

# Advanced Vessel- and Cell-Size MRI to Assess Chemo-Radiation Treatment Response in Pediatric Ependymoma Models

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## DISCLOSURES

I have no disclosures to report.

## OBJECTIVE

To develop and optimize an advanced mpMRI protocol (cell-size, vessel-size and inflammation imaging) to characterize the phenotype and chemo-radiation treatment (CRT) response in an orthotopic mouse of patient-derived xenografts (PDX) of pediatric EPN.

## BACKGROUND

- Ependymoma (EPN) is an aggressive pediatric brain tumor
- After radiation therapy and surgery, EPN recurs in 23-66% of patients
- EPN is characterized by high tumor cellularity, cytological anaplasia, high mitotic index, tumor necrosis, and inflammatory cells.

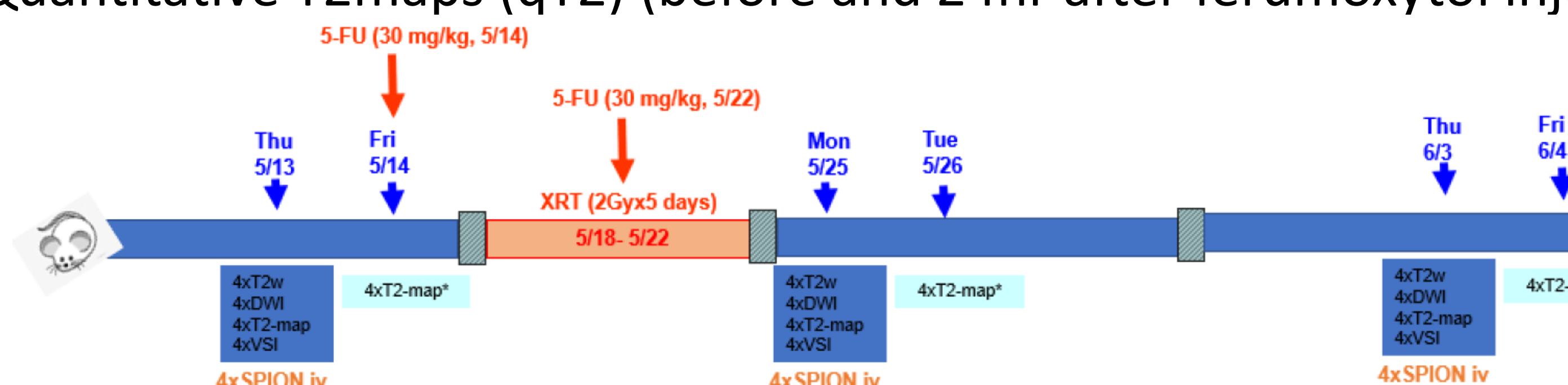
## METHODS

Mouse Models:

- Female severe immunodeficient mice (n=22)
- Placebo group and CRT group (10 Gy radiation plus 30 mg/kg 3-fluorouracil)

MRI protocol:

- High resolution T2w turboRARE (sagittal and axial) for tumor volume
- Diffusion weighted imaging (DWI)
- Selective size imaging using filters via diffusion times (SSIFT)
- Vessel size imaging (VSI) (fast T2\* during 10 mg/kg iron-oxide ferumoxytol injection)
- Quantitative T2maps (qT2) (before and 24hr after ferumoxytol injection)

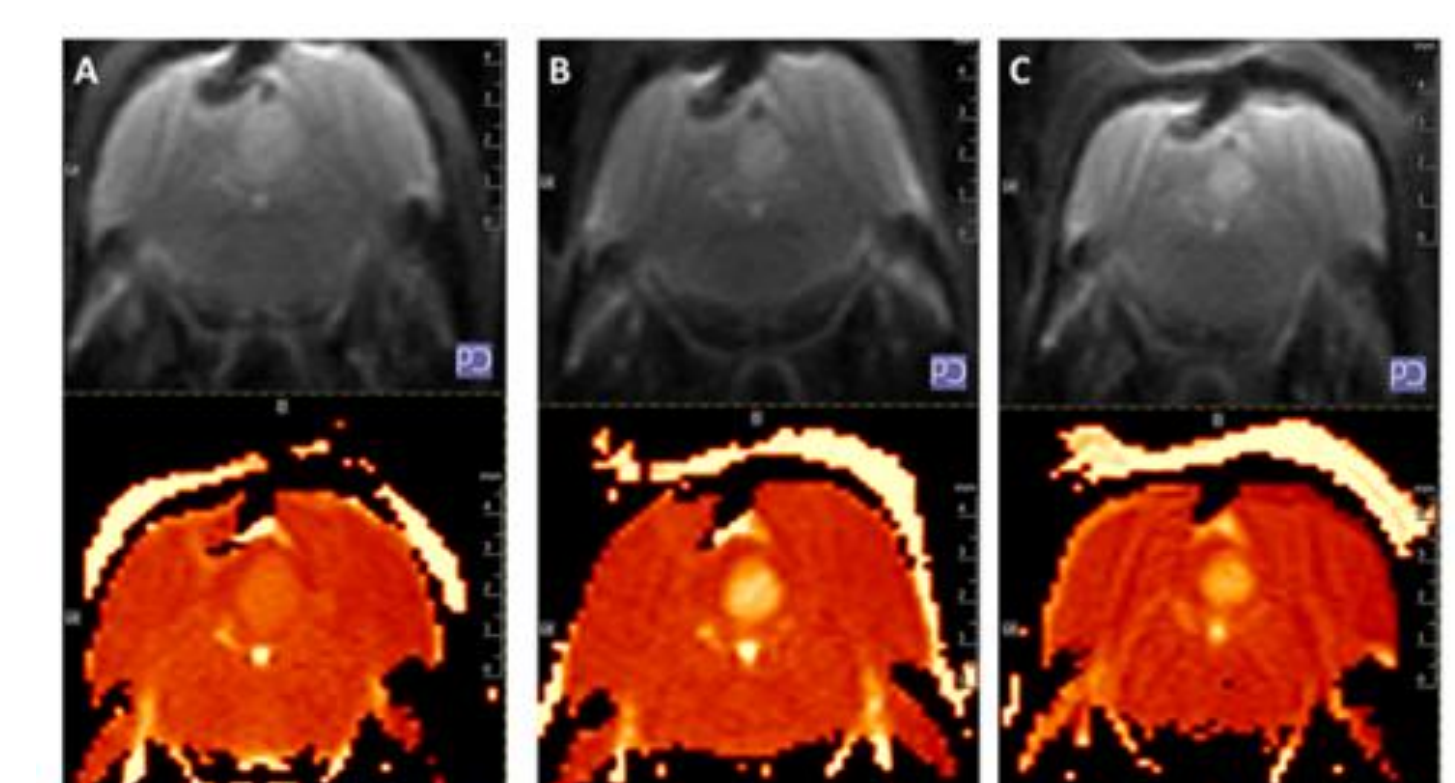
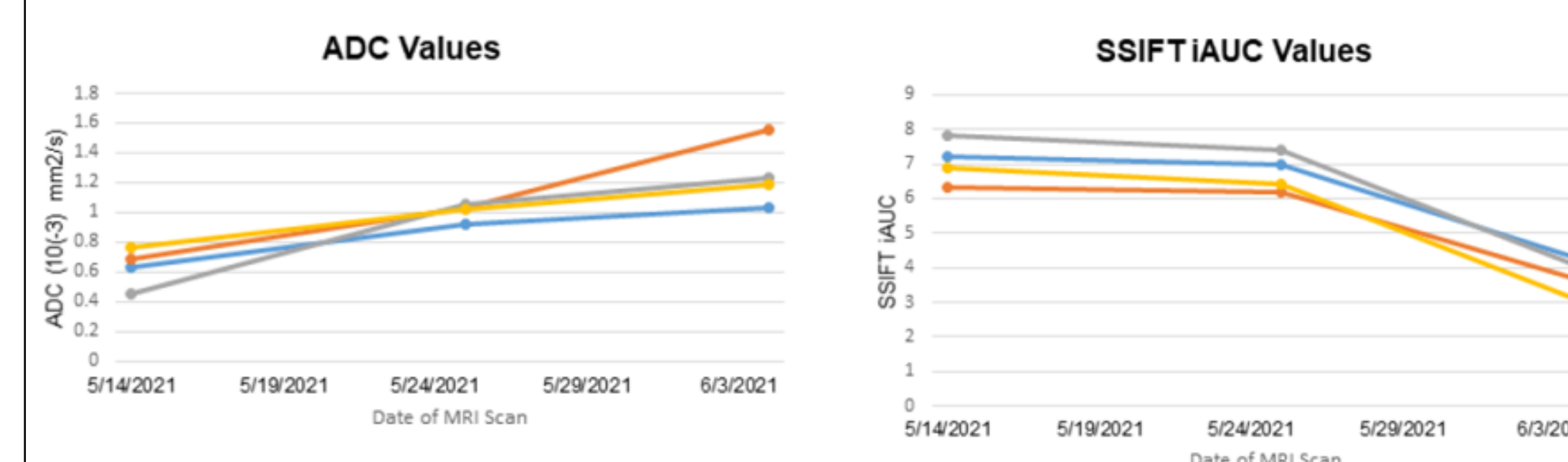
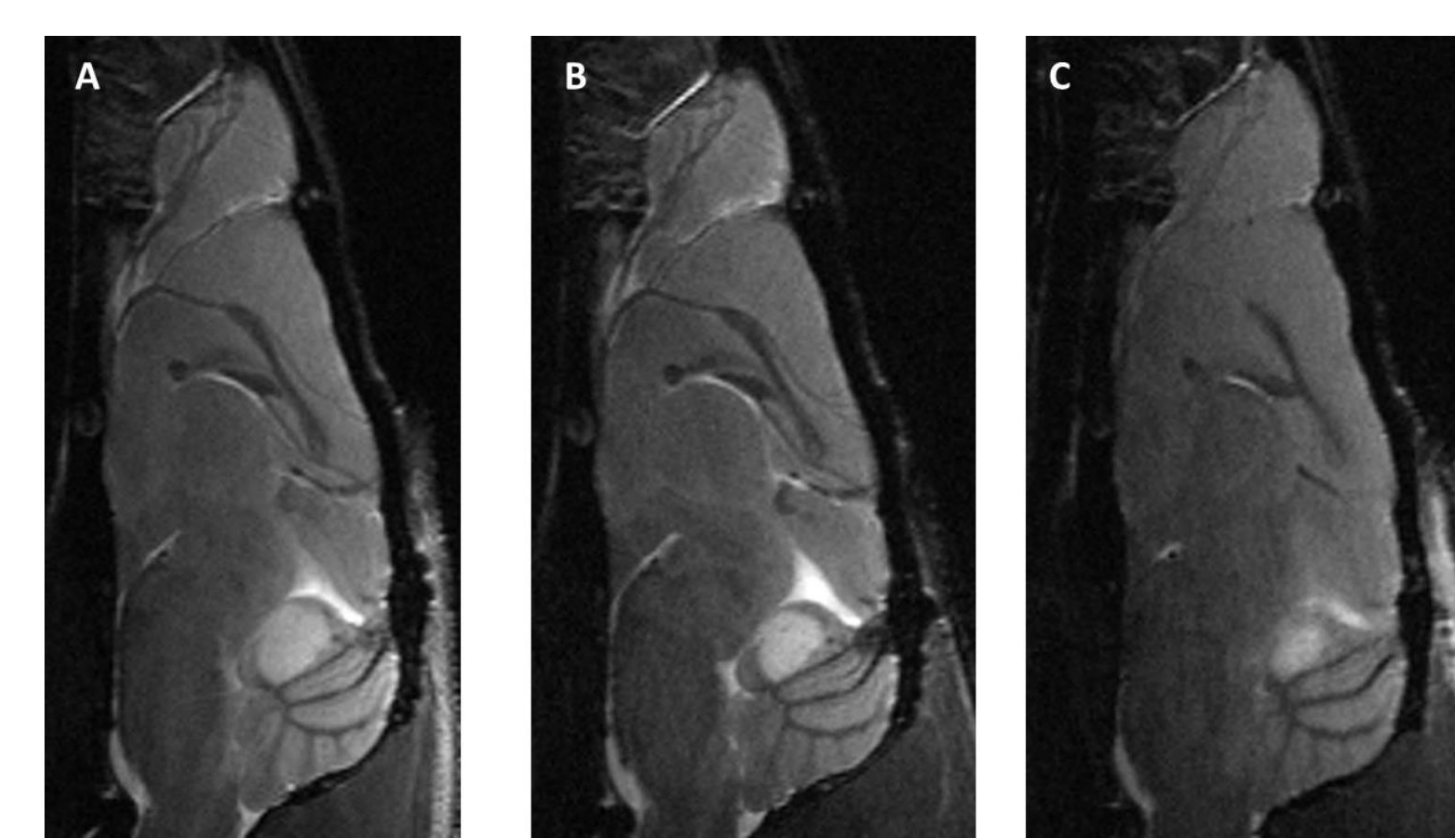


Analysis performed in ParaVision NEO Software and in house MATLAB simulations.



## RESULTS

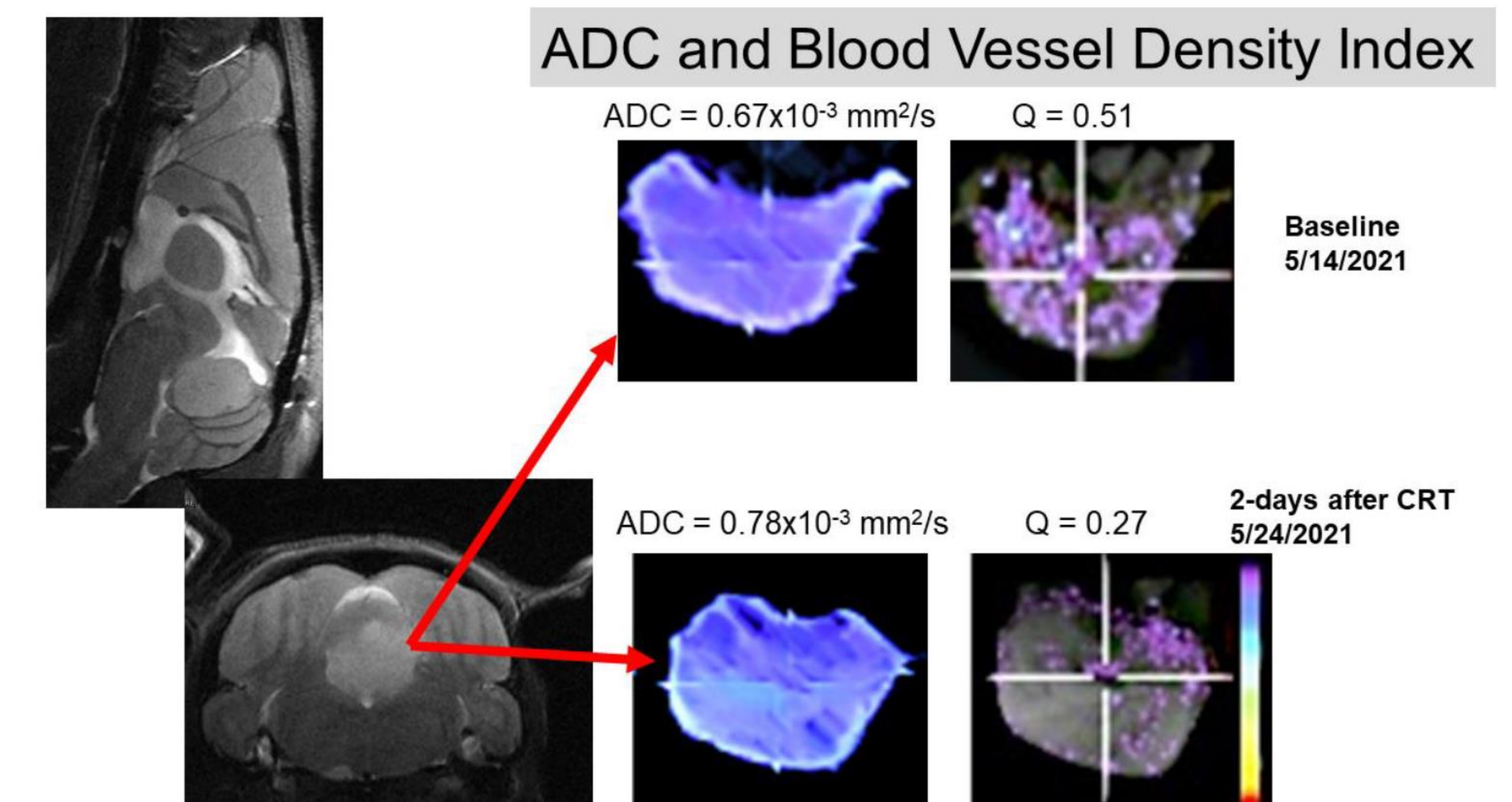
- We report out an EPN-specific phenotype characterized by an increased cell size ( $S=14$  microns), increased vessel density index ( $Q=0.54$ ), and low ADC values ( $0.63 \times 10^{-3}$ ).
- The CRT group showed a decrease in the tumor volumes, increased ADC values and decreased SSIFT iAUC and cell size two weeks after CRT.



Baseline 5/14/2021 2-days after CRT 5/24/2021 2-weeks after CRT 6/3/2021

## RESULTS (CONT.)

- The most immediate response (2 days after CRT) was a decreased blood vessel density and an increased presence of inflammatory macrophages and microglial cells in irradiated EPN.



## CONCLUSIONS & IMPLICATIONS

- Limitation: current focus is on one type of EPN (PFA1 vs PFA2 vs PFB)
- Our advanced mpMRI protocol followed by novel MATLAB algorithm analysis allows for a unique characterization of pediatric EPN as well as assessing the tumor response to a clinically relevant CRT protocol in a mouse model.
- Introduced cell size imaging and ferumoxytol-enhanced transverse relaxation rates for in vivo VSI mapping and inflammatory cell imaging
- Can translate into human imaging for improved understanding diagnostic tools for EPN

## ACKNOWLEDGEMENTS

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