

CoRIPS Research Award 130 - £9,963.00

## The accuracy of the diagnostic pathway for staging of low-mid rectal tumours with endoscopic, MRI and Endo-rectal Ultrasound assessment.

### Lay Summary of Project

Background: The Royal College of Radiologists recommend MRI of the pelvis for the assessment, or T staging, of rectal lesions. They further suggest that endo-rectal ultrasound scans (ERUSS) are a specialised investigation that may be useful for refining the T1/T2 staging to direct newer minimal invasive therapies. We wish to investigate whether providing both an MRI Rectum scan and an ERUS scan, will improve accuracy of staging enabling clinicians to decide on the most appropriate treatment for patients with a low-mid rectal tumour. Accurate identification of early T stage disease improves access to minimally invasive treatment, reducing complications of more extensive surgery.

Aims: To assess the agreement between ERUSS used with MRI, routine MRI of the rectum (alone) and endoscopic assessment. Secondary aims will be to compare both of these modalities with histology. The decision to treat at colo-rectal MDT and the potential to better inform the management of these patients will also be assessed.

Methods: In this prospective study, we will recruit/consent 88 patients with endoscopically diagnosed low/mid rectal tumours with a referral for MRI rectum. These patients will also be invited to receive an Endo-rectal Ultrasound Scan (ERUSS), retrospective cases that fit the dataset (MRI prior to ERUSS) are to be included from a database of 73 cases. Each MRI will be assessed, with the assessor blinded to the ERUSS data. The MRI will then be re-assessed using information from the ERUSS. Both results will be compared to the endoscopic data.

Outcomes: The accuracy of T staging may be improved with the addition of ERUSS into the patient's imaging pathway. The potential is that patients may avoid radical pelvic surgery because of the higher spatial resolution imaging that ERUSS provides compared with MRI Rectum and endoscopic evaluation, comparing to the histology as a gold standard.

## Research Questions

- a) Principal Aim of the study
  - The aim of this study is to compare the T staging of MRI of the rectum and the endoscopic staging to the staging of MRI used in conjunction with ERUSS. This may influence the decision to treat at colo-rectal MDT and better inform the management of these patients.
- b) Primary Research question
  - To what extent does rectal tumour T stage using a standard MRI scan agree with an additional ERUSS endoscopic staging?
- c) Secondary Research questions
  - To what extent will the T staging of the ERUSS and MRI agree with the staging of histology as the gold standard? Patterns in discrepancy will be sought based on the morphology of the tumour on MRI. A specific focus on how bulky, polypoid, mobile or flat lesions may influence accuracy at endoscopy, MRI or Endorectal ultrasound will be sought.
- d) Outcomes
  - The outcome measure for this study is the T stage for the MRI with ERUSS comparable with the MRI scan and endoscopic staging.
  - Is endoscopy followed by MRI and refined by ERUSS the correct diagnostic hierarchy for all tumour morphologies?
- e) Review of the literature and identification of current gap in knowledge

## Review of current literature

The Office for National Statistics (2013) reveal that colorectal carcinoma is the third most common cancer in both males and females in England and, in 2013, there were a total of 9282 newly diagnosed cases of rectal carcinoma. A UK study by Salerno et al (2007) estimates that a third of all colorectal carcinomas are rectal cancers; with a third arising <6cm from the anal verge.

Rullier et al (2013) classify a low rectal lesion as a lesion <6cm from the anal verge. Salerno et al (2009) suggest that a low rectal cancer is <5cm from the anal verge. Christensen et al (2011) explain that surgical improvements have generally been made for both mid and upper rectal cancers; low rectal lesions have been treated by abdominoperineal excision; which leads to high morbidity and permanent stoma. Weiser et al (2009) and Rullier et al (2013) elaborate that there is a surgical challenge of ensuring a clear resection margin whilst attempting to maintain the anal sphincters. Relating this to pathophysiology low rectal tumours are most likely to have a positive margin owing to the tapering of the mesorectum and the associated higher risk of perforation (Salerno et al, 2009). Taylor et al (2008) further suggest that the prognosis of low rectal tumours is different to that for higher tumours. Providing clear and accurate information about the location and extent of the tumour is essential for maximising resection and retaining the anal sphincters.

### Literature Review

Schiessel et al (2012) explain that for patients with T1 low rectal lesions, consideration of a local resection should be with caution because of the limitations of pre-operative nodal staging; increasing the risk of local recurrence. They suggest further that with the introduction of ERUSS for the evaluation of low rectal lesions; an objective approach to the evaluation of the anorectum can take place in addition to the traditional techniques of Digital Rectal Examination, Endoscopic Inspection, MRI and CT. The use of ERUSS helps the clinician to decide the most appropriate surgical approach.

With the advent of transanal surgical approaches to resection of early T1 low and mid rectal lesions, Hassan et al (2015) suggest, the use of both MRI and ERUSS to avoid understaging lesions and thereby ensuring clear resection margins. Granero-Castro et al (2014) studied the use of both ERUSS and MRI for mid and low rectal lesions including only patients with anterior and antero-lateral tumours; concluding that the use of ERUSS can improve the reliability of predicting the clear resection margin for these lesions; particularly those in the low third of the rectum. The accuracies of both modalities were comparable and favourable. The study size was, however, relatively small and there was no inter-observer radiological assessment.

A study of 38 patients by Kuran et al (2014) suggests that ERUSS is advantageous for the assessment of sphincter involvement with low rectal tumours, even in the case of stenotic cancers with a sensitivity of 100% and specificity of 96.3% for external sphincter involvement. The level of agreement between ERUSS staging when compared with histopathological findings was 73.7% overall. The sensitivity and specificity of lymphadenopathy is significantly less; 41.2% and 81% respectively. Kuran et al (2014) also explain that ERUSS is still useful for T staging. Advantages of ERUSS over MRI include an encouraging cost advantage of ERUSS.

This limited study suggests a combination of both ERUSS and MRI is the most accurate method to stage rectal tumours. The authors do, however, suggest that ERUSS is the best imaging hierarchical approach to assess rectal lesions in the hands of an experienced operator (Kuran et al, 2014). To improve the accuracy of pre-operative T staging of mid/low rectal cancer staging through the use of ERUSS or MRI, Muñoz et al (2013) advocate the use of Modified Wong's Classification, particularly when agreement is found between MRI and ERUSS interpretation.

Mezzi et al (2009) focus on the re-staging of distal rectal cancers in a study of 39 patients post radiotherapy using both ERUSS and MRI. Focussing on T and N accuracy, the authors found that ERUSS had a higher diagnostic accuracy than MRI for T0-T2 for prediction of T and N staging (44% vs 33% respectively), whereas for patients with more advanced disease MRI had a higher diagnostic accuracy for T staging (52% vs 48% respectively).

Assessing response to neo-adjuvant chemo radiotherapy is becoming more popular in enabling improved individual patient management. Memon et al (2015) focused on all rectal cancers in a study of 63 patients, involving restaging of rectal lesions post neo-adjuvant chemoradiotherapy, concluded that ERUSS was not significantly more accurate than MRI at the staging of T stage; 65% vs 52% respectively with equal accuracy for nodal involvement 72%.

Shihab et al (2009) explain that the utilisation of MRI for low rectal cancer staging requires precise planes to provide accuracy for interpretation and Radiology must communicate the potential surgical planes to the surgical team. MRI imaging of low rectal lesions is sometimes hampered by incorrect coil positioning, often being positioned too high for the tumour (Wale et al, 2014). Taylor et al (2008) explain that an extra sequence of high spatial resolution coronal imaging to accurately demonstrate the levator muscles, sphincter complex, intersphincteric plane and relation to the rectal wall must be adopted.

Ashraf et al (2011) suggest an algorithm for the use of ERUSS and MRI staging for early small rectal lesions, and only indicate the use of ERUSS in addition to MRI in specialist centres citing poor accuracy in the small data set available in the UK. Similar views are expressed by Marusch et al (2011) who conducted a large, multi-centre prospective study into the efficacy of ERUSS for the uT staging of rectal tumours versus the histology pT stage. It was found that correspondence between the two T stages was only 64.7%. The authors conclude that the accuracy of ERUSS staging for rectal cancers versus reported figures in literature was not found to be favourable and they further

suggested that only operators with a significant case load of ERUSS could facilitate rectal tumour therapy decisions.

Cesmeli (2014) reviews the necessity of ERUSS for rectal tumour staging suggesting that in recent years there had been a shift of referrals to MRI owing to better toleration by patients, improved assessment of the circumferential resection margin and the ability to stage stenotic lesions. Cesmeli (2014) does however discuss the potential advantages of the staging of the pre-therapy early rectal cancer and the selection of the group of patients eligible for local excision. This therefore demonstrates that further research is required to demonstrate for how ERUSS can potentially enhance diagnostic workup for rectal tumours and help to inform the local imaging hierarchy for rectal tumours.

Review of the literature demonstrates that there is little current research into the comparative accuracy of MRI, endoscopic evaluation and ERUSS for staging low/mid rectal lesions. Literature reviewed tends to include all rectal lesions or is limited to one imaging modality. The lack of a dedicated study could possibly be due to the minority patient group that low rectal lesions affect resulting in a small study size. However, due to the controversies of surgical approaches to low rectal lesions (Rullier et al, 2013), standardisation and accuracy of Radiological staging and imaging hierarchical pathways is of utmost importance to patients and clinicians alike.

From a Clinical equipoise standing there is a scarcity of studies that are investigating MRI, endoscopic evaluation and ERUSS for the initial staging of low-mid rectal tumours. Of the identified studies many concentrate of the re-staging of rectal tumours after neo-adjuvant therapies; this patient group will not be eligible for inclusion in this study. It is widely reported that ERUSS is not accurate in evaluating residual tumour post therapy. Due to the poor prognosis of low rectal tumours the pursuit of accurate T staging is of great clinical importance.

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