

Measuring patients' muscles to predict chemotherapy side effects

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Chemotherapy has long been standard treatment for many cancers, but its clinical benefits can also come with well-documented side effects. Doctors say the challenge is knowing which patients will experience these side effects, and to what extent.

Findings from a new study suggest this could be changing.

Researchers at the University of North Carolina Lineberger Comprehensive Cancer Center report in the journal *Clinical Cancer Research* that a tool developed at UNC could potentially help doctors better identify patients at high risk for toxic side effects that could require hospitalizations.

Shlomit Strulov Shachar, MD, the study's first author, said they found that low measures of muscle quality and quantity in patients with early-stage breast cancer were linked to serious side effects and hospitalizations. Based on their findings, the researchers believe measuring muscle composition could be helpful in predicting which patients will experience side effects from chemotherapy, and in determining appropriate drug doses.

"The formula currently used in clinical practice for chemotherapy dosing - body surface area—doesn't really help us predict which patients will develop treatment-related toxicity," said Shachar. "This study supports the concept that body composition may be more sensitive than the formula that has been used for decades to dose chemotherapy."

Earlier research has shown that age-related muscle loss is linked to poor overall survival in patients with solid tumors. But less is known about risks for [early-stage breast cancer](#) patients for developing treatment-related side effects based on their muscle composition.

"More and more studies are showing that muscle mass, especially loss of

muscle and function, or so-called sarcopenia, is associated with poor outcomes, poor survival and more toxicity with cancer treatment," said study co-author Hyman B. Muss, MD, Mary Jones Hudson Distinguished Professor and director of the UNC Lineberger Geriatric Oncology Program. "It may be that muscle mass is related to the metabolism of chemotherapy in your body, as well as your general fitness. So people with a low [muscle mass](#) may simply be less fit, and their bodies don't tolerate chemotherapy treatments as well. These patients may be especially vulnerable to treatment effects."

The researchers reviewed medical data from 151 patients treated for early breast cancer at the N.C. Cancer Hospital between 2008 and 2013. Approximately one third, or 50, of the patients experienced serious chemotherapy toxicities.

They analyzed existing abdominal CT scans for each patient to generate an estimate of the fat and muscle composition in the patient's body. They measured muscle quality and quantity, including the indirect fat content, to develop a "skeletal muscle gauge."

The researchers then reviewed patient medical records to see who experienced serious chemotherapy side effects including hospitalizations, gastrointestinal complications, including nausea or vomiting, depletion of important blood cells, and nerve damage (neuropathy) in the arms or legs.

They found that patients with low muscle quality/quantity had higher risk of blood-related toxicities, gastrointestinal side effects and neuropathy. Patients with lower measures of muscle quality/quantity had twice the risk of hospitalization after they adjusted for age and body surface area. Compared to other body composition measures such as body mass index, skeletal [muscle](#) gauge, the measure developed at UNC, was the most predictive of toxicity.

Researchers said their findings could help clinicians to more accurately determine chemotherapy dosing, which could help lower the risk of treatment side effects.

"Hospitalization is a terrible thing for patients, especially for older patients after chemotherapy," Muss said. "We need better ways of predicting who might be hospitalized for treatment [side effects](#). If we can give a little less dose initially, we might be able to lower toxicities without sacrificing effectiveness. By improving the therapeutic index we can retain the benefits while minimizing the risks of treatment."

Shachar, a former fellow at UNC who is now a medical oncologist in Israel, said improving [chemotherapy](#) dosing is a clinical imperative.

"For me, as a physician in the clinic, it's very troubling when patients get toxicity from therapy," she said. "We need to deliver the best therapies we can with less toxicity. We need to think carefully about how to dose [patients](#) other than relying on just height and weight."

More information: Shlomit Strulov Shachar et al. Body Composition as a Predictor of Toxicity in Patients Receiving Anthracycline and Taxane Based Chemotherapy for Early Stage Breast Cancer, *Clinical Cancer Research* (2017). [DOI: 10.1158/1078-0432.CCR-16-2266](https://doi.org/10.1158/1078-0432.CCR-16-2266)

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