Colorectal liver metastases; imaging strategies

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Maarten van Leeuwen

Radiologie, UMCU

Imaging of CRLM

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- Medical oncology, Surgical oncology, or Radioembolisation?
- UMCU guideline imaging GI and HPB tumors
- CT/MRI/ECHO/PET?
- CT quality control
- RECIST and developments in tumor quantification
- Summary

Medical Oncology

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- Start of therapy: complete inventory
  - *All target and non-target lesions*
    - RECIST 1.1; 5 max, 2 biggest liver lesions
    - Recurrence or other EHD?
  - *All other findings*
- Follow-up: only relevant data
  - *Diameter target lesions*
  - *Trent non-target lesions*
  - *New lesions ?*
  - *No conclusion as to response classification*

Surgical Oncology

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- Liver lesions
  - *Segmental location*
  - *Size*
  - *Nature (B, probl B, questionable, probl M, M)*
- Extrahepatic disease
  - *Anastomosis*
  - *Lymph nodes*
  - *Other locations in abdomen or thorax*
- Anatomy
  - *Arterial supply, portal and hepatic veins*
  - *Individual segmental anatomy*
  - *Relation lesions to vital structures*
    - Liver hilum, IVC, larger hepatic and portal veins
  - *Volume of residual liver*

Radio-embolisation

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- Liver lesion distribution
- Volume of remaining Liver
- Extrahepatic disease ?
- Anatomy
  - *Arterial anatomy*
  - *Portal patency*
- MAA scan
  - *Arterial estuary*
  - *Shunting?*

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	Oesophagus[1]	Maag[1]	Lever, HCC	Lever[2], colorectale meta's, galblaas	Lever, Incidentaloom	Galwegen	Pancreas	Pancreas, endocrien of cysteus	Dunne darm	Colon	Rectum	Anus	< 6 weken oud
X thorax													X
CT Thorax	X	X	X	X		X	X		X	X[3]	X[3]	X[3]	X
CT Abdomen	X	X							X	X	X	X	X
CT Lever 4F			X	X		X							X
CT Pancreas							X	X					X
Echo Bovenbuik				(X)	X	(X)		(X)					X
Echo Hals	X	X											X
MRI Lever, pancreas			(X)	(X)			(X)	X					X
MRI Lever Primovist					X								X
MRCP						X							X
MRI rectum											X	X	X
Colonoscopie										X	X		
Gastroscopie	X	X											
EUS	X	X					(X)	X					X
PET	bij T3?												

Imaging Colorectal liver metastases

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- Medical oncology:
  - *CT Abdomen*
- Pre-operative evaluation:
  - *Multi-phase CT: Arterial, portal, equilibrium*
  - *CT Thorax*
  - *PM:*
    - US liver (5-10%), DD subcm cyst/solid
    - MRI liver (10-20%), characterization lesions
    - PET (< 5%), EHD?, characterization lesions

CT, MRI, US, PET?

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- CT, mono- or multiphasic: first line diagnostic
  - *Reproducable, constant quality*
  - *Chest and abdomen*
  - *Available, not to expensive*
  - *Easy to interpret*
- MRI: second line diagnostic
  - *Higher sensitivity at lesion level*
  - *Better lesion characterization*
  - — *Inconstant imaging quality*
  - — *Limited availability, expensive*
  - — *Difficult to interpret*
- US: targeted problem solution
  - *DD Solid vs cystic*
  - *Anatomical relation tumor and (vascular) surroundings*

Pre-op evaluation CRLM

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68 CRLM patients, referred for partial liverresection

- 5 inoperable on imaging
- 63 laparotomy with curative intent
  - *OR findings:*
    - R0 resection (+/- RFA) 55
    - R1: 7 (pre-op: small margin tumor/resection plane)
    - No resection possible: 1 patient with pre-op detected tumor close to duodenum
    - Number of intra-op detected EHD: none
- R0 resection = 87,3%
- R1 + futile laparotomy = 12,7%

CRLM Sens 80,2%, Spec 67,8% is apparently good enough ……

CT quality control

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- Geometry:
  - *≤ 5 mm section, overlapping*
  - *Entire abdomen and Thorax*
- Enhancement
  - *Sufficient contrast, optimal timing*
    - Med oncology
      - *consistent protocol*
      - *max sensitivity not required*
    - Pre-op evaluation: max sensitivity
      - *≥ 60gr Iodium (200ML at 300mgr I/ml)*
    - Multi-phase: only pre-op
      - *Arterial, Equilibrium*
        Sometimes useful for characterization
        seldom useful for detection CRLM
      - *Art en portal essential for anatomy*
- < 6 weeks before resection
- Always look at previous imaging, especially pre-chemotherapy !

Tumor quantification

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- RECIST 1.0
  - *Max 5 liver lesions*
  - *Lymph nodes: long axis*
- RECIST 1.1
  - *Max 2 liver lesions*
  - *Lymph nodes: short axis*
    - Non-target: 10-15 mm
    - Target: > 15 mm
- Volumetry?
- Lesion “behaviour”?

Tumor quantification; trends

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- Volumetry lesions
  - *More sensitive for change*
  - *More representative for irregular lesions*
- “Behaviour” lesions: functional imaging
  - *MRI parameters*
    - T1, T2
    - Diffusion
    - Perfusion
  - *“Molecular imaging”*
    - SPECT, PET, etc

Summary: imaging and CRLM

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- Consistent protocols for image acquisition and reporting
- CT modality of first choice
  - *Consistent imaging abdomen and thorax*
- MRI, US, PET
  - *Problem solving*
- Medical oncology
  - *Consistency in imaging*
  - *Consistent quantification, reporting and communication*
- Surgical oncology
  - *Maximize sensitivity and optimize characterization*
  - *Anatomical roadmap*
- Radio embolisation
  - *Tumor load intrahepatic and extrahepatic*
  - *Relevant anatomy*