



Post Mortem Temperature and its Effect on PMMRI

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Overview

- In situ post mortem magnetic resonance imaging (PMMRI) of the brain enables postmortem validation of in vivo MRI
- PMMRI is impaired by the temperature dependence of the quantitative MRI parameters
- Prior studies [1-4] corrected the brain MRI parameters according to the body core temperature, although the brain temperature decays faster [5]

Goal: Finding the correlation between the brain temperature and the brain MRI parameters to correct for the temperature in post mortem MR neuroimaging

Methods

- MRI parameters of 11 deceased subjects were measured by a 3T Siemens MRI scanner



Figure 1: Brain temperature probe in sagittal (left), axial (middle) and coronal (right) view

- The temperature probes were placed
 - in the rectum (T_{core} ranging from 8.3°C to 27°C)
 - transsphenoidal along the longitudinal fissure in the brain (T_{brain} ranging from 6.5°C to 14.9°C)

Results

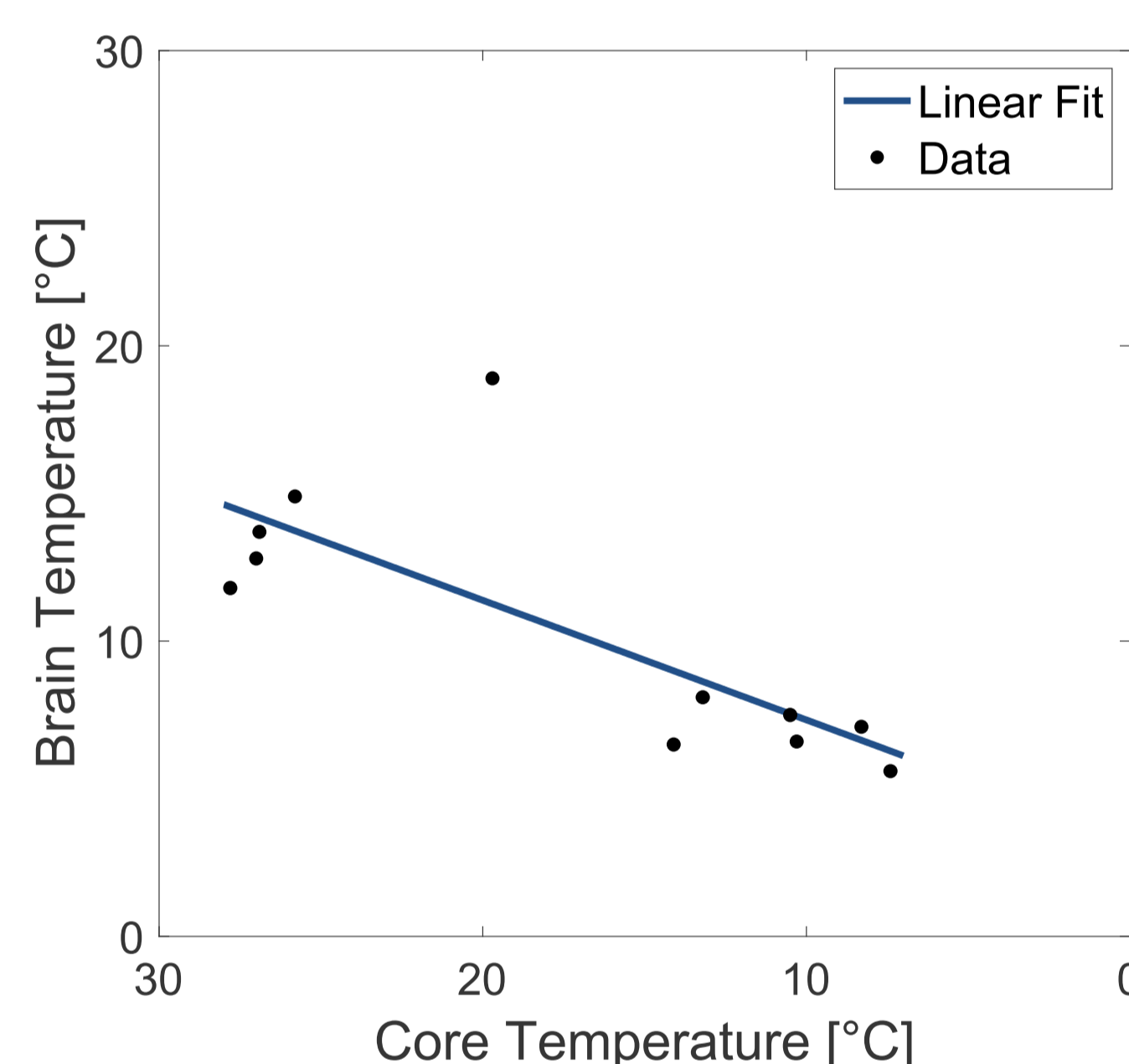


Figure 2: Brain temperature as a function of the core temperature (plotted inversely) measured prior to the MRI scan (linear fit: $R^2=0.54$).

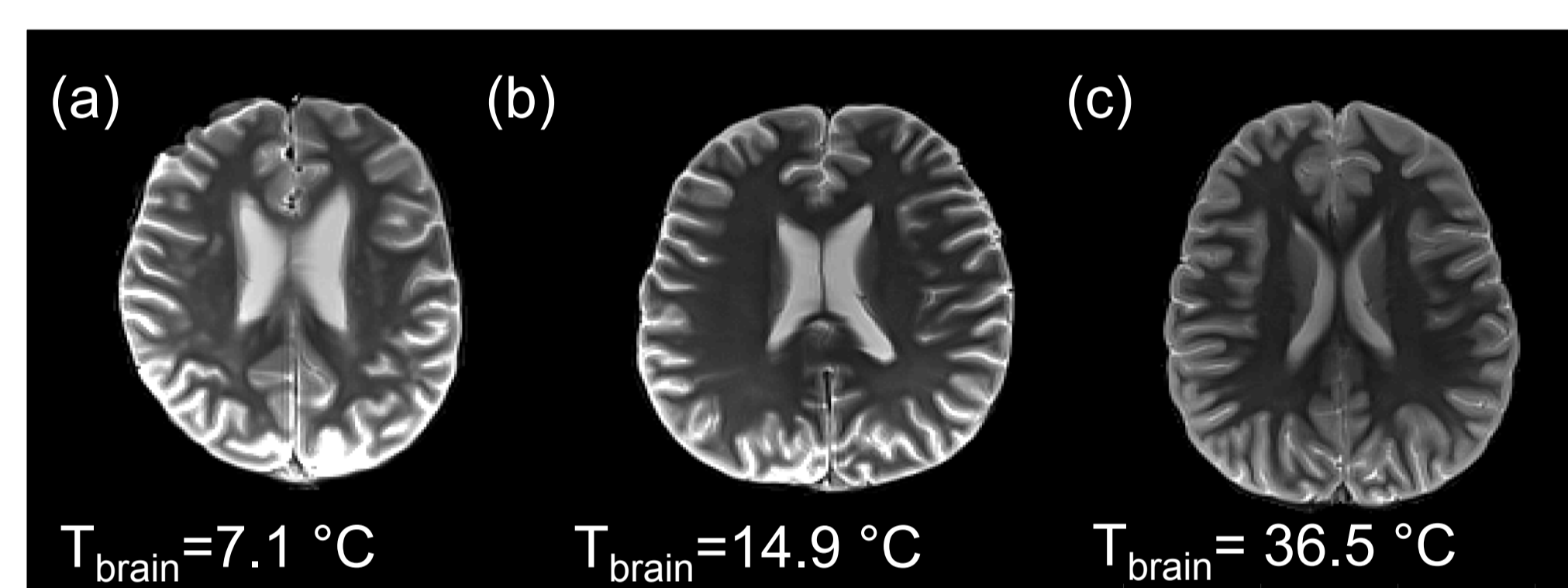
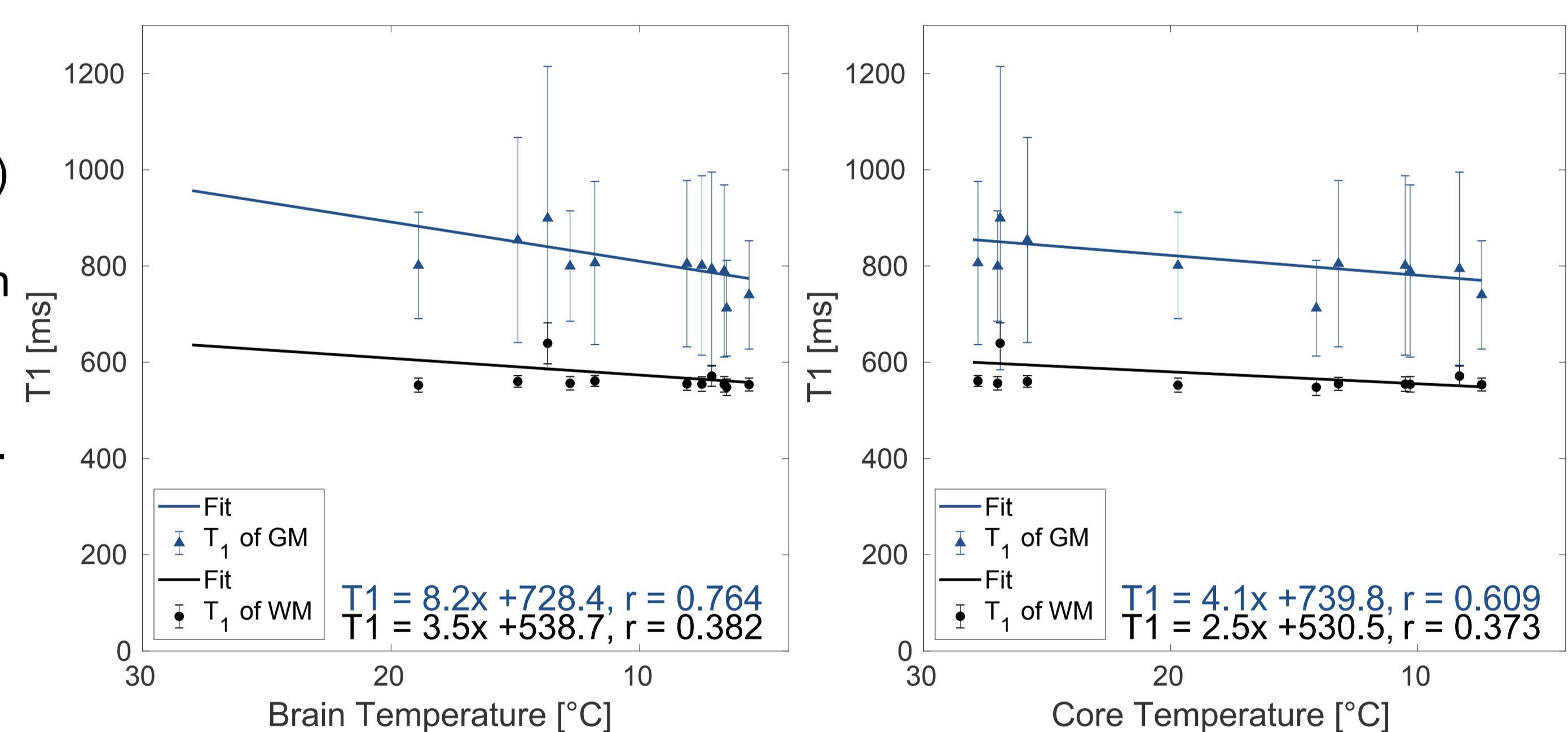


Figure 3: Images acquired with an inversion recovery spin echo sequence (with $TI=200$ ms) of two post mortem cases (a-b) and of an in vivo case (c). Different temperatures lead to tissue contrast changes.

Figure 4: T_1 of white matter (WM) and gray matter (GM) as a function of the brain and core temperature (plotted inversely).



Discussion

- Poor linear correlation between the brain and core temperature based on the observed results (see figure 2)
- The brain temperature affects PMMRI qualitatively (see figure 3) and quantitatively (see figure 4)
- Linear correlations between T_1 of gray matter and the core temperature reveal inferior fit results compared to the brain temperature.

Conclusion

- Results question the found linear relations between the core temperature and the brain's MRI parameters proposed by prior studies [1-4]
- MRI parameters of the brain have to be corrected for the brain temperature
- The temperature effect on the MRI parameters (see figure 3,4) indicates the need to correct PMMRI for the temperature

Literature

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