What Is New in Imaging-Based Tumour Response Assessment:
From RECIST to LI-RADS Treatment Response

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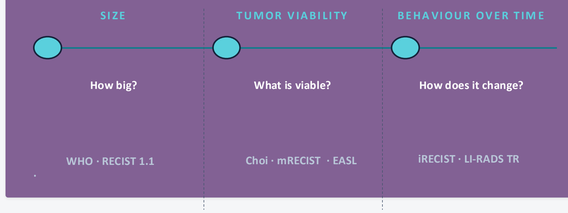
1 Why tumor response assessment criteria is changing

Classic objective tumor response criteria equate
response with target lesion disappearance or shrinkage.

However, **modern therapies do not always shrink tumors:**
✓ locoregional and antiangiogenic treatments can **reduce tumor** viability without size change;
✓ immunotherapy can transiently **enlarge** lesions before regression (= **pseudoprogression**);
✓ radiation-treated tumors keep **enhancing for months** as they slowly involute.

2 Three eras of imaging-based tumor assessment criteria



3 RECIST 1.1 — size matters

✓ up to **5** (easy to measure) **target lesions** (≤ 2 per organ)
✓ measure their longest diameters (shortest in lymph nodes > 15 mm)
✓ compare to the **sum of the longest diameters** (= SLD)
✓ don't forget non-target lesions (*i.e.* ascites, pleural effusion, lymph nodes 10-15 mm)

CR — **complete response** = disappearance of all target lesions; nodes < 10 mm short axis

PR — **partial response** ≥ 30% decrease in the SLD

PD — **≥ progressive disease** = 20% (and ≥ 5 mm) increase, or any new lesion

SD — **stable disease** = neither PR nor PD

Major limitation = it only measures size

✗ ignores enhancement changes or necrosis
✗ mistakes immune flare or post-radiation transitional enlargement for progression

4 Thinking beyond size

mRECIST — 2010

✓ use in **HCC**
✓ measure **only arterially enhancing (viable) tumor, not whole-lesion size!**
✓ the key adaptation for HCC after locoregional treatment
✓ malignant lymph nodes > 20 mm

✓ conceptually similar to EASL criteria (2000) – two-dimensional measurements

CR — **complete response** = disappearance of any intratumoral arterial enhancement in all target lesions, no new lesions

PR — **partial response** ≥ 30% decrease in the sum of diameters of viable (arterially enhancing) target lesions

PD — **≥ progressive disease** = 20% increase in the sum of diameters of viable target lesions, or any new lesion

SD — **stable disease** = neither PR nor PD

Choi — 2007

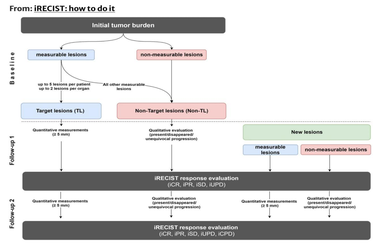
✓ use in **GIST (treated with imatinib)**
✓ measure **TUMOR DENSITY (HU)**
✓ captures tumor response that RECIST misses when assessing only size
✓ tumors can increase in size due to internal hemorrhage, necrosis or myxoid degeneration

CR = disappearance od all lesions, no new lesions
PR = ≥10% size decrease or ≥15% density drop on CT

5 Immune-adapted criteria

iRECIST — 2017

adds **iUPD** (unconfirmed progressive disease) and **iCPD** (confirmed PD) — **progression must be reconfirmed at 4–8 weeks**



6 LI-RADS TR v 2024

✓ ACR standard for reporting HCC after locoregional therapy is
✓ now **split into two mechanism-specific cores**, because irradiated and non-irradiated tumours involute differently on imaging.

Non-radiation core ABLATION · TAE/TACE · RESECTION	**Radiation core** TARE / Y-90 · SBRT
NONVIABLE **Response** No mass-like enhancement → **SURVEILLANCE**	**NONVIABLE** **Response** No mass-like enhancement. → **SURVEILLANCE**
EQUIVOCAL **Indeterminate** Uncertain presence of morphology of mass-like enhancement. → **RE-IMAGE 3 MO**	**NON-PROGRESSING** **New category** Mass-like enhancement that is stable or decreasing over time. → **WATCH & WAIT**
VIABLE **Residual tumour** Mass-like enhancement, any degree / any phase. → **TREAT**	**VIABLE** **Residual / regrowth** Mass-like enhancement that is new or increasing over time. → **TREAT**

Key changes (from v. 2017):

1. Two cores split by mechanism — **non-radiation vs radiation.**
2. Viability simplified to a **single feature**: **mass-like enhancement** (any degree, any phase). Washout and "enhancement like pre-treatment" dropped.
3. Radiation core replaces *Equivocal* with **Nonprogressing** — persistent post-radiation enhancement no longer over-called as viable.
4. Optional **MRI ancillary features** (restricted diffusion; mild–moderate T2) may upgrade to Viable
5. Non-radiation core now also covers **surgical resection margins**; new CEUS TRA core added.

88% → 37%

✓ After Y-90, v2017 called **88%** of lesions viable;
✓ v2024 re-labels most as non-progressing,
✓ leaving **37%** truly viable — with markedly worse survival (median OS **12 vs 46 months**)

7 At a glance

Criteria	Year	When to use?	Basis of treatment response assessment
WHO	1981	Solid tumours	**size — two-dimensional**
RECIST 1.1	2009	Solid tumours (trials)	**size — sum of diameters**
Choi	2007	GIST / imatinib	**viability — CT density**
mRECIST	2010	HCC / LRT	**viability — enhancement**
EASL	2012	HCC	**viability — enhancement**
iRECIST	2017	Immunotherapy	**behavior — confirmed PD**
LI-RADS TR v2024	2024	HCC after LRT	**viability × interval behaviour**

8 Take-home

✓ imaging- based assessment of tumor response reading has moved from tumor **size** → tumour **viability** → tumour **behaviour over time;**
✓ enhancement-based (**mRECIST**) and immune-adapted (**iRECIST**) criteria correct the failures of size-only metrics;
✓ use iRECIST as the primary criteria for combination therapies;
✓ **LI-RADS TR v2024** is the current HCC-after-LRT ACR standard featuring mechanism-specific dual cores, single-feature viability, and a radiation **non-progressing** category.

References
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