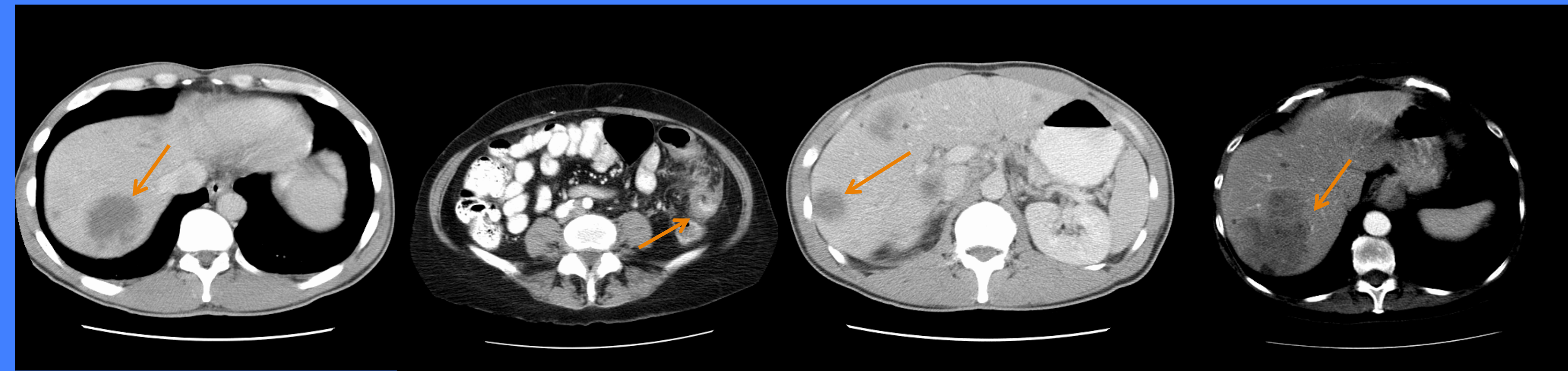# Volumetric assessment of metastatic colorectal cancer: Should we RECIST?

Nicholas Stabo, BS; Meghan Lubner[1], MD; Sam Lubner[2], MD; Alejandro Munoz del Rio[1], Ph. D.; Perry Pickhardt[1], MD

Departments of [1]Radiology and [2]Oncology, University of Wisconsin School of Medicine and Public Health

School of Medicine and Public Health
UNIVERSITY OF WISCONSIN–MADISON

Axial CT showing colorectal metastases to liver and primary colon tumor (second from left).

Introduction

It has been well established that tumor burden is useful in determining disease progression, course of treatment, and overall survival. It is thus important that the size of tumors be measured accurately to convey this tumor burden. Traditionally, uni-dimensional (1D) linear measurements following Response Evaluation Criteria in Solid Tumors (RECIST) have been the standard practice for measuring tumors. The purpose here is to compare uni-dimensional and volumetric assessment of metastatic colorectal cancer burden in predicting response to treatment and survival.
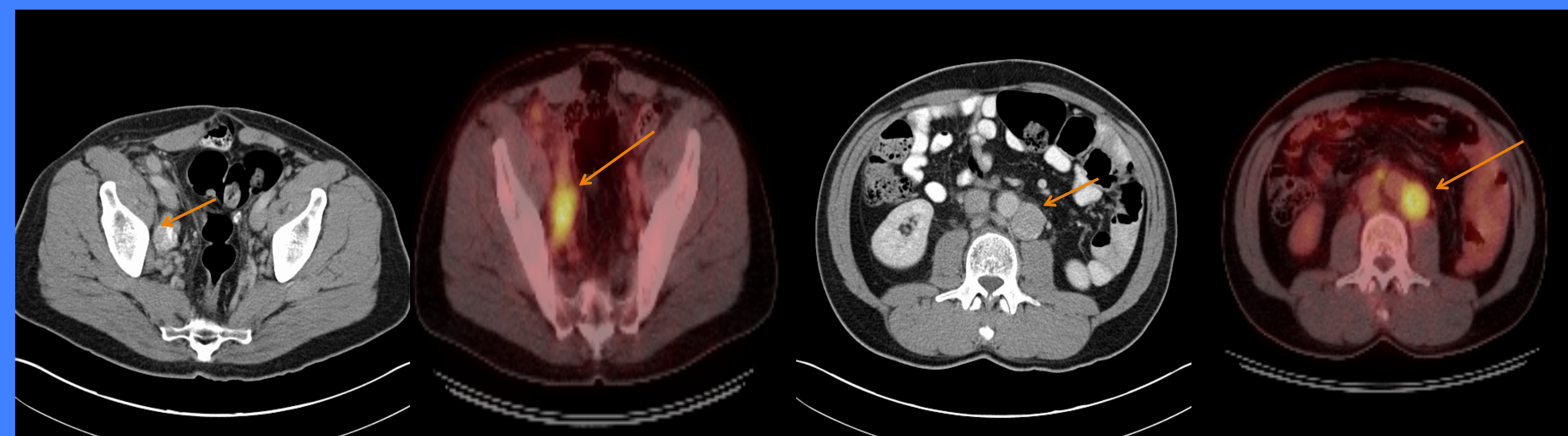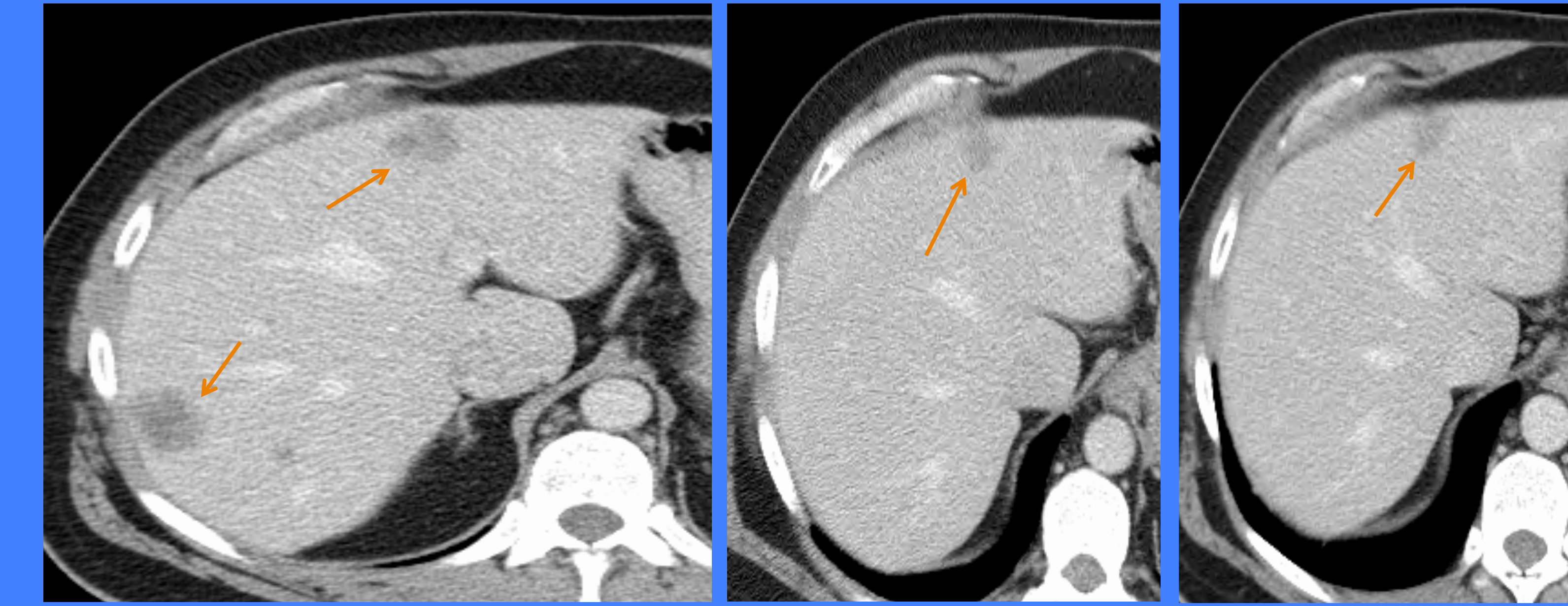

Axial CT and PET scans showing colorectal metastasis to lymph nodes.

Methods

Analysis of CT images in 107 patients who received chemotherapeutic treatment for metastatic colorectal cancer was performed. Both uni-dimensional and volumetric (3D) measures were retrospectively obtained on index lesions at three time points in treatment. Measurements were summed and compared to obtain best overall response. Patient response was categorized based on RECIST (CR, complete response; PR, partial response; SD, stable disease; PD, progressive disease). Survival data was correlated. Concordance of RECIST classification between 1D and 3D measures was assessed and Cox survival models for the measurements as continuous variables were constructed. Kaplan-Meier models with categorical response were constructed and compared.

Results

There was a 19% discordance in response classification between 1D and 3D measures, and 70% of these involved a move between PR and SD. Mean overall survival was 20.2 ± 17.3 months, median survival 14.9 months. Kaplan-Meier curves for 1D vs. 3D were very similar in appearance. Both 1D and 3D measurements separated PD from the SD/PR group, but neither separated SD and PR well. Cox HR and p values were similar for both groups when viewed as continuous variables (1D HR for best response 1.008 95% CI 1.002, 1.015 p=0.013, 3D HR for best response 1.002, 1-1.003, p=0.02).

Patient Survival: Volumetric

Patient Survival: One Dimension

Conclusions

Although there is some discordance in RECIST classification between 1D and 3D measurements, overall the two measures show similar ability to stratify progressive disease from other disease response categories and create similar survival models when taken as categorical or continuous variables.
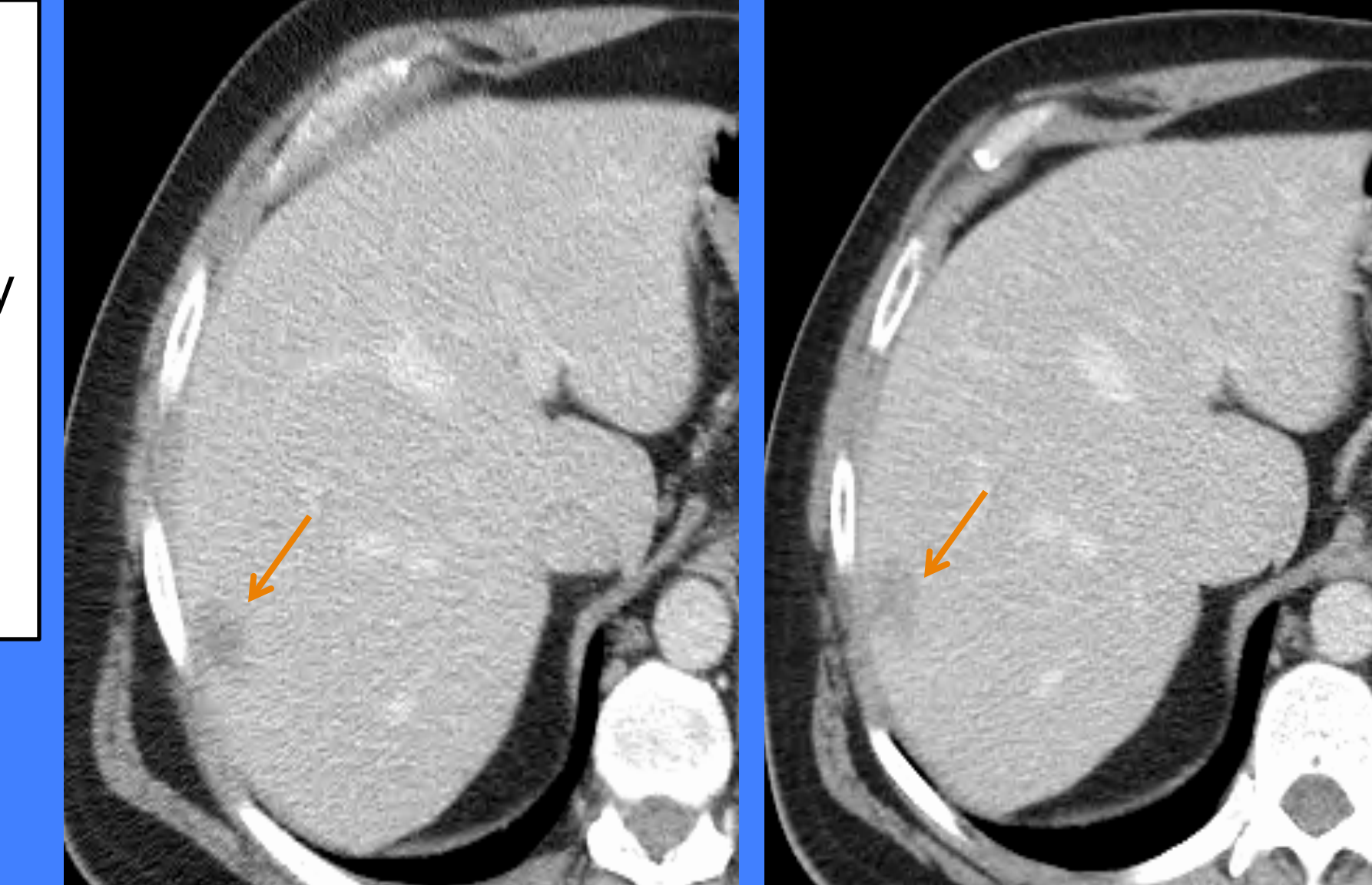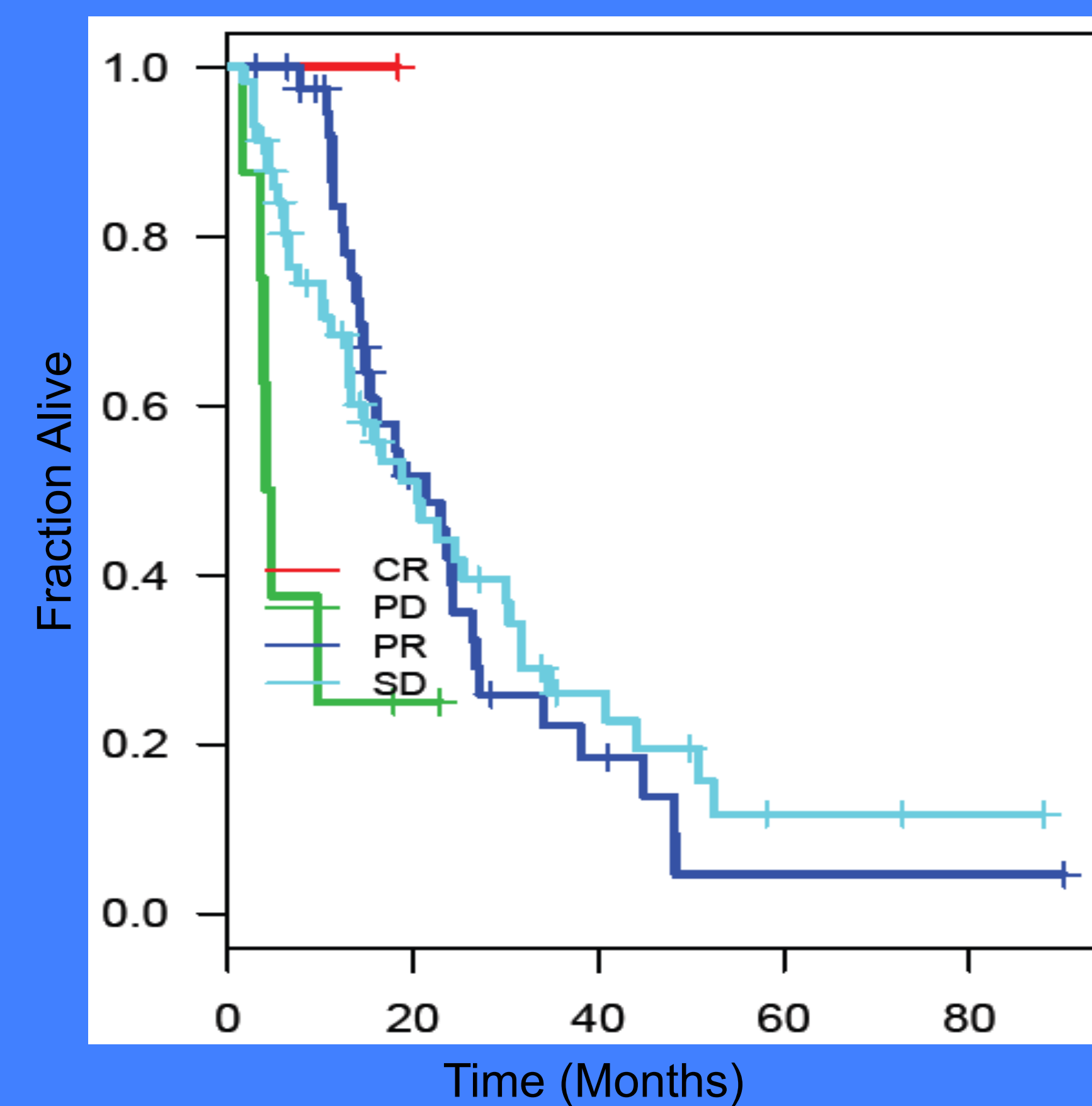

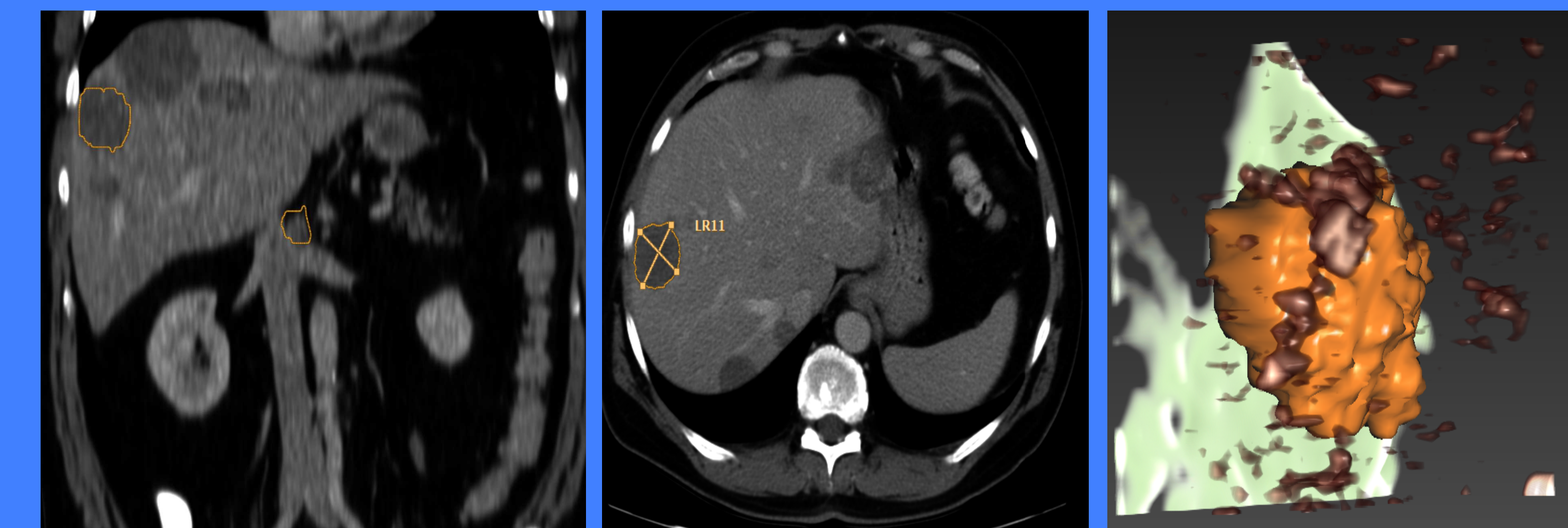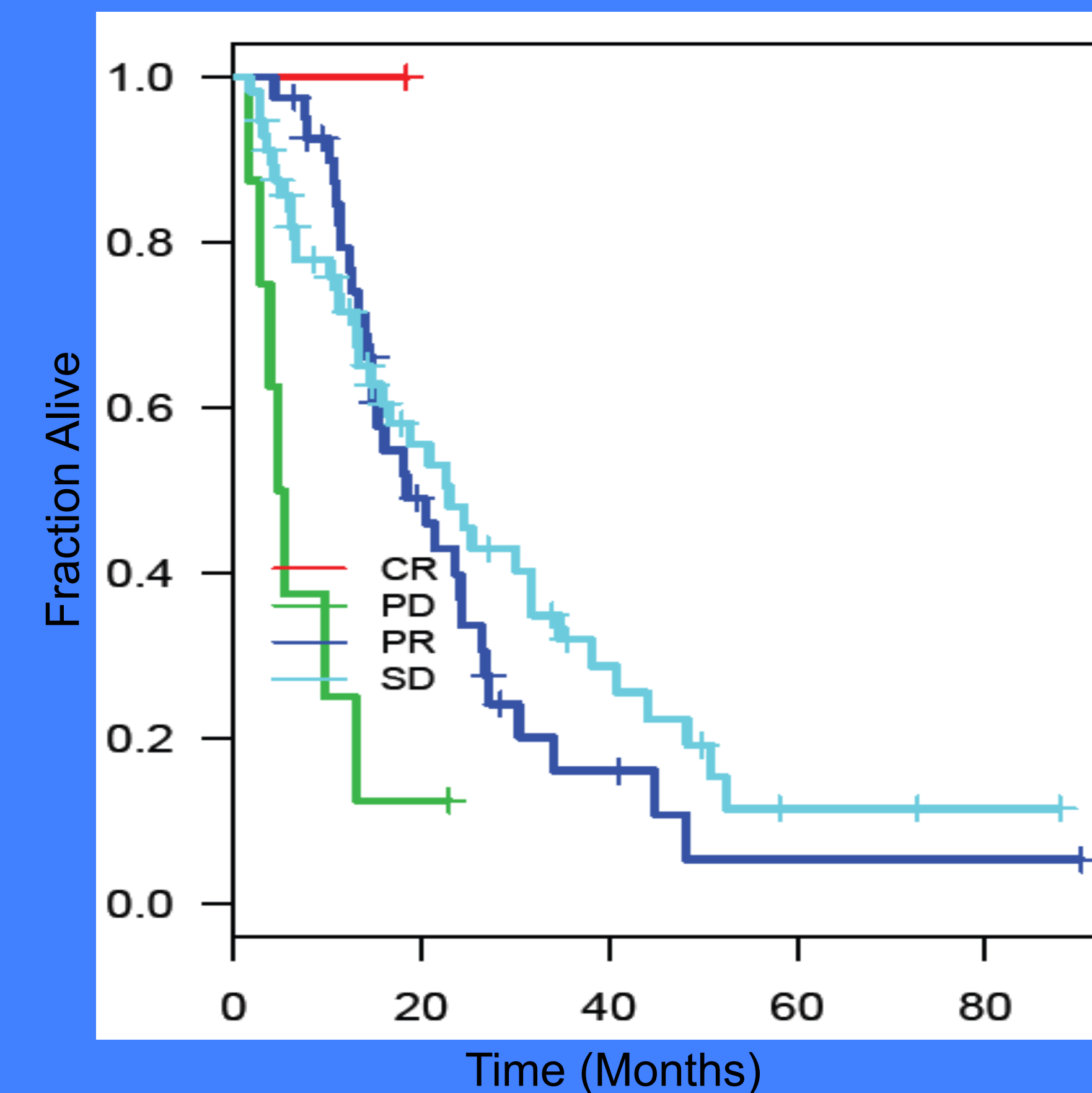Initial   Mid-point   End-point

An example of discordance between uni-dimensional and volumetric measurement. This patient was classified as having stable disease by 1D and partial response by 3D measurements. Results here show that volumetric classification was more accurate.

Volumetric regions of interest constructed for colorectal metastatic lesions. Sagittal (left) and Axial (middle) and 3-dimensional rendering (right).

RECIST	1D	Volume
Complete response (CR)	Lesions resolved	Lesions resolved
Partial Response (PR)	>30% in diameter	>65% decrease in volume
Stable disease (SD)	Response other than PR or SD	Response other than PR or SD
Progressive disease (PD)	>20% increase	>73% increase

RECIST

- Response Evaluation Criteria in Solid Tumors
- Uni-dimensional measurement of the longest transverse dimension
- Sum of diameters determines tumor burden

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