LOWER GI (RECTAL)

RADIOTHERAPY TREATMENT CLINICAL GUIDELINES

Please note: these Guidelines will apply unless the patient is taking part in clinical trial, in which case the trial protocol will supersede the Guidelines.

Contents:

1). SCOPE OF THE GUIDELINES

1. Long Course Chemoradiotherapy (LCCRT) for Rectal Cancer

2. Short Course Radiotherapy (SCRT) for Rectal Cancer.

3. Palliative radiotherapy

2). SELECTION CRITERIA / INDICATIONS FOR TREATMENT

1. LCCRT reduces the risk of locoregional recurrence and has been shown to lead to pathological complete response in 15-25%

- Neoadjuvant LCCRT is indicated for locoregionally advanced rectal cancers with:

    - Involved or threatened (<1mm) circumferential margin (CRM)
    - Involved pelvic side wall (PSW) nodes
    - As part of a total neoadjuvant treatment (TNT) protocol in patients wishing organ preservation.
    - For locally advanced tumours where downstaging required. Either alone or as part of a TNT protocol
    - Those deemed to be of a high risk of local recurrence

- Adjuvant postoperative LCCRT may be considered for patients with:

    - Involved CRM (<1mm)
    - Residual macroscopic disease or disease outside the resection margin

- LCCRT may be considered prior to or after contact Papillion RT for organ preservation or in patients fit for LCCRT but unfit for surgery

2. SCRT reduces the risk of locoregional recurrence and has been shown to contribute to a complete pathological response in 28% of patients when followed by oxaliplatin based chemotherapy as part of a TNT protocol

- Neoadjuvant SCRT can be considered for locoregionally advanced rectal cancers with:

    - 2 or more of the following risk factors: T3c/d, N+, EMVI with or without threatened CRM
    - Involved or threatened (<1mm) CRM in patients unfit for chemotherapy

  - As part of a TNT protocol in patients wishing organ preservation or where downstaging is required

- Adjuvant SCRT may be considered prior to or after contact Papillion RT for organ preservation or in frail patients unfit for surgery

- Palliative RT in frail patients unfit for surgery or patients with inoperable metastatic disease

ESMO guidelines give further details for rectal radiotherapy indications if required:
https://www.annalsofoncology.org/article/S0923-7534(19)42152-2/pdf

3). PRE-TREATMENT INFORMATION FOR RADICAL TREATMENT

- Clinical examination
- Biopsy
- Radiological staging with CT of thorax abdomen and pelvis
- MRI Rectum
- Consider PET CT if suspicion of PSW nodes or distant metastases
- FBC, U&E, LFTs, eGFR, CEA
- Adequate bone marrow function for chemotherapy
- DPD testing for chemotherapy
- WHO performance status 0-1 for chemotherapy
- Negative pregnancy test if age <55
- De-Functioning stoma should be considered in patients with obstructive symptoms or fistulation
- Exclusion of contraindications for pelvic RT (IBD, previous radiotherapy, pregnancy)
- Colorectal MDT discussion

Chemotherapy

Please note: the information below will apply unless the patient is taking part in clinical trial, in which case the trial protocol will supersede.

Concurrent Capecitabine 825mg/m2 po bd daily (starting d1 RT continuously or on days of RT only) with LCCRT.

Consider for patients with previous grade 3 Capecitabine toxicity consider concurrent CI5FU 200 mg/m2 day for 33-35 days (starting d1 RT).

https://www.swagcanceralliance.nhs.uk/wp-content/uploads/2020/09/Capecitabine-radiotherapy1.pdf

4). CONSENT / TOXICITY

Use of the RCR national radiotherapy consent form is recommended
https://www.rcr.ac.uk/sites/default/files/radiotherapy-consent-form-for-rectal-cancer.pdf

Acute Toxicity

- Fatigue
- Bowel symptoms (diarrhoea, increased frequency or urgency)
- Bladder irritability (increased frequency and urgency, pain on micturition)
- Skin irritation
- Pubic hair loss
- Nausea

Chemotherapy related toxicity:
https://www.cancerresearchuk.org/sites/default/files/colorectal_capecitabine_radiotherapy_v2.pdf

Late Toxicity

- Impaired wound healing
- Change in Bowel Function (increased frequency and urgency, bleeding, incontinence)
- Infertility / Early Menopause
- Urinary symptoms (increased frequency and urgency, bleeding, incontinence)
- Sexual Dysfunction (impotence, vaginal stricture)
- Bowel stricture / fistula requiring surgery <5%
- Secondary cancer

5). LOCALISATION

Preparation

- Comfortably full bladder as per local work instructions for pelvic radiotherapy
- Rectal Prep is not mandatory but consider rescanning if rectal diameter > 4 cm
- In patients requiring a defunctioning stoma this should ideally be positioned outside any radiotherapy volumes if fashioned before planned RT

Positioning

- Supine, knee pad and ankle stocks indexed to couch

Imaging

- Planning CT as per local work instructions for pelvic for pelvic radiotherapy
- IV contrast to aid delineation unless contraindicated
- Oral contrast is an option to aid delineation of small bowel loops
- AP and Lateral tattoos
- Radio-opaque marker can be considered as a reference point for low rectal cancers
- Co-registration with diagnostic MRI (and PET CT if available)
- Pregnancy test for women aged <55 will be undertaken prior to planning CT and documented on RT management system

6). VOLUME DEFINITION

This guidance follows the national Rectal IMRT guidelines:
https://www.rcr.ac.uk/system/files/publication/field_publication_files/bfco211-rectal-imrt-guidance_0.pdf

Refer to diagnostic imaging

Co-registration of diagnostic or planning MRI and PET CT (if available)

Some cases may lie outside of these guidelines (for example post operative patients with residual disease or rectal cancers with involved/high risk of external iliac or inguinal node

involvement due to involvement of anal canal or central pelvic organs respectively). These should be discussed at peer review and guidelines individualised appropriately.

Standard Volumes (LCCRT and SCRT*)		
Volume	**Definition**	**Details**
GTVp	Gross Tumour Volume_primary Macroscopic primary tumour, areas of adjacent extramural vascular invasion or post op macroscopic disease identified on imaging.	If the tumour can be confidently identified, the GTVp can include macroscopic disease only, without the whole lumen. In this situation, lumen, rectal gas or faecal contents should not be included in the volume
GTVn	Gross Tumour Volume_nodes All macroscopically involved lymph nodes defined by available imaging	
ICTVp	Internal Clinical Target Volume_primary CTV for primary tumour including a margin for motion	GTVp + 10mm in all directions. For higher tumours that maybe more mobile consider 15mm anteriorly. Edit off bone in all directions except posteriorly. Edit off muscle unless there are obturator nodes, in which case include obturator internus on that side.
ICTVn	Internal Clinical Target Volume_nodes CTV for involved nodes including a margin for motion	GTVn + 5mm in all directions Edit off bone in all directions except posteriorly. Edit off muscle unless there are obturator nodes, in which case include obturator internus on that side.

ICTV_elec	Internal Clinical Target Volume_elective CTV for all elective nodal groups (mesorectum, presacral, internal iliac and obturator) including a margin for motion Following neoadjuvant chemotherapy include all compartments containing disease at baseline. *When indication for use of SCRT is adjuvant before or after local resection of T1/T2 disease or Papillon contact boost as definitive treatment or is palliative then the ICTV_elec should include the mesorectum only	See National guidelines for compartment definitions and voluming atlas Identify superior slice: S1/2 or 2 cm sup to baseline imaging GTV (whichever is most superior) Outline Internal Iliac artery & vein, inferior mesenteric artery and superior rectal vessels to the level of obturator internus Grow vessels by 7mm (0mm in sup/inf direction) Use a 10mm rollerball to join vessels + 7mm volumes along anterior sacrum and edit off bone and piriformis (posteriorly) unless involved and iliopsoas (anterolaterally) and extend volume into sacral notch Identify superior level of mesorectum: at bification of IMA into sigmod and superior rectal arteries OR S2/3 Volume whole mesorectum with a 1 cm margin anteriorly (to allow for motion) Inferiorly include the levator muscles The inferior slice is the level of insertion on levator ani into external sphincter (where mesorectal fat disappears on coronal slices) or 2 cm inferior to baseline imaging GTV (whichever is most inferior) Add the obturator nodes using a 17mm rollerball starting at the superior border of obturator internus muscle and stopping inferiorly where the obturator artery moves laterally to this muscle

ICTV_final	ICTVp+ICTVn+ICTV_elec Internal Clinical Target Volume _final Combines all relevant ICTV volumes And will also include the ICTVsb or ICTV_boost volumes in relevant cases (see below)	
PTV_4500 PTV_2500	Planning Target Volume For patients with one dose level only ICTV_final + 5mm in all directions ICTV_final + 10mm in all directions	If daily online volumetric (CBCT) verification If offline imaging or less than daily CBCT

Additional Volumes Relevant in specific cases		
Volume	**Definition**	**Details**
GTVp_Boost	Primary Gross Tumour volume where the treating clinician considers a Simultaneous Integrated boost is indicated	For example larger or fixed tumours
GTVn_Boost	Nodal Gross Tumour volume where the treating clinician considers a Simultaneous Integrated boost is indicated	For example nodes outside the expected surgical resection margin.
ICTVp_Boost	Internal Clinical Target Volume for primary with SIB CTV for primary tumour to be treated with simultaneous integrated boost (SIB) including a margin for motion	GTVp + 10mm in all directions. For higher tumours that maybe more mobile consider 15mm anteriorly. Edit off bone in all directions except posteriorly. Edit off muscle unless there are obturator nodes, in which case include obturator internus on that side.

ICTVn_Boost	Internal Clinical Target Volume for nodes with SIB CTV for involved nodes to be treated with SIB including a margin for motion	GTVn + 5mm in all directions Edit off bone in all directions except posteriorly. Edit off muscle unless there are obturator nodes, in which case include obturator internus on that side.
ICTV_High	ICTVp_Boost + ICTVn_Boost Combined ICTV volumes to be boosted	
ICTV_sb	Internal Clinical Target Volume_surgical bed Post operative volume at risk of microscopic disease in postoperative adjuvant cases	Volumes should include all areas of potential microscopic disease including all areas of disease present on preoperative imaging. Surgical clips may aid voluming. These cases should will likely require an individualised approach and peer review prior is essential
PTV_High	ICTV_High + 5mm or 10mm	Dependent of volumetric verification protocol as above
PTV_Low	ICTV_elec + 5mm or 10mm Elective dose level for patients treated with SIB	Dependent of volumetric verification protocol as above

7). ORGANS AT RISK

For All Cases		
Organ	**Standardised TPS name**	**Definition**
Small Bowel loops	Bowel_Small	Contour all individual bowel loops including 20mm sup to PTV Contouring large bowel and uterus first and the use of oral contrast aids delineation
Bladder	Bladder	Contour outer wall of bladder to include base and dome
Proximal femurs	Femur_Head_R Femur_Head_L	Contour femoral ball, neck, greater and lesser trochanters as one structure to the caudal aspect of the lesser trochanter
Optional for low rectal cancers and LCCRT		
Organ	**Standardised TPS name**	**Definition**
External genitalia	Female_genitalia Male_genitalia	Women; Include clitoris, labia majora and minora. The lateral extent is the inguinal creases. The cranial extent is the mid symphysis pubis Men: Include penis and scrotum

See section 9, “Plan evaluation”, for constraints (p.12)

8). DOSE AND FRACTIONATION

Treat Neoadjuvant and Adjuvant patients as Category 2 with VMAT delivery.

Treat Palliative patients as Category 3 with VMAT or VSIM.

Indication	Dose	Fractions	Prescribed to	Scheduling
SCRT	25Gy	5	ICRU Median Dose (D50%) of PTV	5-7 days
LCCRT	45Gy	25	ICRU Median Dose (D50%) of PTV	33-35 days
LCCRT with SIB Simultaneous Integrated boost to GTVp / GTVn for larger / fixed tumours or post op R1	45Gy + 50Gy	25	ICRU Median Dose (D50%) of PTV	33-35 days
LCCRT with SIB Postoperative residual macroscopic disease or disease outside the resection margin. Patients wishing organ preservation.	45Gy + 52Gy	25	ICRU Median Dose (D50%) of PTV	33-35 days
Palliative fractionation	25Gy 20Gy 8Gy	5 5 1	ICRU Median Dose (D50%) of PTV ICRU Median Dose (D50%) of PTV / mid plain Mid plain	

9). PLAN EVALUATION

Target Objectives			
ROI	**Volume**	**Dose (%TD)**	**Dose (Gy)**
PTV_4500 PTV_Low	D99% D95% D50% D2%	>90% >95% =100% +/- 2% <105%	>40.5Gy >42.75Gy 45Gy <47.25Gy
PTV_High PTV_5200 (52Gy SIB)	D99% D95% D50% D2%	>90% >95% =100% +/- 2% <105%	>46.8Gy >49.8Gy (49.4Gy) 52Gy +/- 1Gy <54Gy (54.6Gy)
PTV_High PTV_5000 (50Gy SIB)	D99% D95% D50% D2%	>90% >95% =100% +/- 2% <105%	>45Gy >47.5Gy 50Gy +/- 1Gy <52.5Gy
PTV_4500 minus PTV_5200 + 5m	<107% (D15%)	<15% (<107%)	<48.15Gy
Target Objectives			
ROI	**ROI**	**ROI**	**ROI**
PTV_2500	D99% D95% D2%	>90 >95 <105	>22.5Gy >23.75Gy <26.25Gy

Dose Constraints Organs at Risk: LCCRT (PTV_4500/5000/5200)			
OAR	**Volume**	**Objective (Gy)**	**Mandatory Dose (Gy)**
Bowel_Loops	180cc 100cc 65cc 0.5cc	<35Gy <40Gy <45Gy	 <52.5Gy
Spc_Bowel (bowel bag)	400cc 250cc 200cc	<20Gy <30Gy <43Gy	 <47.5Gy
Femoral _Head_R/L	50% 35% 5%	<30Gy <40Gy <50Gy	<45Gy <50Gy <52.5Gy
Bladder	50% 35% 5%	<35Gy <40Gy <50Gy	<45Gy <50Gy <52.5Gy
Genitalia	50% 35% 5%	<20Gy <30Gy <40Gy	<35Gy <40Gy <52.5Gy

Dose Constraints Organs at Risk: SCRT (PTV_2500)		
OAR	**Volume**	**Dose (Gy)**
Bowel_Loops	200cc 150cc 20cc	<20Gy <22Gy <25Gy
Spc_Bowel (bowel bag)	400cc 250cc 200cc	<10Gy <18Gy <23Gy
Bladder	45%	<21Gy

10). VERIFICATION

SCRT:

- Daily cone beam CT (CBCT)

LCCRT:

- Daily CBCT is recommended
- Minimum verification require d1-3 CBCT then weekly CBCT with daily KV imaging

11). ON-TREATMENT REVIEW

Please refer to local protocol

12). FOLLOW UP

Please refer to local protocol.

- Neoadjuvant treatment:
  - MRI rectum to assess response and CT CAP to exclude metastatic progression 6-12 weeks post RT
  - MDT review

- Palliative or Adjuvant treatment:
  - Please refer to local protocol.

13). IMPROVING STANDARDS

Peer review:

Where possible, prospective peer review should occur before the first fraction of radiotherapy. This is especially important in situations where a clinically important difference in judgement might occur. Peer review should be undertaken by a minimum of two Clinical Oncology Consultants with site-specific expertise. It is recommended that Specialist Registrars, Radiotherapy Physics & Radiographer representatives also attend. Outcomes of peer review should be recorded.

Quality indicators:

The following quality metrics will be reported annually:

- Proportion of patients receiving radical EBRT whose volume or plan is prospectively peer reviewed.

14). AUDIT

Further details around the audit requirements & frequency will be agreed at the Network level in due course.

15). NETWORK TUMOUR GROUP MEETINGS

Further information on this will follow in due course.

16). CHANGE/GOVERNANCE PROCESS FOR THE REGIONAL SW RT ODN GUIDELINES

To access all available SW RT ODN Clinical Guidelines, please click here (SWAG CA website).