Accuracy of Pre-Operative MRI Staging and Assessment of Tumour Response following Chemoradiation in Rectal Cancer: a DGH experience

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Purpose

To evaluate the accuracy of magnetic resonance imaging (MRI) staging of rectal cancer compared to histology and assess tumour response following chemoradiation within a district general hospital.

Introduction

Locally advanced rectal cancer is associated with a poor prognosis due to a high frequency of metastasis and local recurrence. Hence, every effort is made to achieve a complete resection. Identifying circumferential resection margin (CRM) involvement pre-operatively allows for neo-adjuvant chemo-radiotherapy treatment to be given to improve resectability, local control, local recurrence rates and most importantly overall survival\(^1\). In the UK, the National Institute for Clinical Excellence (NICE), recommends that in locally advanced rectal cancer, MRI should be performed before treatment begins to determine which patients might benefit either from neo-adjuvant therapy or surgery alone\(^2\).

We audited the accuracy of MRI staging of rectal cancer compared to final histology and assessed tumour response following chemo-radiation within our practice at the West Middlesex University Hospital.
Methods and Materials

Pre-operative staging MRI and final histology in 35 consecutive patients who had surgery for primary localised rectal cancer at West Middlesex University Hospital between January 2007 and February 2010 were respectively reviewed. Age at diagnosis, histology type, symptoms and treatments including indications for radiotherapy and type of surgery were recorded. Accuracy of MRI in determining tumour (T) and nodal (N) staging, circumferential resection margin involvement (CRMI) and extra-mural vascular invasion (EMVI) was established by correlation with post-operative histology. Accuracy rates were compared following stratification by treatment: pre-operative long-course chemo-radiotherapy (LCRT), short-course radiotherapy (SCRT) and surgery alone. In patients who underwent LCRT, post-radiotherapy MRI was used for comparison. Response rates to neoadjuvant LCRT were also analysed.

The following exclusion criteria were applied: patients with metastatic disease, previous radiotherapy to the rectum or pelvis, recurrent rectal cancer and patients with squamous cell carcinoma.

Prior to treatment, all patients had their case, histology and staging investigations (MRI and CT) reviewed and discussed in a multi-disciplinary meeting attended by colorectal surgeons, gastroenterologists, histopathologists, oncologists and radiologists. SCRT was given to Duke's C1 and C2 MRI-staged tumours with the aim of reducing local recurrence rate. LCRT with or without chemotherapy was given where the CRM was involved or threatened on pre-operative MRI and in low rectal cancer.

Statistical analysis was performed using Cohen's kappa calculated by SPSS software (v13).
Results

We identified a total of 35 patients between January 2007 to February 2010 from our rectal cancer database. There were 17 males and 18 females with a mean age of 68 years old (range 40 to 86). Thirty-four had adenocarcinoma and one had mucinous adenocarcinoma. Seven and 16 patients had SCRT and LCRT respectively, whilst 12 had surgery as their first treatment.

Overall accuracy was 68% for T ($\# = 0.453$, $p < 0.001$), 54% for N ($\# = 0.169$, $p = 0.197$), 88% for CRMI (specificity=90%, sensitivity=67%, $\# = 0.434$, $p = 0.011$) and 70% for EMVI (specificity=62%, sensitivity=67%, $\# = 0.365$, $p = 0.058$).

Partial response to LCRT was noted with 47% tumour down-staging, 38% nodal down-staging, 71% conversion of radiologically positive to negative CRM and 33% conversion of radiologically positive to negative EMVI. There was complete pathological response in 12%.

Discussion

In 2006, members of the colorectal multidisciplinary team attended a national MDT training workshop. The workshop was attended by all members of the MDT and covered the current evidence base in the management of rectal cancer including preoperative staging, targeted preoperative strategies for chemoradiotherapy, surgery, accurate pathological assessment and adjuvant therapy\(^3\). This audit demonstrates an improvement in our accuracy rates since then.

Our complete pathological response rates are comparable with published data\(^4\). Despite this, reasons for inaccuracies are movement artefacts from the bowel and patient, and in patients who have undergone LCRT include fibrosis, desmoplastic reaction, oedema, inflammation and involvement of tumour within fibrotic tissue.

In our series, we employed a 1 Tesla MRI machine. In March 2010, a new 1.5 Tesla MRI machine was installed. The new machine will allow better images with quicker acquisition and higher resolution and hence improve accuracy rates further.
Conclusion

We conclude that MRI is essential in pre-operative staging of rectal cancer and reliably predicts disease stage. Furthermore, the national MDT training programme is valuable in improving quality and standards of care of patients with rectal cancer. Repeat audit with studies acquired using the new MRI machine will be useful to establish consistency and further improvement in accuracy rates.
References


