

Brit-Leigh Fermaniuk, Vickie Baracos, Lawrence Lee, Vincent Thai, Robin Fainsinger, Anne Huot, Dalton Schiessel

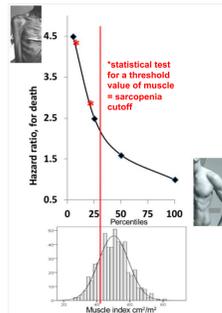
Division of Palliative Care Medicine, Department of Oncology, University of Alberta

BACKGROUND

What is sarcopenia and how is it defined?

- Body weight and BMI cannot differentiate skeletal muscle and fat tissue. This description may underestimate the frequency of reduced muscle mass in overweight or obese patients¹.
- Quantitative radiological assessment of muscle and fat mass can be accomplished using computed tomography (CT)².

Figure 1: Relationship between muscle index and mortality



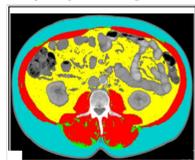
- **Definition of sarcopenia:** a low level of muscle, characterized by statistically significant* increase in health risk (mortality, toxicity, physical disability). Cut points of these values are defined in the literature³.
- Published data detail muscle loss and sarcopenia in patients with cancer⁴, however there are none describing patients in palliative care settings.
- We hypothesized that hospitalized palliative cancer patients would be significantly depleted in muscle compared to early stage disease.

METHODS

Retrospective CT image and chart review, of hospitalized cancer patients receiving palliative care

- Retrospective cohort study
- Included patients:
 - Edmonton Zone Palliative Care Program
 - Random sample of patients from the Tertiary Palliative Care Unit from July 2006 - March 2016
 - Patients referred to the Palliative Care Consult Service at the University of Alberta Hospital from January 2008 - October 2009
- Excluded patients:
 - Non-cancer diagnoses
- Comparative group:
 - 785 ambulatory outpatients with cancer of early stage (I-III) seen at the Cross Cancer Institute in Edmonton, AB
- Last CT image on record was assessed at the level of L3 to obtain cross sectional areas (cm²) of skeletal muscle and adipose tissue
- CT image analysis indicate tissue annotation in axial images using Slice-O-matic software³.

Figure 2: Cross-sectional area at the third lumbar vertebra (L3) analyzed for body composition



- Muscle - cm²
- Subcutaneous fat - cm²
- Visceral fat - cm²
- Intramuscular fat - cm²

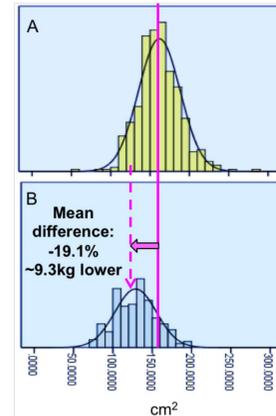
L3 cross-sectional area is strongly correlated with whole-body muscle mass and fat mass².

RESULTS

Table 1: Patient Demographics

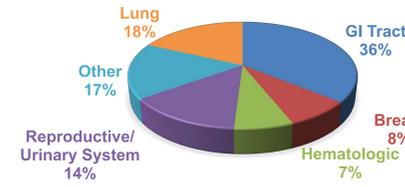
Number of patients (n):	356
Tertiary Palliative Care Unit:	102
University of Alberta Hospital:	254
Sex, male:	55.4%
Age (years):	Mean: 65 ± 13 SD
PPS (Palliative Performance Scale):	Mean: 43 ± 13 SD
Time from CT scan to death (days):	Median: 73
Overall survival (days):	Median: 74 [95%CI 62.3-85.7 d]

Figure 4: Overall muscle area distribution is lower in male palliative care patients than in early stage disease



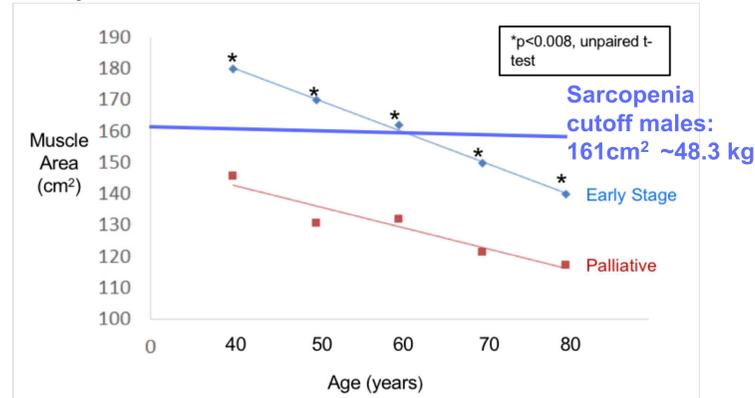
Distribution of muscle area (cm²) in men. A: Early stage cancer (I-III) n= 441. B: Advanced stage cancer seen by a Palliative Care Service n=197. Independent of age muscle mass was lower -19.1% in palliative patients compared to early stage disease.

Figure 3: Types of Cancer



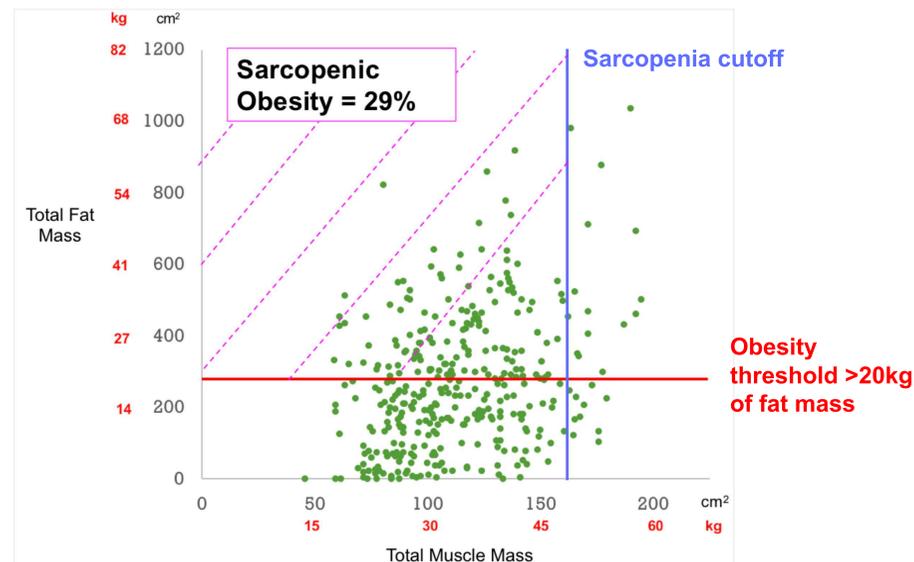
Results presented are those of male patients in the interests of brevity

Figure 5: Reduced muscle mass in palliative stage disease is independent of patient age in male patients



Muscle cross sectional area by age (decade) in early stage disease vs. palliative patient populations; male patients. On average palliative stage disease patients were sarcopenic. 85.3% of males in this population met sarcopenia criteria.

Figure 6: Sarcopenic obesity is the most prevalent phenotype in hospitalized cancer patients receiving palliative care



Body composition of palliative cancer patients. This graph indicates the different phenotypes in this population depending on total fat and muscle mass. One in three patients are sarcopenic obese. Patients with reproductive/urinary system cancer were most affected by this phenotype. Specifically prostate (44%) and urinary tract (45%).

DISCUSSION

Significance of findings

- First description of body composition in a palliative care setting using radiological criteria.
- There is a striking degree of variability in muscularity and adiposity in our patient population.
- 85.3% male and 75.5% females met sarcopenic criteria which is significantly higher than any previous published studies (mean of 40%)⁴.
- The comparison to patients of early stage cancer highlights the progressive deterioration of muscle mass over the disease course.
- **Patients with sarcopenia were not necessarily thin, many patients with sarcopenia were simultaneously obese (i.e. with an absolute fat mass of >20 kg and up to 46 kg), making "sarcopenic obesity" (SO) which was seen in 29% of patients the most prevalent phenotype. This is higher than any previous study (mean of 9%)⁵.**
- This "mantle of adipose tissue" obscures the functionally and physiologically important deficits in muscle mass⁶.
- The most affected tumor sites were prostate (44%) and urinary tract (45%) which could be due to anti-androgen therapy.
- Studies in other populations consistently show SO to be associated with morbidity and mortality^{4,5,7,8}.

Implications in a palliative care setting

- Patients may be deemed erroneously "well" and have not been assessed from a cachexia standpoint or initiated in any interventions for sarcopenia.
- This may lead to a higher symptom burden, decreased quality of life, mobility problems, altered responses to therapy and in turn placement issues on discharge.
- This information can modify patient assessments, communication regarding prognosis, and expectations about rehabilitation goals.
- This new knowledge could significantly change the way Palliative Care Physicians view their patients.

Strengths

- No published studies analyzing body composition in a palliative care setting.
- Large patient population with a wide variety cancer types.
- Utilization of a comparative group allowed assessment of muscle loss throughout disease trajectory.

Limitations

- Study conducted in a single urban inpatient setting.
- No consensus diagnostic criteria for sarcopenic obesity.
- We did not assess symptomatology or nutritional interventions.

Future Directions

- Determining prognostic significance of sarcopenia and sarcopenic obesity in a palliative care setting.
- Qualitative assessment of symptom burden comparing different phenotypes.
- Utilization of CT body composition analysis in clinical practice to guide and improve management/interventions in palliative patients.

REFERENCES

1. Kim et al. Prognostic significance of cachexia score assessed by CT in male patients with small cell lung cancer. Eur J Cancer Care. 2018;Jan;27(1). doi: 10.1111/ecc.12695.
2. Shen et al. Total body skeletal muscle and adipose tissue volumes: estimation from a single abdominal cross-sectional image. J Appl Physiol. 2004;97: 2333-2338
3. Prado CM et al. Prevalence and clinical implications of sarcopenic obesity in patients with solid tumours of the respiratory and gastrointestinal tracts: a population-based study. Lancet Oncol. 2008;9(7):629-35.
4. Simonsen C et al. Sarcopenia and Postoperative Complication Risk in Gastrointestinal Surgical Oncology: A Meta-analysis. Ann Surg. 2018;Jan 25. doi: 10.1097/SLA.0000000000002679. [Epub ahead of print]
5. Baracos VE & Arribas L. Sarcopenic obesity: hidden muscle wasting and its impact for survival and complications of cancer therapy. Ann Oncol. 2018;29(suppl_2):ii1-ii9.
6. Fearon KC et al. Cancer cachexia: mediators, signaling, and metabolic pathways. Cell Metab. 2012;16:153-66.
7. Rodrigues VH et al. Body composition and survival in the early clinical trials setting. Eur J Cancer. 2013;49(15):3068-75.
8. Shachar SS et al. Prognostic value of sarcopenia in adults with solid tumours: A meta-analysis and systematic review. Eur J Cancer. February 2016;57:58-67