RadioGraphics

Radiologic Assessment of Response to Therapy: Comparison of RECIST Versions 1.1 and 1.0[1]

Hamid Chalian, MD • Hüseyin Gürkan Töre, MD • Jeanne M. Horowitz, MD • Riad Salem, MD • Frank H. Miller, MD • Vahid Yaghmai, MD

CME FEATURE

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LEARNING OBJECTIVES FOR TEST 6

After completing this journal-based CME activity, participants will be able to:

- Describe the major differences between RECIST versions 1.0 and 1.1.
- Identify the lesion characteristics that are most important when selecting targets for measurement according to RECIST 1.1 criteria.
- Apply RECIST guidelines to categorize disease response on the basis of target lesion measurements before and after treatment.

TEACHING POINTS

See last page

Improvements in radiologic imaging technology and therapeutic options available for management of tumors have necessitated the revision of guidelines for the imaging-based assessment of tumor response to therapy. The purpose of this article is to familiarize radiologists with the modifications to the Response Evaluation Criteria in Solid Tumors (RECIST) that have been incorporated in the latest version of the guidelines, RECIST 1.1. The most important differences between this version and the previous one, RECIST 1.0, include reductions in the maximum number of lesions per patient and per organ that may be targeted for measurement, augmentation of the criteria defining progressive disease, additional guidelines for reporting findings of lesions that are too small to measure and for measuring lesions that appear to have fragmented or coalesced at follow-up imaging, new criteria for characterizing lymphadenopathy, new criteria for selecting bone lesions and cystic lesions as targets for measurement, and the inclusion of findings at positron emission tomography among the indicators of disease response.

Introduction

Assessment of tumor response to different physical and pharmaceutical treatments is an integral and increasingly imperative role of radiologists working in oncologic imaging. Imaging studies provide an objective method for monitoring tumor response. In 1979, the World Health Organization (WHO) issued the first version of its tumor response criteria. The WHO criteria introduced the concept of overall assessment of the tumor burden by summing the products of two-dimensional lesion measurements. Baseline lesion measurements are then compared with follow-up measurements to determine whether change has occurred (1). During the years after the introduction of

Abbreviations: RECIST = Response Evaluation Criteria in Solid Tumors, WHO = World Health Organization

RadioGraphics 2011; 31:2093–2105 • **Published online** 10.1148/rg.317115050 • **Content Codes:** CT NM OI

[1]From the Department of Radiology, Northwestern Memorial Hospital, Northwestern University–Feinberg School of Medicine, 676 N St Clair St, Suite 800, Chicago, IL 60611. Presented as an education exhibit at the 2010 RSNA Annual Meeting. Received March 14, 2011; revision requested May 27 and received June 18; accepted June 22. For this journal-based CME activity, the authors, editor, and reviewers have no relevant relationships to disclose. H.C. and H.G.T. were supported by an education grant from Siemens Healthcare. **Address correspondence to** V.Y. (e-mail: *v-yaghmai@northwestern.edu*).

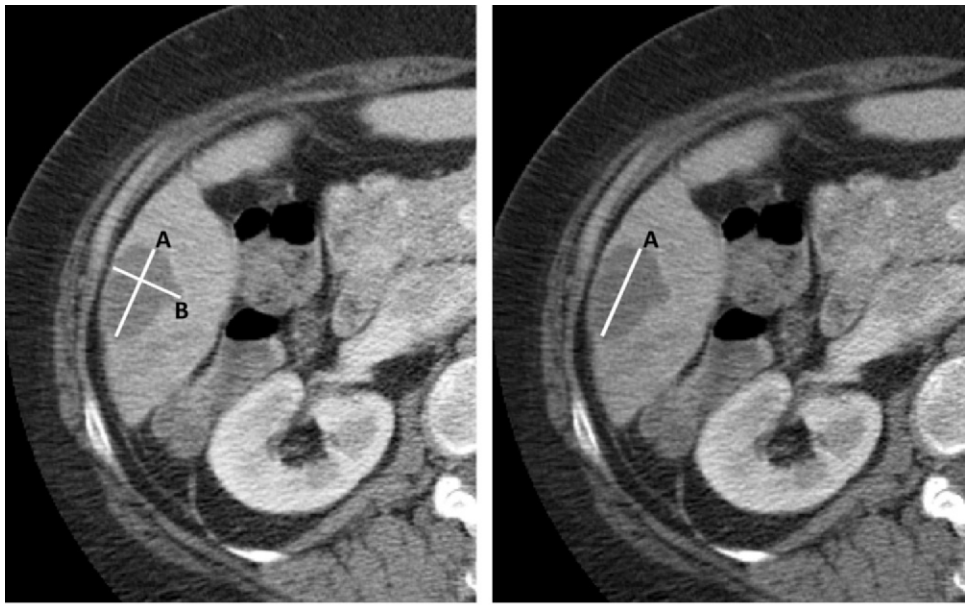


Figure 1. Difference between WHO and RECIST guidelines for lesion measurement. **(a)** Axial CT scan with overlay shows lesion measurement according to initial WHO guidelines, which recommended summing the products of the two largest orthogonal diameters (*A* and *B*, represented by intersecting white lines) of all lesions. **(b)** Axial CT scan with overlay shows lesion measurement according to RECIST guidelines, which specify that only the longest diameter *(A)* of each target lesion must be measured.

the WHO criteria, cooperative groups and pharmaceutical companies made various modifications to these criteria to improve their precision or to accommodate the use of new technologies (2). The accumulation of ad hoc modifications over time underlined the need for a new version of the criteria to avoid confusion in the interpretation of results from different trials. In 2000, the WHO, the U.S. National Cancer Institute, and the European Organization for Research and Treatment of Cancer adopted a new set of tumor response criteria, Response Evaluation Criteria in Solid Tumors (RECIST) version 1.0 (3). RECIST 1.0 incorporated a one-dimensional lesion measurement criterion instead of the two-dimensional criterion used in the initial WHO guidelines (Fig 1). Subsequent rapid innovation in imaging technologies, including the introduction of multidetector computed tomography (CT) and positron emission tomography (PET) and their combined application in PET/CT, created the need for a revision of the RECIST 1.0 guidelines. In January 2009, the RECIST Working Group published a revised version of the guidelines (RECIST 1.1) that was developed by analyzing a database of more than 6500 patients with more than 18,000 target lesions (2).

The article describes the modifications that are embodied in RECIST 1.1. Using cases from their own practice, the authors show how the RECIST 1.1 guidelines are applied in the radiologic imaging–based evaluation of tumor response. Current limitations of the guidelines are considered, and possibilities for their future evolution are discussed.

What Has Changed since RECIST 1.0?

Fewer Target Lesions

RECIST 1.0 specified that 10 target lesions should be measured in each patient. Using a database obtained from 16 clinical trials including over 18,000 target lesions, the RECIST 1.1 Working Group retrospectively calculated the effect of selecting one, two, three, or five lesions instead of 10. They concluded that the selection of five target lesions instead of 10, with a maximum of two target lesions per organ instead of five, did not change the result of overall response assessment (4) (Fig 2). This finding was confirmed by the results of a simulation study in which tumor response based on the measurement of five lesions was compared with that based on the measurement of 10 lesions (5).

Teaching Point

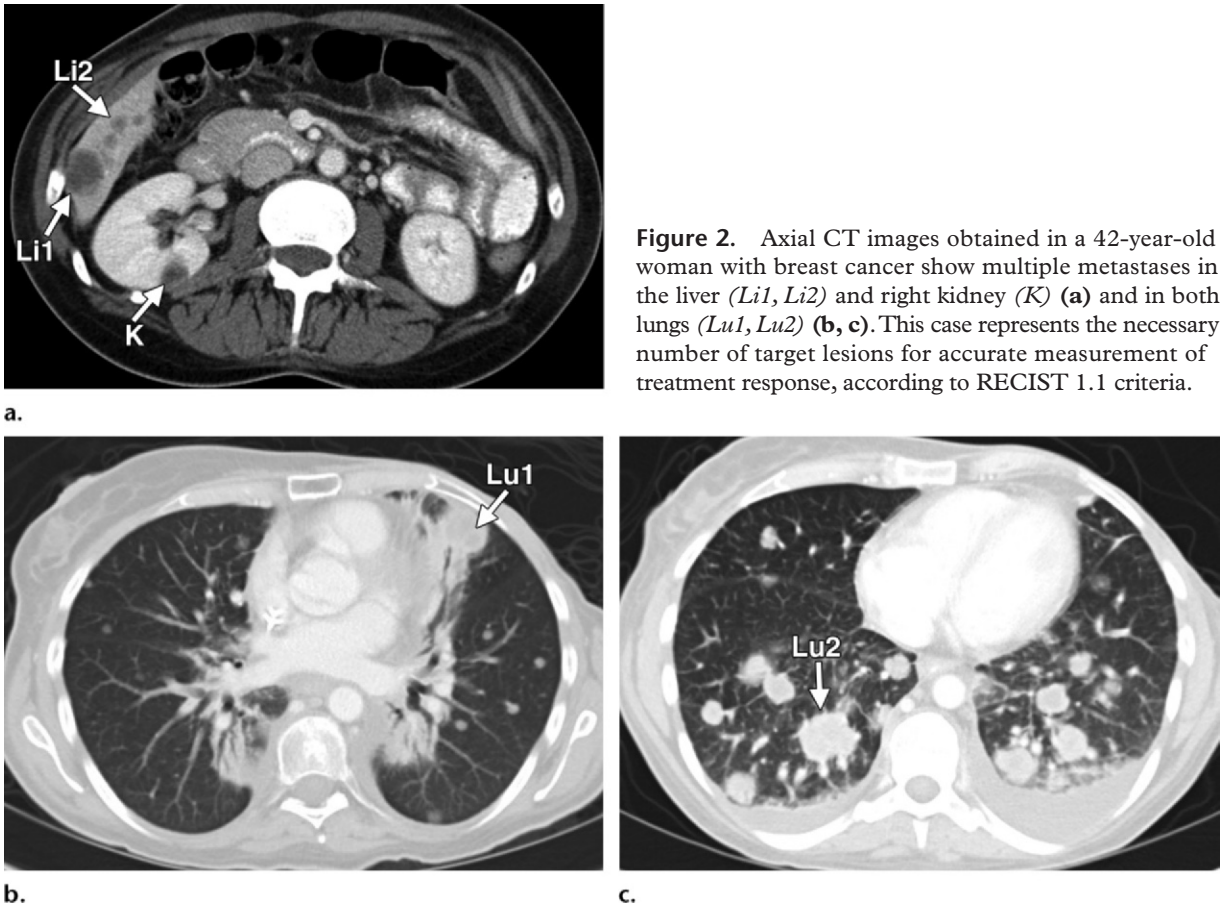


Figure 2. Axial CT images obtained in a 42-year-old woman with breast cancer show multiple metastases in the liver *(Li1, Li2)* and right kidney *(K)* **(a)** and in both lungs *(Lu1, Lu2)* **(b, c)**. This case represents the necessary number of target lesions for accurate measurement of treatment response, according to RECIST 1.1 criteria.

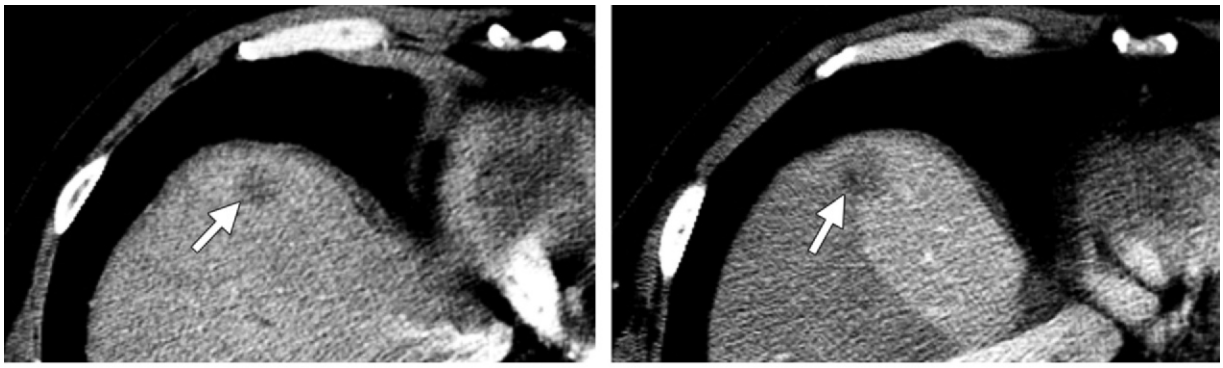


Figure 3. Axial CT images obtained at baseline **(a)** and posttreatment follow-up **(b)** in a patient with colorectal cancer demonstrate a hepatic metastasis (arrow) that increased in size from 13.2 mm at baseline to 16.8 mm at follow-up, an increase of 21%, or 3.6 mm in absolute terms. This change does not constitute progressive disease according to RECIST 1.1 criteria.

Clarification of Progressive Disease

According to RECIST 1.1, disease progression is defined in part by an absolute increase of 5 mm or more in the sum of the longest diameters of the target lesions (Fig 3). This new criterion was added to the RECIST 1.0 specification of an increase of 20% or more in the sum of the longest diameters of the target lesions (2). The new criterion is aimed at eliminating inaccurate findings of disease progression at follow-up assessments of small tumors, which can increase in size by 20% or more after treatment without that change constituting a significant increase in the tumor burden.

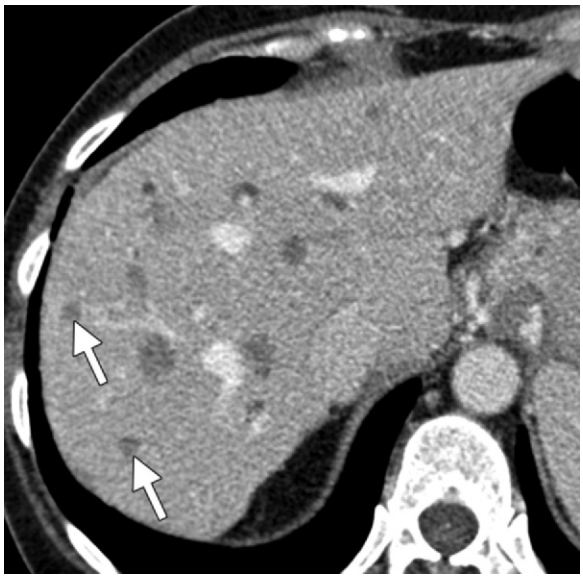


Figure 4. Axial CT image obtained after radioembolization of hepatic metastases from colorectal cancer depicts two target lesions in the liver, each with a longest diameter of less than 5 mm (arrows). According to RECIST 1.1 guidelines, such lesions should be assigned a default value of 5 mm, meaning that they are nonmeasurable.

Reporting the Size of Target Lesions That Are Too Small to Measure

Lesions may decrease in size at follow-up and still be measurable. However, depending on the thickness of the image sections, the measurement of very small lesions may not be accurate or reproducible. To prevent false results suggestive of disease response or progression because of measurement error, RECIST 1.1 recommends the use of 5 mm as a default value for reporting the size of lesions that are visible but too small to measure (Fig 4). This default value is derived from an assumed minimal CT section thickness of 5 mm and should not be altered to accord with the actual CT section thickness. However, if the radiologist can confidently provide an accurate lesion measurement, that measurement should be recorded in the radiology report, even if it is less than 5 mm (2).

Assessment of Lymph Nodes

RECIST 1.0 provided no specific recommendations for the assessment of lymph nodes, although these anatomic structures seem to merit special attention, since they may be visible at imaging even if they are not involved in a malignant process. RECIST 1.1 provides specific guidelines for nodal assessment: Lymph nodes with a short-axis diameter of less than 10 mm are considered normal, those with a short-axis diameter of at least 10 mm but less than 15 mm are considered nontarget lesions, and those with a short-axis diameter of 15 mm or more are considered target lesions. According to RECIST 1.1, complete response is defined by a reduction in the short-axis diameter of any pathologic lymph node to less than 10 mm (Fig 5) (2). Research has since shown that the short-axis measurement (in a direction perpendicular to the longest diameter) of lymph nodes is the most reliable parameter of nodal size and is likely to be more uniform throughout the body than the long-axis nodal measurement (6).

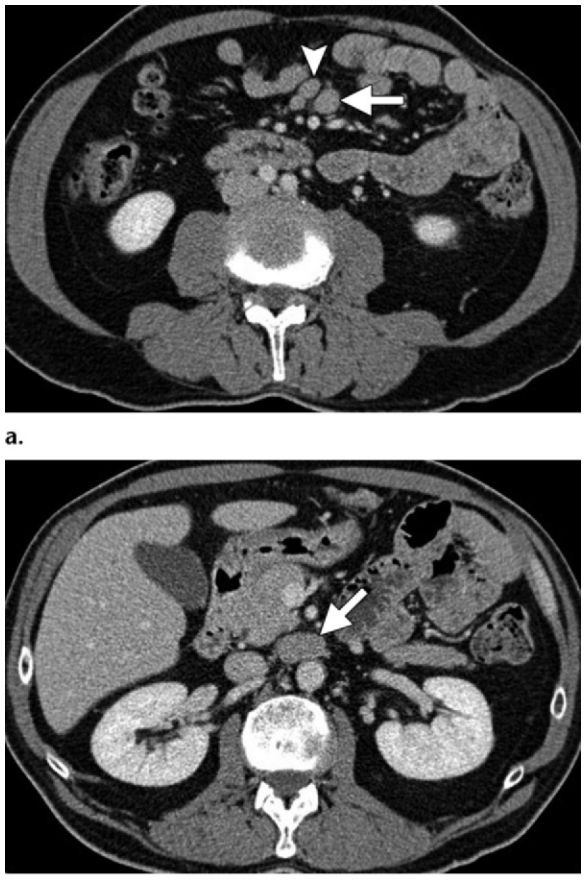
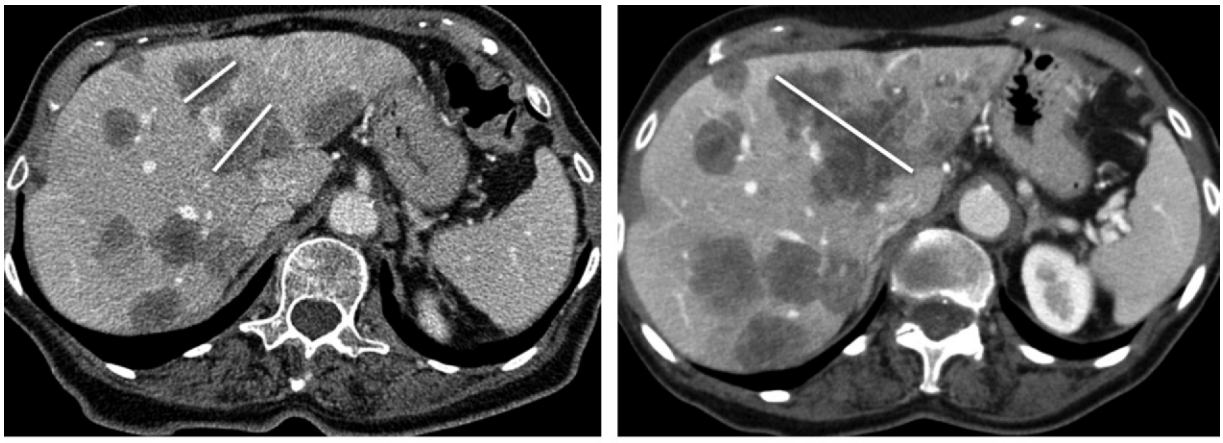


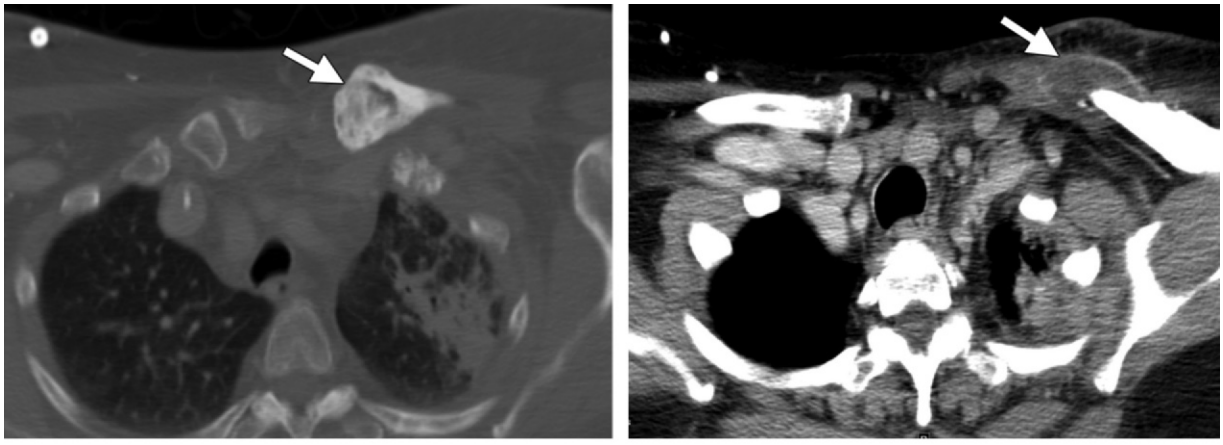
Figure 5. Normal, nontarget, and target lymph nodes in a 64-year-old man with a history of lymphoma. **(a)** Axial CT image shows a mesenteric lymph node with a short-axis diameter of less than 10 mm (arrowhead), a finding indicative of a normal node, and a larger node with a short-axis diameter of at least 10 mm but less than 15 mm (arrow), a finding indicative of a nontarget lesion. **(b)** Axial CT image obtained in the same patient shows a lymph node with a short-axis diameter of 17 mm (arrow) in the para-aortic region, a finding that meets the RECIST size criterion for a target lesion.

Teaching Point



a. b.

Figure 6. Axial CT images obtained in an 80-year-old woman show multiple hepatic metastases from colorectal cancer. Two lesions in Couinaud segment IV appeared to be separate at baseline examination **(a)** but were coalescent at the follow-up evaluation **(b)**. White lines indicate appropriate lesion diameter measurements according to RECIST 1.1 guidelines.



a. b.

Figure 7. Axial CT images obtained in a 61-year-old woman with a history of metastatic breast cancer show a sclerotic bone lesion that has enlarged part of the head of the left clavicle (arrow in **a**), a finding that does not meet RECIST criteria for a target lesion. However, the soft tissue component of the lesion (arrow in **b**) could be selected as a target for measurement.

Fragmentation and Coalescence of Lesions after Treatment

RECIST 1.0 did not include specific guidelines for measuring lesions that split or merge after treatment. RECIST 1.1 specifies that *(a)* when lesions fragment, they should be treated as separate lesions, and the longest diameters of all the fragments should be added together; *(b)* when lesions are nearly coalescent but a plane remains between them, the maximum diameter of each lesion should be measured separately and the measurements added together; and *(c)* when previously separate lesions become inseparable, the longest diameter of the entire coalescent lesion should be measured (2) (Fig 6). In this context, it is worth noting that RECIST 1.1 recommends that only lesions that are well defined be selected as targets, to ensure reproducible and accurate measurements. The largest lesions are not necessarily the best targets for measurement.

Teaching Point

Measurement of Bone Lesions and Cystic Lesions

In RECIST 1.0, bone lesions and cystic lesions were considered nonmeasurable. RECIST 1.1 specifies that bone lesions may be selected as target lesions in the following specific circumstances: *(a)* they are either lytic or mixed lytic-blastic with a soft tissue component that meets the criteria for measurability (Fig 7); *(b)* they are assessed with CT or magnetic resonance (MR) imaging. The results of bone lesion assessment with PET, bone scintigraphy, or radiography should not be used when assessing disease response (2).

Teaching Point

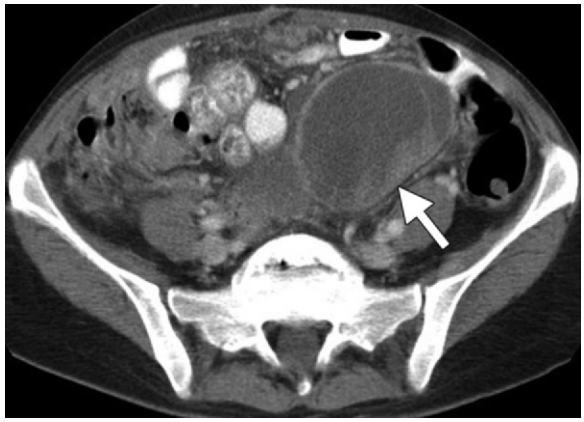
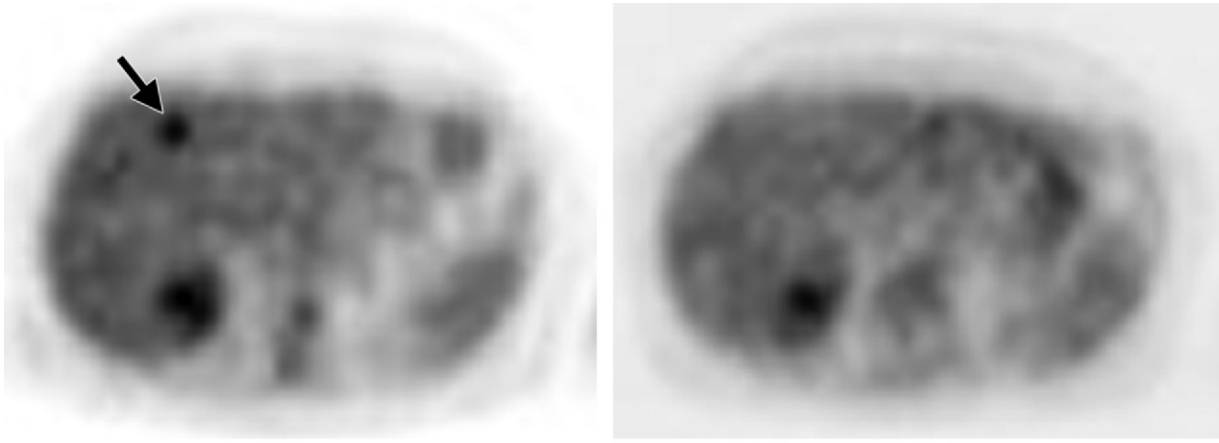


Figure 8. Axial CT image shows a complex cystic metastasis (arrow) in a 49-year-old man with a history of appendiceal carcinoma. The complex contents of this cystic metastasis make it a measurable lesion according to RECIST 1.1 criteria.



a. **b.**

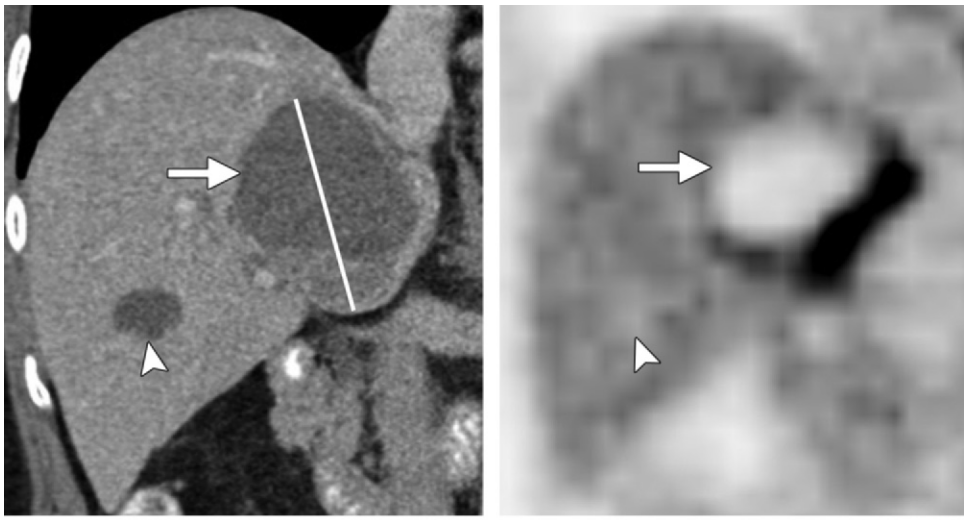
Figure 9. **(a)** Axial PET image obtained at follow-up evaluation in a patient who underwent treatment for colon cancer shows a hepatic metastasis, a new lesion not depicted on the baseline PET image **(b)**. This finding represents progressive disease according to RECIST 1.1 criteria.

Complex cystic metastases also may be measurable if they meet the RECIST 1.1 criteria (described in detail in the section "Identifying Measurable Lesions") (Fig 8). However, noncystic lesions are preferred as targets. Radiographically defined simple cysts should not be considered target lesions (2,7).

PET as an Adjunct to CT

The recent development of cytostatic anticancer drugs that induce necrosis in tumors but do not necessarily reduce the tumor size underscores the limitations of using anatomic criteria exclusively when assessing tumor response (8). The RECIST 1.1 Working Group acknowledged this limitation of RECIST 1.0 by including PET performed with fluorine 18 fluorodeoxyglucose (FDG) (which allows the differentiation of viable tumor tissue from nonviable necrotic tumor tissue) among the modalities that may be used in the assessment of disease response. RECIST 1.1 guidelines specify that a positive finding at follow-up FDG PET after a negative finding at baseline FDG PET should be considered a new lesion and evidence of progressive disease (Fig 9). Furthermore, a positive finding at follow-up FDG PET in a patient who did not undergo FDG PET at baseline imaging should be considered a new lesion and evidence of progressive disease if the finding is confirmed at follow-up CT, but not if the lesion was seen at baseline CT (2).

Teaching Point



a. b.

Figure 10. Hepatic metastases from a gastrointestinal stromal tumor after treatment with imatinib mesylate. **(a)** Contrast-enhanced CT image shows two metastatic lesions that are measurable according to RECIST 1.1 criteria: a large lesion (arrow) with a maximum diameter (straight white line) of 8 cm (baseline maximum diameter before treatment was 3 cm), and a second, smaller lesion (arrowhead) in the right lobe of the liver. **(b)** PET image shows that most of the large lesion (arrow) is photopenic, a finding that represents necrotic tissue. The smaller lesion (arrowhead) shows no radiotracer uptake. RECIST guidelines do not yet take into account the significance of such findings.

Definition of Unequivocal Progression

Unequivocal progression is defined in RECIST 1.1 by the following criteria: *(a)* in patients with measurable disease, an overall substantial enlargement of nontarget lesions that merits discontinuation of therapy, even in the presence of stable disease or partial response seen in target lesions; and *(b)* in patients without measurable disease, an overall increase in tumor burden comparable to that meeting the criteria for progressive disease in patients with measurable disease.

Confirmation of Response

According to RECIST 1.0 guidelines, a finding of complete or partial response requires a repeat assessment for verification no earlier than 4 weeks after the assessment that first indicated response (3). According to RECIST 1.1 guidelines, confirmation of a partial or complete response is required only in nonrandomized trials in which response is the primary endpoint, to ensure that an identification of response is not the result of a measurement error. In all other situations (eg, randomized trials or clinical studies in which stable disease or progression is the primary endpoint), confirmation of response is not sought because it would not add value to the interpretation of the results (2).

Issues Yet to Be Addressed in RECIST 1.1

RECIST 1.1, like RECIST 1.0, assumes that all lesions are spherical and that those that respond to treatment decrease uniformly in size. Of course, actual tumors are not perfectly spherical (9). The prolate ellipsoid formula, $L \cdot W \cdot H \cdot (\pi/6)$, where L is the length, W is the width, and H is the height, has been used to estimate the volume of anatomic structures and tumors (10,11). At the same time, current imaging modalities allow more accurate and reproducible measurements of tumor volume (9,12–14). It may therefore be possible to measure the volume instead of the one-dimensional diameter of tumors (15,16).

As mentioned earlier, the largest lesion may not always be the best target lesion. Large lesions may be partially necrotic or contain cavitations and may not decrease in size to the same extent as small lesions that respond to treatment (16). A number of new anticancer therapies produce necrosis and cystic change in solid tumors without necessarily causing tumor shrinkage (17) (Fig 10). Studies incorporating functional imaging methods such as dynamic contrast-enhanced imaging (with

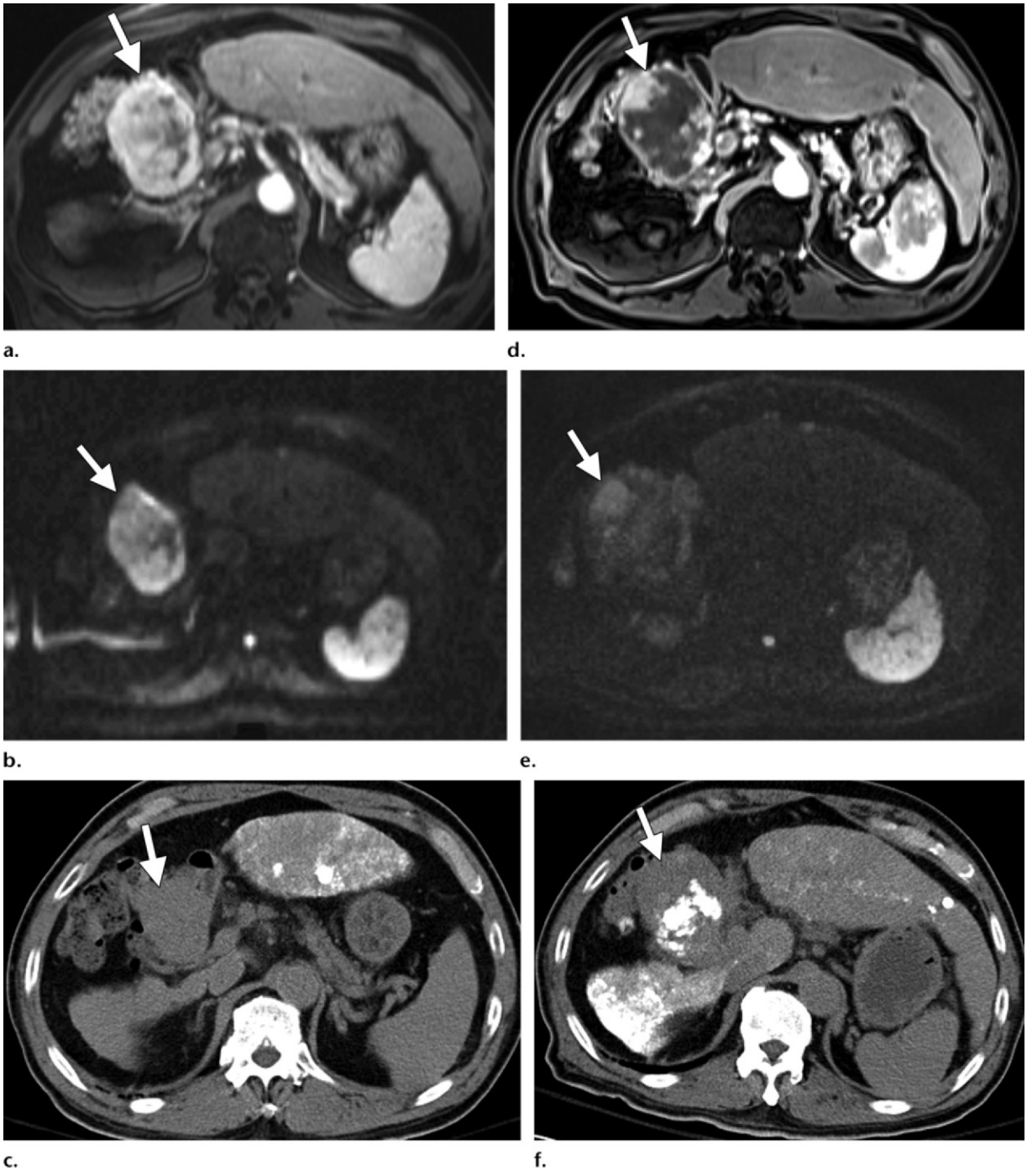
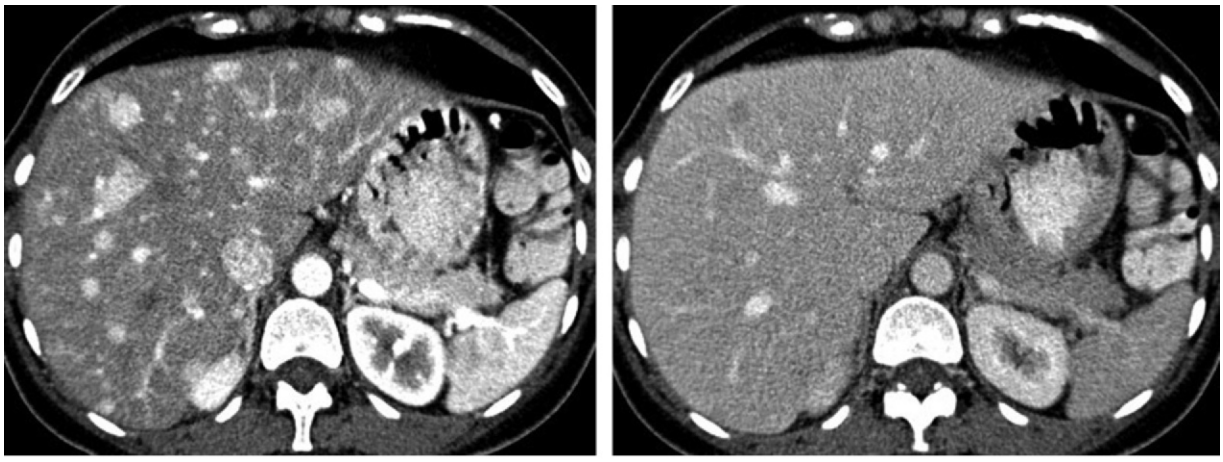


Figure 11. Images obtained in a 70-year-old man before **(a–c)** and after **(d–f)** chemoembolization for treatment of hepatocellular carcinoma show a large hepatic mass in segment IV at contrast-enhanced T1-weighted fat-suppressed gradient-echo MR imaging **(a, d)**, diffusion-weighted MR imaging (b = 800 sec/mm^2) **(b, e)**, and unenhanced CT **(c, f)**. At baseline evaluation, the lesion (arrow) appears hypervascular on the contrast-enhanced MR image **(a)** but demonstrates restricted diffusion on the diffusion-weighted image **(b)**. The diameter of the exophytic mass as depicted in **c** did not change significantly after treatment **(f)** and would be considered stable according to RECIST criteria. However, the central part of the mass does not appear enhanced in **d**, and the restricted diffusion seen in this portion of the lesion in **b** has improved after treatment **(e)**. Note the lipiodol accumulation in the lesion on the unenhanced CT scan obtained after chemoembolization **(f)**, a feature absent from the baseline CT scan **(c)**.



a. b.

Figure 12. Axial CT images obtained in a 39-year-old woman with multiple neuroendocrine tumor metastases to the liver show numerous enhancing metastases in the arterial phase **(a)** that are much less recognizable in the venous phase **(b)**.

CT or MR) or diffusion-weighted MR imaging have yielded promising results (8,18) (Fig 11). With the use of these modalities, the degree of necrosis can be evaluated as an aspect of overall disease response (18). However, this potential has not yet been realized in the RECIST guidelines.

Another shortcoming of RECIST 1.1 is that it does not specify in which phase after the administration of intravenous contrast material the measurements should be performed. A lesion may demonstrate different sizes depending on the timing of image acquisition (15) (Fig 12).

RECIST 1.0 and RECIST 1.1 both specify a number of lesions that should be measured to obtain an accurate assessment of overall disease response. It is possible that the measurement of fewer target lesions might affect the assessment result (19). Further studies are needed to verify the minimum number of lesions that may be used to determine overall disease response (19).

According to RECIST 1.1, the detection of new lesions at follow-up assessment corresponds to progressive disease. However, it is common for bone lesions to change in nature (from osteolytic to sclerotic, or vice versa) without an accompanying change in size (15). Such changes could be mistakenly attributed to healing in a lesion that was not detected at the previous imaging examination.

Using RECIST 1.1 to Evaluate Disease Response

Patients who were initially evaluated with either version 1.0 or version 1.1 of the RECIST guidelines should continue to be evaluated with the same version throughout the follow-up period. In addition, it is generally not advised that the results of studies performed by using RECIST 1.1 be compared with the results of those performed by using RECIST 1.0 (3).

Identifying Measurable Lesions

At the baseline evaluation, all lesions should be categorized as either measurable or nonmeasurable. Measurable lesions are defined as those with a longest diameter of at least 10 mm at CT with a section thickness of 5 mm or less, a longest diameter of 20 mm or more at nonhelical CT with a section thickness of more than 10 mm or at MR imaging, or a longest diameter of 20 mm or more at baseline radiography (3). Nonmeasurable lesions are those with a longest diameter of less than 10 mm. Leptomeningeal disease, ascites, pleural and pericardial effusions, inflammatory breast disease, lymphangitis cutis and pulmonis, and abdominal masses not confirmed and monitored with imaging techniques are considered nonmeasurable (3).

Choosing Target Lesions

After all lesions are categorized as either measurable or nonmeasurable, the target lesions are identified. According to RECIST 1.1 criteria, five target lesions (two per organ) (Fig 2) should be selected from among the measurable lesions (2). Although lesions with the longest diameter at baseline may reflect the overall tumor load, the largest lesions are not necessarily the best targets (20). Target lesions should be selected on the basis of their superior conspicuity (Fig 13) and the likelihood that their measurement will be reproducible at follow-up imaging evaluations (3,20). All lesions other than target lesions are considered nontarget lesions.

Measuring the Tumor Burden

At each follow-up evaluation, the sum of the longest diameters of the target lesions should be calculated and recorded. The same target lesions are to be measured at each evaluation (2).

Lesions with Enhancing Rims.—A hypervascular enhancing rim within a lesion should be included in the measurement of the longest diameter of the lesion (Fig 14). The presence of central necrosis does not alter the lesion measurement (21).

Adjacent Lesions.—Lesions should be measured separately unless they are coalescent. Target lesions should not be measured across normal tissue (non–tumor tissue) planes (22) (Fig 15).

Reporting Nontarget Lesions

It is not necessary to measure nontarget lesions, but the fact of their presence or absence should be recorded and their extent should be described in the radiology report at each evaluation time point (3).

Categorizing Disease Response

RECIST 1.1 defines four response categories: complete response, partial response, stable disease, and progressive disease. Target lesion characteristics that fulfill the criteria for each response category are summarized in Table 1. Since the measurement of nontarget lesions is not required, different response categories are applied to nontarget lesions (Table 2).

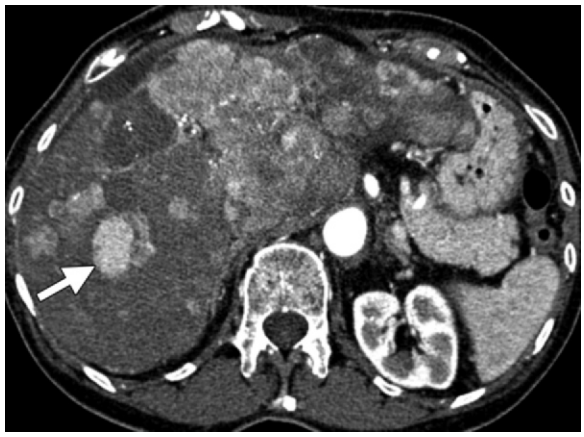


Figure 13. Axial CT scan obtained in an 82-year-old man with hepatocellular carcinoma shows a lesion with excellent conspicuity (arrow). This lesion meets the RECIST criteria for selection as a target lesion on the basis of its conspicuity and the likely reproducibility of its measurement at follow-up examinations.

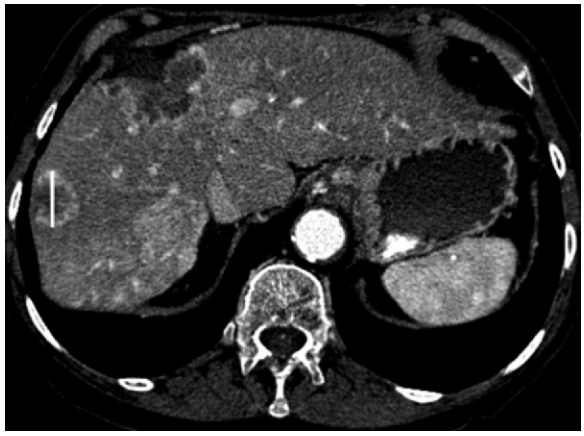
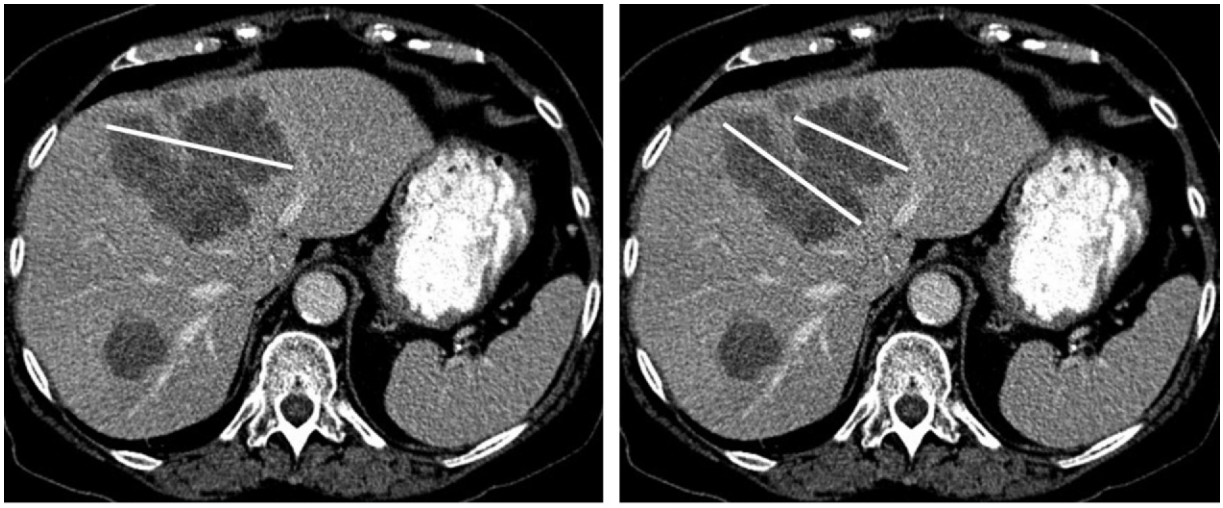


Figure 14. Axial CT image obtained in an 83-year-old woman shows a hepatocellular carcinoma with a hypervascular enhancing rim after radioembolization. When target lesions with this appearance are measured to determine their response to treatment, the enhancing rim should be included in the measurement of the longest diameter (straight white line).



a. b.

Figure 15. Axial CT images obtained in an 82-year-old woman with colon cancer metastases to the liver show incorrect **(a)** and correct **(b)** measurements of the longest diameters of two adjacent target lesions that are nearly coalescent. Such lesions should be measured separately, and normal tissue between them should not be included in the measurement of the longest diameter.

Table 1
RECIST Criteria for Categorizing Response of Target Lesions

Response Category	RECIST 1.0	RECIST 1.1
Complete response	Disappearance of all target lesions	Disappearance of all target lesions, plus reduction in short-axis diameter of pathologic lymph nodes to <10 mm
Partial response	≥30% decrease in the sum of the longest diameters of target lesions	≥30% decrease in the sum of the longest diameters of target lesions
Stable disease	Neither partial response nor progressive disease	Neither partial response nor progressive disease
Progressive disease	≥20% increase in the sum of the longest diameters in comparison with the smallest sum of the longest diameters recorded since treatment started	≥20% increase (≥5 mm absolute increase) in the sum of the longest diameters, in comparison with the smallest sum of the longest diameters recorded since treatment started

Table 2
RECIST Criteria for Categorizing Response of Nontarget Lesions

Response Category	RECIST 1.0	RECIST 1.1
Complete response	Disappearance of all nontarget lesions and normalization of tumor marker level	Disappearance of all nontarget lesions and normalization of tumor marker level; reduction of short-axis diameter of all lymph nodes to <10 mm
Noncomplete response or nonprogressive disease	Persistence of one or more nontarget lesions and/or maintenance of tumor marker level above normal limits	Persistence of one or more nontarget lesions and/or maintenance of tumor marker level above normal limits
Progressive disease	Appearance of one or more new lesions; increase in size of one or more nontarget lesions	Appearance of one or more new lesions; increase in size of one or more nontarget lesions; any increase in size of nontarget lesions resulting in increased overall tumor burden

Table 3
Categorization of Overall Disease Response with RECIST Criteria

Target Lesion Status	Nontarget Lesion Status	New Lesion Present?	Overall Response
A: RECIST 1.0 Criteria Carried Over to RECIST 1.1			
Complete response	Complete response	No	Complete response
Complete response	Noncomplete response or nonprogessive disease	No	Partial response
Partial response	Nonprogressive disease	No	Partial response
Stable disease	Nonprogressive disease	No	Stable disease
Progressive disease	Any	Yes or no	Progressive disease
Any	Progressive disease	Yes or no	Progressive disease
Any	Any	Yes	Progressive disease
B: Additional Criteria in RECIST 1.1			
Complete response	Not all evaluated	No	Partial response
Partial response	Nonprogressive disease or not all evaluated	No	Partial response
Stable disease	Nonprogressive disease or not all evaluated	No	Stable disease
Not all evaluated	Nonprogressive disease	No	Nonevaluable

The overall disease response is determined on the basis of the measurement of target lesions, evaluation of nontarget lesions, and presence or absence of new lesions. The presence of new lesions may either confirm the overall response category or alter it, depending on the categorization of response among target and nontarget lesions (2,3). Once the appropriate response categories for target and nontarget lesions have been identified, the overall response can be determined by using the guidelines in Table 3 (2,3).

Conclusions

RECIST 1.1 addresses many of the shortcomings of RECIST 1.0. However, it does not address all the issues that have arisen with the development of new cytostatic and local-regional therapies. With data on volumetric tumor measurement and molecular imaging now emerging, it is expected that functional imaging modalities and volumetric measurement methods will be incorporated in the next RECIST update.

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Radiologic Assessment of Response to Therapy: Comparison of RECIST Versions 1.1 and 1.0

Hamid Chalian, MD • Hüseyin Gürkan Töre, MD • Jeanne M. Horowitz, MD • Riad Salem, MD • Frank H. Miller, MD • Vahid Yaghmai, MD

RadioGraphics 2011; 31:2093–2105 • **Published online** 10.1148/rg.317115050 • **Content Codes:** CT NM OI

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Using a database obtained from 16 clinical trials including over 18,000 target lesions, the RECIST 1.1 Working Group retrospectively calculated the effect of selecting one, two, three, or five lesions instead of 10. They concluded that the selection of five target lesions instead of 10, with a maximum of two target lesions per organ instead of five, did not change the result of overall response assessment (4) (Fig 2).

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RECIST 1.1 provides specific guidelines for nodal assessment: Lymph nodes with a short-axis diameter of less than 10 mm are considered normal, those with a short-axis diameter of at least 10 mm but less than 15 mm are considered nontarget lesions, and those with a short-axis diameter of 15 mm or more are considered target lesions.

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RECIST 1.1 specifies that *(a)* when lesions fragment, they should be treated as separate lesions, and the longest diameters of all the fragments should be added together; *(b)* when lesions are nearly coalescent but a plane remains between them, the maximum diameter of each lesion should be measured separately and the measurements added together; and *(c)* when previously separate lesions become inseparable, the longest diameter of the entire coalescent lesion should be measured (2) (Fig 6).

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In RECIST 1.0, bone lesions and cystic lesions were considered nonmeasurable. RECIST 1.1 specifies that bone lesions may be selected as target lesions in the following specific circumstances: *(a)* they are either lytic or mixed lytic-blastic with a soft tissue component that meets the criteria for measurability (Fig 7); *(b)* they are assessed with CT or magnetic resonance (MR) imaging. The results of bone lesion assessment with PET, bone scintigraphy, or radiography should not be used when assessing disease response (2).

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RECIST 1.1 guidelines specify that a positive finding at follow-up FDG PET after a negative finding at baseline FDG PET should be considered a new lesion and evidence of progressive disease (Fig 9). Furthermore, a positive finding at follow-up FDG PET in a patient who did not undergo FDG PET at baseline imaging should be considered a new lesion and evidence of progressive disease if the finding is confirmed at follow-up CT, but not if the lesion was seen at baseline CT (2).