Correlation of pre- and post-treatment MRI and pathological response grading in rectal cancer patients

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Purpose: MRI is increasingly being used in the staging of rectal cancer. In a previous study involving a group of 408 patients with rectal cancer, MRI has been shown to accurately predict curative resection during preoperative staging[1]. In patients with large or locally advance rectal cancer, management of these patients routinely involves administration of a regime of chemoradiotherapy prior to surgery. In a significant proportion of these patients, surgical resection reveals a complete pathological response to therapy (no tumour found) and no residual tumour. MRI may provide an assessment of tumour response to therapy prior to surgery that would have a significant impact on the management of these patients. Using pre- and post-therapy MR, we examined the relationship between a measure of response to treatment prior to surgery using MR (as assessed by reduction of MR tumour volume), and post-operative pathological response grading.

Method: 49 patients with biopsy proven rectal adenocarcinoma were recruited into a prospective, blinded study between Sept 2004 and August 2006.
All patients had routine long course pelvic radiotherapy, 40 of whom also received chemotherapy. All patients had a pre-treatment staging MR of the pelvis using a T1 and T2 fast spin echo thin slice protocol using the phased array torso coil of a 1.5T signa NVi/Cvi system (General Electric, Waukesha, USA). This MR protocol was repeated at the end of treatment, approximately one week prior to surgery. All patients had subsequent surgical resection (total mesorectal excision) that was submitted for pathological staging. Pathological staging gave conventional TN stage and Duke's stage, in addition to a tumour response grading from 1 to 4. 1 represented no tumour response to treatment, 2/3 represented partial response, and 4 a complete response (no tumour found).
For MRI tumour TN stage was determined for both pre-and post-treatment scans, and the tumour response on the post-treatment scan was graded as no response, partial and complete responses based on reduction in tumour size.

Results: Regarding response (pathological grades 2-4) or no response to treatment, 45/49 (92%) of patients had agreement between MRI and pathological scoring. 4/49 (8%) of patients described as non-responders using pathology grading all had a (minimal) partial response on MRI.
Regarding individual response grades, comparing the pathological response and MR response grades, the following results were found. Partial response agreed in 33/33 cases (100%), with no disagrees; complete response agreed in 5/11 (46%) and disagreed in 6/11 (54%); and no response agreed in 1/5 (20%) and disagreed in 4/5 (80%) of cases.
Comparing tumour TN stage on post-treatment MRI and pathological staging, the following were noted. 25/49 (51%) agreed, and 24/49 (49%) disagreed.
In the latter group, 23/24 (96%) were given a more advanced TN stage on MRI compared with pathology.

Conclusion and Discussion: There is a 92% agreement between pre and post-treatment MRI and pathological grading with regard to tumour response to treatment. Partial response shows the best agreement (100%), with agreement on complete response in approximately half of the cases, and poor agreement between MRI and pathology for no response. Assessment of complete response on MRI is hampered by the effects of chemoradiotherapy treatment that tends to cause high signal oedema, and can be difficult to distinguish from residual tumour. In the pathological non-responders, all showed minimal but definite response on MRI, and a possible source of error is the single stage pathological interpretation compared with both pre and post-treatment MRI assessment. TN staging agrees in approximately half the cases, and interestingly in the non-concordant cases, MRI nearly always overstages. The latter effect is felt to be the result of chemoradiotherapy on the tumour, which is known to cause an inflammatory response, and makes MRI difficult to interpret accurately.

References:

1. Mercury study group. British Medical Journal, 333: 779-782