2D Radiation Techniques in Head and Neck Cancers



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Bite block

An effective tongue blade can push the tongue inferiorly and allow for mucosal sparing of the hard palate



Bite block



Some patients can tolerate bite blocks which are narrower then the tongue allowing lateral edge of the tongue rolled over the tongue depressor. This will lead to insufficient dose to the lateral edge of the tongue.

Bite block

Two notches on a cork ensure that it is held in the same position between upper and lower incisors during every treatment session;

Guidelines

- Anterior skin of neck to be shielded where ever possible
- Prevent desquamation and laryngeal edema.



- Usually Two field Technique
 - –Upper Neck along with Primary disease
 - usually by two lateral portals
 - –Lower Neck
 - By direct ant portal

By Two Lateral Portals

UPPER NECK

Upper Border of Portal



Location of Level II Lymph Nodes

Caudal edge of transverse process of C1

Upper Border of Portal



If Retrostyloid Region is to be included.

Lymph node up to base of skull

LOWER NECK

Junction of Two Portals

By Separate Direct Anterior Portal





Half Beam Block





Asymmetrical collimation





Junctional Shield

NO

Along lower border of Clavicle to shield the lung

Whole length of the lower portal (Split Field)



Lower Neck

Thyroid Notch

Junction Should not be over the Gross Disease

Shrinking Field Technique

Omit the

50 Gy

spinal cord



Finally cone down boost to primary 70GY



Further Reduce the field to primary and first echelon nodes 60 GY

Whole Neck 44 Gy.

Fraction Size is 2 Gy per fraction

Oral Cavity



Huang Med Oral Patol Oral Cir Bucal 2013



Margins

- < 1 mm Positive
- 1-5mm Close
- > 5 mm Negative

Oral Cavity

- Postoperative RT of the primary site is based on
- positive margins,
- bone invasion,
- Muscle invasion
- invasion of the soft tissues of neck,
- perineural invasion, and LVI.
- T3 and T4 lesions
- Indications for postoperative RT related to the neck include
 - extracapsular extension and
 - multiple positive nodes.

Dose of PORT

- patients with negative margins receive 60 Gy in 30 fractions over 6 weeks.
- Patients with close margins receive 66 Gy in 33 fractions.
- Patients with positive margin or ECE receive CRT with dose of 66 Gy in 33 fraction
- Prophylactic Neck RT.
 - Level Ib, Ila and III.
 - Level IV also in oral tongue
 - Level Ia also in lower lip, ant floor mouth, ant alveolar ridge.

Upper Border ^{2cm} above the dorsum of the tongue

Dorsum of the Tongu

Thyroid Notch to cover level II nodes

2 Cm

Cm

Anterior Border

Lower Border



Posterior Border

To adequately cover the level II nodes posteriorly

Two Groups IIA

Posterior Border of IJV

IIB

In NO neck IIB is unlikely to be involved

Posterior Border



NO Anterior edge

of mastoid N+

Tip of the vertebral spine



Anterior border of SCM muscle at its origin



Posterior border of SCM muscle at its origin

Posterior Border in relation to surface anatomy



Shielding

→ Brain Tissue

Submental Tissue

EXTENSION

Bilateral Lower Neck

Lower Neck

Ipsilateral Lower neck in lateralized NO disease

Small laryngeal shield to prevent overlap

Level V Not to be treated

Definitive Radiation of the Floor of Mouth

- a stainless steel marker can be inserted into the floor of the mouth at the posterior tumor border.
- This confirms that the entire extent of mucosal spread, which can be difficult to delineate on CT scan, is properly treated.

Intra oral cone

- Indications
 - patient is edentulous
 - small, anterior, superficial lesion
 - low alveolar ridge
- The very small lesions might be treated solely by cone RT (50 Gy/3 weeks or 60 Gy/4 weeks, given doses),

Intra oral cone

- larger lesions
- Intra oral cone :- 20 to 25 Gy at 2.5 to 3 Gy per fraction
- External Beam RT 45 to 50 Gy.
- intraoral cone irradiation precedes externalbeam RT because the lesion can be well delineated and the mouth is not sore, therefore facilitating cone placement.

EBRT for lesion confined to floor of mouth



Cork is placed in such a way that tip of tongue is displaced up from treatment field.

EBRT for floor of mouth lesion with tongue invasion 0 Cork is placed in such a way that tongue is also depressed.
Full Thickness of the mandibular arch

Thyroid Notch

EXTENSION

Posterior border similar to the ca ant tongue depending upon Level II B to be included or not



Shielding

The oropharynx, much of the oral cavity, and parotid glands are out of portal

Oropharynx



Lymph Nodes

- NO:-
 - Bilateral Level II-IV,
 - Level IIb may be omitted .
 - RP(in soft palate and post pharyngeal wall).
- N1 & N2a:-
 - Bilateral Level II-V, and RP in all sub sites.
 - Retrostyloid if level II node on the side of node
- N2b onwards (Multiple nodes):-
 - Bilateral Ib also included with II-V & RP
 - Retrostyloid region to be included on the side of the disease.



Base of Tongue

- the risk of subclinical nodal disease is probably at least 50%.
- The low neck is treated with an anterior field with a tapered midline larynx block.



Upper Border

Post. Border

Ant. Border



Inferior Border

The inferior border is usually at or below the thyroid notch depending upon the extent of the disease inferiorly.



Antero inferiorly, skin and subcutaneous tissues of sub mentum are shielded, except in case of advanced disease.

shaped to keep at BOS posteriorly In N +ve upper border is shaped to keep at 1.5 cm above BOS

In NO

upper

border is

posteriorly

Bilateral Lower Neck N1 Level V to be treated

NO Level V Not to be treated



Lower Neck

Tonsil

Tonsil

- For the T1-T2/N0 well-lateralized tonsil lesions with no tongue invasion and no significant extension onto the soft palate, ipsilateral treatment with a wedge pair can preserve contra lateral salivary flow along with radiation to the same side of neck.
- For more advanced disease treated with conventional RT, parallel-opposed portals with either a 3:2 or 1:1 weighting are generally used. When trismus is present, it is necessary to include the pterygoid plates up to the base of skull.

nx Hard Palate Soft Palate Palato Pharyngeus Muscle OR Post Tonsillar Pillar Palato Glossal M Tonsil OR **Ant Tonsillar Pillar**

nx Sub mucosal spread

2 cm above the junctio of soft & Hard palate

23 Molar

In more advanced disease 2cm from anterior extension

Thyroid Notch

Spinous

Process

If disease is limited to tonsil At 1st or 2nd molar tooth Upper Border Ant. Border

Lower Border Post Border



Antero inferiorly, skin and subcutaneous tissues of sub mentum are shielded, except in case of advanced disease.

shaped to keep at BOS posteriorly In N +ve upper border is shaped to keep at 1.5 cm above BOS

In NO

upper

border is

posteriorly

Bilateral Lower Neck 111 Level V to be treated

NO Level V Not to be treated



Lower Neck

Soft Palate

- Cancers of the soft palate are relatively infrequent and can be treated conventionally using a parallel-opposed technique.
- If a boost is to be delivered by intraoral cone, the boost is done before the external-beam RT to allow for more accurate target volume delineation.

Larynx

NO

level II-IV.

Level IIb may be omitted.

Till N2a

include level V (II-V)

N2b onwards

Include Ib also (IB-V).

With trans glottic and sub glottic ext also include level VI

Carcinoma Glottis

- T1 and T2 Radiotherapy
- T3 Concurrent CRT
- T4 Total Laryngectomy followed by post op RT

Carcinoma Glottis

- Early carcinoma:- T1 and T2
- Advanced carcinoma:- T3 and T4



Early Carcinoma

- Target:- Only primary disease.
- Because the risk of subclinical disease in the cervical lymphatics is remote, the portals are limited to the primary lesion.
- The patient is treated in the supine position with the neck extended and the head immobilized in an aquaplast mask.

Upper Border

Middle of the thyroid notch

Top of the thyroid notch if min supra glottic extension

Inferior Border

Bottom of the cricoid cartilage

In case of subglottic extension at least 2 cm below the gross tumor

One or two tracheal ring to be included

Anterior Border

1cm in the air



Posterior Border

Ant 2/3rd of the Vocal Cord

Ant border of vertebral body

Post vocal cord

1 cm post to ant border of Vertebral body

T3-T4 Glottic Cancer with N0

- Target:-
 - -Primary
 - -Entire Pre-epiglottic space.
 - -Sub-glottic extension
 - –Level II, III, IV and Level VI nodes if pre-epiglottic and sub-glottic extension.

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At BOS to include level II Nodes

Along the inferior border of mandible to include repiglottis

Hyoid Bone

In the air

Bottom of the cricoid cartilage

Upper Border

Anterior Border

Inferior Border



In case of subglottic extension at least 2 cm below the gross tumor One or two tracheal ring to be included



Posterior Border

Along the ant border of spinous process

Lower Neck

Level IV and VI nodes



Two lateral oppose portal to treat whole neck with **Primary**

0/229-13-2303

\$230 124/0233313

To include level V

1.5 cm above BOS

Upper Border

Posterior Border

T3-T4 Glottic Ca with N+ve N1 & N2a 0/229-13-2303

\$2303 124/02333132

Level lb to be included

T3-T4 Glottic Ca with N+ve N2b onward

IMRT in Glottic Cancer

- No role in early cancer.
- IMRT is required in special situation.
 - When matching with lower field is problem as in case of short neck.
 - In N+ve neck when same side of retrostyloid region to be treated so that other parotid can be spared.
 - In a short neck with sub glottic extension when primary may not be covered with lateral oppose portals.

Supraglottic Larynx

Nodes

NO Level II, III & IV N₂a Level II, III, IV & V N2b onwards Level Ib, II, III, IV & V

Supraglottic Larynx

- The inferior border of the portal is adjusted according to the extent of the disease. For a false cord or infrahyoid epiglottic cancer, the bottom of the cricoid cartilage is usually chosen.
- For an epiglottic tip cancer, the lower border may be placed at or above the level of the true cords, depending on the extent and growth pattern (infiltrative vs. exophytic) of the disease.





Indication of PORT

- close or positive surgical margins,
- extension of primary lesion through cartilage into soft tissues of the neck,
- perineural invasion,
- extensive subglottic extension,
- multiple positive nodes,
- presence of extracapsular extension (ECE).
- The need for emergent tracheotomy is also an indication for postoperative radiation
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At BOS to include level II Nodes

Behind the

spinous

process

Along the inferior border of mandible

epiglottis

In the air

0.44

Border Anterior Border

Upper

Posterior Border nx

 Tip of Epiglottis Middle of the cricoid cartilage
 Infra hyoid epiglottis

 Lower border of cricoid cartilage
 Sub glottic extension
 2cm below lower extension

Lower Border

Cricoid Cartilage

Hyoid







Upper border above BOS to include the retrostyloid region in neck positive disease

Hypopharynx

- Treat bilateral neck.
- N0:- Level II-IV and RP in case of post pharyngeal wall
- With single node <6cm, also include level V and RP nodes (Level II-V with RP)
- With multiple nodes or >6cm size also include level I also(I-V with RP)
- With Pyifrom sinus apex and esophageal extension also include level VI.
- With NO, IIb may be omitted

Pyriform Sinus

- The pyriform sinus lies posteriorly within the pharynx and extends from the pharyngoepiglottic fold superiorly to the apex, which is located between the superior and inferior borders of the cricoid cartilage.
- Because the apex is situated below the level of the vocal cords, invasion by tumor can readily produce vocal cord paralysis.



Indication for PORT are same as in Larynx

Pyriform Sinus



- Superiorly, portal covers lymph nodes at the base of the skull, so upper border 1.5cm above BOS which corresponds to tragus to ala nose, then sweeps anteroinferiorly to cover posterior tongue base and level II lymph nodes.
- Anteriorly, at least 1 cm of skin and subcutaneous tissues (as viewed from lateral projection) is usually spared.
- The posterior field edge usually encompasses the spinous process of the C2 vertebral body.
- B: The location of lateral retropharyngeal lymph nodes in relation to C1–2 vertebral bodies.

Pyriform Sinus

Upper border 1.5 cm above the skull base to include the RP and upper most level II nodes



Ant border 1 cm fall off

behind the spinous processes or more posteriorly in the presence of a large nodal mass encompasses primary lesion with margin (as low as possible while avoiding the shoulders)

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Matching anterior portal is used to treat the lower neck nodes



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Upper border above BOS to include the retrostyloid region

Oral cavity shielded

Boost Field for Pyriform Sinus Primary

depends on the extent of the disease; at least include the AE folds superiorly

mid vertebral bodies, or posterior one third of vertebral bodies when the primary involves posterior pharyngeal wall

 depends on the extent of the disease; at least include cricoid cartilage inferiorly

1 cm fall-off, except when the primary lesion is confined to the posterior structures, where a small strip of anterior skin may be spared

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Posterior Pharyngeal Wall

- Radiation or CRT is the treatment of choice.
- levels II including retrostyloid region, III, IV, as well as the retropharyngeal nodes are at risk.
- Radiation portal same as in pyriform sinus.
- When posterior border of the field is shifted anterior to the spinal cord after cord tolerance, one should be very careful otherwise inadequate dose may be delivered to the posterior part of the tumor.



If field edge bisects vertebral body when spinal cord is shielded, part of cancer will be in penumbra or altogether outside irradiated volume. So post border after spinal cord tolerance should be placed at post edge of body or posterior 3rd of body

of the vertebrae.

Unknown Primary

- Classically, treating the possible primary sites for the patient who presents with upper cervical node squamous cell cancer included treating the nasopharynx, oropharynx, larynx, and hypopharynx.
- One of the advances in head and neck cancer within the last 10 to 15 years has been the realization that most patients who present with an unknown primary cell carcinoma of the head and neck have tumors arising in the tonsillar fossa or tongue base.
- Currently, patients presenting with the involvement of the level II lymph nodes receive RT to the oropharynx, through parallel-opposed portals and low-neck RT to the level of the clavicles through an anterior field.

Unknown Primary

- However, since the retropharyngeal nodes and retrostyloid region are to be included as standard of practice, the portals are enlarged to a modest degree to include the nasopharynx as well in the unlikely event that the primary site is located there.
- the low neck receives 50 Gy in 25 q.d. fractions. Gross nodal disease is boosted to approximately 70 Gy.

Unknown Primary



- Superiorly, the portal treats the nasopharynx and the jugular and spinal accessory lymph nodes to the base of the skull.
- The posterior border is behind the spinous process of C2.
- The inferior border is at the thyroid notch.
- Anteroinferiorly, the skin and subcutaneous tissues of the submentum are shielded, except in the case of advanced neck disease.
- The anterior tongue margin is set so as to obtain a 2-cm margin on the base of the tongue and tonsillar fossa, as well as the nasopharynx. One portal reduction is shown.
- Junction at the node to be avoided.

Boost Technique for Large or Fixed Lymph Nodes



Parallelopposed anterior and posterior neck portals with wedges. Medial border is usually 1.5 to 2.0 cm from midline.