

UC Davis
Orthopaedic Surgery

Title

The use of contrast in CT staging of patients with extremity sarcoma: is it over utilized and unnecessary?

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Introduction

Background:

- Lungs are the most common site of metastasis for bone/soft tissue sarcoma.
- Regular lung metastasis staging studies are standard.
- American College of Radiology (ACR) recommends CT without contrast for staging since 2015.

Identified Quality Improvement Issue:

- At UC Davis there is a tendency to perform CT of the chest with contrast for routine staging.
- It is suspected that CTs ordered without contrast are replaced with contrast studies.
- The exact frequency of ordering CT of the chest with contrast is unknown.

Institutional Effect:

- There is unnecessary cost and procedure to both the patient and hospital.

Hypothesis

CT Chest imaging with contrast is frequently ordered by non-sarcoma specialists for sarcoma metastasis screening. Non-contrast CT of the chest orders are often converted to contrasted studies. Contrast CT imaging incurs unnecessary patient and institutional cost.

Methods

- Retrospective chart review of 366 sarcoma patients.
- Compared CT ordering yearly & among specialists.
- Compared diagnoses of <5mm nodules between modalities.
- Analyzed cost between CT modalities.

Inclusion Criteria:

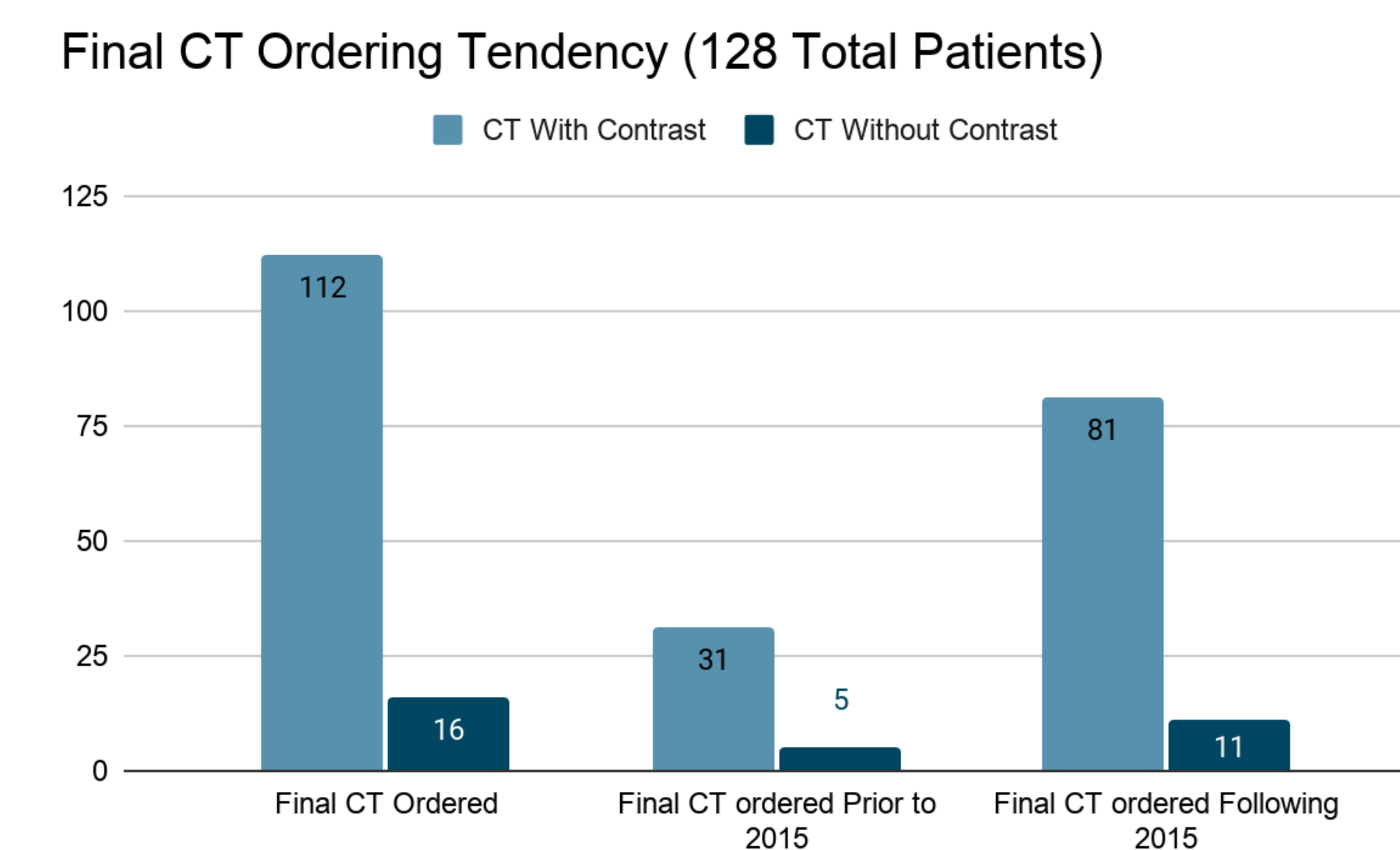
- Diagnosis of extremity bone/soft tissue sarcoma.
- Must have undergone CT for staging/surveillance.
- No restriction to length of follow-up or age.

Exclusion Criteria:

- CT imaging completed outside UC Davis.
- Exams that include CT of the Abdomen/Pelvis.
- Myxoid liposarcoma/atypical lipomatous tumor/ well differentiated liposarcoma.

Total Patients Meeting Criteria: 128 of 366 patients

Results



Modality	Patients <5 mm Nodules	Nodules called Indeterminate	Nodules called Metastasis
CT With Contrast	27 patients	23 patients	4 patients
CT Without Contrast	5 patients	5 patients	0 patients

Modality	Total Studies	Facility Cost of Study	Total Institutional Cost
CT With Contrast	840	\$4178	\$3,509,520
CT Without Contrast	143	\$3979	\$568,997

Difference in Modality Cost:

\$199

Average Incurred Cost Per Patient (Avg. 6.6 CT w/ contrast)

\$1,313.40

Total Cost Incurred by ordering 840 Contrast Studies:

\$167, 160

QR Code for Abstract



Figure 1: This line graph depicts total number of CTs ordered yearly from 2005 to 2018 for all 128 patients. It distinguishes CT with vs without contrast. Even after 2015, there are substantially more CTs with contrast than without contrast.

Average # of CTs with Contrast per patient: 6.6
Average # of CTs without Contrast: 1.1

Figure 2: This bar graph represents the final CT ordered for all 128 patients. 112 patients had CT with contrast ordered for their final imaging modality at UC Davis. It segregates the ordering tendencies both before and after 2015.

Figure 3: This table compares diagnosis of <5mm nodules. Of the 32 patients with <5 mm nodules initially called, 28 (87.5%) were labelled as indeterminate.

Only 4 patients (12.5%) with <5 mm nodules were labelled as metastasis. All of these patients underwent CT with contrast.

Figure 4: This figure represents the average cost per patient incurred by ordering the average number of CTs with contrast per patient in our population (6.6 CTs with contrast). It also depicts that total cost by the entire patient population for all of the CTs with contrast ordered.

Summary

Our investigation revealed several striking findings:

- The overwhelming majority of providers across all specialties are ordering CT with contrast for staging.
- 98.4% of our population had at least 1 CT with contrast
- 26 total CTs ordered without contrast were altered to CT with contrast

Even after the ACR guidelines, ordering tendencies have not improved.

- Of the 342 total studies ordered after 2015, 93.2% (319), were ordered with Contrast
- 81 (88.0%) of the final staging CTs ordered after 2015 were ordered with contrast.

Small sample size, but contrast did not appear to obviously assist with diagnosis of <5mm nodules.

Over the last 15 years, UC Davis and patients have incurred an additional \$167,160 in unnecessary costs.

Conclusions/Further Study

- UC Davis continues to order screening chest CTs for sarcoma patients with contrast.
- There has been minimal improvement of this activity despite ACR guidelines.
- There is an opportunity to educate ordering providers from all specialties.
- Improving ordering patterns will reduce both patient and institutional costs.
- Will allow more time efficient scheduling of exams
- Possibly improved patient experience w/ fewer IVs
- Ordering with guidelines in the future could contribute to non-inferiority study.

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