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Title: Non-invasive temperature measurements by MRI as a predictor of the survival of medulloblastoma patients.

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Although five-year survival for paediatric medulloblastoma is now approaching 75%, there remains a large variability in individual patient outcome that can be difficult to predict at diagnosis. It is becoming increasingly important to develop methods of stratifying patients for improved disease management. Tumour temperature has been proposed as a novel marker of prognosis in other tumours and can be measured non-invasively by the technique of magnetic resonance spectroscopy (MRS) thermometry. MRS thermometry has previously detected differences between childhood brain tumour types. In this single centre study we investigated its potential to predict survival in medulloblastoma. Pre-treatment MRS thermometry data were acquired for 40 histology confirmed medulloblastoma patients, 18 of which had died by the end of the study. Treatment was according to national guidelines or clinical trials and included surgery, followed by chemotherapy and/or radiotherapy. Histopathology reports and standard radiological imaging were available for all cases. Using Kaplan-Meier analysis with a median cut-off value, MRS thermometry identified patients with poor survival within the first 5 years ($p < 0.01$). The mean apparent temperature in the poor prognosis group was 0.7°C higher than the good prognosis group, which may reflect increased metabolic rate in this group. No correlations were found between MRS thermometry and Chang stage, histological subtype or radiological features, which individually were not predictors of survival. Age and sex did not significantly influence patient survival. All reported myc status for the cohort were negative. MRS thermometry can provide a novel non-invasive prognostic marker for medulloblastoma and potentially aid treatment stratification.