Sarcopenia in Lower Extremity Reconstruction

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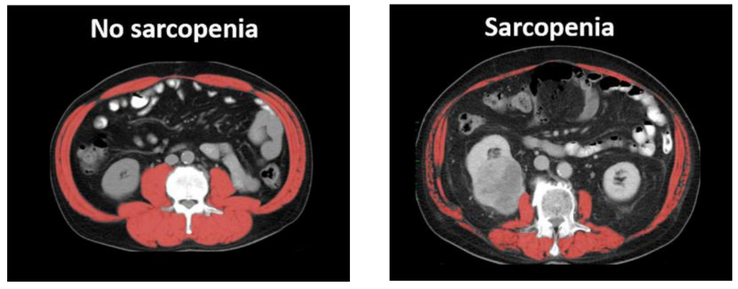
Introduction

- **Sarcopenia** is a progressive and generalized disorder involving the degenerative loss of muscle mass and function
- Sarcopenia naturally occurs in advanced age but is also influenced by reduced activity, immobilization, and malnutrition
- Consequences of sarcopenia include
  - reduced physical capacity
  - impaired cardiopulmonary performance
  - unfavorable metabolic effects
  - poorer quality of life,
  - higher health care expenditures
  - disability and mortality
- Sarcopenia can occur in obese or non-obese individuals and is linked to poor outcomes throughout the surgical literature
- No study has investigated the potential value of sarcopenia as a prognostic factor for surgical morbidity in lower extremity (LE) reconstruction



Sarcopenia Assessment

- The Housfield unit (HU) is a measure of radiation attenuation that can be detected on computerized tomography (CT) imaging
- Housfield unit average calculation (HUAC) score represents the mean HU across the precisely traced psoas cross-sectional area and is influenced by muscle density and intramuscular fat infiltration (Fig. 1)
  - Lower HUAC score ➔ atrophic and fatty muscle characteristic of sarcopenia
- Assessment of HUAC can be complicated by the relative hassle of precisely tracing each psoas muscle which requires advanced and expensive software.
- Our novel ellipse method utilizes the same HUAC procedure, except psoas cross sectional area is estimated with an ellipse tool instead of precisely traced, obviating the need for expensive software (Fig 1.)

Specific Aims:

1) Examine the effects of sarcopenia on surgical morbidity following LE reconstruction
2) Compare two methods of sarcopenia assessment, including our novel “ellipse method”

Methods

- 50 patients undergoing free flap reconstruction of the LE were included.
- Chart review included patient demographics and any surgical complications including flap failure, venous insufficiency, DVT, PE, dehiscence, infection, or the need for hardware removal.
- Assessment of sarcopenia by traditional HUAC (Fig. 1 C,D) and Ellipse method (Fig. 1 E, F).
- Analysis of:
  - Association between traditional HUAC and ellipse measures
  - ROC analysis for “any complication”
  - Risk of “any complications” associated with sarcopenia (Fisher’s exact test)
  - Compared the predictive power of risk factors using model fit statistics from simple logistic regression models of any complication

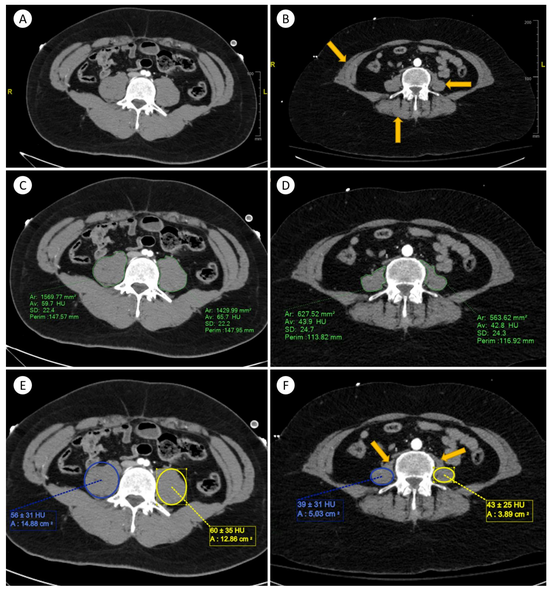


Figure 1. Assessment of Housfield unit average calculation (HUAC) in a non-sarcopenic (A/C/E) and sarcopenic (B/D/F) patient via the traditional HUAC (C/D) and ellipse (E/F) methods. (A/B) CT at the L4 spinal level demonstrating substantially less skeletal muscle mass and greater fatty infiltration (arrows) in the sarcopenic patient (B) relative to the non-sarcopenic patient (A).

Results

High concordance between both HUAC measures ($\rho = 0.83$, $p < 0.0001$)

Table 1. Receiver operating curve (ROC) analysis (N=50) for any complication

Method	Likelihood Ratio Test p-value	AUC	Predicted Probability	Accuracy	Sensitivity	Specificity	Value
Traditional HUAC	0.0656	0.6404	0.4	60	57.1	62.1	20.7
Ellipse HUAC	0.0089**	0.7077	0.42	70	66.7	72.4	20.6

- Sixteen (32%) patients were classified as sarcopenic under the ellipse method and twelve (24%) under the traditional method.
- The risk for “any complications” was higher in sarcopenic patients (n= 12/16, 75%) than non-sarcopenic patients (9/34, 26.5%) by the ellipse method (p = 0.0019*)
- Under the traditional HUAC classification, 58.3% of sarcopenic patients experienced a complication compared to 36.8% of non-sarcopenic patients (p = 0.3145).
- Sarcopenic status (continuous and discreet status) as determined by the ellipse method was a better predictor of “any complication” postoperatively than BMI, obesity (BMI > 30), extreme obesity (BMI > 35), ASA score, sex, race, tobacco use, pre-albumin level, or albumin levels.

Conclusions

- Classification via the ellipse HUAC had greater overall accuracy, sensitivity, and specificity in predicting postoperative complications when compared to the traditional HUAC (Table 1).
- Sarcopenia determined by the “user-friendly” ellipse method has a stronger association with post operative complications than traditional predictive measures - such as obesity – in LE reconstruction
- These results emphasize the importance of peri-operative nutrition in the setting of free flap surgery. As little as 7-10 days of nutritional support has been shown to improve surgical outcomes.

References

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