

Advancing Nutrition Assessments in the ICU

Using Psoas Density via Computed Tomography as a Proxy for Malnutrition

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CURRENT RESEARCH

Critically ill patients have unique physiologic states that promote catabolism and result in increased calorie and protein requirements. Failing to meet these energy needs can result in malnutrition. Malnutrition can occur either prior to admit or during a hospital stay and is associated with adverse outcomes.¹

Computerized tomography (CT) has shown promise as a tool for assessing malnutrition prior to or during admit.²⁻⁷ According to current guidelines and emerging research, decreased psoas density on CT scans has been associated with:

- Increased risk of malnutrition;
- Increased hospital length of stay;
- Increased complications during hospital stay;
- Increased risk of mortality.

PATIENT CL: CASE STUDY

CL is a 62-year-old female admitted to the ICU for acute respiratory distress syndrome related to Covid-19:

Previous medical history. CL has a history of asthma, pre-diabetes, and Covid-19 unvaccinated status.

ICU admission. Covid-19 symptoms started 27 days prior to MICU admission, and CL admitted to an outside hospital 10 days after symptom onset with hypoxemic failure, desaturation, acute pulmonary embolism, and sepsis. She was intubated one day prior to ICU admit.

Complications. The clinical course was complicated by prolonged intubation and need for a tracheostomy, bowel surgeries related to ileus and infection, delirium, and malnutrition.

CLINICAL COURSE

- **HD 1-34:** Relative nutritional stability – CL receives 85-100% of TF goal
- **HD 35:** Diagnosis - moderate malnutrition not present on admit due to weight loss, muscle wasting
- **HD 36-38:** CL experiences complications from her percutaneous endoscopic gastrostomy tube, and undergoes an exploratory laparotomy
- **HD 39-40:** TFs are restarted, and then held again due to concern for an ileus
- **HD 42:** CL has received 31% of her TF goal over the previous 7 days
- **HD 44:** CL experiences incision dehiscence and undergoes an exploratory laparotomy. Due to prolonged intake <50% of energy needs and abdominal distress, the team recommends total parenteral nutrition. Peripheral parenteral nutrition is placed instead due to lack of central line access
- **HD 45: CT scans show a reduction in psoas density since admit, consistent with research showing decreased density with malnutrition during critical illness (see Figure 1).**

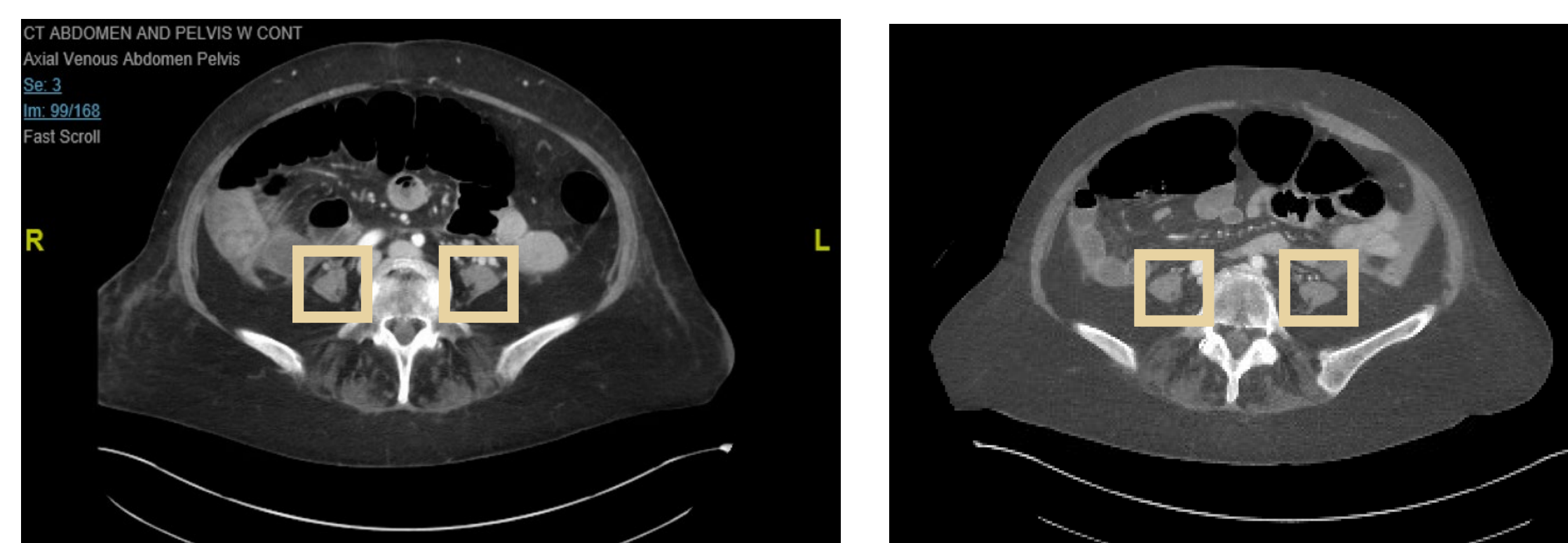


Figure 1. Axial abdominal CT scan of patient psoas muscle at the lumbar 4 region taken HD 37 (left) and HD 45 (right). The yellow boxes show the psoas muscles. The density decreased from 55.5 +/- 18 Hounsfield units (HU) to 46.0 +/- 11.5 HU. A normal psoas density is 50-60 HU.

LIMITATIONS

While a useful data point when other parts of the nutritional assessment are unavailable, psoas density as a proxy for malnutrition has its limitations:

- **Radioactivity load.** CT scans incur a level of radioactivity. The benefit of a CT scan can outweigh the potential drawbacks, but this consideration makes clinical trials with repeat CT scans unethical. Additionally, CT scans cannot be used as a frequent assessment tool unless medically necessary.
- **Costs.** CT scans are expensive both for hospitals and patients, especially those uninsured. Many may not consent to this cost unless critical to their care plan.
- **Interprofessional resources.** Many CT readings, including the area of psoas density, require interpretation by trained radiographers and specialized physicians. This can add to the time to receive results, as well as labor costs and considerations during staffing shortages.
- **Size inclusivity.** Some CT technology may not be appropriate for those in larger bodies, limiting the generalizability of results and applications.

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