Determining the utility of pre-treatment MRI data in predicting the survival interval of patients diagnosed with carcinoma of the cervix treated with chemoradiotherapy

M. D. Pickles[1], S. Booth[2], and L. W. Turnbull[1]
[1]Centre for MR Investigations, University of Hull, Hull, East Yorkshire, United Kingdom, [2]Institue of Oncology, St James' Hospital, Leeds, West Yorkshire, United Kingdom

Introduction Cisplatin based concurrent chemoradiotherapy (CCRT) in combination with brachytherapy has become the standard treatment for FIGO stage Ib1 to IIIb cervical carcinomas. Although the intent of the treatment is curative a significant number of patients do not survive beyond 5 years. Additionally, traditional prognostic indicators seem to be of limited value. Consequently, biomarkers of reduced survival intervals are currently being sought. The aim of this work was to determine if any of the studied MR derived parameters were associated with longer disease free (DFS) and/or overall survival (OS).

Methods Patients scheduled for CCRT underwent a research MR scan prior to treatment and a further clinical MR examination 3 months after the completion of treatment. Patients were then followed up in clinic for signs of treatment failure. All patients were scanned on an HDx 3.0T scanner in combination with an 8 channel phased array coil. MR examinations comprised of T2-W morphological imaging, DWI and DCE-MRI. Multiple MR parameters were extracted from the data [volume, longest diameter (pre and post treatment), ADC, vascular characteristics (pharmacokinetic and empirical), MR FIGO stage, MR TNM stage, MR nodal status]. To determine if any parameter was significantly associated with survival intervals Kaplan Meier survival plots were utilised. DFS and OS internals were defined as time from treatment to critical event (DFS – recurrence, metastatic failure, cancer related death prior to documented treatment failure, OS – cancer related death).

Results Thirteen patients completed CCRT, however, only nine of these patients underwent the DCE-MRI examination. Following treatment there were 6 DFS critical events and 5 cancer related deaths. Of all the MR parameters studied only MR FIGO (≤ T2 vs. ≥ T3) and MR TNM (≤ $T2N_{any}M_{any}$ vs. ≥ T3 $N_{any}M_{any}$) stage demonstrated a significant association with DFS and OS. Table I presents the results of the Kaplan Meier analysis while the survival plot for MR FIGO stage and OS is illustrated in Figure I.

Disease free survival					Overall survival				
Parameters		Mean	95% CI	p value	Parameters		Mean	95% CI	p value
MRI FIGO	≤ T2	694	540 - 848	0.001	MRI FIGO	≤ T2	751	614 - 888	<0.001
	≥ T3	133	17 - 249			≥ T3	161	26 - 296	
MR TNM	≤ T2	742	605 - 879	0.005	MR TNM	≤ T2	807	709 - 905	0.002
	≥ T3	190	95 - 285			≥ T3	217	122 - 312	

Table I. Kaplan Meier Survival Analysis

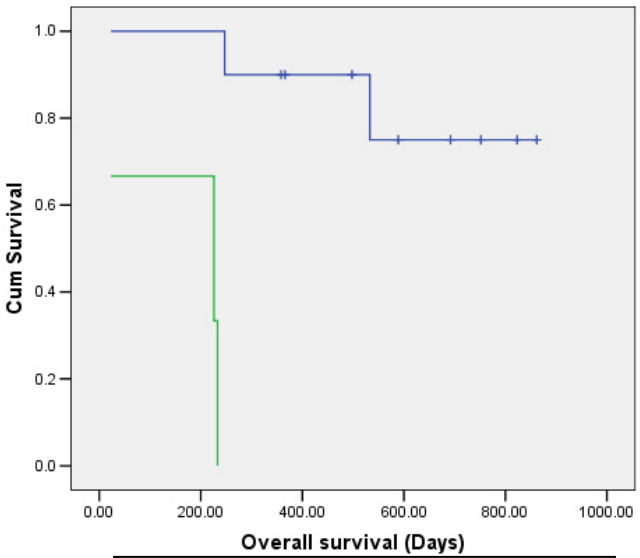

Fig I. Kaplan Meier survival plot for OS
FIGO ≤T2 — FIGO ≤T2 censored +
FIGO ≥T3 — FIGO ≥T3 censored +

Conclusions For this cohort the MR derived stage (FIGO or TNM) based on morphological assessment of the disease present provided the most significant association with survival intervals. Consequently, we conclude that the semi-quantitative parameters studied were of little value in predicting likely treatment response, and that practitioners should concentrate on optimising their morphological imaging to ensure staging accuracy.