Thames Valley and Wessex Radiotherapy Network (RTN)

Radiotherapy Protocols

Spine (Nervous System)

This document is the standardised Thames Valley and Wessex Radiotherapy Network Spine (Nervous System) treatment protocol developed collaboratively by the RTN Neurological Cancers site Protocol Working Group:

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Document History

Date of Issue	Version Number	Date Approved	Responsible for Change	Nature of Change	Ratification/ Approval
18.08.2021	0.1. (1st draft)	18.08.2021	The Working Group	Cross reference of existing local protocols and evidence literature	The Working Group
10.10.2021	0.2 (2nd draft)	20.10.2021	The Working Group	Organs at risk constraints tables alignment	The Working Group
20.10.2021	0.3 (3rd draft)		The Working Group		
24.11.2021	V 0.4 draft		The Working Group		
09.02.2022	V 1.0 (final)		The Working Group	Changes to naming nomenclature and grading in line with the latest guideline	
22.02.2022	V 1.0 (final)	25/02/22			Thames Valley and Wessex RT NOG
01.10.2023	V 2.0		The Working Group	Changes in line with the latest clinical evidence	
18.01.2025	V 3.0	21.02.2025	The Working Group	Changes in line with the latest clinical evidence	

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1. Primary Objectives and Scope

To summarise the planning and treatment of patients receiving external beam radiotherapy treatment for spinal nervous system tumours for use in Radiotherapy Centres in the Thames Valley and Wessex Radiotherapy Network.

2. Indications

Exculsion Criteria

1. Vertebral body metastases – refer to TVW ODN palliative spine/MSCC protocol.
2. Patients requiring craniospinal axis radiotherapy – refer to Whole CNS TVW ODN protocol.
3. Paediatrics

RADICAL RADIOTHERAPY					
Clinical Indication (including treatment criteria)	**Grade/ stage**	**Dose (Gy)**	**Fractionation**	**RT technique**	**Chemo**
GBM (PS 0-1) Post-op RT should be considered for all patients	**4**	**50.4** (consider up to 60Gy/30# if patient has significant neurological damage from tumour)	**28**	VMAT/ IMRT preferred	Concurrent and Adjuvant Temozolomide x 6 (consider up to 12 only if residual responding disease)
Astrocytoma (PS 0-1)	**3**	**50.4** (consider up to 60Gy/30# if patient has significant neurological damage from tumour)	**28**	VMAT/ IMRT preferred	
Oligodendroglioma (PS 0-1)	**3**	**50.4** (consider up to 60Gy/30# if patient has significant neurological damage from tumour)	**28**	VMAT/ IMRT preferred	
Ependymoma (PS 0-1)	**3**	**50.4** (consider up to 60Gy/30# if patient has significant neurological damage from tumour)	**28**	VMAT/ IMRT preferred	No
Glioma Following evidence of disease progression Persistent symptoms or disease affecting a critical site at outset (i.e., spinal cord patients usually receive RT)	**1-2**	**50.4** **50**	**28** **30**	VMAT/ IMRT preferred	

Clinical Indication (including treatment criteria)	Grade/ stage	Dose (Gy)	Fractionation	RT technique	Chemo
Ependymoma Following evidence of disease progression Persistent symptoms or disease affecting a critical site at outset (i.e. spinal cord patients usually receive RT)	**1-2**	**50.4** **50**	**28** **30**	VMAT preferred	
Meningioma For incompletely resected disease in critical sites, or recurrent Grade 1 or Grade 2 Meningioma usually following second operation.	**1**	**50.4** **50**	**28** **30**	VMAT preferred	
Meningioma For incompletely resected disease in critical sites, or recurrent Grade 1 or Grade 2 Meningioma usually following second operation.	**2**	**50.4** **50**	**28** **30**	VMAT preferred	
Meningioma Consider RT for all Grade 3 Meningioma (following complete/partial or no resection).	**3**	**50-54**	**28-30**	VMAT preferred	

PALLIATIVE RADIOTHERAPY					
Clinical Indication (including treatment criteria)	**Grade/ stage**	**Dose (Gy)**	**Fractionation**	**RT technique**	**Chemo**
Palliative spinal cord tumour		**20** **30** **8**	**5** **10** **1**	C Spine – parallel opposed lateral fields prescribed to ICRU ref point T/L Spine – direct posterior field prescribed to cord depth	
Retreatment Caution in using this following detailed evaluation of previous treatment dose, MDT discussion and MPE physics discussion					

3. Contouring Guidelines for Spinal (Nervous System) Tumours

- Note that OAR PRV margin= 2mm
- Consider pre op imaging, but take account of all anatomical changes following surgery

RADICAL RADIOTHERAPY			
Clinical Indication	**GTV**	**CTV**	**PTV**
Grade 4 Glioblastoma	GTV = pre-op tumour volume (consider post-op imaging as well if tumour volume significantly smaller)	CTV = GTV + 1.5-2.0cm or to anatomical boundary include all T2 abnormality	PTV = CTV + 0.7-1.0cm
Grade 3 Astrocytoma Oligodendroglioma Ependymoma Meningioma	GTV = pre-op tumour volume (consider post-op imaging as well if tumour volume significantly smaller)	CTV = GTV + 1.5 cm or to anatomical boundary include all T2 abnormality	PTV = CTV + 0.7-1.0cm
Grade 1 or 2 Astrocytoma Oligodendroglioma Ependymoma Meningioma	GTV = post-op tumour volume (consider pre-op imaging as well if tumour volume significantly smaller)	CTV = GTV + 1.0cm or to anatomical boundary	PTV = CTV + 0.7-1.0cm

PALLIATIVE RADIOTHERAPY			
Clinical Indication	**GTV**	**CTV**	**PTV**
Grade 3/4 Glioma Ependymoma	GTV = contrast enhancing tumour from pre-op imaging	Field Margin = GTV + 3 cm	n/a
Palliative Spinal Cord Tumour	GTV = tumour	Field Margin = GTV + 2 cm – usually covering adjacent vertebral body	n/a

4. Normal Tissue Dose Constraints

Normal tissue tolerance (maximum) doses: <2Gy/fraction
See QUANTEC papers Int. J. Radiation Oncology Biol. Phys., 2010 Vol. 76, No. 3, Supplement

Brain stem PRV	Dmax 54Gy (2Gy #) to entire brain stem	Risk <5%
	aV59 <=10cm^3	(Absolute volume receiving 59Gy <= 10 cm^3) risk <5%
Spinal cord PRV	Dmax = 50Gy	0.2% risk of myelopathy - full cord cross-section
	Dmax = 60Gy	6% risk of myelopathy
	Dmax = 69Gy	50% risk of myelopathy
Kidney	V12Gy <55%	<5% risk for combined kidneys
	V20Gy <32%	<5% risk for combined kidneys
	V23Gy <30%	<5% risk for combined kidneys
	V28Gy <20%	<5% risk for combined kidneys
Spleen*	*Mean < 10Gy*	

**Aim to keep the spleen Dmean < 10Gy. If the mean splenic dose is >10Gy the patient should be considered at high risk for functional hypo-splenism and managed based on national guidelines from the British Committee for Standards in Haematology. This should include pneumococcal, haemophilus influenza type B conjugate vaccine, meningococcal conjugate vaccine at least 2 weeks prior to starting RT. In addition, prophylactic antibiotics should be offered and started when RT starts and given a supply of emergency antibiotics.*