Rectal MRI Update – 2023

I this update I will cover the questions I have been asked, highlight where we are in 2023 and where we may be going.

Key points;

1. **Identify Tumour Deposits and report them separately**
2. **Call EMVI positive in medium and large vessels – don't overcall small vessels <3mm**
3. **MRF replacing CRM for MRI, with a 1mm cut off. LN almost never cause a positive margin**
4. **All tumours have an invasive edge - even in T1 and T2. Find it in large tumours to help identify the deepest site of invasion. It may be quite thin due to ulceration**
5. **The % reduction of tumour post treatment is not relevant for mrTRG – just if there is any tumour left. Use mrTRG for the whole mesorectum, and beware of diffusion pitfalls.**
6. **Provide a post treatment MRI Stage which assesses tumour and fibrosis. This gives a surgical roadmap for where tumour cells may be, as they can be present in dense fibrosis.**
7. **Deep Resolve is not yet shown to be accurate in rectal MRI**

PRIMARY STAGING

Tumour Deposits (TD) / N1c

- **What are they? –** The same things we call N1c. That is –splats of tumour in the mesorectum that are NOT in LNs. Although this definition is more complicated for the pathologists.
- **How do you know it's a TD?** - They are usually irregular and interrupt a vein. They may taper into a vein (comet tail) and sometimes surround it. TDs can be large and obvious, but also small. You will often see them if you trace a vein away from the tumour. [Fig 1] Make sure you go all the way to the mesorectum and check it looks abnormal in 2 HR planes. Sometimes a small vessel will curl around and look irregular in one plane only.
- **What do they mean?** - There is increasing evidence for just how bad TDs are for the prognosis of rectal cancer [1,2]. EMVI is bad – add tumour deposits and it's even worse. (irrespective of nodal stage)
- **How do we report them?** There is no universal guideline, and we are waiting to see what the AJCC v9 does (? 2024/5). For clarity and prognosis, it is recommended radiologists use the term mrTD instead of N1c. Adding a line for TDs and reporting them separately from LN is suggested, so it's clear they are present. Also encouraging clinicians to realise their importance, and use of EMVI and TD in prognosis, over just TNM [3]

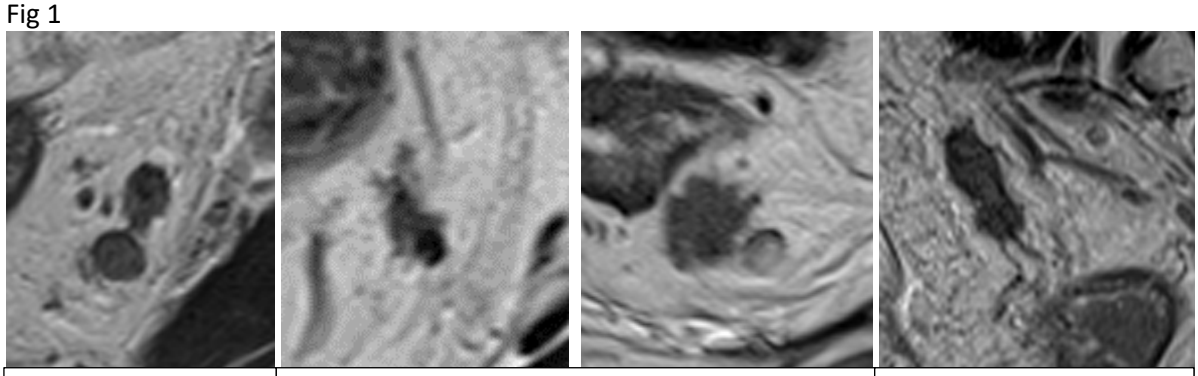
EMVI

- **Don't overcall –** When we started reporting EMVI we also looked at small vessels, but veins <3mm are beyond the proven limit of MRI. [4] To report EMVI positive – focus on the medium to large veins, not the tiny ones at the tumour edge, and be convinced it's real. These may be at the edge of the tumour, but should have linear tumour signal.

TIP – If you are doubting yourself or ability to convince someone else – it's probably not real

- **Discontinuous EMVI** –report this if you see an elongated vessel distended with tumour in the mesorectum on multi-planar imaging, which does not connect with the tumour [Fig1]. But we are moving away from calling any focal TD also discontinuous EMVI, as reporting TDs in their own subheading provides the poor prognostic information. If it's just a focal 'splat' its TD +ve, but not automatically discontinuous EMVI +ve.

Fig 1



LN with ECE	Tumour Deposits	TD+ & Discont. EMVI

LN and MRF

- 'MRF' (mesorectal fascia) is replacing CRM (circumferential resection margin) as the MRI term. 'TME plane' can be used for low tumours. [5]
- There remains no evidence to support a LN close to the margin which has smooth borders causes a positive CRM (i.e the pathologist will tell the surgeon the gap between tumour and margin is <1mm after fixation)
- An irregular border suggesting extracapsular spread (or a TD) within 1mm or the MRF is positive.
- This is a binary assessment – MRF is predicted clear or involved – with tumour < 1mm on MRI the best predictor for tumour within 1mm post surgery (the term threatened is no longer recommended). Sitting on the fence is no help to the clinician
- LN are still best assessed by morphological criteria only, despite the use of the 'Dutch criteria' in ESGAR and SAR guidelines. There is evidence large benign LN (bland, homogeneous signal) are protective. Given their reduced implication in prognosis, beware of overstaging LN – but do find the TDs.
- We know mrLN assessment is not great, but beware many publications assessing their accuracy use poor technique (larger voxels), so the claims of low accuracy can't be truly extrapolated. Resolution makes a significant difference to tumour and LN assessment [Fig 2].

TIP: Make a call on the staging elements to assist the clinician, noting we have limitations. Use the criteria we have to do the best possible. Sometimes I need to tell the clinicians – 'I may be wrong, but using MRI criteria, this node looks benign'

T STAGE & Invasive Edge

There is still some confusion over the term 'invasive edge'. This just means the site at which the tumour is attached to the mucosa, with possible depths of invasion from T1 sub-mucosal only, to T2, T3 and T4. So even a superficial T1 tumour has an invasive edge – it just hasn't invaded very deeply.

Why is it important? By identifying the shape of the tumour you can predict where the deep invasion will be – which can be surprisingly difficult to appreciate on some advanced T3 tumours with deep ulceration.

TIP – look at the superior & inferior borders of a large tumour to find the raised rolled edges and work out the shape.

POST TREATMENT

'Regrowth' = new tumour in the mesorectum during watch and wait after Complete Response (CR).
'Recurrence'= pelvic local recurrence after surgery (local excision or TME)

Regrowth can occur in the mesorectum at sites of TD / EMVI or deep in the rectal wall that is not visible endoscopically – check all these areas, as this is where MRI really adds value.

Tumour Response assessment

Unlike other tumours the percentage reduction is not important – it all comes down to what is left. Is it safe to watch or does it need surgical removal? So don't be swayed by 'good response' (i.e much less tumour than was there before), when there is still a small amount of definite tumour visible. Any visible residual tumour can be bad.

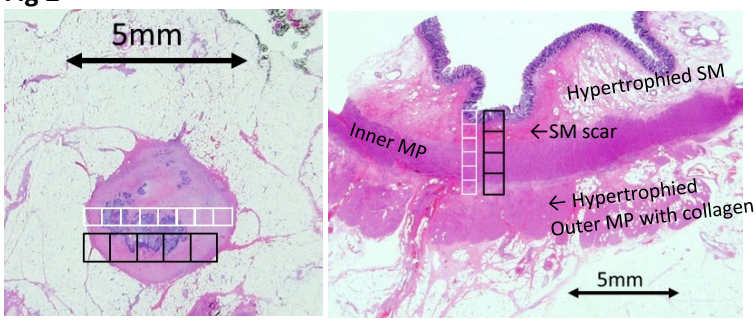
mrTRG is well described and needs good quality scans to separate out the different signals. [Fig2]

<u>All residual mesorectal disease</u> contributes to the mrTRG score (Primary, LN, TD, EMVI). [6]

If the tumour was T3, there may be a mix of muscle cells and collagen in the muscularis layer which will make the signal brighter than the adjacent dark fibrosis only. This can be mistaken for tumour.

TIP – Check where the tumour was before, and look for homogeneous signal which is similar to the original tumour

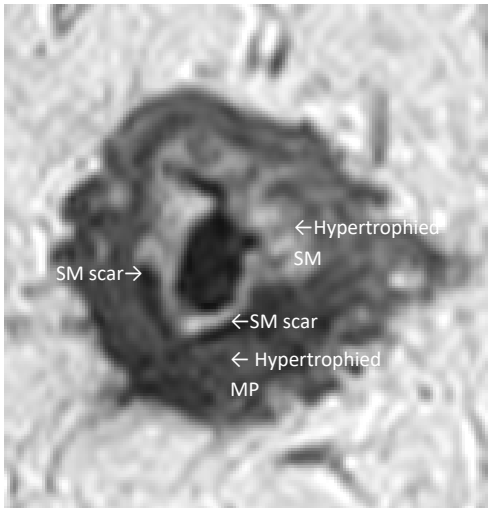
Fig 2



In plane resolution 0.6 x 0.6mm (white) v 0.8 x 0.8mm (black)
Larger size will average the different signals in a lymph node and rectal wall, reducing accuracy

SM – submucosa
MP – Muscularis propria
The SM scar is low T2. A continuous thick black line = the 'split scar sign'

Path Images – Dr Nick Rodgers



Post Treatment (Same patient as path image above) mrT3 at initial staging

The MP is thickened and contains some hypertrophied muscle cells & collagen, giving an intermediate signal which is NOT homogeneous or same as original tumour

An intact thin inner black line which <u>must be continuous in all planes</u>, is a '<u>split scar sign</u>'.

It may or may not also have dark fibrosis outside the MP, depending if it was a T1/2 or T3/4 originally.

This is potentially prognostic for sustained CR [6,7]

Diffusion

DWI has an increasing role in post treatment assessment, but remains hampered by artifacts. Microlax enemas have been shown to reduce these, though the ARGANZ survey results from 2021 showed only 15% of ANZ radiologists used them. Uptake appears to be personal preference.

Some centres are using high b values &/or calculated images and 3/3.5mm angled to match HRT2.

Important points to remember are;

- Any high DWI abnormality needs a matching low ADC
- Make sure the area is where the tumour was, preferably with a matching T2 abnormality – beware submucosal hypertrophy and artifact

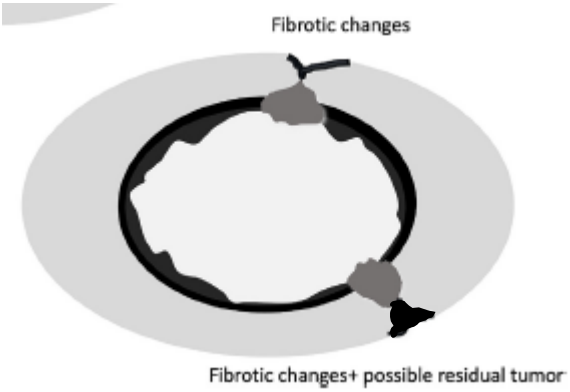
Why do we give an MRI stage post Treatment? (ymrT,E,N,C)

- Because unless the imaging returns to completely normal (which is quite rare) there may be microscopic tumour cells in any fibrosis we see.
- So the surgeon needs to know how far out the fibrosis (and possible tumour) goes if they are planning to operate.
- Post treatment ymr Staging (T,E,N,C + TD) is recommended in many countries and centres. If your surgeons don't think they want it, I suggest you do it anyway and let them ignore it.

CRM involvement

People often ask how to stage the possible involvement of the CRM / MRF / low rectal plane after treatment. The recent French Post treatment Guidelines has nice examples. Basically;

- If its thick fibrosis that might have tumour cells within 1mm of MRF – stage as ymrMRF involved
- Reduction to a few thin strands extending to the MRF are OK, even if there is some indrawing – call negative
- Low rectal tumours are the same concept, with thick low T2 fibrosis within 1mm of the TME plane considered as involved, as it may contain tumour



"Post CRT drawing shows two frequent situations. Thin fibrotic spiculation attached to the MRF and in keeping with **no** CRM involvement, and thick fibrotic changes post CRT which may be associated with residual tumor." **(CRM positive**)

Adapted from 6. Nougaret S et al. MRI restaging of rectal cancer Diagn Interv Imaging. 2023 Jul-Aug; 104(7-8):311-322.

CLINICAL UPDATES

Near Complete Response (nCR)

A number of publications refer to nCR. This does not yet have an agreed definition, long term outcome data, or agreement on how to manage these patients. It doesn't fit with a particular mrTRG category, but describes mrTRG3 with small volume disease.

Some centres consider these patients have a poor response and should go to surgery, and others will watch. If 1-2 MRIs at 3 monthly intervals show persistent tumour, surgery is recommended [5]

Total Neoadjuvant Treatment (TNT) and Chemo Only

5-7 year results being presented for the consolidation (CRT + chemo) and induction (chemo + CRT) TNT (OPRA/RAPIDO/PRODIGE) remain promising. 5-10 year results for using chemotherapy only and avoiding radiotherapy (PROSPECT/FOWARC) show non-inferiority, although the treatment groups were wide. Treatment with chemotherapy only, is likely to reduce the amount of fibrosis visible on MRI. Clinical use of these protocols is still being debated [9].

OTHER

DEEP RESOLVE

I am yet to be convinced that Deep Resolve [10] is optimal in rectal cancer, which relies on direct interrogation of potentially very small areas of different tissues. Radiologists using it have reported concerns, and on the scans I've reviewed it seems less reliable. So don't let your techs just use it for rectal MRI without conscious assessment. A lower level may be reasonable, but requires further assessment.

MEDICARE Funding - Australia

ARGANZ has provided a joint statement with CSSANZ (Colorectal Surgical Society of ANZ) via RANZCR to the Dept of Health, outlining suggested modifications to the current item to include post treatment MRI – at least one scan, and also a full course of watch and wait. The initial discussions have been positive, and I will continue to push for a positive outcome.

USEFUL ARTICLES / REFS

These are a few useful recent articles, some with nice summaries

1. Lord AC, D'Souza N, Shaw A et al. **MRI-Diagnosed Tumor Deposits and EMVI Status Have Superior Prognostic Accuracy to Current Clinical TNM Staging in Rectal Cancer**. Ann Surg. 2022 Aug 1;276(2):334-344
2. Schaap DP, Voogt ELK, Burger JWA et al. **Prognostic Implications of MRI-Detected EMVI and Tumor Deposits and Their Response to Neoadjuvant Therapy in cT3 and cT4 Rectal Cancer**. Int J Radiat Oncol Biol Phys. 2021 Nov 1;111(3):816-825.
3. Zhao M, Feng L, Zhao Ket al. **An MRI-based scoring system for pretreatment risk stratification in locally advanced rectal cancer**. Br J Cancer. 2023 Aug 9
4. Koh DM, Smith NJ, Swift RI, Brown G. **The Relationship Between MR Demonstration of Extramural Venous Invasion and Nodal Disease in Rectal Cancer**. Clin Med Oncol. 2008;2:267-73.
5. Lee S, Kassam Z, Baheti AD, et al. **Rectal cancer lexicon 2023 revised and updated consensus statement from the Society of Abdominal Radiology Colorectal and Anal Cancer Disease-Focused Panel**. Abdom Radiol (NY). 2023 May 5.
6. Nougaret S, Rousset P, Lambregts DMJ, et al. **MRI restaging of rectal cancer: The RAC (Response-Anal canal-CRM) analysis joint consensus guidelines of the GRERCAR and GRECCAR groups**. Diagn Interv Imaging. 2023 Jul-Aug;104(7-8):311-322
7. Santiago I, Barata M, Figueiredo N, et al. **The split scar sign as an indicator of sustained complete response after neoadjuvant therapy in rectal cancer.** Eur Radiol. 2020 Jan;30(1):224-238.
8. Yuan Y, Zheng K, Zhou L, et al**. Predictive value of modified MRI-based split scar sign (mrSSS) score for pathological complete response after neoadjuvant chemoradiotherapy for patients with rectal cancer**. Int J Colorectal Dis. 2023 Feb 15;38(1):40.
9. Jain A, Gormly KL, Glyn T, et al. **Management of rectal cancer in the era of total neoadjuvant therapy and watch and wait: A multidisciplinary team discussion at the Australasian Gastro-Intestinal Trials Group (AGITG) Annual Scientific Meeting 2022**. Asia Pac J Clin Oncol. 2023 Jun 21
10. https://www.siemens-healthineers.com/magnetic-resonance-imaging/technologies-and-innovations/deep-resolve

- Lambregts DMJ, Bogveradze N, Blomqvist LK, et al. **Current controversies in TNM for the radiological staging of rectal cancer and how to deal with them: results of a global online survey and multidisciplinary expert consensus**. Eur Radiol. 2022 Jul;32(7):4991-5003.
- Nougaret S, Rousset P, Gormly K, et al. **Structured and shared MRI staging lexicon and report of rectal cancer: A consensus proposal by the French Radiology Group (GRERCAR) and Surgical Group (GRECCAR) for rectal cancer**. Diagn Interv Imaging. 2022 Mar;103(3):127-141.