
XXXIII CONGRESSO NAZIONALE AIRO
AIRO2023
BOLOGNA,
27-29 OTTOBRE 2023
PALAZZO DEI CONGRESSI
Radioterapia Oncologica: l'evoluzione al servizio dei pazienti
Associazione Italiana
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TREATMENT EFFECTS AND DISEASE PROGRESSION DISTINCTION IN TREATED BRAIN TUMORS IS A CHALLENGE. PROMISING RESULTS USING DELAYED CONTRAST MRI.

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No conflict of interest

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BACKGROUND

Treatment effects:

- Glioblastomas: 14-30%
- Brain metastasis: 5-24%

Pseudoprogression: within 3 months from treatment end

Radiation Necrosis (RN): > 3 months from treatment end

BACKGROUND

Spectroscopy MRI - Tissue metabolism

CT/PET - Amino acid tracers

Perfusion-weighted MRI:

- Decreased rCBV for RN
- High rCBV for solid tumoral tissue

BACKGROUND

IMPERFECT

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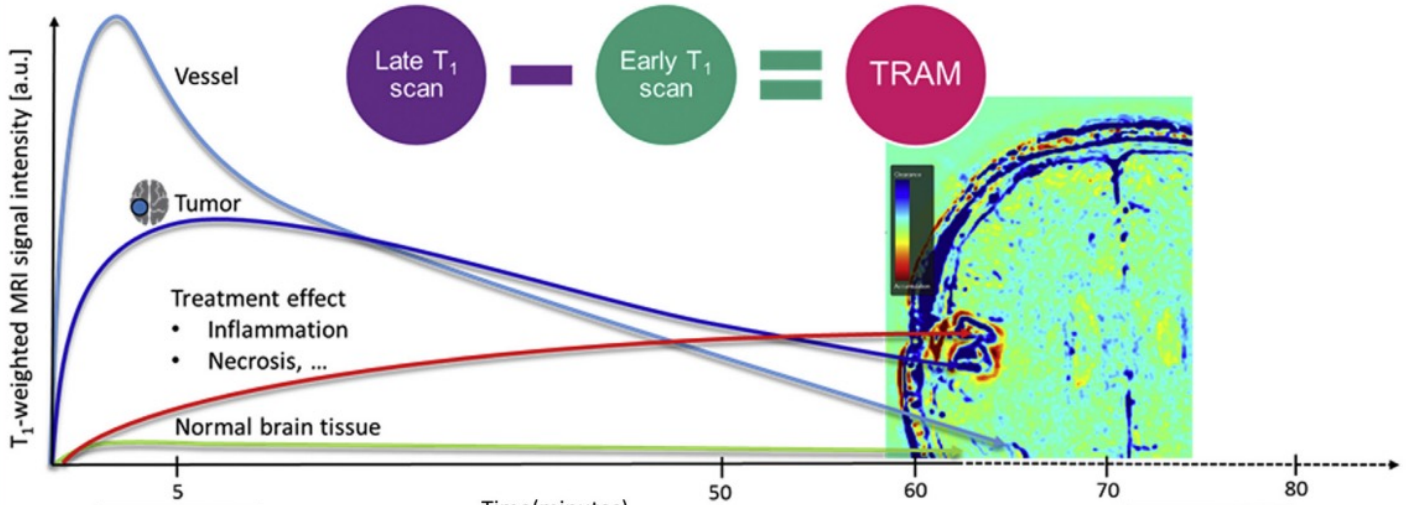
HOW DOES IT WORK?

TRAMs are calculated by subtracting ceT1MRI images:

- **Early:** acquired 5 minutes after contrast injection
- **Delayed:** acquired 60-105 minutes after contrast injection

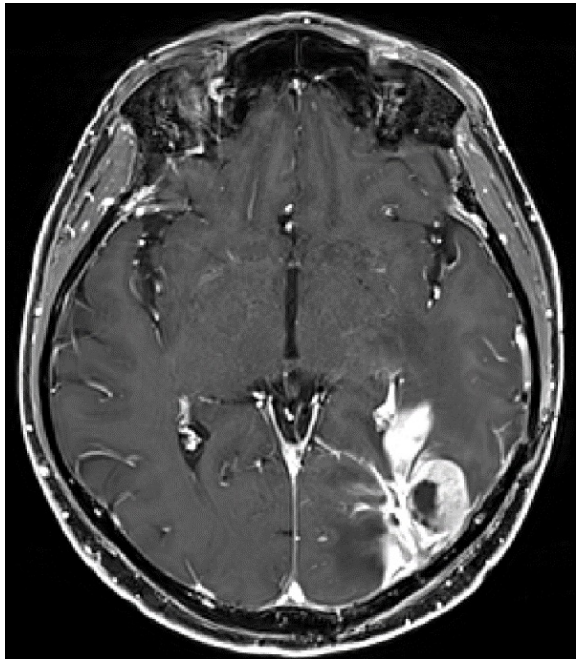


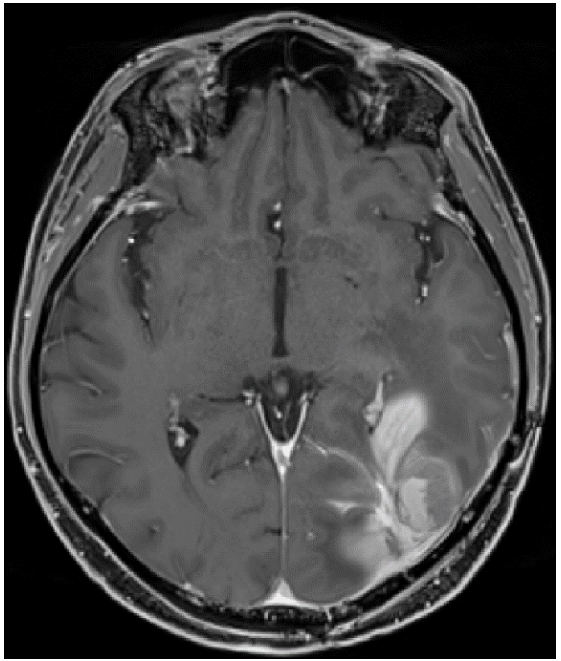
HOW DOES IT WORK?

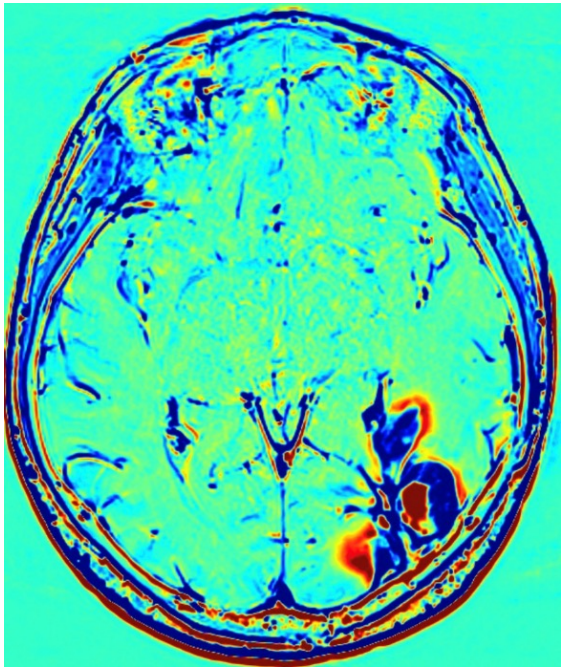
Disease and dense vasculature show a rapid increase in signal intensity followed by a relatively rapid clearance → Subtraction is negative: **BLUE**

Areas with damaged vasculature typically show slow accumulation of contrast → Subtraction is positive: **RED**

HOW DOES IT WORK?







AIM OF THE STUDY

Aim of this exploratory analysis is to assess Contrast Clearance Analysis MRI (CCA) and treatment response assessment maps (TRAMs) in differentiating RT effects and tumor progression

MATHERIALS AND METHODS

Recurrent primary brain tumors 13 patients underwent re-irradiation

From February 2021 to November 2022

64 patients:

- **Primary brain tumors**: 26 tumors treated with Surgery + RT +/- CT
- **Brain metastasis**: 38 lesions treated with SRS or HSRS

CCA median time 32 months (range 9-100 months)

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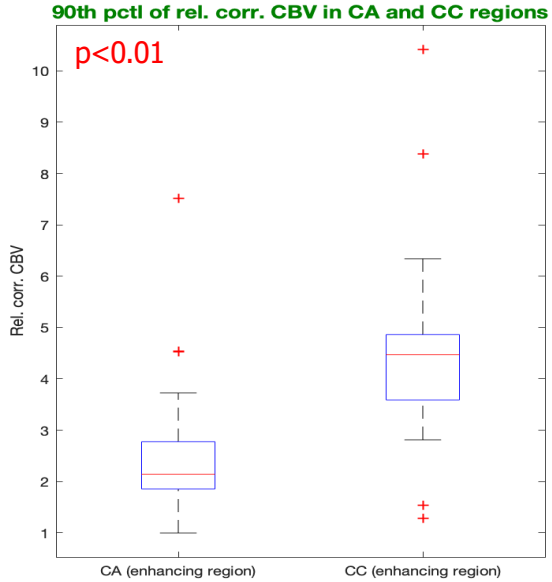
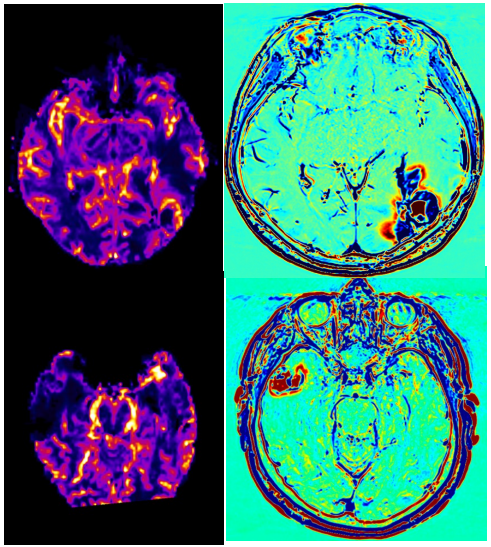
MATHERIALS AND METHODS

	N°	%
Patients	64	100
Primary brain histologies	**26**	**40.6**
• GBM	16	25.0
• IDH-mutate astrocytoma	8	12.4
• Pleomorphic xanthoastrocytoma G2	1	1.6
• Anaplastic xanthoastrocytoma	1	1.6
Brain Metastases histologies	**38**	**59.4**
• NSCLC	22	34.5
• Melanoma	7	10.9
• Breast Cancer	5	7.8
• Renal Cell Carcinoma	2	3.1
• Colo-Rectal Cancer	2	3.1
Treatment	**77**	
Surgery followed by RT +/- concomitant and adjuvant TMZ	26	40.6
SRS/HSRS	38	59.4
Re-irradiation	13	20.3

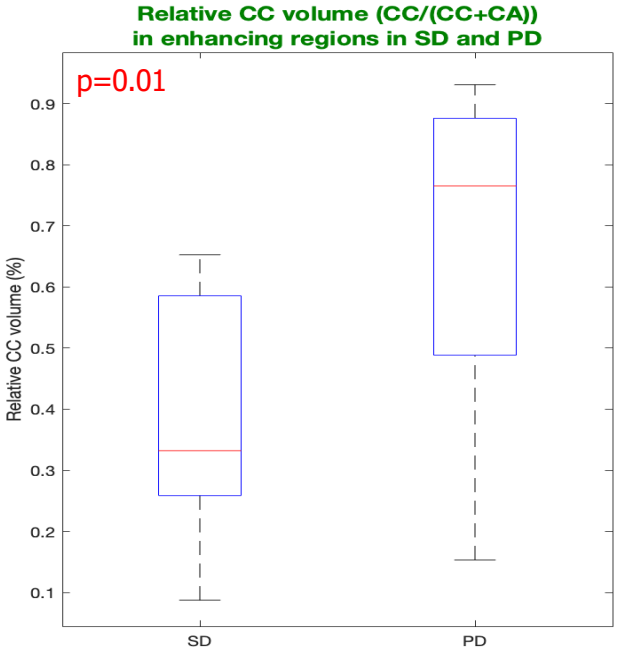
RESULTS

We observed significantly increased rCBV values in CC (blue) compared to CA (red) regions





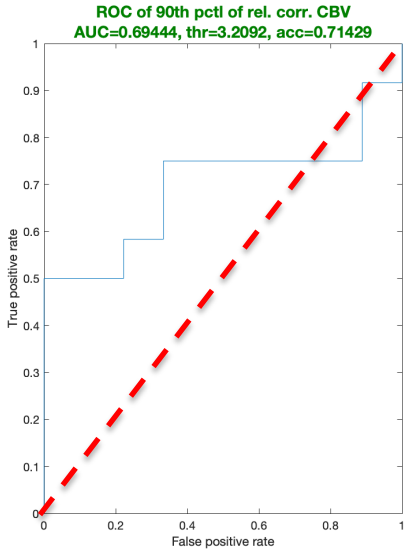
RESULTS



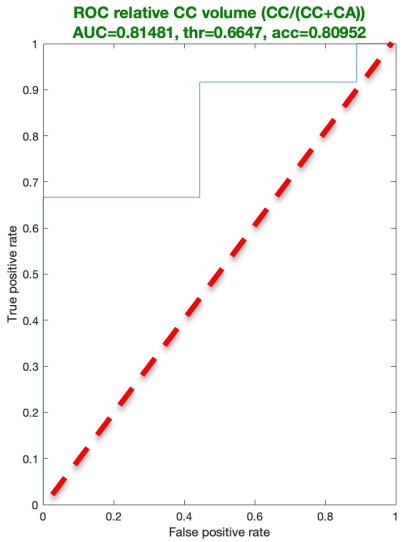
Progressive disease → Greater rvCC (blue)

Stable disease or partial response → Lower rvCC (blue)

RESULTS



Perfusion-MRI AUC 0.69



TRAMs AUC 0.81

PROS AND CONS

PROS

High resolution and sensitivity

Clear differentiation between CA and CC regions

Entire brain tumor volume

Low sensitivity to suscetibility artifacts

CONS

Delayed scan >1h

Inability to depict non-enhancing tumor regions

More sensitivity to motion artifacts

CONCLUSIONS

- Contrast Clearance (CC) regions within enhancing tumor volumes correspond to viable tumor tissue according to rCBV values
- Contrast Accumulation (CA) areas corresponds to treatment-induced tissue changes
- CCA and DSC-MRI at least comparable accuracy in discriminating true tumor progression from treatment-induced tissue changes
- Improve patient management

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THANK YOU!