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Diagnosis

Therapy-related Changes

Prognosis
Diagnosis

Therapy-related Changes

Prognosis
Diagnosis

CT

MRI
Diagnosis

CT

CT is only recommended

- MRI contraindication
- MRI is not available

Brain metastases imaging.
Delmaire C, Savatovsky J, Boulanger T, et al. 2015, Cancer Radiotherapy
Diagnosis

MRI

Recommended MRI protocol:

- Non contrast T1
- Diffusion-weighted images
- Susceptibility-weighted images
- MR perfusion images
- contrast-enhanced FLAIR (3D)
- contrast-enhanced T1 (3D)

Brain metastases imaging.
Delmaire C, Savatovsky J, Boulanger T, et al. 2015, Cancer Radiotherapy
Diagnosis

MRI

Leptomenigeal Metastases

- ≥1.5 Tesla MRI
- Contrast-enhanced T1weighted images and FLAIR images
- 10 minutes after injection of 0.1mmol/kg Gadolinium
- Slice thickness ≤ 1mm
- Before surgical intervention (lumbar puncture, shunt placement)

Diagnosis

- no significant difference in the number identified metastases

- Interpretation time:
  50s were at least saved per case

- Mean contrast-to-noise ratio for small lesions (<4mm) was lower for non-overlapping MIPs
Diagnosis

- Imaging key role in tumor characterization

- Conventional MRI sometimes not sufficiently

- Multimodal Imaging!
Diagnosis

Detection

conventional MRI

Tumor characterization

Diffusion-weighted Imaging (DWI)
Susceptibility-weighted Imaging (SWI)
MR-Perfusion (DSC, DCE, ASL)
MR-Spectroscopy (MRS)
Positron-Emission-Tomography (PET)
Diagnosis
Diagnosis

Tumor characterization
Multimodal Imaging Protocol
Diagnosis

Therapy-related Changes

Prognosis
Therapy-related Changes

Therapy monitoring - Chemoradiotherapy

- ADC values increased after first treatment cycle
- max. tumor diameter decreased earliest after the second cycle

Invalid subgroup:
- No difference of ADC values between BL and after first treatment cycle

Liu et al. 2018, BMC Medical Imaging
Therapy-related Changes
Stereotactic Radiosurgery

- MRI < 12 weeks after SRS
- Significant difference (p=0.032) of Ktrans SD between patients with PD and without PD
- Posttreatment volume change was not associated with outcome (p=0.941)
Therapy-related Changes

Radiation necrosis

Typical radiological Findings:
- Contrast-enhancing lesion
- Mass effect and edema – atrophy

Rare:
- involvement of corpus callosum with midline crossing
- multiple lesion
- subependymal spread
Therapy-related Changes

47y lung cancer patient
Therapy-related Changes

47y lung cancer patient

Flair

T1 KM

DSC

ADC

MRS

FET-PET
Therapy-related Changes

Radiation necrosis

- Flair
- T1 KM
- DSC
- ADC
- MRS
- FET-PET
Therapy-related Changes

69y breast cancer patient
Therapy-related Changes

69y breast cancer patient
Therapy-related Changes

Tumor recurrence

- Flair
- T1 KM
- DSC
- ADC
- MRS
- FET-PET
Therapy-related Changes

Combined FET PET/MRI radiomics differentiates radiation injury from recurrent brain metastasis

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Diagnostic accuracy:  
- CE- MRI 81%  
- FET-PET 83%  
- Combination 89%
Diagnosis

Therapy-related Changes

Prognosis
Prognosis

Edema

Prognosis

Temporal muscle thickness

Sarcopenic based approach

Cancer patients with muscle mass loss – worse outcome

Cross sectional area of lumbar muscles L4
**Prognosis**

**Temporal muscle thickness**

Leitner J, et al. in revision

n=154 BM patients (Melanoma, Lung cancer)

Correlation of cross-sectional area of the lumbar skeletal muscle - TMT

Spearman corr. coefficient 0.733

Leitner J, et al. in revision
**Prognosis**

**Temporal muscle thickness**

Breast cancer (n=188)  
NSCLC (n=247)  
Melanoma (n=146)

Risk of death was reduced by 19% (breast cancer), 24% (NSCLC) and 27.9% (Melanoma) with every additional millimetre of baseline TMT.

Prognosis

Temporal muscle thickness

- Baseline TMT correlates with prognosis in patients with brain metastases
- Surrogate maker for sarcopenia, which can be assessed on cranial MRI

positive correlation
TMT – survival
Conclusion

Diagnosis
- Detection – conventional MRI
- Tumor characterization/Therapy-related changes – Multimodale Imaging approach!!!

Prognosis
- Edema – pos. correlation
- Diffusion restriction – neg. correlation
- Temporal muscle thickness – pos. correlation