City of Hope

THIRD ANNUAL

ISSPP Congress 2022

International Society for the Study of Pleura and Peritoneum

PERITONEAL ASSESSMENT

Modified RECIST Criteria for Peritoneal Response

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Disclosures

- I do not have any relevant financial relationships.

This presentation and/or comments will provide a balanced, non-promotional, and evidence-based approach to all diagnostic, therapeutic and/or research related content.

Introduction

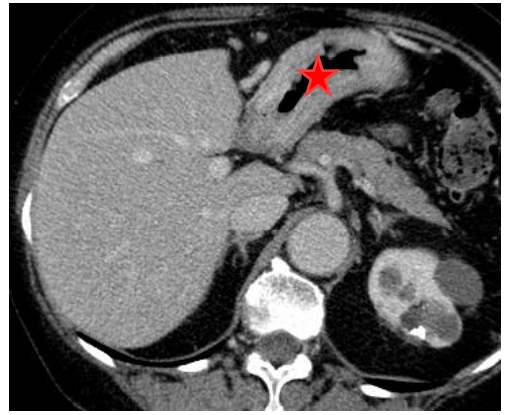
- Treatment response assessment by imaging plays a vital role in solid tumors management
- Evaluating changes is crucial in standard care and therapeutic clinical trials
- Morphological evaluation
    - RECIST 1.1 is the reference standard imaging response criteria
- However, RECIST 1.1 may not address the issues of peritoneal metastases
    - Functional evaluation is not ready with many weaknesses

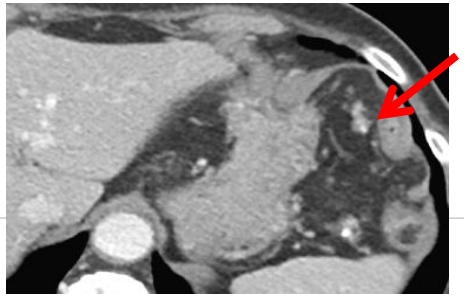
➡ Need for modified RECIST criteria dedicated to peritoneal metastases

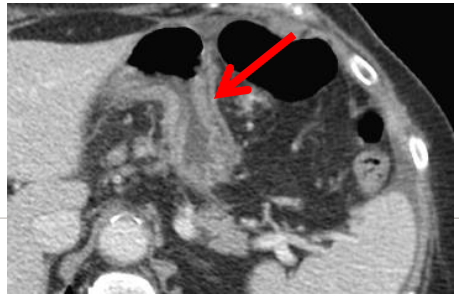
E.A. Eisenhauer et al. European J. Cancer 2009 Tseng J Lancet Oncol 2017 Ruchalski et al. EJR 2022 Kepenekian. Nat Rev Clin Oncol. 2022

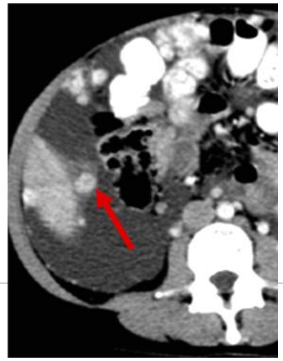
Shortcomings of RECIST 1.1 for PM evaluation

- Target lesion
  - Definition: Size ≥ 1 cm, ≥ 1.5 cm if lymph node
    Maximum of 5 targets and up to 2 per organs
  - Primary lesion: often hard to measure
  - Peritoneal metastases specificities
    - Rarely nodular or well-defined
    - Difficult to follow peritoneal target lesion
      (ascites disappearance and mobility)









E.A. Eisenhauer et al. European J. Cancer 2009

Follow-up by the sum of target lesions

RECIST 1.1. Overall Response Tables

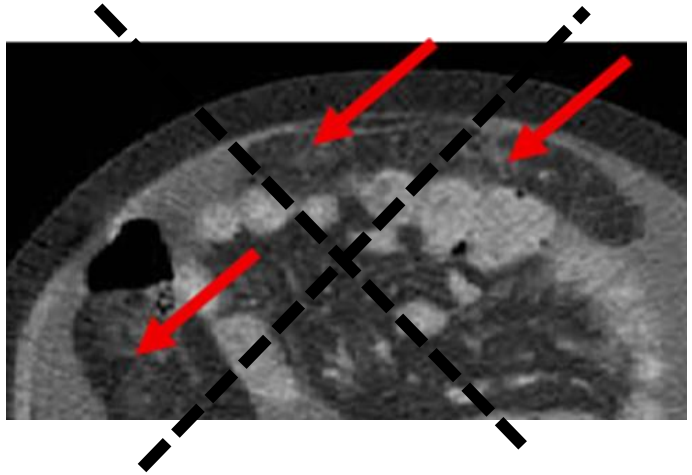
	Target Lesion	Nontarget Lesion	New Lesion	Overall Response
	CR	CR	No	CR
-100%	CR	Non-CR/non-PD	No	PR
	CR	NE	No	PR
-30%	PR	Non-PD or NE	No	PR
	SD	Non-PD or NE	No	SD
	Not all evaluated	Non-PD	No	NE
+20%	PD	Any	Yes or No	PD
	Any	PD	Yes or No	PD
	Any	Any	Yes	PD

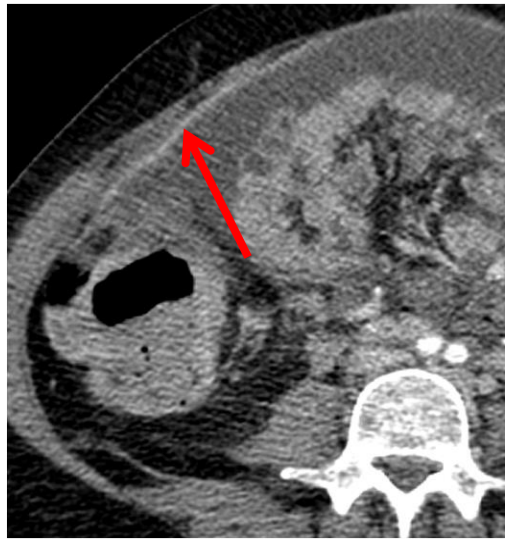
CR – complete response
PR – partial response
SD – stable disease
PD – progressive disease
NE – non-evaluable

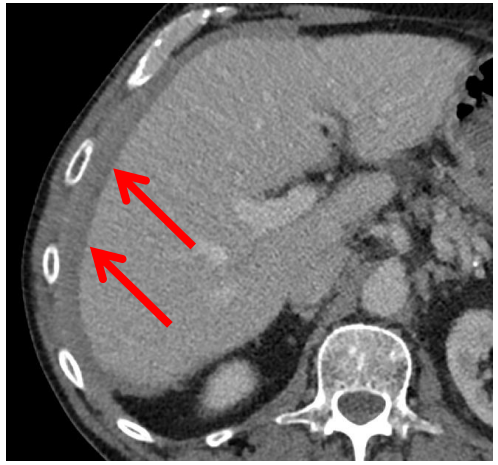
Source: Perceptive Informatics, www.recist.com.

Shortcomings of RECIST 1.1 for PM evaluation

- Non target lesion
  - Peritoneal thickening
  - ~~Fat stranding~~
  - ~~Ascites~~







Follow-up : increase or disappearance

RECIST 1.1. Overall Response Tables

Target Lesion	Nontarget Lesion	New Lesion	Overall Response
CR	CR	No	CR
CR	Non-CR/non-PD	No	PR
CR	NE	No	PR
PR	Non-PD or NE	No	PR
SD	Non-PD or NE	No	SD
Not all evaluated	Non-PD	No	NE
PD	Any	Yes or No	PD
Any	PD	Yes or No	PD
Any	Any	Yes	PD

CR – complete response
PR – partial response
SD – stable disease
PD – progressive disease
NE – non-evaluable

Source: Perceptive Informatics, www.recist.com.

Modified RECIST 1.1 for pleural mesothelioma

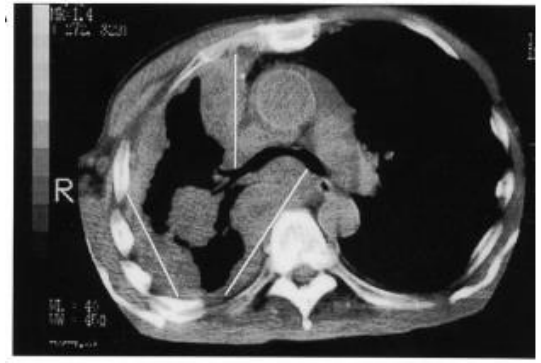
Original article

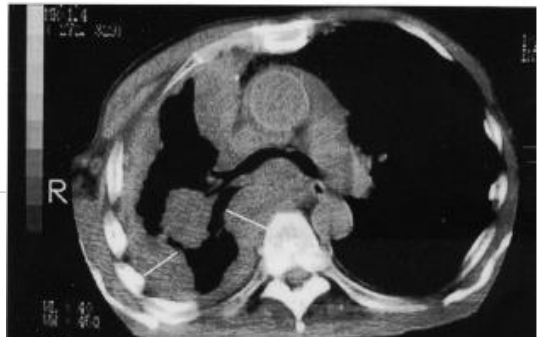
Annals of Oncology 15: 257–260, 2004
DOI: 10.1093/annonc/mdh059

Modified RECIST criteria for assessment of response in malignant pleural mesothelioma

M. J. Byrne[1]* & A. K. Nowak[1,2]

RECIST 1.1 criteria could be applied differently by different investigators





Lines represent suggested measurement sites perpendicular to fixed structures, chest wall and vertebral column, according to Modified RECIST criteria

Original response criteria RECIST 1.1	Modified RECIST criteria				
	CR	PR	SD	PD	Total
CR	0	0	0	0	0
PR	0	72	5	4	81
SD	0	11	93	1	105
PD	0	1	2	47	50
Total	0	84	100	52	236

CR - complete response
PR - partial response
SD - stable disease
PD - progressive disease

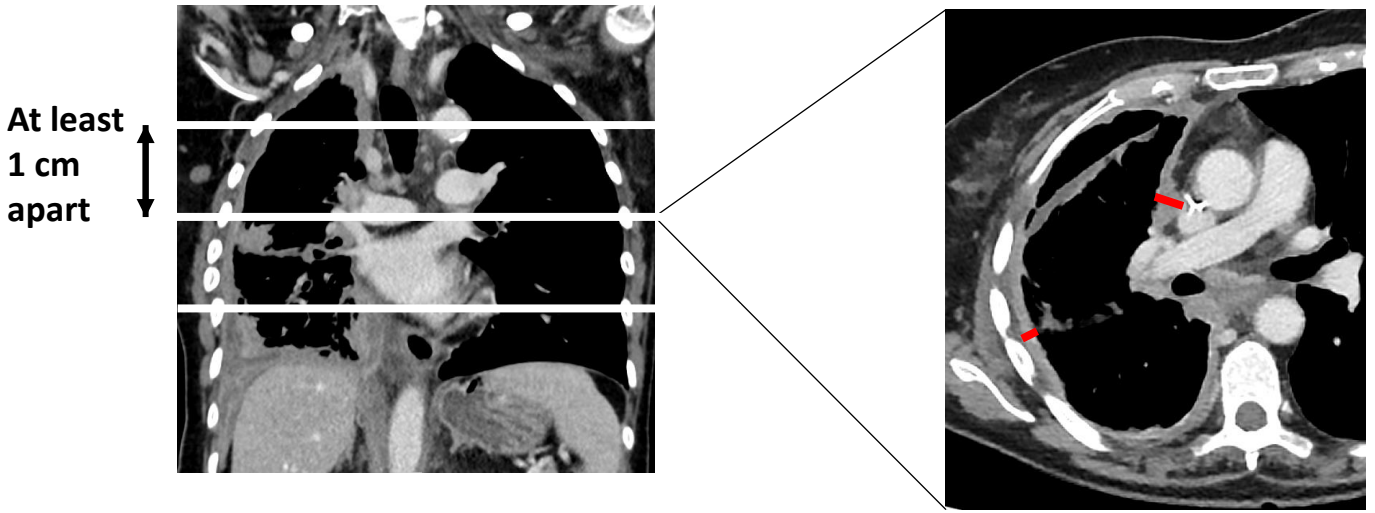
Modified RECIST 1.1 for pleural mesothelioma

ORIGINAL ARTICLE

Revised Modified Response Evaluation Criteria in Solid Tumors for Assessment of Response in Malignant Pleural Mesothelioma (Version 1.1)

Samuel G. Armato III, PhD,[a,*] Anna K. Nowak, MBBS, FRACP, PhD[b]

Journal of Thoracic Oncology 2018



- Pleural thickness of **at least 7 mm in short axis thickness** and **up to two locations at three separate axial levels** along the pleura
- **Up-to-six measurement** sites
- Target thickening must be the same throughout the time evaluation: **need of key images for reproducible site and type of measurement**

Sum of pleural measurements
⇒ **single diameter**
To **determine categorical response by mRECIST** following the same categorical response criteria as RECIST 1.1

Modified RECIST 1.1 for pleural mesothelioma

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Journal of Thoracic Oncology 2018

- Follow-up measurement of all sites that reduce in size below the minimum measurable size, **a default value of 2 mm** (which deviates from RECIST 1.1) **if tumor is present at a site but is too thin to measure**
- **Pleural disease measurable but not used** as a measurement site **or considered to be non-measurable** might individually be identified as **non-target lesions**

Modified RECIST 1.1 for pleural mesothelioma

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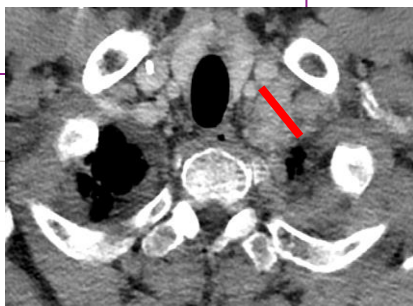
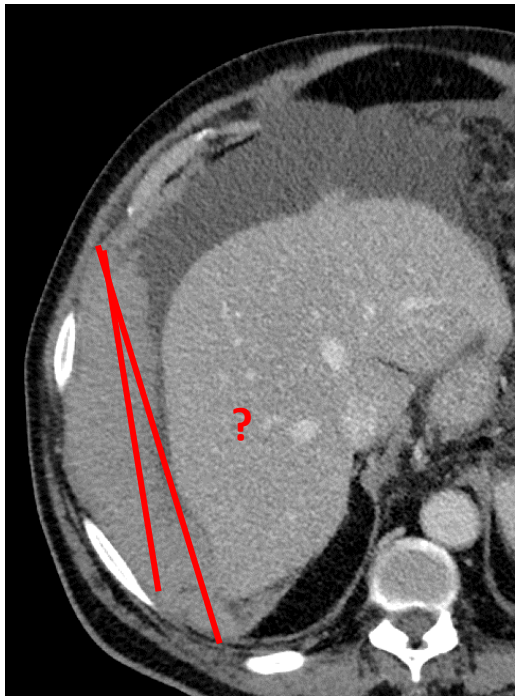
Journal of Thoracic Oncology 2018

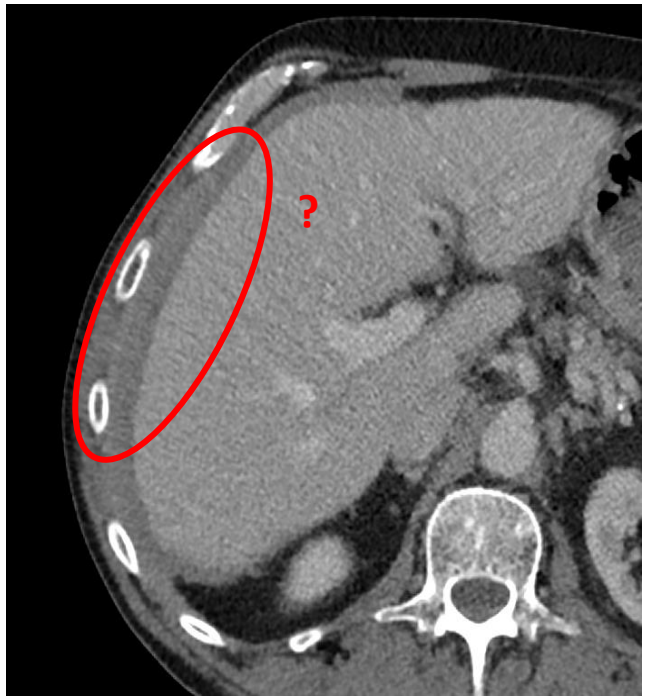
- PD (> 20%) also requires an increase of at least 5 mm over the nadir summed measurement per RECIST 1.1
- PD also in case of an unequivocal new non-pleural lesion or an unequivocal new focus of pleural thickening that exceeds the minimum measurable size
- **The presence of measurable non-pleural lesions is to be handled consistent with RECIST 1.1**

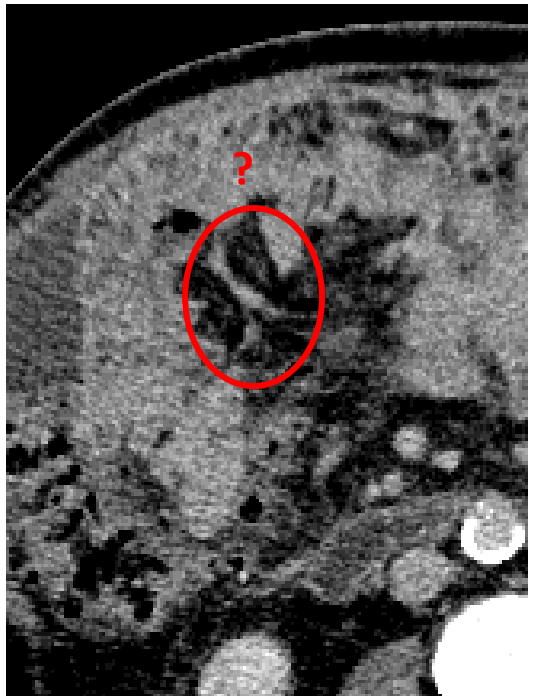


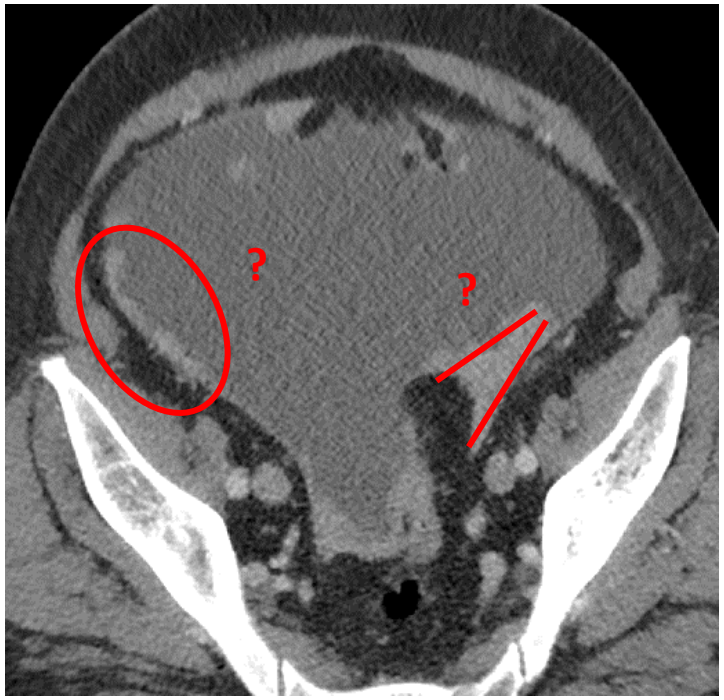
Modified RECIST 1.1 for peritoneal metastases

PM evaluation may show the same limitations as for pleural mesothelioma



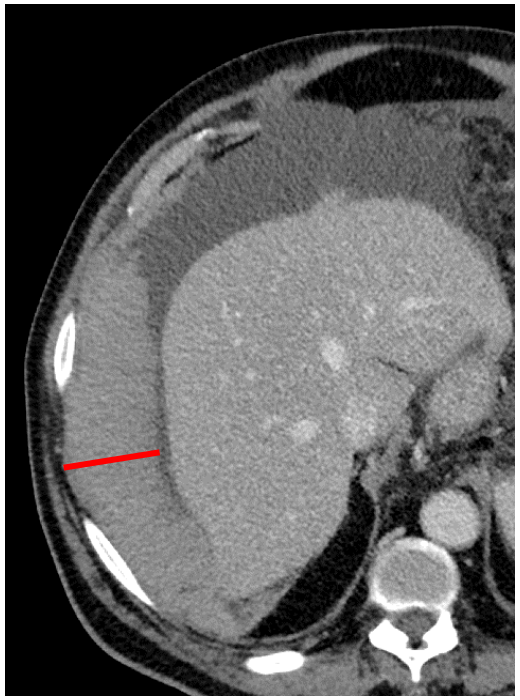
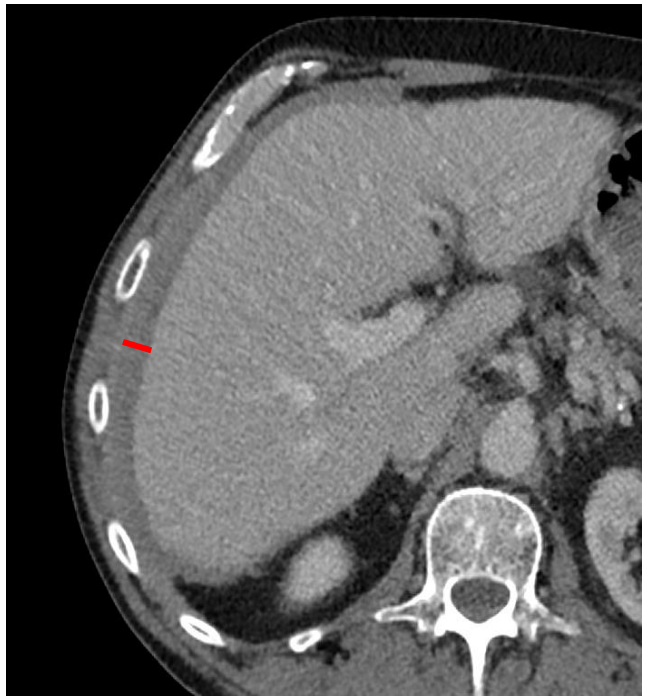
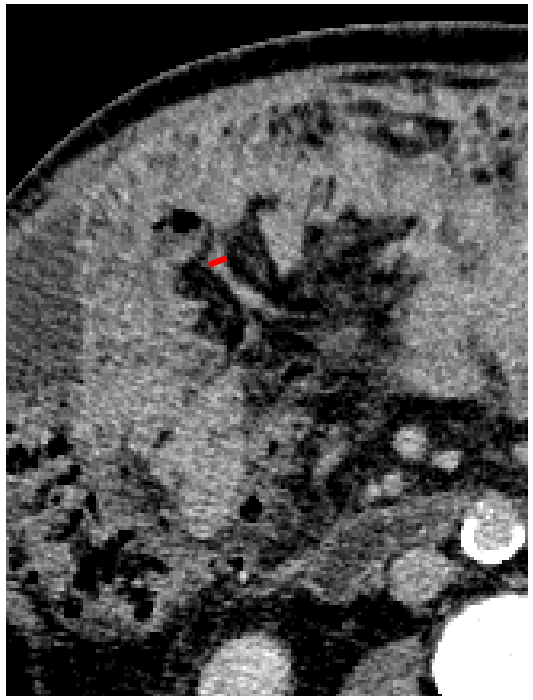
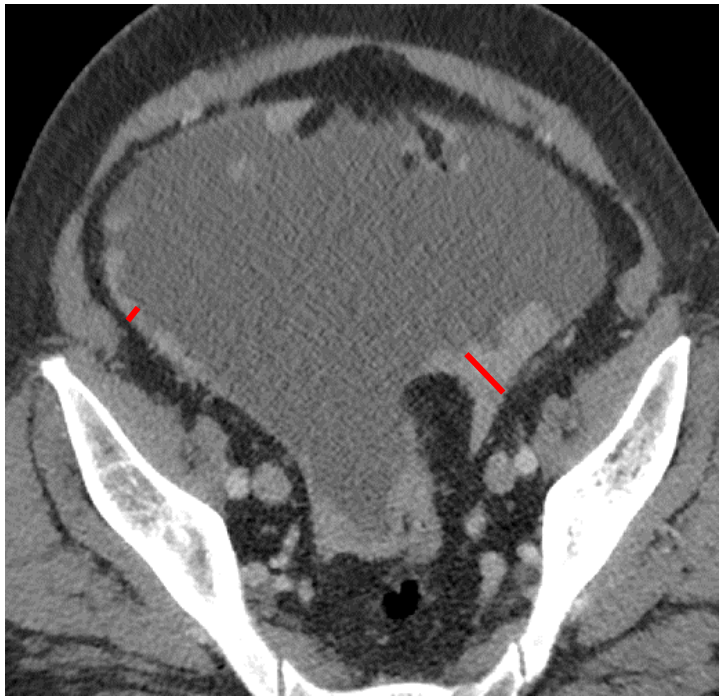






Modified RECIST 1.1 for peritoneal metastases

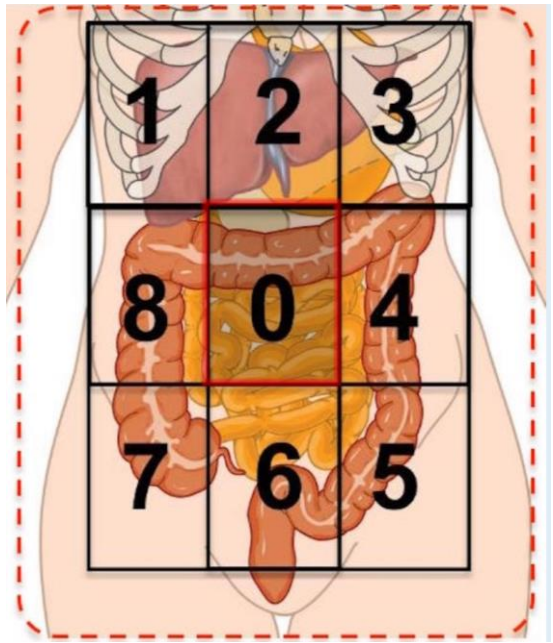
PM evaluation may show the same limitations as for pleural mesothelioma

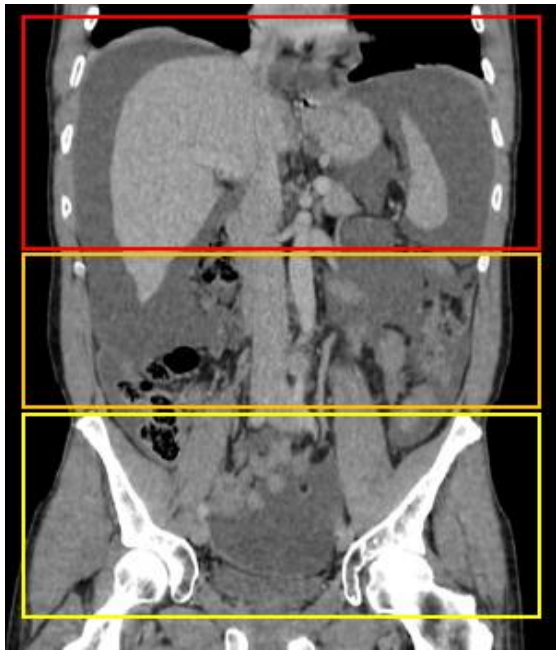





Modified RECIST 1.1 for peritoneal metastases

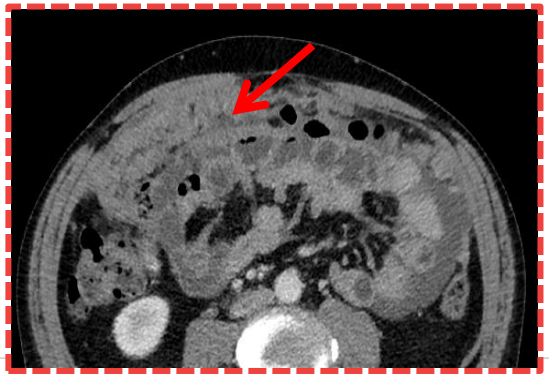
- Proof of concept
- Definition of 3 levels and some dedicated rules
  - Measurement site selection
    - **Up to two locations at three separate axial levels**
    - **At least 2 measures = from 2 to 6 measures**

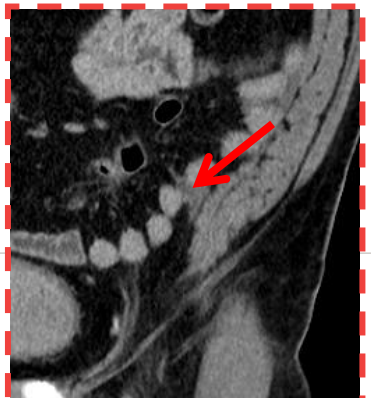
Section must be at least 3 cm apart

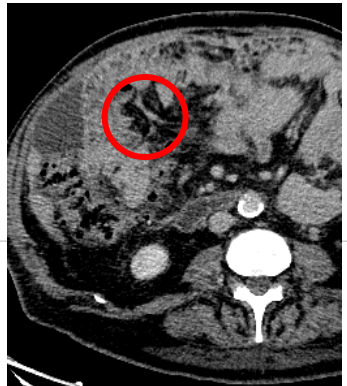


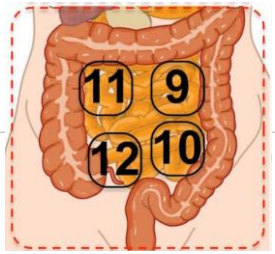


http://www.e-promise.org



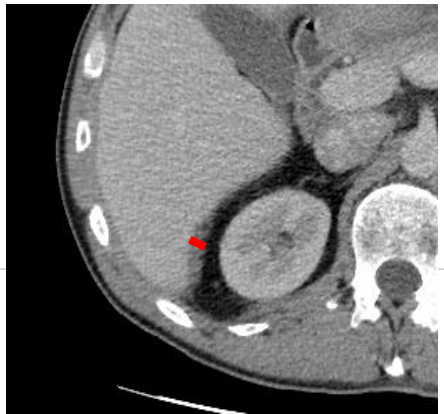


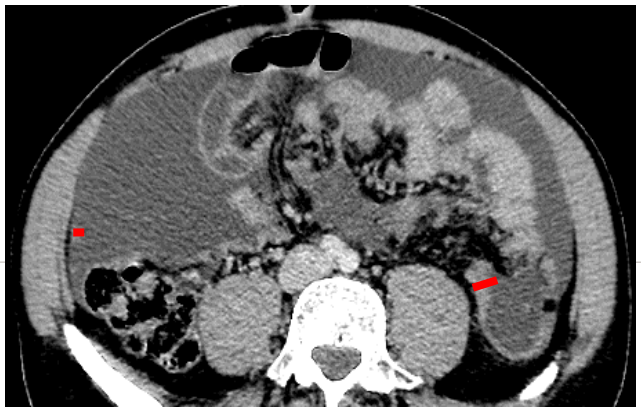


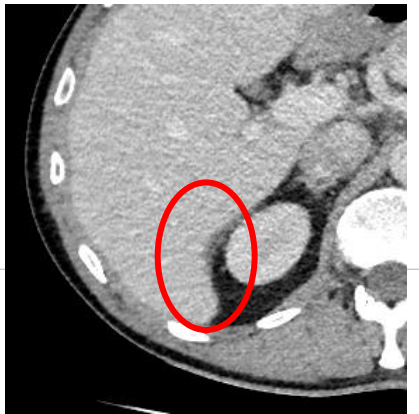


Modified RECIST 1.1 for peritoneal metastases

- Proof of concept
- Definition of 3 levels and some dedicated rules
  - Measurement site selection
    - Peritoneal thickness of **at least 5 mm** in short axis thickness
    - Measure **perpendicular to the peritoneal surface**
    - At the level of **anatomic landmarks** to facilitate identification of matched sites in subsequent scans
    - Follow-up : lesions too small to measure are assigned a default value of 2 mm







Modified RECIST 1.1 for peritoneal metastases

- Example: Epithelioid malignant peritoneal mesothelioma

50 year-old man

August 2017 : diagnosis of epithelioid mesothelioma

Sept - Dec 2017 : **bidirectionnal chemotherapy** combining systemic chemotherapy (Cisplatin + Pemetrexed) and PIPAC (cisplatin and doxorubicine)

PIPAC 1 : PCI 27, non resectable due to small intestine invasion
PIPAC 5 : PCI 22, **incomplete small intestine exploration**

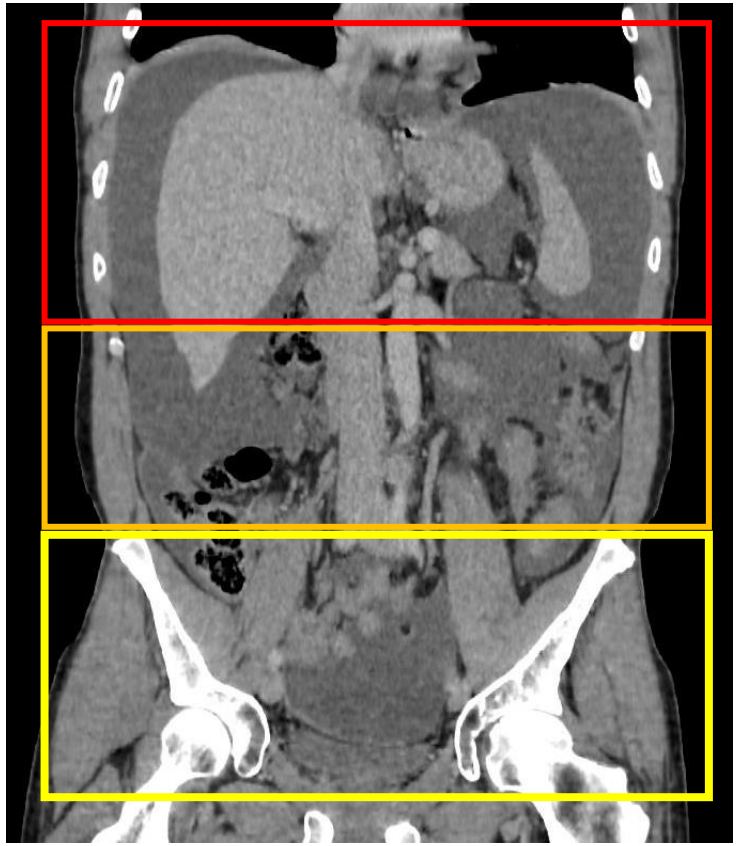
May 2018 : **failure of CRS** : too important small intestine invasion

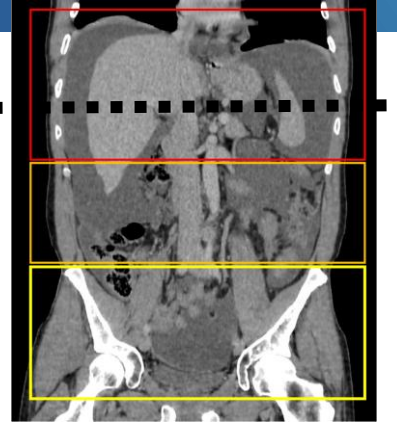
Back to bidirectionnal chemotherapy

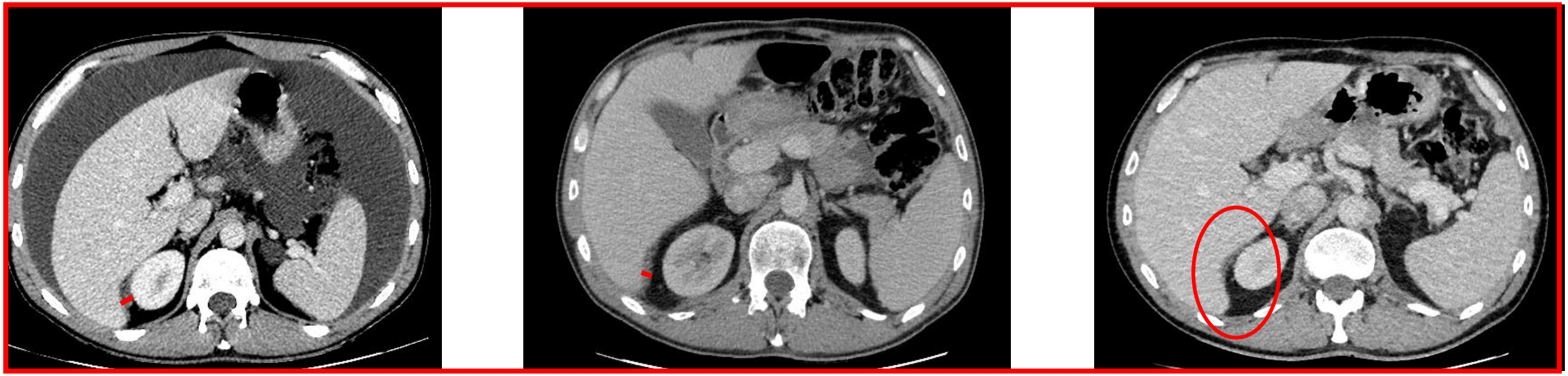
PIPAC 6 : PCI 22
PIPAC 8 (may 2019) : 20 but **incomplete exploration**

July 2019 : CRS (CC1) + HIPEC cisplatin – doxorubicne

September 2022 : **alive without detectable recurrence**





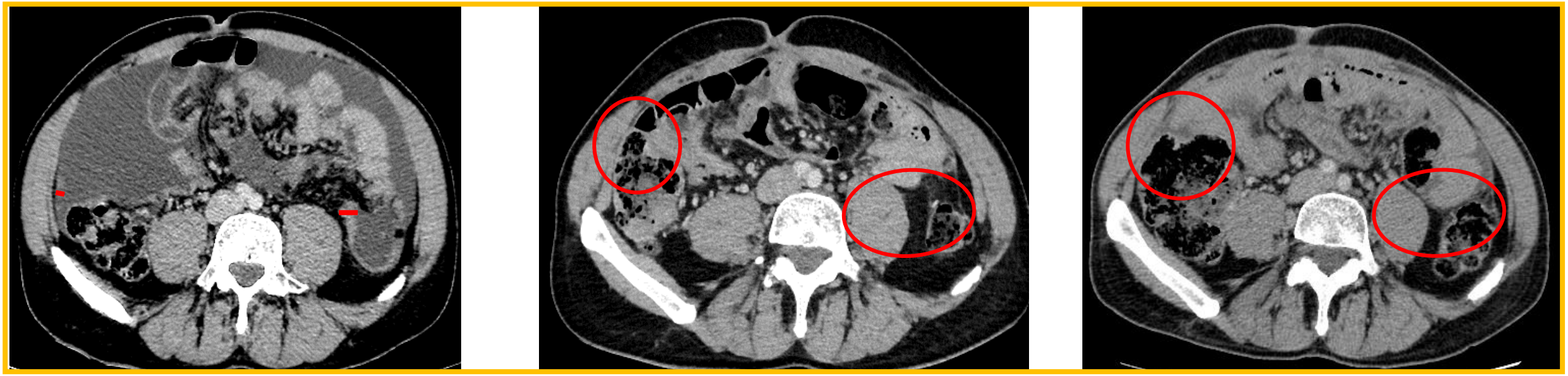


August 2017 Baseline CT

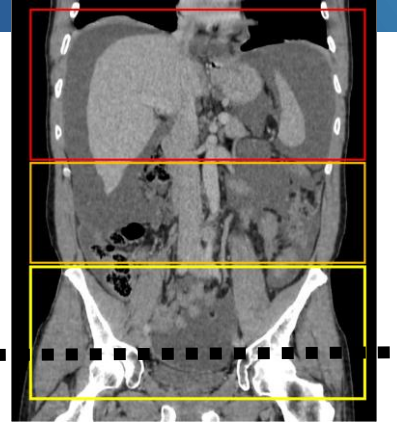
April 2018

June 2019

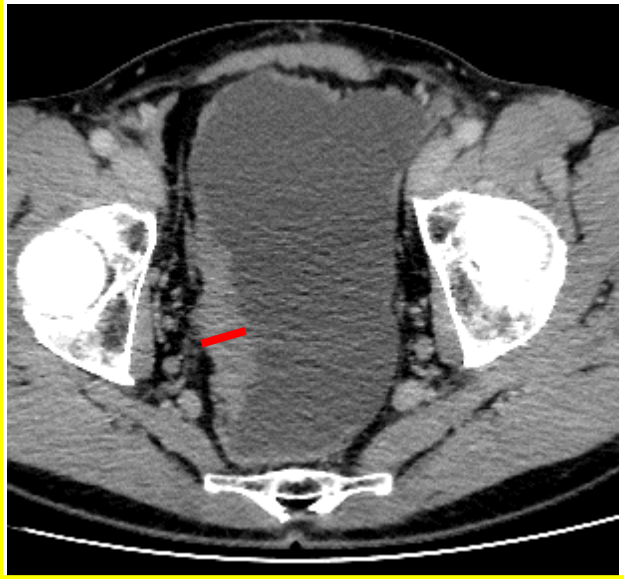
5 + 0	5 + 0	2 + 0

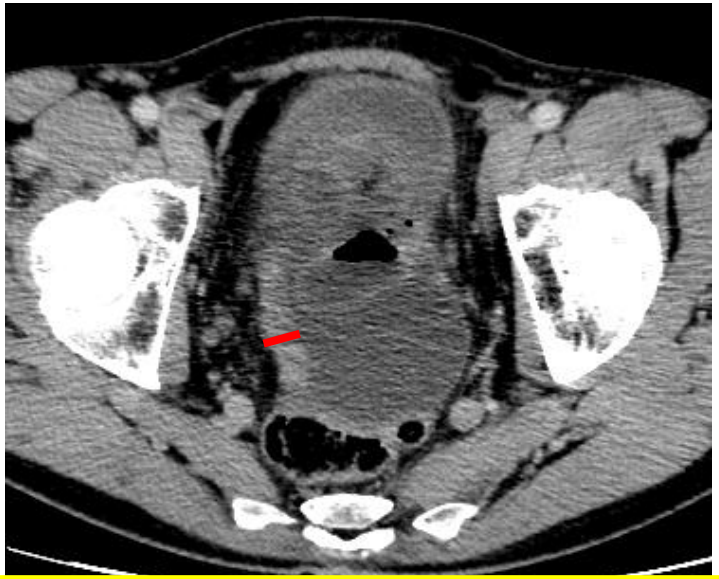


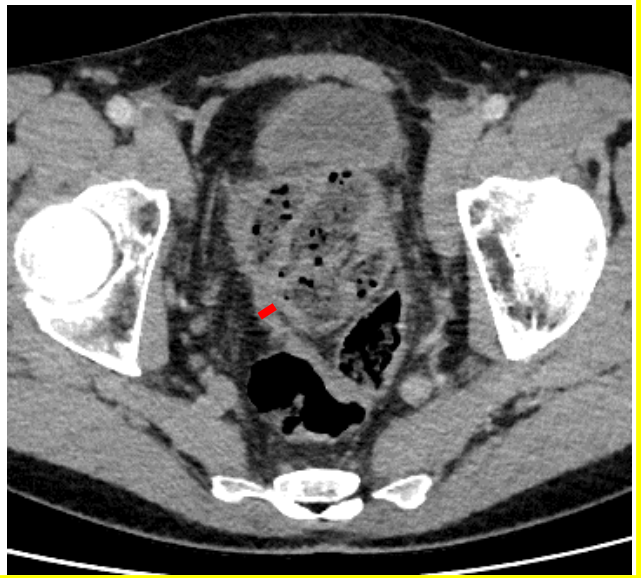
August 2017 Baseline CT	April 2018	June 2019
5 + 0	5 + 0	2 + 0
6 + 9	0 + 0	0 + 0



RECIST 1.1: Non-CR/Non-PD
- No target lesion
- Only non target lesion







August 2017 Baseline CT	April 2018	June 2019
5 + 0	5 + 0	2 + 0
6 + 9	0 + 0	0 + 0
21 + 0	10 + 0	6 + 0
= 41 mm	= 15 mm	= 8 mm
	- 63%	- 80%

Conclusion

mRECIST for peritoneal metastases is a promising perspective to be evaluated:

- Being dedicated to peritoneum that is a unique and singular organ
- Allowing tumor measurement and response assessment across the next generation of clinical trials in almost all types of peritoneal malignancy
- Can be adapted for immunotherapy and iRECIST
- Particularly suitable for peritoneal MRI exploration