NICO - CA209-891: Neoadjuvant and adjuvant nivolumab as Immune Checkpoint inhibition in Oral cavity cancer

Radiotherapy Outlining, Planning and Quality Assurance Guidelines

Version 3

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Radiotherapy Guidelines Authorisation Signature

Name and Role:	Signature:	Date Authorised:
Dr Stefano Schipani **Clinical Oncologist**		8.1.19
Dr Joseph Sacco **Chief Investigator**		08-JAN-2019

TRIAL CONTACTS

Sponsor: Clatterbridge Cancer Centre NHS Foundation Trust
Chief Investigator: Dr Joseph Sacco
Senior Trial Coordinator: Mr Robert Hanson

NICO Trial Office:
Cancer Research UK Liverpool Cancer Trials Unit (LCTU)
University of Liverpool
1stFloor, MerseyBio
Crown Street
Liverpool L69 7ZB
Tel: 0151 794 8852
Fax: 0121 414 3529
Email: nicoct@liverpool.ac.uk

National Radiotherapy Trials Quality Assurance Contacts:

NICO RTTQA Group Contact:
Hannah Eyles
The Royal Marsden NHS Foundation Trust
Fulham Road,
London
SW3 6JJ
Tel: 020 7808 2671
Email: NICOqa.enh-tr@nhs.net

Elizabeth Miles
RTTQA Coordinator
Mount Vernon Cancer Centre
Rickmansworth Road
Northwood
HA6 2RN

RTTQA Clinical Reviewers: Dr Stefano Schipani
Dr Claire Patterson
Dr Anoop Haridass
Dr Caroline Brammer

Further information
RTTQA Group website: www.rttrialsqa.org.uk

ABBREVIATIONS

3DCRT	Three-Dimensional Conformal Radiotherapy
CBCT	Cone-Beam Computed Tomography
CT	Computerised Tomography
CTV	Clinical Target Volume
DICOM	Digital Imaging and Communications in Medicine
DLT	Dose Limiting Toxicity
ECS	Extracapsular Spread
Gy	Gray
IMRT	Intensity Modulated Radiotherapy
ICRU	International Commission on Radiation Units and Measurements
MDT	Multi-Disciplinary Team
OAR	Organs at Risk
PRV	Planning Organ at Risk Volume
PTV	Planning Target Volume
QA	Quality Assurance
RP	Retropharyngeal
RTQA	Radiotherapy Quality Assurance
RTTQA	Radiotherapy Trials Quality Assurance
SCM	Sternocleidomastoid Muscle
TNO	Trial Number
VMAT	Volumetric Modulated Arc Radiotherapy

Contents

1. SCOPE

This document provides guidelines for the radiotherapy planning, delivery and Quality Assurance (QA) for patients included in the NICO trial who will be receiving radiotherapy according to the trial protocol.

When used in conjunction with the main trial protocol it provides all the information necessary for delivering radiotherapy within the trial.

This document should not be used as a guide for the treatment of patients outside of the NICO trial.

Every care has been taken in drafting these guidelines but corrections or amendments may be necessary. These will be circulated to Investigators in the trial, but centres entering patients for the first time are advised to contact the NICO Trial Office to confirm they have the most recent and approved version.

If you have any queries in regards to this document please contact the main Radiotherapy Trials Quality Assurance (RTTQA) contacts, as well as the NICO Trial Office, using the contact details provided at the front of this manual.

2. INTRODUCTION

For all sites, Radiotherapy Quality Assurance (RTQA) will be coordinated by the National RTTQA group and data will be sent directly to the RTTQA group contact.

2.1 Radiotherapy quality assurance and data collection

2.1.1 Pre-accrual quality assurance**:**

Radiotherapy QA streamlining through the RTTQA group aims to reduce unnecessary QA repetition.

• Centres that are QA approved for delivering Intensity Modulated Radiotherapy (IMRT) for current UK Head and Neck trials will be eligible for streamlining of the pre-accrual

QA process for treating within the NICO Trial:

•Additional pre-accrual planning QA will not be required.
•Pre-accrual outlining QA will be required unless a PI has been QA approved for other Head and Neck Trials which include the oral cavity (e.g. Wisteria) and has had outlines reviewed for an oral cavity patient within said trial.

•Centres not QA streamlined must successfully complete a Head and Neck QA programme.

For clarification, please contact the RTTQA contacts for details.

2.1.2 during accrual quality assurance:

The outlining and planning will be prospectively reviewed for at least the first case enrolled in the NICO trial.

Data should be submitted, in Digital Imaging and Communications in Medicine (DICOM) format, to the RTTQA Group as soon as they have been completed and at least 72 hours prior to the patient's intended first day of radiotherapy treatment on Week 1 – Day 1.

The outlines should be submitted for review once approved by the PI. The planning stage should start once the outlines have been approved.

QA approval should be received before patients are treated.

Centres will be notified by email when a patient is due for prospective review.

Further prospective and/or timely retrospective reviews may be deemed necessary at the discretion of the RTTQA group.

2.1.3 Data collection**:**

In addition to the cases collected for the prospective case reviews, data will be collected for **all** patients treated in the NICO trial. Data should be submitted to the RTTQA group once the patient has been approved for treatment locally. Please send, in DICOM format unless specified otherwise, the following data:

• Planning Computerised Tomography (CT) images

• Contours, ensuring all Clinical Target Volumes (CTV), Planning Target Volumes (PTV)

and Organs at Risk (OAR) are present and correctly named using the trial nomenclature (see Appendix 1 for standard trial nomenclature)

• Plan and dose

• Completed Plan Assessment Form (see Appendix 2 for IMRT Dose Reporting – 30# Schedule and Appendix 3 for Plan Assessment Form)

To allow a quick turnaround of the case studies and to facilitate a secure method of data transfer, all data should be transferred to the RTTQA group via the NHS secure server. The NHS secure server can be accessed via: https://nww.sft.nhs.uk/sft/upload1. Its use requires at least the sender or recipient to have an NHS.net email account. Please send QA submissions to the RTTQA group: NICOqa.enh-tr@nhs.net. Data associated with any re-plans of NICO patients during radiotherapy treatment must also be submitted to the RTTQA group. These data will not be subject to prospective review, however, may be reviewed retrospectively at the QA groups discretion.

2.1.4 Data Anonymisation:

Please Note that all data must be pseudo-anonymised prior to being sent to the RTTQA group; data that has not been anonymised will not be accepted. Please ensure that the anonymisation is performed appropriately using the patient's Trial Number (TNO).

2.2 Radiotherapy timelines

IMRT should commence within 8 weeks (56 days) of surgical resection, equating to a cumulative treatment time of 14 weeks. Any patient experiencing an 8 week or greater interval between surgery and commencement of radiotherapy/chemoradiotherapy will be withdrawn from the trial. Week 1 – Day 1 starts on the first day of radiotherapy.

If radiotherapy is not given on a planned day as scheduled, then this will be compensated for in accordance with local practice.

2.3 General considerations

Post-operative chemo-radiation is indicated in the setting of a positive (≤1 mm) surgical resection margin and/or nodal extra-capsular spread. Other risk factors for local recurrence, meriting post-operative radiotherapy alone, include completely resected pT3/4 tumours, pN2-3 disease, close margin (>1 mm but <5 mm), perineural invasion/lymphovascular invasion, and tumour thickness >5mm. Different levels of risk are likely to co-exist.

It is acknowledged that when radiotherapy is given post-operatively, particularly in the setting of a major resection with flap reconstruction, the anatomy visible on the planning CT will differ greatly from that of the initial diagnostic images. Close liaison with surgeon and pathologist is therefore advised.

2.4 Specifics of the planning process

Immobilisation should be performed using a thermoplastic shell with the patients head in a neutral position. Planning CT slice thickness should be set at ≤3mm and where possible contrast enhanced scanning is advised. The use of bolus is not permitted however, when CTV/PTV is close to skin, PTV can be cropped to skin surface and optimization build up used at the discretion of individual treating clinician / local practice. The use of a mouth bite is at the discretion of the treating clinician. The use of a mouth bite will be recorded in the radiotherapy form.

2.4.1 Site-specific contouring guidelines

Guidelines for delineating the CTV_6500, CTV_6000 and CTV_5400 are provided below. The CTV_6000 may be omitted if none of the criteria is met. Laterality must be decided by the treating Multi-Disciplinary Team (MDT) and documented in the clinical and radiotherapy notes.

A **lateralised tumour** is defined as tumour with <1cm medial extension and >1cm clearance from midline and N0-1. In this case, the ipsilateral neck will be generally irradiated (see Section 3).

A **non-lateralised tumour** is defined as tumour with ≥1cm medial extension or ≤1cm clearance from midline or ≥N2 (Figure 1). In this case, the bilateral neck will be generally irradiated (see Section 4).

In case of lateralised tumour with concerning pathological features (e.g. thickness>4mm, extensive lympho-vascular invasion, multiple nodal involvement, etc), it may be decided to irradiate the contra-lateral neck.

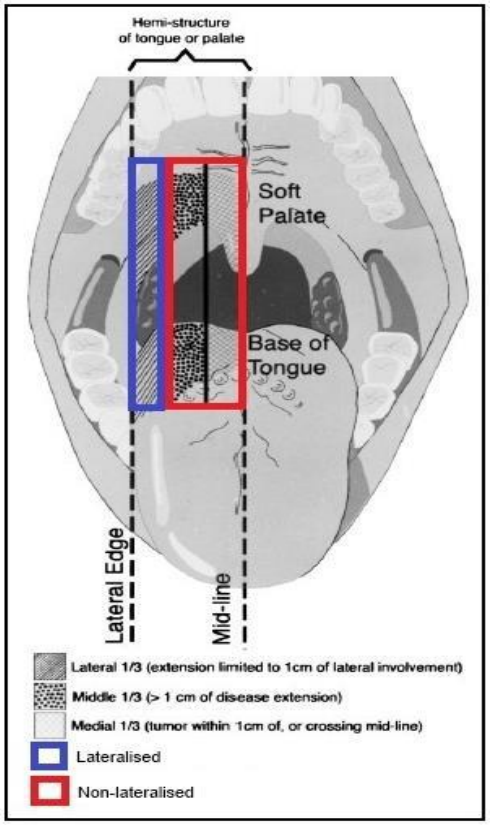


Figure 1. Lateralised and non-lateralised tumour of the oral cavity (Adapted from O'Sullivan B 2001)

3. GUIDANCE FOR IPSALATERAL ONLY NECK IRRADIATION

IPSILATERAL ONLY NECK IRRADIATION is based on radiology, pathology (primary tumour, nodal disease) and patient fitness. It will be confirmed at the MDT.		
Volume	**Definition and description**	
CTV_6500	Include the high risk areas defined as Primary tumour with POSITIVE MARGIN: include the surgical bed (i.e. surgical flap) with an expansion of 10mm on the positive margin and an expansion of 5mm on the negative margin. Nodes with ECS: include the whole nodal level. For nodal levels included in the CTV_6500, the overlying sternocleidomastoid muscle (SCM) should be included.	
CTV_6000	Include the intermediate risk areas defined as Primary tumour with NEGATIVE MARGIN: include the surgical bed (i.e. surgical flap) with a margin of 5mm. Nodes with NO ECS: include the whole nodal level.	
CTV_5400	IA	Included if tumour involves floor of mouth or anterior mandible
	IB	Always included ipsilaterally if not already included in CTV_6500 or CTV_6000
	II	Always included ipsilaterally if not already included in CTV_6500 or CTV_6000.
	III	Always included ipsilaterally if not already included in CTV_6500 or CTV_6000
	IV	Always included ipsilaterally if not already included in CTV_6500 or CTV_6000
	V	Included if ipsilateral II, III or IV is node positive if not already included in CTV_6500 or CTV_6000
	VIIa	Included ipsilaterally if retromolar trigone primary with soft palate extension or VIIb positive if not already included in CTV_6500 or CTV_6000
	VIIb	Included if ipsilateral level II is node positive if not already included in CTV_6500 or CTV_6000

CTV should be adjusted considering anatomical barriers and air cavities.

4. GUIDANCE FOR BILATERAL NECK IRRADIATION

The BILATERAL NECK IRRADIATION is based on radiology, pathology (primary tumour, nodal disease) and patient fitness. It will be confirmed at the MDT.		
Volume	**Definition and description**	
CTV_6500	Include the high risk areas defined as <u>Primary tumour with POSITIVE MARGIN</u>: include the surgical bed (i.e. surgical flap) with an expansion of 10mm on the positive margin and an expansion of 5mm on the negative margin. <u>Nodes with ECS</u>: include the whole nodal level. For nodal levels included in the CTV_6500, the overlying sternocleidomastoid muscle (SCM) should be included.	
CTV_6000	Include the intermediate risk areas defined as <u>Primary tumour with NEGATIVE MARGIN</u>: include the surgical bed (i.e. surgical flap) with a margin of 5mm. <u>Nodes with NO ECS</u>: include the whole nodal level.	
CTV_5400	IA	Included if tumour involves floor of mouth or anterior mandible
	IB	Always included bilaterally if not already included in CTV_6500 or CTV_6000
	II	Always included bilaterally if not already included in CTV_6500 or CTV_6000.
	III	Always included bilaterally if not already included in CTV_6500 or CTV_6000.
	IV	Always included bilaterally if not already included in CTV_6500 or CTV_6000.
	V	Included if ipsilateral II, III or IV is node positive if not already included in CTV_6500 or CTV_6000.
	VIIa	Consider including bilaterally if retromolar trigone primary with soft palate extension if not already included in CTV_6500 or CTV_6000.
	VIIb	Included if ipsilateral level II is node positive if not already included in CTV_6500 or CTV_6000.

CTV should be adjusted considering anatomical barriers and air cavities.

5. ORGANS AT RISK

The minimum mandatory set of OAR to be contoured is as follows:

• **Spinal cord** – the spinal cord should be outlined from the slice below the level of the foramen magnum to 2 cm below the most inferior slice of the PTV. The spinal cord itself, rather than the spinal canal, should be delineated. A typical expansion of 3-5mm (depending on local practice) should be applied to form the Planning Organ at Risk Volume (PRV).

• **Brainstem** – the whole brainstem should be contoured from the slice above the most superior slice of the spinal cord, extending superiorly. A typical expansion of 3-5mm should be applied to form the PRV according to local practice.

• **Optic nerves**

• **Optic chiasm**

• **Left and Right Parotid** – both superficial and deep lobes should be defined as a single organ. Where blood vessels are encased by the gland, these should be included. Where applicable, the anterior boundary should extend to incorporate either the gland or parotid duct lateral to the masseter muscle. Parotid_L/R_PC will be defined as the parotid outside the PlanPTVs with a margin of 5mm. Parotid_L/R_PC will be used for plan optimisation and both Parotid and Parotid_PC will be considered for dose reporting.

• **Mandible** – entire mandible bone, without teeth; the use of bone view settings is recommended; Mandible and Mandible_PC (i.e. cropped 5mm from PlanPTV) will be considered for dose reporting.

• **Larynx** - from superior border of the body of the hyoid bone to the inferior border of the thyroid cartilage.

• **Trachea** - from the inferior border of the thyroid cartilage to 2 cm below the most inferior slice of the PTV.

• **Oesophagus** - from the inferior border of the thyroid cartilage to 2 cm below the most inferior slice of the PTV.

The following optional set of OARs should also be contoured for the purposes of IMRT planning for each patient as per local practice and the doses recorded on the Plan Assessment Form (see Appendix 3).

• **Globe**

• **Lens**

6. PLANNING TARGET VOLUMES

All PTVs are defined by an isotropic margin added to each CTV in line with ICRU50, 62 and 83 recommendations. The margin should be 3-5 mm depending on local practice, as determined by the geometrical accuracy of their immobilisation systems.

7. TREATMENT PLANNING, EVALUATION AND DELIVERY

All patients in the NICO Trial will be treated with IMRT (fixed-beam or rotational arc therapy, including volumetric modulated arc radiotherapy -VMAT- and TomoTherapy).

For fixed field therapy, a five to nine field technique for bilateral irradiation, and a 4-5 field technique for lateralised cases, are likely to be required to achieve adequate target coverage and fulfil the dose constraints outlined below.

For arc therapy, a partial arc may be required for lateralised cases to minimise dose to the contralateral side.

PlanPTV_XXXX structures should be created and used in the optimisation process in place of actual PTV volumes to minimize the tendency of inverse planning algorithms to regard low dose in the build-up region as under dosing, thereby leading to hotspots in the target or elsewhere. PlanPTV_XXXX structures comprise the PTVs edited back from the skin by up to 6 mm. Alternatively, when using optimisation build up PTVs should be edited back to skin surface and PlanPTV_XXXX_OPT structures created.

Where higher and lower dose PTVs overlap, the lower dose PlanPTVs should be edited off the respective higher dose PlanPTVs by a margin of 0 mm.

Dose distributions should be calculated and corrected for inhomogeneity. Dose is prescribed to the PlanPTV_XXXX and to the median dose.

Parotid_L/R_PC will be defined as the parotid outside the PTV with a margin of 5mm. Parotid_L/R_PC will be used for plan optimisation.

Planning aims should be prioritised as follows:

- Critical organ dose constraints (i.e. spinal cord and brainstem, optic chiasm, nerves)
- Higher dose PTV coverage
- Lower dose PTV coverage
- High priority organ dose constraints
- Medium/low priority organ dose constraints

OAR dosing is to be recorded on the Plan Assessment Form (see Appendix 2 for IMRT Dose Reporting – 30# Schedule and Appendix 3 for Plan Assessment Form).

Plans should be evaluated on every slice by the treating clinical oncologist to ensure adequate conformity, as well as normal tissue and OAR sparing. OAR dose concessions may be appropriate in some circumstances; these should be recorded on the Plan Assessment Form and discussed in advance with the NICO Trial Office and the main RTTQA contacts, using the contact details provided at the front of this manual.

Please note that all structures of the plan must be labelled according to the standardised trial nomenclature as detailed in Appendix 1.

7.1 Dose verification

Patient specific quality assurance dose verification should be conducted according to local practice.

7.2 On-Treatment verification

Treatment verification is required for at least the first three fractions to determine if any systematic error exists. As a minimum correction should be carried out at fraction four according to local practice, and a further check made to confirm the adjustment. Verification is then performed once weekly throughout the remainder of the treatment, tolerances are according to local practice. Planar MV, kV portal imaging or volumetric imaging (Cone-Beam Computed Tomography (CBCT)) may be used. The number of monitor units used for verification should be minimised.

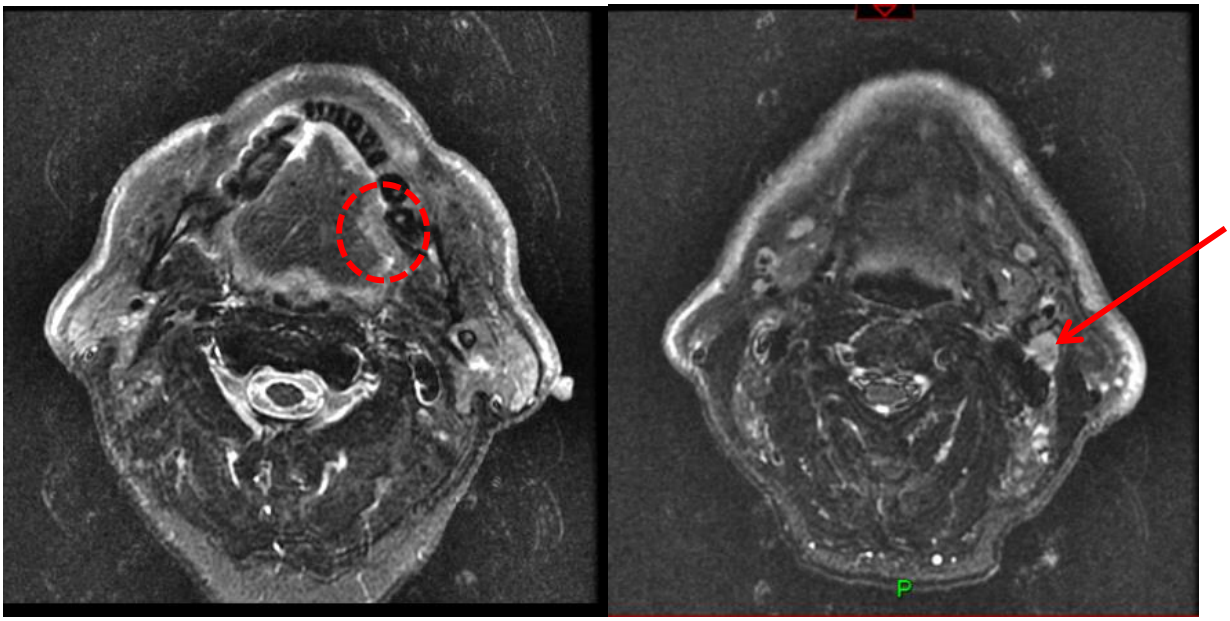
If a weekly image has an out of tolerance error, verification images should be reported for the next two fractions to allow calculation of a new systematic shift. Re-planning should be according to local practice and must be reported to the NICO Trial Office and to the RTTQA contact as detailed above (see section 2.1).

Test Cases

Lateralised T2N1 SCC left lateral tongue. Ipsilateral only neck irradiation.

Clinical Information: 66 year old male, retired glass factory worker who attends gym regularly (PS0). Presented with white spot on left tongue increasing in size, painful. Difficult to eat and drink. Past medical history of hypercholesterolaemia with nil medications. Never smoked, 20 units of alcohol per week.

Imaging report: MRI Neck with contrast: There is enhancement along the left postero-lateral edge of the tongue with increased STIR signal. This area measures approximately 23 x 8 mm on axial dimensions. No obvious invasive features. Alveolar margin appears to be intact. There is an 8mm rounded necrotic appearing left level II lymph node. There are further small sub centimetre lymph nodes in left level II and III which are indeterminate.
No obvious abnormality of the nasopharynx and larynx. Symmetrical appearance of the submandibular and parotid glands. Radiological staging; T2, N1.



Surgery: Left partial glossectomy and left levels I,II and III selective neck dissection with left forearm radial flap.

Post op histology: Moderately differentiated SCC of left tongue pT2pN1

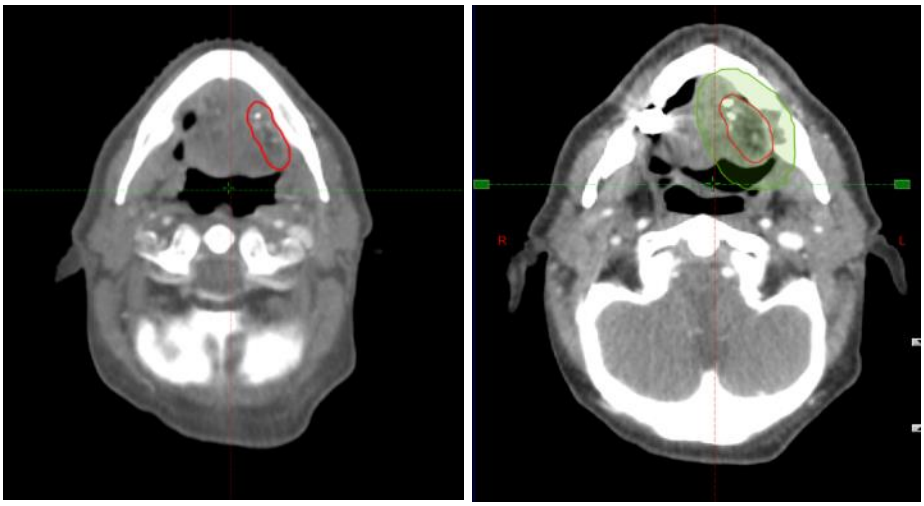
1/32 lymph nodes positive SCC with ECS @ left level II

Margins:
Post.peripheral 1.0mm

All others >5mm

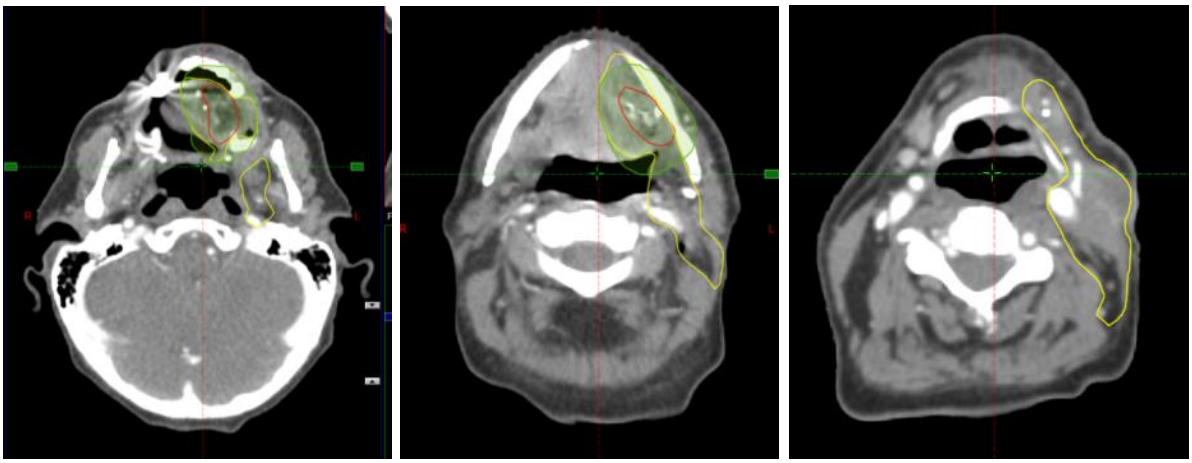
Step 1:

Surgical bed outlined (red), isotropic margin expanded by 1cm (green) to begin creating high risk CTV_6500.



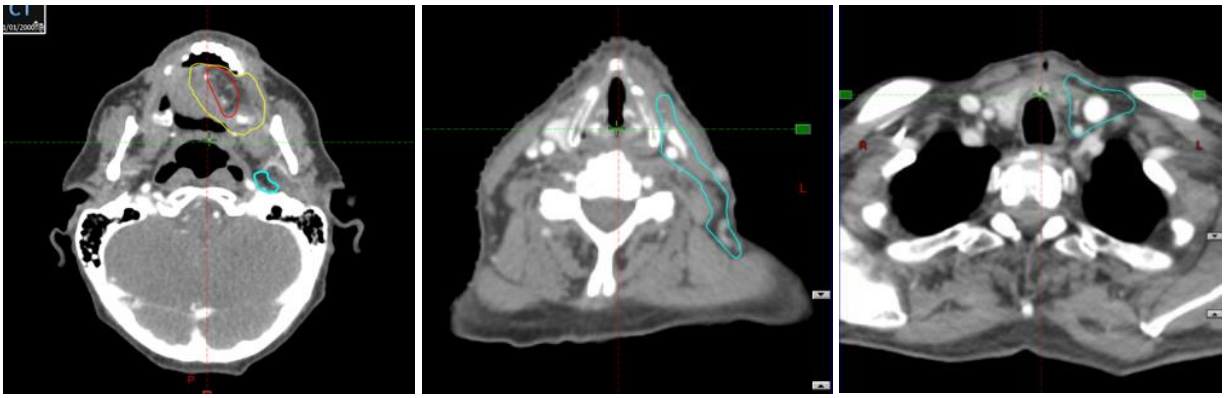
Step 2:

Surgical bed + 1cm margin (green) cropped to exclude bone and air and expanded to include high risk nodal levels with ECS (yellow) – level II, SCM included and outlining adjusted to account for anatomic changes post-surgery. This completes CTV_6500. Surgical bed + 1cm (green) margin can now be deleted.



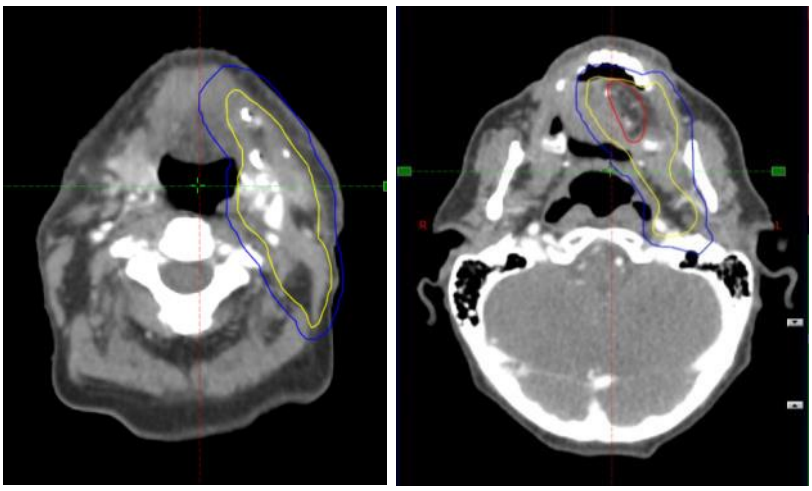
Step 3:

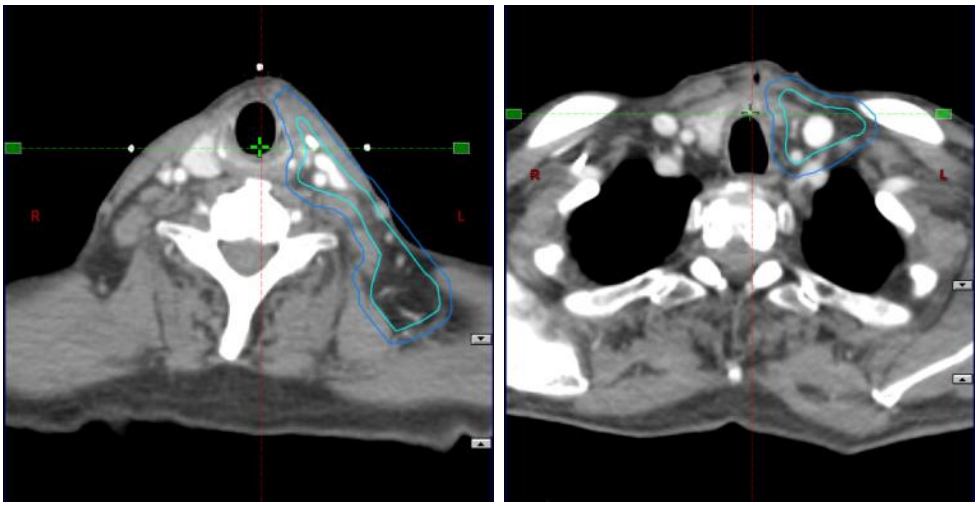
No intermediate CTV_6000 required. Low risk CTV_5400 outlined (turquoise) – levels III, IV and V, VIIb



Step 4:

PTV_6500 (dark blue) and PTV_5400 (light blue) created by growing 3-5mm isotropic margin from respective CTVs.

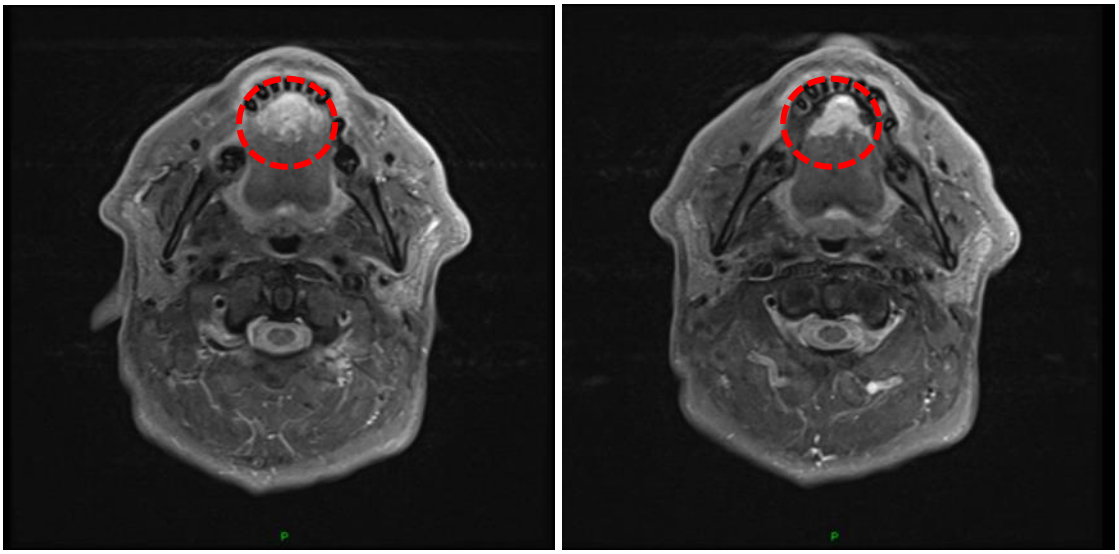




Non-lateralised T2N2c SCC floor of mouth. Bilateral neck irradiation

Clinical information: 60 year old male, currently working as a farmer (PS0). Dentist notices lesion within floor of mouth. Past history of hypertension and current medications include amlodipine, irbesartan and paracetamol. Smoker of 20 cigarettes/day and drinks 40 units of alcohol per week.

Imaging Report: MRI neck with contrast – Enhancing floor of mouth lesion, involving midline and right side, 23x14mm in cross section. Encroaches on mandible, no cortical involvement. No pathological lymphadenopathy. Radiologically staged at T2N0



Surgery: Anterior Mandibulectomy, Left neck dissection and right level I-III neck dissection

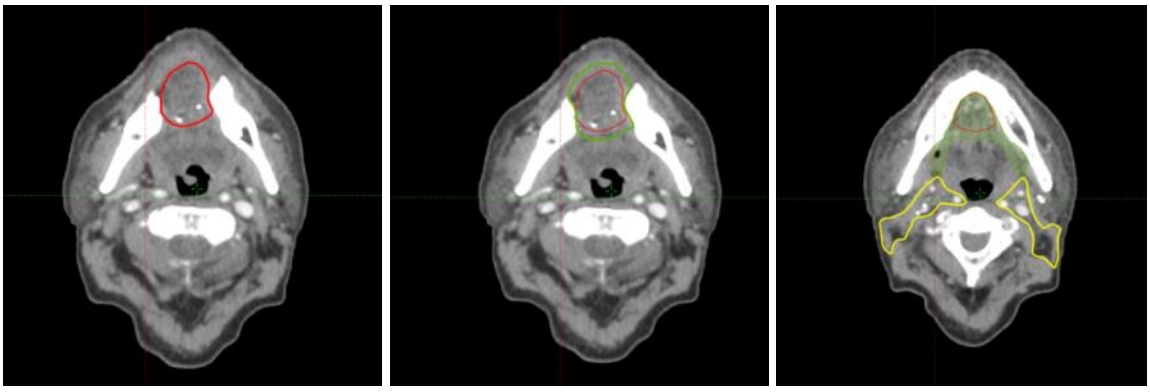
Post op Histology: Moderately differentiated SCC Floor of mouth pT2 N2c

Closest margin - deep @ 0.7mm, all others >5mm

Left neck dissection 2/17 lymph nodes positive SCC:	Level I, ECS +
	Level II, ECS -
Right neck dissection 2/21 LN positive SCC:	Level I, ECS +
	Level II, ECS -

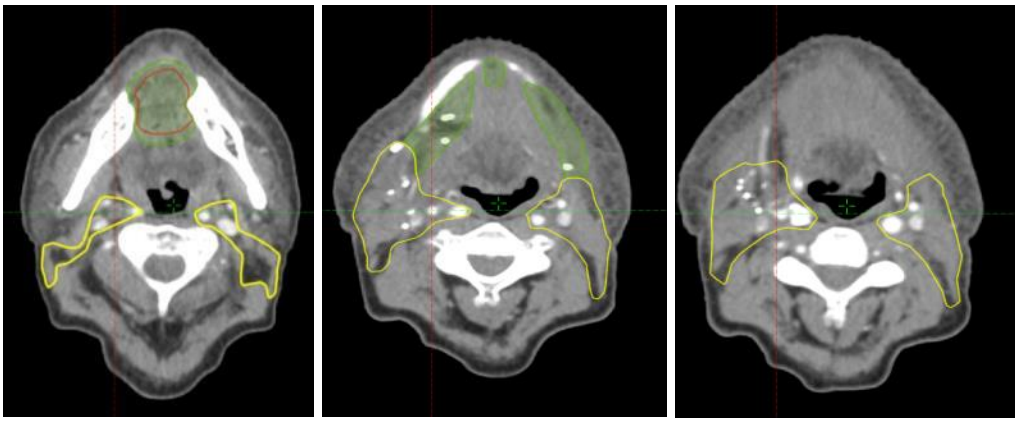
Step 1:

Tumour bed outlined (red) and expanded by isotropic 1cm margin to form the high risk CTV_6500 (green). Expanded further to include high risk nodal levels with ECS (green) – bilateral level I. Cropped to exclude bone and air.



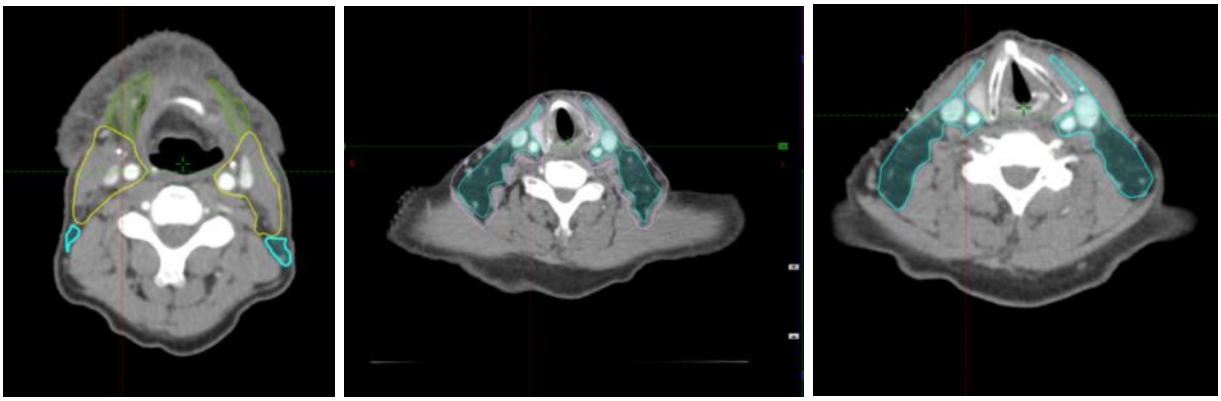
Step 2:

CTV_6000 (yellow) outlined to include intermediate risk levels – bilateral level II (positive nodes without ECS), with inclusion of SCM and adjusted to account for anatomic changes post surgery.



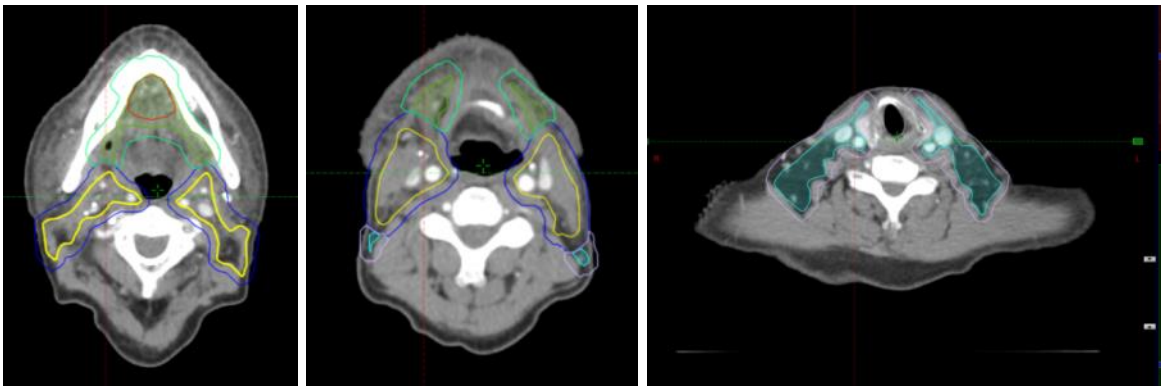
Step 3:

CTV_5400 (turquoise) outlined to include low risk uninvolved nodal levels – III, IV, V and VIIb.



Step 4:

All CTV volumes were expanded by 3-5mm to form PTV_6500 (light green), PTV_6000 (blue) and PTV_5400 (purple).



APPENDIX 1: STANDARDISED TRIAL NOMENCLATURE

All structures must be labelled according to the following standardised trial nomenclature:

Target Volumes:

Name	Description
CTV_6500	CTV to receive a dose of 65Gy
CTV_6000	CTV to receive a dose of 60Gy
CTV_5400	CTV to receive a dose of 54Gy
PTV_6500	PTV to receive a dose of 65Gy
PTV_6000	PTV to receive a dose of 60Gy
PTV_5400	PTV to receive a dose of 54Gy
PlanPTV_6500	PTV cropped by up to 6 mm from the skin to receive a dose of 65Gy
PlanPTV_6000	PTV cropped by up to 6 mm from the skin and 0 mm from PlanPTV_6500 to receive a dose of 60Gy
PlanPTV_5400	PTV cropped by up to 6 mm from the skin and 0 mm from PlanPTV_6500 and PlanPTV_6000 to receive a dose of 54Gy
PlanPTV_6500_OPT	PTV cropped to skin with optimisation build up used to receive dose 65Gy
PlanPTV_6000_OPT	PTV cropped to skin with optimisation build up used and 0mm from PlanPTV_6500 to receive a dose of 60Gy
PlanPTV_5400_OPT	PTV cropped to skin with optimisation build up used and 0mm from PlanPTV_6500 and PlanPTV_6000 to receive a dose of 54Gy

Organs at Risk:

Name	Description
Body	Body outline
SpinalCord	Spinal cord

SpinalCord_xx	Spinal cord PRV (expansion margin of 3-5 mm)
BrainStem	Brain stem
BrainStem_xx	Brain stem PRV (expansion margin of 3-5 mm)
Parotid_L or Parotid_R	Left or Right parotid
Parotid_L_ PC	Left parotid outside the PlanPTV (5mm margin)
Parotid_R_PC	Right parotid outside the PlanPTV (5mm margin)
Larynx	Larynx
Mandible	Mandible
Mandible_PC	Mandible outside the PlanPTV (5mm margin)
Trachea	Trachea
Oesophagus	Oesophagus
Globe_L or Globe_R	Left eye globe or Right eye globe respectively
Lens_L or Lens_R	Left eye lens or Right eye lens respectively
Chiasm	Optic chiasm
OpticNerve	Optic nerve

APPENDIX 2: HEAD AND NECK IMRT DOSE REPORTING – 30# SCHEDULE

Objectives		PlanPTV_6500	PlanPTV_6000	PlanPTV_5400
Volume	**Dose**	**Dose**	**Dose**	**Dose**
99% ≥	≥90%	58.5 Gy	54 Gy	48.6 Gy
98%	-	-	-	-
95%	≥95%	61.75 Gy	57 Gy	51.3 Gy
50%	=100%	65 Gy*	60±1 Gy**	54±1 Gy**
5%	≤105%	68.25 Gy	As low as possible	As low as possible
2%	≤107%	69.55 Gy	As low as possible	As low as possible

** Centres who are unable to prescribe to the median dose due to their planning system capabilities may alternatively prescribe to the mean dose and this should be indicated in the questionnaire.*

** D50% should ideally aim to be within 0.5 Gy of the prescription dose for the PlanPTVs.

Mandated OAR	Volume Constraint	Dose Constraint	Priority
SpinalCord_xx (PRV)	Max	48Gy	Critical
	1cc	44Gy	Critical
BrainStem_xx (PRV)	max	50Gy	Critical
	1cc	48Gy	Critical
Chiasm	max	50Gy	Critical
OpticNerve	max	50Gy	Critical
Parotid_L/R* (non cropped structure)	Mean	35Gy	Medium
Parotid L/R_PC***	Mean	24Gy	Medium
Mandible	Max	65Gy	Low
Mandible_PC***	Mean	50Gy	Low
Larynx	Mean	40Gy	Low
Trachea	Mean	40Gy	Low
Oesophagus	Mean	40Gy	Low

* For ipsilateral irradiation, the contralateral parotid dose should be kept as low as possible (ideally Dmean<12Gy)
** OARs_PC (cropped 5mm from PlanPTVs)

Optional OAR	Volume Constraint	Dose Constraint
Globe	Max	40Gy
Lens	Max	8Gy

APPENDIX 3: PLAN ASSESSMENT FORM

Plan Assessment Forms should be completed electronically only.

Patient Trial No: | Patient Initials | Date form Completed

Treating Centre: | Overviewing clinician

GENERAL

Site of primary disease:

Use of mouth bite

PRESCRIPTION

Plan PTV6500: 65Gy in 30# | Plan PTV6000: 60Gy in 30# | Plan PTV5400: 54Gy in 30#

Please comment if Plan PTV6000 has not been created :

TARGET VOLUME DELINEATION

Target Volumes CTV-PTV margin (mm): | PTV-Body margin (mm):

	Volume (cm^3)	Comments
CTV_6500		
PTV_6500		
Plan PTV_6500		
CTV_6000		
PTV_6000		
Plan PTV_6000		
CTV_5400		
PTV_5400		
Plan PTV_5400		

	PRV margin (mm)	
SpinalCord_xx		
BrainStem_xx		

PLAN DETAILS

Technique: | TPS and algorithm

Number of field/arcs: | Comments

PROTOCOL DEVIATIONS

Please comment on any NICO protocol deviations:

DOSE/VOLUME REPORTING

Key: Mandatory Constraint Optimal Constraint No Constraint

65 Gy Target Volumes	Dose Achieved (Gy)	
Objective	PlanPTV_6500	**Comments**
D99% ≥ 90% (58.5Gy)		
D98%		
D95% ≥95% (61.75Gy)		
D50% = 100% (65.0Gy)		
D5% = 105% (68.25Gy)		
D2% = 107% (69.55Gy)		

60 Gy Target Volumes	Dose Achieved (Gy)	
Objective	PlanPTV_6000	**Comments**
D99% ≥ 90% (54Gy)		
D98%		
D95% ≥95% (57Gy)		
D50% = 100% (60 ± 1Gy)**		
D5%		
D2%		

*** D50% should ideally aim to be within 0.5Gy of the prescription dose for the PlanPTVs*

54 Gy Target Volumes	Dose Achieved (Gy)	
Objective	PlanPTV_5400	**Comments**
D99% ≥ 90% (48.6Gy)		
D98%		
D95% ≥95% (51.3Gy)		
D50% = 100% (54 ± 1Gy)**		
D5%		
D2%		

*** D50% should ideally aim to be within 0.5Gy of the prescription dose for the PlanPTVs*

Organs at Risk

Mandatory:

Structure	Volume Constraint	Dose Constraint	Dose Achieved (Gy)	Priority	Comments
SpinalCord_xx (PRV)	Max	48Gy		Critical	
	1cc	44Gy		Critical	
BrainStem_xx (PRV)	Max	50Gy		Critical	
	1cc	48Gy		Critical	
Chiasm	Max	50Gy		Critical	
OpticNerve	Max	50Gy		Critical	
Parotid_L*	Mean	35Gy		Medium	
Parotid_R*	Mean	35Gy		Medium	

Parotid_L_PC	Mean	24Gy		Medium	
Parotid_R_PC	Mean	24Gy		Medium	
Mandible	Max	65Gy		Low	
Mandible_PC	Mean	50Gy		Low	
Larynx	Mean	40Gy		Low	
Oesophagus	Mean	40Gy		Low	
Trachea	Mean	40Gy		low	

* For ipsilateral neck irradiation, the contralateral parotid dose should be kept as low as possible (ideally Dmean<12Gy)

Optional:

Structure	Volume Constraint	Dose Constraint	Dose Achieved (Gy)	Comments
Globe	Max	40Gy		
Lens	Max	8Gy		

Planned: Signed	Name: (optional): Date:	

Checked: Signed	Name: (optional): Date	

Clinician: Signed	Name: (optional): Date	

For Replans:

Please include a description of the reason for replanning (e.g. weight loss) and no. of # treated on the original plan
