist circumference (WC) is a simple and affordable outpatient measurement and is correlated with visceral adipose tissue and other metabolic conditions[32].

The latest consensus on WC[33] addresses it as a vital metric in clinical practice, and shows that WC is little used in routine clinical practice to predict morbidity and risk of death. It emphasizes that BMI alone has proven ineffective in assessing abdominal adiposity[33].

The association between WC with morbidity and mortality is reinforced when it is adjusted with BMI, thus obtaining a unique indicator to monitor the effectiveness of treatment and to propose interventions to control obesity. This can be explained in part by the ability of WC to identify adults with increased visceral adipose tissue[33]. All studies included in this review did not consider the measurement of WC as a parameter for the assessment of visceral obesity.

Choi et al.[6], showed that BMI and WC measured from CT images were lower in sarcopenic patients and higher in visceral obese patients. Lieffers et al.[34], have shown that increases in mass and proportion of tissues, including liver and tumor, can impact the assessment of body composition. Thus, CT allows discriminating the different body components (muscle, liver, spleen) and provides a more accurate result in assessing body composition[34].

Barret et al.[8], do not consider body weight and BMI as acceptable criteria for the diagnosis of malnutrition in patients with CRC; however they recommend the evaluation of weight loss history, validated nutritional indices, and evaluation of body composition by CT. Although body weight and weight loss may be useful tools regarding prognosis, these variables do not provide information on body composition changes[27].

The assessment of isometric handgrip strength was relevant in elderly cancer patients according to the Guideline for Nutritional Therapy in the Cancer Patient[35]. Two studies of this review[18,19] considered the evaluation of isometric handgrip strength as a diagnostic parameter to identify sarcopenia. This parameter can be performed in any clinical setting, which allows the feasibility of its use. The Consensus of the European Working Group on Sarcopenia in Older People (EWGSOP)[36] suggests as cut-off points 27 kg for men and 16 kg for women. However, these parameters should be used with caution for other populations[37] since the consensus considered an elderly British population.

Arm muscle circumference was a method used in only one study[18] and is among the anthropometric measurements referenced by the Cancer Cachexia Consensus[24]. To ensure reliability, measurements need to be performed by the same examiner[18], as the same as the other tools, including CT[11,12,17,20,28].

This systematic review is associated with some limitations. It included only seven studies with different methodologies (most of them are cross-sectional and retrospective studies). Lastly, there is no standardization for the cut-point values to classify sarcopenia, visceral fat, and myopenia.

CONCLUSION

Current evidence suggests that CT has better accuracy in diagnosing sarcopenia, visceral fat, and myopenia among individuals with CRC. Further studies with patient homogeneity are needed to standardize cut-off points for these changes aggravated by CRC.

Authors' contribution

Monaco-Ferreira DV, Magro DO, and Coy CSR participated in the conception and design of the review. DVMF and DOM participated in the study selection and extraction of data. Mônaco-Ferreira DV, Magro DO and Coy CSR contributed to data classification and analysis and participated in the interpretation of data and writing of the paper. All authors approved the final version.

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Monaco-Ferreira DV, Magro DO, Coy CSR. Avaliação de diferentes ferramentas para avaliação da composição corporal no câncer colorectal – uma revisão sistemática. Arq Gastroenterol. 2022;59(2):296-303.

RESUMO – Contexto – O estado nutricional de pacientes com câncer colorretal (CCR) tem impacto na resposta ao tratamento e na morbidade. Uma avaliação eficaz da composição corporal inclui as medidas de gordura visceral e massa livre de gordura e está sendo usada atualmente no diagnóstico do estado nutricional. O melhor entendimento das ferramentas nutricionais para avaliação da composição corporal em pacientes com CCR pode impactar no desfecho. **Métodos –** Revisão sistemática conduzida de acordo com as diretrizes itens preferidos de relatórios para revisões sistemáticas e meta-análise (PRISMA). Foi realizada uma pesquisa bibliográfica nas bases de dados BVS (LILACS), PubMed, Embase, Cochrane, Scopus e Web of Science. **Resultados –** Para a busca inicial, 97 estudos foram selecionados e 51 manuscritos duplicados foram excluídos. Assim, 46 foram revisados e sete estudos incluídos, com um total de 4.549 pacientes. Entre eles estavam um ensaio clínico, um estudo prospectivo (coorte), dois estudos retrospectivos de coorte e dois estudos transversais. Todos os estudos incluíram composição corporal avaliada por tomografia computadorizada (TC), um com impedância bioelétrica, um com força de preensão manual e dois empregaram a circunferência muscular do braço e o índice de massa corporal. **Conclusão –** As evidências atuais sugerem que a TC tem melhor acurácia no diagnóstico de sarcopenia, gordura visceral e miopenia em indivíduos com CCR. Mais estudos são necessários para identificar pontos de corte para essas alterações agravadas pelo CCR.

Palavras-chave – Neoplasias colorretais; composição corporal; sarcopenia; tomografia computadorizada; avaliação nutricional.

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