NHS
East Midlands Radiotherapy
Operational Delivery Network

Radiotherapy Protocol for the management of UGI Cancer

This is radiotherapy protocol for the East Midlands RT Operational Delivery Network (ODN). Tumour sites are: Oesophagus

Document revision History

Version Number	Date	Document History.
0.01	23/09/22	Initial Draft Collation by PM
0.02	14/3/23	Edits following email feedback from CK
0.03	19/04/23	Changes throughout following UGI protocol review meeting In attendance: E.James, C.Knox, Z.Stokes, P.Das, J.Davies. K.Das Updated draft shared to clinician group for any further comments
0.04	11/05/23	Feedback from R.Silverman
0.05	12/08/23	Changes added for palliative management following NICE guideline update Recommended agreed by R.Gabitass. Agreed by UGI clinicians via email.
0.06	27/02/24	Reviewed by Radiotherapy planning team. In attendance: D.Holmes, V.Ohlendorf, M.Bland, L.Martins. Updated draft shared to planning team for any further comments
0.07	22/03/24	Reviewed at ECAG and agreed for approval.
1.0	April 2024	Final version uploaded to SharePoint
V1.1	January 2025	KD/PM- References improved as per Dec 2024 NOG action

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1. Indications for treatment

- Histologically confirmed Squamous cell / Adeno carcinoma of the oesophagus or Other rarer types like Small cell / Large cell carcinoma.
- Staging confirms no distant metastases
- PS 0-2 for Radical treatment
- Primary tumour and nodal disease encompassable within a radiotherapy field
- If patient had previous radiotherapy, retreatment is at clinician's discretion and consider Peer review.
- No contraindications to chemotherapy if having concurrent treatment.

Treatment options:

- Definitive Chemoradiotherapy (DCRT)
- Pre-Operative Neoadjuvant Chemo-Radiotherapy
- Post Operative Radiotherapy +/- Chemotherapy
- Radical radiotherapy only
- Palliative Radiotherapy

2. Investigations required

- Histological confirmation of malignancy
- Diagnostic / staging imaging to include:
  - OGD
  - EUS – If indicated for further local staging, according to the local practise. EUS should be ideally reported with reference to CT identifiable structures.
  - Staging laparoscopy (where indicated)
  - CT TAP with contrast
  - 18-FDG PET-CT
  - Full Lung function tests:

·Definitive ChemoRT and Definitive Radiotherapy: *FEV1 ≥ 1.0l, TLCO/DCLO ≥ 40%*

· Pre-Operative Neoadjuvant ChemoRT and Post–operative Adjuvant: *FEV1 ≥ 1.5l, CPEX acceptable. TLCO/DCLO ≥ 40%* (Ideal guidelines-NeoSCOPE[10])

- For patient receiving chemotherapy with radiotherapy, further investigations will be required according to chemotherapy protocols

Review of clinical history to include:

-Previous radiotherapy
-History and examination, PS

Special Circumstances to consider:

-Chronic conditions or disease that affects radiosensitivity
-Ongoing medication that may affect response to radiotherapy

3. Information given to patients

-General radiotherapy booklet
-Site specific treatment leaflet including long term side effects

4. Consent

-By IR(ME)R Practitioner at new patient / planning clinic
-By Entitled IR(ME)R Operator under delegated authority at new patient / planning clinic

5. Trials

-Consider current trials open in any of the radiotherapy centres in the East Midlands.
-[EMRTN TRIALS TRACKER LINK]
-If a patient is being treated in a clinical trial then the Trial Protocol overrides the departmental protocol.

6. Position and immobilisation

All patients will be CT scanned **as per local protocol** and should consider including the following:

- Appropriate scan levels and suitable thorax patient immobilisation.
- All patients will be scanned supine
- With middle or lower third primary, the patient's arms will be positioned with arms above the head
- In cases with upper third involvement, before CT planning scan, is recommended to use a thermoplastic head and neck shell and discuss treatment position with Physics staff if required.
- Knee support and immobilisation forming with thermoplastic device or vacuum cushion, as per local protocols.

- Consider asking lower third oesophageal/GOJ patients to fast and then drink water prior to CT planning and treatment as per local protocol (in an attempt to reproduce the same anatomical position of the stomach due to filling throughout treatment). It is crucial the same stomach preparation procedure is followed before planning and treatment. Patients who have a nasogastric tube inserted and are unable to drink due to dysphagia should use their tube for this purpose.

- 3DCT CT scan with intravenous contrast (providing adequate renal function and no other contraindications).
- Consider 4DCT for lower third oesophagus or GOJ, (immediately following the 3DCT), subject to patient's suitability.

- The superior extent of the scan should be least 1cm superior to the apices of the lungs and 6cm superior to the proximal disease (whichever is highest). The inferior extent of the scan should cover the whole stomach or all of the Kidneys if lower it's a lower tumour.

- The planning CT scan should be performed at the time of or within 2 weeks of commencing neo-adjuvant chemotherapy.
  Consider fiducials or radio opaque markers if tumour is difficult to visualise.

7. Planning

Technique

- IMRT/VMAT is the primary choice of planning technique for radical patients.
- Conformal Radiotherapy may be considered on a case by case basis
- If the treatment is off protocol this should be noted and the correct local procedure for recording off protocol treatments followed.

- Diagnostic information should be available and discussed at MDT.
- The PET-CT can be fused with the planning CT where applicable.
- The volume defined from CT and EUS should not be reduced based on the PET findings alone.

Volume definition

- **Follow nationally recognised, peer reviewed or trial protocols (See references[4][5][6][10]) for volume contouring and margins**
- The GTV, CTV/ITV margins are to be outlined by the clinical oncologist/registrar or other appropriately trained and approved clinician (e.g. consultant radiographer)
- There will be situations where individual anatomy and other special conditions require that the coverage of the PTV may need to be compromised. In these cases, the approved clinician is required to exercise his/her clinical judgement and to clearly indicate the clinical priorities to the treatment planning team
- Consider including 4DCT outlining for definitive and pre-operative lower third tumours (subject to patient's suitability for 4DCT and subject to the 4DCT quality).[4]
- Post–operative Adjuvant Radiotherapy: CTV according to area at risk of recurrence. The pre-op GTV is used to outline and should be included in the CTV/ITV.

Organs at risk

- Organs at risk (OAR) to be outlined as per nationally recognised, peer reviewed protocols. In addition, if close to PTV, the spleen should be included as per RCR guidance.[2]

OAR	
	Spinal Cord and Spinal Cord PRV
	Stomach
	Lung – Combined
	Heart
	Liver
	Spleen if close to PTV
	Right and Left Kidneys if close to PTV

8. Dose Constraints

Follow nationally recognised, peer reviewed or trial protocols (See references) [4] [5][6][10] for constraints.
• Dose escalation is acceptable within a national/trial protocol scope • For all radical cases, if the mean radiation dose to the spleen >10Gy, consider a vaccination programme and prophylactic antibiotic regimen as laid out in RCR- 'Incidental irradiation of the spleen' [2]

Example constraints are listed below

*-Dose constraints for **definitive RT** and **ChemoRT** (taken from SCOPE2):*

Structure Name	Constraints	Optimal	Mandatory
PTV	V95% (47.5Gy) D median/mean	> 95% 100%	≥ 90% The median/mean should be between 98-102% of the prescription dose
External	D1.8cc		<107% of highest prescribed dose
SpinalCord_PRV	D0.1cc	< 40Gy	< 42Gy
Heart	D mean V30Gy	< 25Gy < 45%	< 30Gy
Lungs (combine lungs)	D mean V20Gy	< 17Gy < 20%	< 19Gy ≤ 25%
Stomach_excl_PTV (Stomach excluding PTV)	V50Gy	< 16cc	< 25cc
Liver	D mean V30Gy	≤ 28Gy < 30%	≤ 30Gy
Kidney_L and Kidney_R (Individual kidneys)	V20Gy	< 25%	≤ 30%

*-Dose constraints for **Neoadjuvant ChemoRT** and **post-op adjuvant RT** (from NeoAEGIS):*

Structure	Naming convention*	Dose Objective	Comments / acceptable ranges
PTV if 'type B' algorithm used	PTV	V95% ≥ 99% – (0.4*% lung/PTV overlap) V95%≥95% for all cases	V95% objective is individually determined based on the percentage of PTV which overlaps with lung tissue according to the formula adopted from Wills 2009. Reduced coverage is only allowed in the areas of the PTV that overlap with lung.
PTV (general)		Dmean= 100% (41.4Gy)	Under dosage of PTV is only allowed if requested due to the proximity of a serial OAR. In this situation a maximum of 5% of the PTV volume should receive less than 95% of the prescription dose. The mean should be between 98-102% of the prescription dose (i.e., 41.4Gy).
ICRU Maximum dose	Label patient outline as *External*	D1.8cc < 107%	Defined as the maximum dose to 1.8cc of any structure within the external contour of the patient
Spinal cord	Spinal cord	D0.1cc < 45Gy	
Spinal Cord PRV	SpinalCord_PRV	D1cc < 40Gy	If the PTV lies close to or overlaps with the Spinal Cord PRV, the treating clinician may discretionally allow a point maximum dose up to 44.3Gy (107% of 41.4Gy).
Combined Lungs	Lungs	V20Gy < 25% V5Gy < 65%	See notes in Neo-AEGIS protocol. Total lung volume and V5 lung, VS5 lung (the volume of normal lung spared of exposure to doses of 5Gy or higher), and mean lung dose are recorded. Every effort should be made to maintain V5<65% of total lung volume.
Heart		V40Gy < 30% V25Gy < 50	Optimal objective – to be achieved where possible but at lower priority than other objectives.
Liver		V30Gy < 30%	
Individual Kidneys		V20Gy < 25%	The glomerular filtration rate of each kidney has to be taken into account in case of suspicion of a decreased renal function.
Stomach	Stomach		See notes in NEO-AEGIS protocol. Currently not defined as an organ at risk but data will be collected to explore correlation with toxicity.

9. Prescribed dose [1]

Criteria	Dose fractionation
Definitive ChemoRT	50Gy in 25# over 5 weeks (Grade A)
	50.4Gy in 28# over 5.5 weeks (Grade A)
	60–66 Gy in 30# over 6 weeks **For upper third oesophageal carcinoma only. Moderate dose escalation with IMRT can be considered, wherever possible within the context of a clinical trial (Grade C)**
	40Gy in 15# over 3 weeks (**Neuroendocrine Oesophageal Tumours only)**
Neoadjuvant ChemoRT	41.4Gy in 23# over 4.5 weeks (Grade A)
	45Gy in 25# over 5 weeks (Grade B) **(For Adenocarcinoma)**
Definitive RT alone	50Gy in 15-16# over 3 weeks (GTV ≤ 5cm) (Grade C)
	50-55Gy in 20# over 4 weeks (Grade C)
	60Gy in 30# over 6 weeks (Grade D)
Post-operative ChemoRT:	40-50.4Gy in 20-28# (Grade A)

10. Prescription Point

Prescribed as per ICRU 50/62 reports [11]

11. Palliative Intent

Patients with limited distant metastatic disease and good PS may be considered for definitive CRT to maximise locoregional disease control. There may be options small volume metastases outside of primary region e.g. resection of liver or lung metastases, SABR. Patients with locally advanced disease, but are unfit for CRT, or have metastatic disease, may be considered for palliative radiotherapy.

Palliative dose fractionations:[1]

- 30Gy in 10 fractions over 2 weeks
- 20Gy in 5 fractions over 1 week
- 35Gy in 15# over 3 weeks
- 40Gy in 15# over 3 weeks
- 8-10Gy in single fraction

NICE Recommendations on palliative management of luminal obstruction with no curative intent for adults with oesophageal or oesophago-gastric junctional cancer[7]

- Do not routinely offer external beam radiotherapy after stenting for people with oesophageal and oesophago-gastric junctional cancer.
- Consider external beam radiotherapy after stenting of oesophageal and oesophago-gastric junctional cancer for people with prolonged post-interventional bleeding or a known bleeding disorder.

Palliative HDR Brachytherapy:

- Consider HDR intraluminal brachytherapy for palliation of symptomatic dysphagia in patients with carcinoma of upper / middle / lower oesophagus.
- The practitioner requires an ARSAC certificate. Written authorisation can be given to a non ARSAC certificate holder who then acts on their behalf.
- Currently **ULHT** are the only trust delivering this treatment within the network and the local protocol for Oesophageal Brachytherapy should be followed.

12. Treatment

- Final pre-treatment, Physics and 1st day checks should be carried out as per local protocol.
- These should ideally cover or take into account the following:
- Monitoring and managing Radiotherapy delays to ensure patients start treatment according to national guidelines
- Checking plan approval status and parameters as per local protocol
- All prior preparatory and required patient information is available
- Imaging requirements for the planned treatment are adequate according to patient plan and local protocol
- Any prior In vivo dosimetry has been performed as per local protocol.

13. During treatment

- Any other patient monitoring as specified in the local protocol should be performed e.g. dietician review, weight checks, monitoring of bloods.
- On treatment imaging as per local protocols. The use of CBCT for radical oesophagus patients is mandatory for accurate treatment.
- For gaps in treatment follow local policy and RCR guidelines
- On treatment and follow up reviews as per local protocols.

14. Peer Review[12]

- Peer Review will enable clinicians to provide high quality treatments despite potentially limited referrals. Documenting peer review is essential as per RCR Recommendation 10 + 11.

- In order to meet the RCR standards the review will cover patient selection, prescription and target / OAR delineation. For some cases it may be necessary to review the final treatment plan also.

- The reviewee must provide the reviewer with all relevant clinical information to peer review, which may include demographics, diagnosis and details of proposed treatment. Any relevant clinical tests or images must also be provided (see Table 1 above).
- Responsibility for the patient will remain with the clinician under whom the patient receives their care. If a peer review does not occur, whatever the reason may be, it is that clinician's responsibility to address this.

15. Late Effects

- Late effects will have been discussed as part of the initial discussions and counselling by the treating clinician and is dependent on the radiotherapy target volumes

- If available, details of the local department's late effects clinic should be provided at the appropriate interval following completion of Radiotherapy.

16. Follow Up

- Patients should be followed up as per local department policy.
- **Considerations:**

- Patients seen 4-6 weeks after completion of radiotherapy
- Restaging CT at end of treatment if patient planned for surgery after chemo-radiotherapy
- Restaging CT 3 months after completion of radiotherapy if having definitive radiotherapy

17. Glossary

Abbreviation	Definition
#	Fraction (i.e. Fractions of treatment)
3DCT	Three dimensional computed tomography (standard CT scan)
CBCT	Cone Beam computed tomography
ChemoRT	Chemotherapy with Radiotherapy
CT	Computed tomography
CTV	Clinical target volume
EMRTN	East Midlands Radiotherapy Network
GTV	Gross tumour volume
Gy	Gray (unit of measure for radiation dose)
ICRU	International commission on radiation units and measurements
IMRT	Intensity modulated radiotherapy
ITV	Internal target volume
IR(ME)R	Ionising Radiation (Medical Exposure) Regulations
MDT	Multi-disciplinary team
MRI	Magnetic resonance imaging
NOG	Network oversight group
LDR	Low dose rate - (Brachytherapy)
HDR	High dose rate - (Brachytherapy)
OAR	Organs at risk
PSA	Prostate specific antigen
PET (PET-CT)	Positron emission tomography (Positron emission tomography – computed tomography)
PRV	Planning organ at risk volume
PS	Performance status
PTV	Planning target volume
RCR	Royal college of radiologists
RT	Radiotherapy
SABR	Stereotactic ablative Radiotherapy
U+E	Urea and electrolytes
VMAT	Volumetric modulated arc therapy

18. References

[1]

- https://www.rcr.ac.uk/media/0dvanjpu/05-gastrooesophageal-cancer-radiotherapy-dose-fractionation-fourth-edition.pdf

[2]

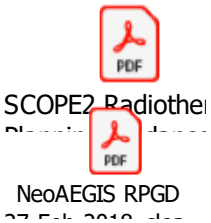
- RCR Incidental irradiation of the spleen- BFCO(21)9 Date: 2021, (https://www.rcr.ac.uk/system/files/publication/field_publication_files/bfco219-incidental-irradiation-spleen.pdf)

[3]

- RCR Timely delivery of radical radiotherapy: guidelines for the management of unscheduled treatment interruptions, fourth edition BFCO(19)1 Date: 2019

[4]

- SCOPE2 Radiotherapy Planning Guidance Document Version: 3.0 Date: 31/01/2020



[5]

- NeoAEGIS Radiotherapy Planning Guidance Document Version: 2.0 Date:27/02/2018

[6]

- SCOPE1 Radiotherapy Planning Guidance Document Version:

[7]

- NICE, Oesophago-gastric cancer: assessment and management in adults https://www.nice.org.uk/guidance/ng83

[8]

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4041542/

[9]

- https://aapm.onlinelibrary.wiley.com/doi/pdf/10.1120/jacmp.v12i2.3343

[10]

- https://pmc.ncbi.nlm.nih.gov/articles/instance/5341738/bin/mmc1.pdf (NeoSCOPE)

[11]

- https://www.icru.org/reports

[12]

- https://www.rcr.ac.uk/media/bpvngu2n/rcr-publications_radiotherapy-target-volume-definition-and-peer-review-second-edition-rcr-guidance_october-2022.pdf