Thames Valley and Wessex Radiotherapy Network

Radiotherapy Protocol

Head and Neck Cancers

This document is the standardised Thames Valley and Wessex Radiotherapy Network Head and Neck Cancer Protocol developed collaboratively by the Network Head & Neck Protocol Working Group:

Trust	Clinician	Physicist	Radiographer
Oxford University Hospitals NHS Foundation Trust	Dr Ketan Shah		Suzanne Dance
University Hospitals Dorset NHS Foundation Trust	Dr Joseph Davies		
Portsmouth Hospitals University NHS Trust	Dr Oliver Donnelly Dr Mostafa El-Haddad		
Royal Berkshire Hospitals NHS Foundation Trust	Dr Alice Freebairn		
University Hospitals Southampton NHS Foundation Trust	Dr Sathish Harinarayanan Dr Ian Boon		

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1. Objective and Scope

To describe agreed elements of the Head and Neck Radiotherapy treatment protocol, for adoption by the Radiotherapy Centres within the Thames Valley and Wessex Radiotherapy Network.

Where relevant and agreed by the Working Group, the document follows national (Paleri et al 2016, RCR 2022) and international (Gregoire et al. 2013, Gregoire et al. 2018, Baiu et al. 2019) consensus guidelines for Head and Neck radiotherapy treatment.

Local treatment centres will maintain their own protocols, which may incorporate any or all of the elements described here.

Within clinical trials, follow the appropriate trial protocol.

2. Indications

2.1. **Radical Radiotherapy** is a treatment option for squamous cell carcinomas in the head and neck region (most commonly oropharynx, hypopharynx and larynx) and nasopharynx cancers, after discussion at a H&N Cancer MDT.

2.2. **Adjuvant (post-operative) Radiotherapy** is a treatment option after resection of head and neck tumours of all histologies, after discussion at a H&N Cancer MDT.

Indications may include:

Either a positive resection margin or extra-capsular lymph node extension;

2 or more of: Close (<5mm) resection margins, invasion of soft tissues, 2 or more positive nodes, >1 node group, node(s) >3cm, multifocal primary, perineural invasion, vascular invasion, poor differentiation, stage III/IV, oral primary, carcinoma-in-situ/dysplasia at the margin, uncertainties in surgical/pathology findings.

2.3. **Concomitant chemotherapy** should be considered for locally advanced cancers depending on age and performance status.

2.4. **Induction chemotherapy (see RCR H&N Consensus 2022)**

Non-nasopharyngeal head and neck squamous cell cancer excluding sinonasal tumours: Do not offer induction chemotherapy prior to definitive (chemo-) radiotherapy unless there is an urgent need for a rapid response in advanced and symptomatic local disease or as part of a protocol for organ preservation.

Nasopharyngeal cancer: Consider induction chemotherapy for locoregionally advanced, node-positive nasopharyngeal cancer in suitably fit patients.

Chemotherapy regimens, doses and support are not considered in detail in this protocol.

2.5. Re-irradiation (see RCR H&N Consensus 2022)

The risk–benefit ratio of radical reirradiation changes with time. Avoid reirradiation in patients who have recurrence with a short latency period (eg within 6–12 months of completing radiotherapy) or with significant late effects.

Treat the GTV with small margins (maximum GTV to CTV expansion of 5 mm). The re-irradiated CTV should ideally be less than 50 cm^3.

Do not include elective nodal areas within reirradiation treatment volumes.

Keep the cumulative spinal cord and other important organs at risk (OAR) doses as low as possible. Ensure a thorough radiobiology evaluation with advice from physicists has taken place with risks considered and discussed with the patient.

3. Pre-Radiotherapy Investigations and preparation

3.1. History & examination to include:

Weight

Smoking and alcohol history

Nutritional history

Swallow function

Voice quality

Current medications

Flexible nasoendoscopy findings if appropriate

Results of examination under anaesthesia

3.2. Investigations:

FBC, U+Es, LFTs, Blood Glucose, Calcium, Magnesium, Phosphate,

Consider baseline Thyroid function

Consider measured GFR nuclear medicine test if eGFR< 60ml/min

Biopsy

MRI / CT /PET/USS as appropriate (including pre-op/pre-chemo Ix)

Staging investigations should be less than 6 weeks unless it is done post operatively then up to 3 months.

For primary radiotherapy consider PET planning (in treatment position) where available if PET/CT not already performed.

Dental OPG (orthopantomogram)

Consider baseline ophthalmic / audiometry assessment.

3.3. Assessments

Dental assessment should be as early as possible in the pathway, where there may be irradiation to mandible/maxilla. ODN supports dental assessment in parallel to diagnostic investigations where there is a high suspicion of cancer. If prophylactic extractions advised, allow at least 7 days for healing before starting treatment.

Social and functional assessment: Involvement of Dietitian, Speech and Language Therapy Team, Head and Neck Clinical Nurse Specialist and Palliative Care Team as appropriate.

Consider prophylactic feeding tube, especially for bilateral treatment and chemoradiotherapy.

4. Therapeutic Schemata

Dose and fractionation schedules (informed by RCR Dose Fractionation guidance, Third edition):

Clinical indications	Dose and fractionation schedules
Radical radiotherapy with or without chemotherapy for malignant disease	• Radical volume: 65Gy in 30 fractions over 6 weeks • Intermediate volume: 60Gy in 30 fractions • Prophylactic volume: 54 Gy in 30 fractions • Alternatively 70/63/56 Gy in 35 fractions over 6-7 weeks e.g. nasopharyngeal cancer, large hypopharynx volume
Radical radiotherapy for malignancy in 20# (early larynx or special situation e.g. Covid pandemic)	• Radical volume: 55Gy in 20 fractions • Intermediate volume: 50Gy in 20 fractions • Prophylactic volume: 45 Gy in 20 fractions
Adjuvant radiotherapy for malignancy	• Adjuvant volume: 60Gy in 30 fractions • Consider 65Gy in 30 Fractions or 66Gy in 33 fractions for ENE and positive margins • Prophylactic volume: 54Gy in 30 fractions

Benign disease e.g. paraganglioma, parotid adenoma	• Local control e.g. paraganglioma 45Gy in 25 fractions or 54Gy in 30 fractions (where benefits>risks) • Adjuvant volume 45Gy in 25 fractions
Palliative radiotherapy	• 14Gy in 4 x 3.5Gy fractions (i.e. Quadshot – can be repeated to total 3 treatments if beneficial) • 8Gy single fraction • 20Gy in 5 x 4Gy fractions • 30Gy in 10 x 3Gy fractions • 36Gy in 12 x 3Gy fractions • 40Gy in 10 x 4Gy fractions over 4 weeks • 40Gy in 15 x 2.67Gy fractions • 30Gy in 15 x2Gy fractions e.g. retreatment • Up to 36 in up to 6 x 6Gy fractions once/twice a week • 40Gy in 10 fractions split week course with 2 weeks interval break

5. Pre-Treatment

Local treatment centre protocols should cover all other aspects of treatment, which may include:

- Pre-planning, scheduling, simulation, immobilisation, preparation for planning (including image fusion) etc

6. Volume Definition – general considerations

Volume definition is according to ICRU reports 50,62 & 83

Gross tumour volume (GTV) is the tumour present. After chemo/surgery, indicative volumes may be reconstructed using prior imaging i.e. GTVpreop, GTV prechemo etc.

Clinical tumour volume (CTV) includes the tumour (if present) and possible areas of extension and spread.

Post-operatively, high/intermediate dose CTV = GTVpreop + 10mm at least for primary and nodes.

Planning tumour volumes (including CTV-PTV margin) should follow local treatment centre protocol.

RCR H&N Consensus 2022 includes:

- Use the '5+5' technique to generate CTVs for well-defined head and neck cancer: a volumetric expansion of 5 mm from GTVp (the primary gross tumour volume) to define the high-dose CTV and a 10 mm margin from GTVp for a lower-dose CTV.
- Consider using larger margins from GTV (eg 10–15 mm) if there are concerns regarding the certainty of GTVp determination based on the quality of imaging or clinical information.
- Edit the CTVs to:
  - Exclude air cavities
  - Exclude structures limited by anatomical barriers that prevent microscopic disease extension boundaries (eg bone and fascia)
  - Include any other region at high risk of containing microscopic tumour.
- Consider using a larger craniocaudal margin (eg 15 mm) from GTV for the lower-dose CTV in the case of hypopharyngeal posterior pharyngeal wall tumours, due to the risk of submucosal extension.
- Lymph nodes:
  - Delineate involved nodes as GTVn. Expand GTVn by 5 mm to form the high-dose CTVn, editing from bone and air as for CTVp.
  - Use a 10 mm margin around nodes with obvious extranodal extension (eg into the sternocleidomastoid muscle) to form the high-dose CTV.
  - Consider a larger margin (up to 20 mm) to include more of an involved muscle above and below the site of infiltration within a lower-dose CTV.

- Delineate the rest of an involved nodal level to form part of a lower-dose CTV, extending at least 10 mm craniocaudally from GTVn

- Consider omitting the high-level II lymph nodes from the elective target volume in an uninvolved contralateral neck when delivering radical or adjuvant radiotherapy for non-nasopharyngeal head and neck squamous cell carcinoma (defined as the most cranial axial CT image where the posterior belly of the digastric muscle crosses the internal jugular vein)

7. Volume definition – tumour site specific guidance

7.1. Oral cavity

In most cases, radiotherapy will be given post-operatively. Ensure staging is <3m old.

High/intermediate dose volumes will include sites of primary and involved nodes, with a 10mm margin at least.

RCR H&N Consensus 2022: <u>For oral tongue</u> only: Offer <u>contralateral neck radiotherapy</u> for patients having adjuvant ipsilateral radiotherapy for **oral tongue** squamous cell carcinoma who have had surgery to the primary site and an ipsilateral neck dissection if any of the following apply:

- T3 or T4 tumour
- Primary is within 10 mm of the midline
- Two or more pathological lymph nodes in the ipsilateral neck*
- Extranodal extension (ENE) is present in the ipsilateral neck*
- Also *consider* if one positive ipsilateral node

*Local agreement that these are relative, not absolute indications

Low dose volumes are guided by Biau et al 2019:

Selection of low risk nodal target volumes for oral cavity cancers.

Nodal Category (AJCC/UICC 8th ed.)	Levels to be included in CTV-N-LR	
	Ipsilateral Neck	Contralateral Neck[1]
N0-1 (in level I, II, or III)	I, II[2], III, +IVa[3], +IX[4]	I, II[2], III, +IVa[3]
N2a-b	I, II, III, IVa[5], Va,b[6,7], +IX[4]	I, II[2], III, +IVa[3]
N2c	According to N category on each side of the neck	According to N category on each side of the neck
N3	I, II, III, IVa[5], Va,b, +VIIb[7], +IX[4]	I, II, III, +IVa[3]

AJCC, American Joint Committee on Cancer; UICC, Union for International Cancer Control; CTV-N-LR, low risk nodal clinical target volume.

[1] Unilateral treatment is recommended for N0-N2a lateralized tumors of upper and lower alveolar ridge, lateral floor of mouth and buccal mucosa; and discussed for N2b patients. It could be considered for N0-N1 lateral border of oral tongue not approaching the midline by less than 1 cm.

[2] Level IIb could be omitted if no cervical lymph nodes involvement on the same side.

[3] For anterior tongue tumor and any oral cavity tumor with extension to the oropharynx (e.g., anterior tonsillar pillar, tonsillar fossae, base of tongue); for N1 tumor with involvement of level III.

[4] For tumor of the buccal mucosa.

[5] Level IVb should be included in case of involvement of level Iva.

[6] Level V could be omitted if only levels I to II are involved.

[7] Level VIIb should be included in case of bulky involvement of the upper part of level II.

7.2. Oropharynx

Define high and (usually) intermediate volumes using the “5+5” technique for well-defined tumours following principles in section 6 along with CTVp guidance from Gregoire et al. 2018. For less well-defined tumours, larger margins should be used.

Subsite	T stage	Guidance for CTVp60 – note max 10mm from GTVp
Tonsil	T1	May include superior pharyngeal constrictor (SPC) Exclude parapharyngeal space (PPS)
	T2/3	May include SPC and PPS, overlap level 2&7a nodes glossotonsillar sulcus, adjacent base of tongue, mobile tongue Exclude medial pterygoid muscle
	T4	Includes PPS, may include pterygoid muscles, mandible, retromolar trigone, base of tongue, mobile tongue, hard palate
Soft Palate	T1	Include full thickness of soft palate; may include tonsillar fossae
	T2/3	May include adjacent hard palate, lateral pharyngeal wall, PPS; Exclude medial pterygoid muscle, mobile tongue
	T4	Includes hard palate, lateral pharyngeal wall, nasopharynx, nasal cavities

Posterior pharyngeal wall	T1	Include pharyngeal constrictor; retropharyngeal space may be included
	T2/3	Include pharyngeal constrictor, retropharyngeal space Exclude longus colli, longus capitis muscles
	T4	Include prevertebral fascia, longus colli, longus capitis muscles, may include adjacent vertebral bone
Vallecula	T1	Exclude pre-epiglottic space
	T2/3	Include pre-epiglottic space
	T4	May include pre-epiglottic space, supraglottic larynx, hypopharynx, hyoid, base of tongue, PPS
Base of Tongue	T1	Exclude hyoglossus.
	T2/3	Through hyoglossus, into PPS, may include lateral SPC, part of mobile tongue (esp T3)
	T4	Include PPS, hyoid, mobile tongue, may include supraglottis

CTV54 consists of the remainder of involved nodal levels, and uninvolved nodal levels at high (>~15%) risk of spread

At the clinician's discretion, the remainder of the involved primary subsite may be included in the CTV54. The reason for inclusion e.g. uncertainty on imaging, clinical field changes etc should be documented.

RCR H&N Consensus 2022: Omit the contralateral retropharyngeal lymph nodes from the elective target volume when delivering radical radiotherapy for oropharynx cancer if all the following apply:

- No involved nodes in the contralateral neck
- No ipsilateral involved retropharyngeal lymph nodes
- GTVp does not involve the soft palate or posterior pharyngeal wall.

Low dose nodal volumes are guided by Biau et al 2019 (note "Nodal Category follows p16 negative staging definitions)

Nodal Category (AJCC/UICC 8th ed.)	Levels to be included in CTV-N-LR	
	Ipsilateral Neck	Contralateral Neck[1]
N0-1 (in level II, III, or IV)	(Ib)[2], II, III, IVa[3], +VIIa for posterior pharyngeal wall tumor	II, III, IVa, +VIIa for posterior pharyngeal wall tumor
N2a-b	Ib, II, III, IVa[3], Va,b, +VIIa, +VIIb[4]	II, III, IVa, +VIIa for posterior pharyngeal wall tumor
N2c	According to N category on each side of the neck	According to N category on each side of the neck
N3	Ib, II, III, IVa, Va,b, +VIIa, +VIIb[4]	II, III, IVa, +VIIa for posterior pharyngeal wall tumor

AJCC, American Joint Committee on Cancer; UICC, Union for International Cancer Control; CTV-N-LR, low risk nodal clinical target volume.

[1] Unilateral treatment is recommended for N0-N2a tonsil fossa tumor not infiltrating the soft palate nor the base of tongue; and discussed for N2b patients.

[2] Any tumor with extension to the oral cavity (e.g., retromolar trigone, mobile tongue, inferior gum, oral side of anterior tonsillar pillar), and/or in case of anterior involvement of level II.

[3] Level IVb should be included in case of involvement of level IVa.

[4] Level VIIb should be included in case of bulky involvement of the upper part of level II.

[*] For p16+ oropharyngeal cancers, the total number of positive lymph nodes, their size and their sites (homolateral, contralateral, bilateral) have to be taken into account for defining the low risk nodal target volume selection and not only the new AJCC/UICC 8th edition classification; there is no data to suggest a different selection compared to p16- tumors.

7.3. Nasopharynx

Nasopharynx cancer is rare in the UK. Treatment should follow international guidelines (Lee et al. 2018).

RCR H&N Consensus 2022: Consider induction chemotherapy for locoregionally advanced, node-positive nasopharyngeal cancer in suitably fit patients.

Define high and (usually) intermediate volumes using the “5+5” technique for well-defined tumours and nodes following principles in section 6 along with CTVp guidance from Lee et al.

The GTV should be based on post-chemotherapy imaging. The CTV will take into account a geometric expansion (5-10mm depending on imaging definition), the pre-chemotherapy imaging and anatomical barriers (i.e. bone and air).

Detailed guidance on anatomical coverage is found in Lee et al. 2018. Since these cases are infrequent, use of the paper is encouraged for each case.

Nodal volumes follow Lee 2018 and Biau 2019 and are treated at 50-60Gy:

Nodal Category (AJCC/UICC 8th ed.)	Levels to be included in the CTV-N-LR	
	Ipsilateral Neck	Contralateral Neck
N0	II-V, VIIa, VIIb[1]	II-V, VIIa, VIIb[1]
N1, N2	II-V, VIIa, VIIb[1,2,3,4]	II-V, VIIa, VIIb[1,2,3,4]
N3	Ib-IVb, Va,b,c, VIIa, VIIb	Ib-IVb, Va,b,c, VIIa, VIIb

AJCC, American Joint Committee on Cancer; UICC, Union for International Cancer Control; CTV-N-LR, low risk nodal clinical target volume.

[1] Levels IV and Vb could be omitted for patients with no cervical lymph nodes involvement on the same side.

[2] + level Ib in case of disease involvement of the submandibular gland, and/or involvement of structures that drain to level Ib as the first echelon site, and/or level II involvement (adenopathy >2 cm and/or with extra-nodal extension suspicion).

[3] Level IVb in case of level III–IVa involvement.

[4] Level Vc in case of level Va,b involvement.

7.4. Hypopharynx

Define high and (usually) intermediate volumes using the “5+5” technique for well-defined tumours and nodes following principles in section 6 along with CTVp guidance from Gregoire et al. 2018. The guidance allows for a *further* 5mm margin for the intermediate dose (i.e. 15mm total from GTV) where submucosal spread is suspected.

For poorly defined tumours, the entire hypopharynx (including pyriform fossae, post-cricoid and posterior pharyngeal wall) may be included in the high or intermediate volume.

For post-operative cases consider including tracheostomy site with bolus depending on surgical margin. It may be useful to include post-operative sites at risk in the intermediate volume.

Low dose nodal volumes are guided by Biau et al 2019:

Nodal Category (AJCC/UICC 8th ed.)	Levels to be included in the CTV-N-LR	
	Ipsilateral Neck	Contralateral Neck[1]
N0	II, III, IVa, +VIIa for posterior pharyngeal wall tumor + VI for apex of piriform sinus, postcricoïd and/or esophageal extension	II[2], III, IVa, +VIIa for posterior pharyngeal wall tumor + VI for esophageal extension
N1, N2a-b	Ib, II, III, IVa[3], Va,b, +VIIa + VIIb[4] + VI for apex of piriform sinus, postcricoïd, esophageal extension, and/or possibly N2b	II[2], III, IVa, +VIIa for posterior pharyngeal wall tumor + VI for esophageal extension
N2c	According to N category on each side of the neck	According to N category on each side of the neck
N3	Ib, II, III, IVa[3], Va,b, +VIIa + VIIb[4], +VI	II[2], III, IVa, +VIIa for posterior pharyngeal wall tumor + VI for esophageal extension

AJCC, American Joint Committee on Cancer; UICC, Union for International Cancer Control; CTV-N-LR, low risk nodal clinical target volume.

[1] Unilateral neck treatment for small tumor of the lateral wall of the piriform sinus.

[2] Level IIb could be omitted if no cervical lymph nodes involvement on the same side.

[3] Level IVb should be included in case of involvement of level IVa.

[4] Level VIIb should be included in case of bulky involvement of the upper part of level II

7.5. Larynx

Early larynx cancers (T1N0 and non-bulky T2N0) can be treated with radical radiotherapy alone with 55Gy in 20 fractions of 2.75Gy each:

GTV= gross tumour (use clinical and radiological information)

CTV= entire larynx (extends from inferior hyoid to cricoid, outline outside the laryngeal cartilage). Ensure that there is a minimum of 15mm superiorly and inferiorly from the GTV.

For all other larynx cancers, consider using the “5+5” technique for well-defined tumours and nodes following principles in section 6 along with CTVp guidance from Gregoire et al. 2018.

For poorly defined tumours, or where tumour motion and/or field change is a concern the entire larynx may be included in the high or intermediate volume.

For post-operative cases consider including tracheostomy site with bolus depending on surgical margin. It may be useful to include post-operative sites at risk in the intermediate volume.

Low dose nodal volumes are guided by Biau et al 2019:

Nodal Category (AJCC/UICC 8th ed.)	Levels to be included in the CTV-N-LR	
	Ipsilateral Neck	Contralateral Neck
N0-1 (in level II, III, or IV)	II[1,2], III, IVa[3], +VI for transglottic or subglottic extension	II[1], III, IVa, +VI for transglottic or subglottic extension
N2a-b	II[2,3,4], III, IVa[3], Va,b, +VI for transglottic or subglottic extension	II[1], III, IVa, +VI for transglottic or subglottic extension
N2c	According to N category on each side of the neck	According to N category on each side of the neck
N3	Ib, II, III, IVa[3], Va,b, +VIIb[4] + VI	II[1], III, IVa, +VI for transglottic or subglottic extension

AJCC, American Joint Committee on Cancer; UICC, Union for International Cancer Control; CTV-N-LR, low risk nodal clinical target volume.

[1] Level IIb could be omitted if no cervical lymph nodes involvement on the same side.

[2] Level Ib should be included in case of anterior involvement of level II.

[3] Level IVb should be included in case of involvement of level IVa.

[4] Level VIIb should be included in case of bulky involvement of the upper part of level II.

7.6. Salivary Glands (incl parotid, submandibular, minor salivary glands etc)

Primary radical radiotherapy is not appropriate in the management of most salivary gland tumours (benign or malignant). It may be used as primary palliation.

Post-operative radiation should be considered by the MDT in all except for T1N0 carcinomas, with low-grade histology and negative margins of excision.

GTV= pre-op GTV outlined from fused pre-op imaging. (Note that the pre-op GTV may fall partly outside the body contour, and that the pre-op GTV may extend beyond the edited CTV

CTV= GTV + 10-15mm edited off bone and any other structure not at risk of invasion e.g. pinna, but including whole gland remnant if present.

For adenoid cystic carcinoma: There is a high incidence of perineural invasion so the CTV should follow the nerve where appropriate e.g. the entire course of facial nerve within the petrous temporal bone.

For parotid: The CTV should encompass the entire parotid bed, superiorly from the zygomatic arch to the lower border of the hyoid. Anteriorly, from the anterior margin of the masseter muscle or anterior to the submandibular gland, to the anterior border of the mastoid process. Laterally to skin, consider bolus to the scar and medially to the lateral aspect of the oropharyngeal mucosa including the ipsilateral parapharyngeal space / pterygoid fossa. The position of the contralateral parotid can be a helpful guide.

For node positive tumours, all involved nodal levels are included and levels Ib, II and adjacent RP nodes.

7.7. Paranasal sinuses

Consider induction chemotherapy for advanced/inoperable cases.

Primary radical radiotherapy is rarely appropriate in the management of most paranasal sinus tumours (benign or malignant). It may be used as primary palliation.

Consider stereotactic immobilisation and imaging e.g. ExacTrac to optimise sparing of normal tissue structures.

The CTV60/65 should encompass the pre-operative GTV and the mucosa of neighbouring sinuses, with at least a 10mm margin on the pre-operative GTV

Any neighbouring structures involved by tumour (orbital cavity, cribiform plate, etc.) should be included and the volume is edited out of barriers to tumour spread.

For maxillary sinus tumours: the CTV60/65 should include at least the entire maxillary sinus and consider bilateral nasal cavity and ethmoid sinuses and ipsilateral pterygoid fossa and masticator space.

For ethmoid sinus tumours: the CTV60/65 should include at least the ethmoid sinuses bilaterally, sphenoid sinus, ipsilateral lateral orbital wall/lamina papiracea and cribiform plate.

All involved nodal levels are included in CTV60/65 (See Section 8.2). If there is involvement of the nasopharynx, retropharyngeal nodes should be included.

A CTV54 is rarely needed as prophylactic treatment of nodal levels is rarely used. Indications will depend on histology and nodal involvement and general guidance on delineation of the N0 neck should be followed.

The TVW ODN Working Group decided not to follow Biau et al for this indication.

Consider referral to the National Proton Panel for appropriate cases.

8. Organs at Risk and Dose Tolerances

Organ at risk	**Parameter**	**Usual Tolerance over 30# treatment**	***Modification for 20 or 25# (if any)***
Brainstem	**Dmax**	**≤ 55Gy**	***≤ 48Gy***
	1cc	**≤ 54Gy**	***≤ 48Gy***
Brain stem PRV	**Dmax**	**≤ 55Gy**	***≤ 48Gy***
	1cc	**≤ 54Gy**	***≤ 48Gy***
Pituitary gland	**Dmax**	**≤20Gy**	*-*
Optic chiasm	**Dmax**	**≤54Gy**	***≤48Gy***

Optic nerves	**Dmax**	**≤54Gy****	***≤48Gy***
Eyes PRV	**Dmax**	**≤50Gy**	***≤40Gy***
Cornea	**Dmax**	**≤40Gy**	*-*
Retina	**Dmax**	**≤50Gy**	***≤46Gy***
	<60% vol	**≤45Gy**	***≤40Gy***
Lacrimal gland	**Dmax**	**≤30Gy**	*-*
Lens	**Dmax**	**≤6Gy**	*-*
Cochleae PRV	**Mean (each side)**	**<40Gy**	*-*
Whole Parotid - ipsilateral	**Mean**	**<25Gy**	*-*
Whole Parotid - contralateral (unliateral Rx)	**Mean**	**ALARA e.g <10Gy**	*-*
Superficial Parotids (used for bilateral Rx)	**Mean**	**<25Gy**	*-*
Submandibular gland	**Mean**	**Aim for ≤35Gy***	*-*
Pharyngeal constrictors	**Mean**	**Aim for <60Gy***	***Aim for <53Gy****
Larynx	**Mean**	**Aim for ≤44Gy***	***Aim for ≤40Gy****
	≤ 27% vol	**Aim for ≤ 50Gy***	***Aim for ≤ 46Gy****
Spinal cord	**Dmax**	**≤ 48Gy**	***≤ 44Gy***
	1cc	**≤ 46Gy**	***≤ 44Gy***
Spinal cord PRV	**Dmax**	**≤ 48Gy**	***≤ 44Gy***
	1cc	**≤ 46Gy**	***≤ 44Gy***
Brachial plexus	**Dmax**	**≤60Gy**	***≤ 46Gy***
Anterior Mandible	**Mean**	**<37Gy**	*-*
Lips	**1cc**	**<30Gy**	

** If constraint is not achievable due to overlap with PTV, aim for as low as reasonably possible without compromising PTV.*

*** However, these are conservative doses and generally when there is a PTV which jeopardises optic tolerances then the risks of RT-induced visual loss need to be balanced against the threat of tumour-related visual loss.*

Cerebellum dose is recorded – no tolerance available

Note that NHSE is developing dose metrics for central reporting

9. Other considerations for local protocols

Local treatment centre protocols should cover all other aspects of treatment, which may include:

- Peer/radiologist review of contours
- Physics planning volumes
- Treatment modality and energy
- Beam arrangements
- Prescription point
- Dose constraints
- Plan evaluation
- Target verification
- QA considerations
- Treatment delivery including IGRT and verification
- Clinical review and follow up
- Related tumour sites e.g. ear canal, lip, thyroid

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