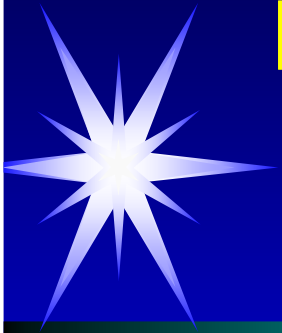
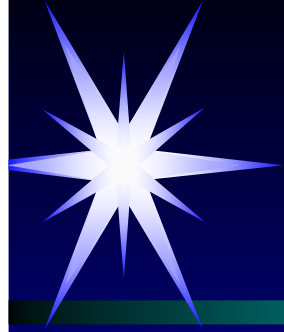


# Two Dimensional Radiation Treatment Planning In Carcinoma Head & Neck

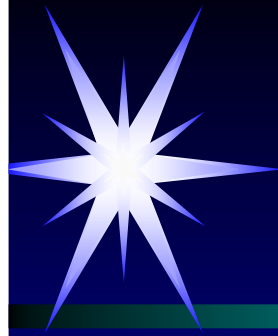


Dr. Vivek Kaushal  
Senior Professor and Head  
Department of Radiation Oncology  
Regional Cancer Centre  
Pt. B. D. S. PGIMS, Rohtak



## 2-D Planning in Ca Head and Neck

- Goals of irradiation
  - Uncomplicated destruction of primary tumor and regional lymphatic metastases
  - Preservation of normal tissues and function

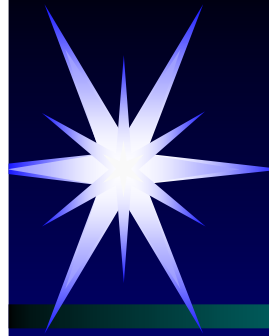


# Radiation Treatment Planning

- Zero Dimensional planning (point dosimetry)
- One Dimensional Planning (along central axis)
- **Two Dimensional Planning (on central slice)**
- Three Dimensional Planning (3D Calculation)
- Four Dimensional Planning and Delivery

Tight margins to save normal tissues

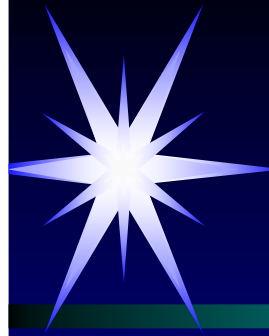
More dose to tumor



# 2D Radiation Treatment Planning

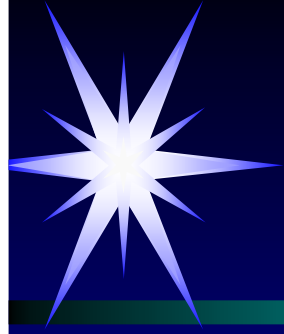
Radiation treatment Planning is the work involved in graphically displaying a dose distribution when one or more beams converge on the target volume

Conventionally done on central slice



## Aims of Radiation Treatment Planning

- The dose to the target volume should be homogenous  $+7\%$  &  $-5\%$  (Not applicable in IMRT SIB)
- The dose to normal tissues should be minimum
- The tolerance of normal tissues should never be exceeded
- Integral dose should be minimum



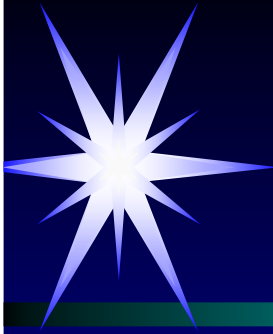
# Steps of 2D Radiation Treatment Planning

- Tumor Localization
- Verification
- Field Placement, Dose Calculation and Prescription
- Treatment Delivery and Reduplication



## 2-D planning in Ca Head and Neck

- Optimal field Margins
  - Large enough to prevent regrowth of tumor at the margins
  - Limited enough to prevent excessive irradiation of normal structures
- Optimal dose distribution
  - Sufficiently large to prevent tumor recurrence
  - Not so large to cause late radiation complication



# Indications of Radiation Therapy in Ca Head and Neck\* (General Principles)

## Radiation With Curative Intent

### 1. Radical Radiation alone

T1, T2 and carefully Selected T3 tumors cure rate similar as surgery with preservation of organ

2. **Radical Radiation with Chemotherapy** increases local control and survival in T3 and T4 tumors. Concomitant is better than induction chemotherapy followed by RT.

Certain sites e.g. Ca Nasopharynx RT is indicated in all stages. Radical surgery is never done.

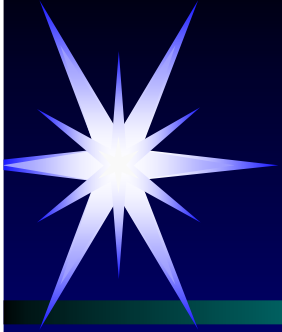
### 3. Radiation therapy with Surgery

Post Operative Radiation Therapy usually indicated in T3, T4 tumors

## Radiation with Palliative Intent

\*Site Specific NCCN Guidelines 2014 need to be followed





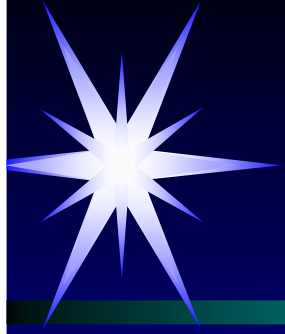
## Indications of Post operative Radiotherapy in Head and Neck Cancer

- Positive resection margins
- Extracapsular nodal spread
- Close resection margins < 5mm
- Invasion of soft tissue
- >2 nodes involved
- Involved node >3cm in diameter
- Vascular invasion
- Perineural invasion
- Poor differentiation
- Stage III/IV
- Multicentric primary



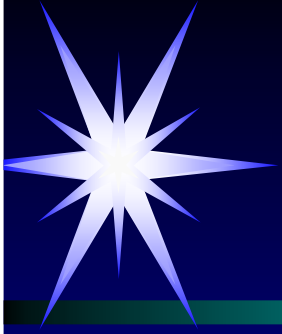
# Tumor Lethal Dose in Head and Neck Carcinoma

- Usually varies between 60-70 Gy
- 1.8-2 Gy per fraction
- A common schedule is 66 Gy/33F/6.5 weeks
- Hypofractionated schedules may be used in special circumstances e.g. T1N0M0 Glottic Ca
- Tolerance of Normal tissues is to be respected



# Patient Workup

- Detailed History
- Thorough General Physical, systemic and Local examination
- Pan endoscopy
- Xray Chest
- Complete Hemogram
- Blood Biochemistry e.g. LFT, KFT
- Plain Radiographs depending on site involved e.g. Xray Soft tissue neck, Xray PNS etc.
- CTScan, MRI Scan, PET scan, etc. (optional)

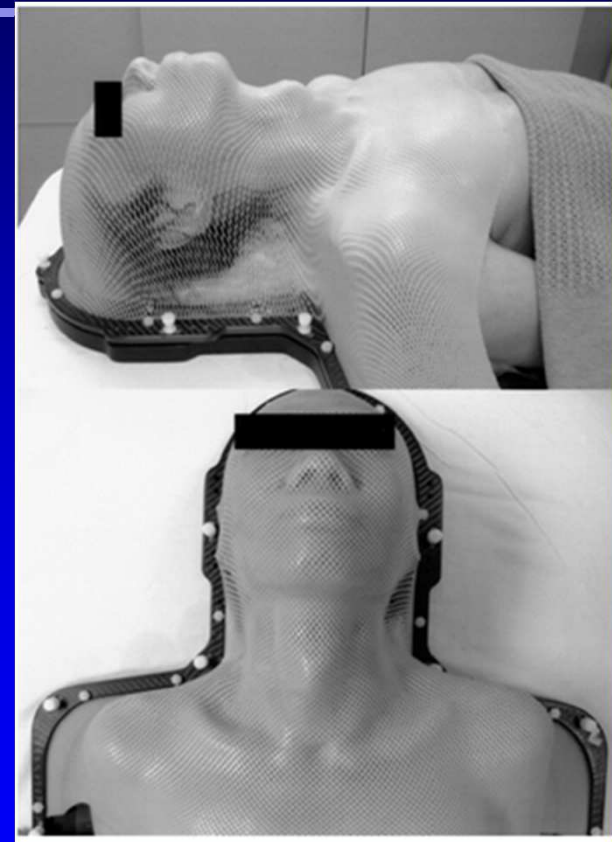


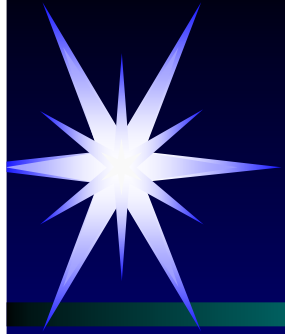
# Patient Workup

- All patients should have dental evaluation and dietician consultation prior to commencement of RT
- Physical and radiographic examination to localize primary tumor
- External landmarks placed on skin to define volume of irradiation e.g lymph nodes etc.
- Relationship between external landmarks and internal anatomy is determined by visual inspection, endoscopy, or by radiographic technique (e.g. Xray Soft tissue Neck Lateral view, Xray PNS, CTScan, MRI Scan, PET scan, etc.

# Treatment Preparation

- Positioning:
  - Supine position (usual)
  - Head should be extended
- Immobilization
  - To ensure accuracy in setup patient should be immobilized with a custom-made thermoplastic cast

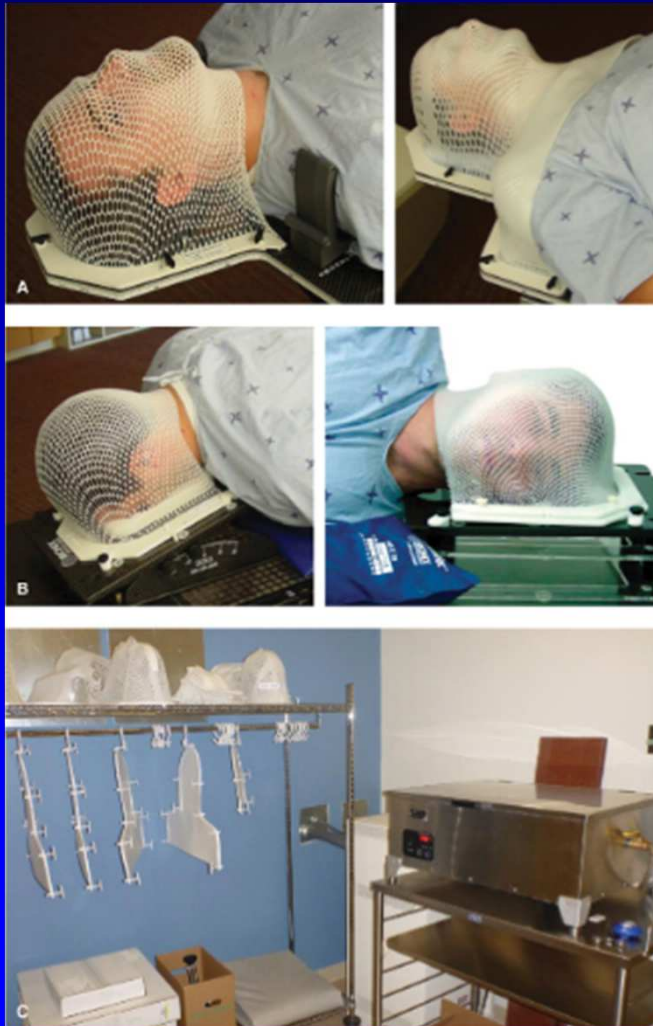




# Immobilisation

- Patients should have good and reproducible immobilisation
- Individual thermoplastic shell is made to cover head neck and shoulders
- Occasionally stereotactic frames or relocatable devices are used but usually these are not required.
- Further imaging in mask

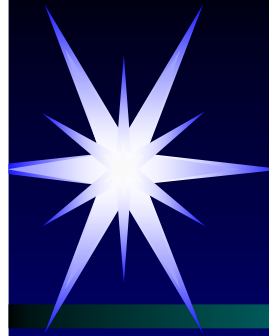
# Thermoplastic Masks



For treatment of targets in the head and neck, thermoplastic masks are routinely used for custom immobilization

Short versions that cover only the head, as well as longer versions that extend over the patient's shoulders are used.

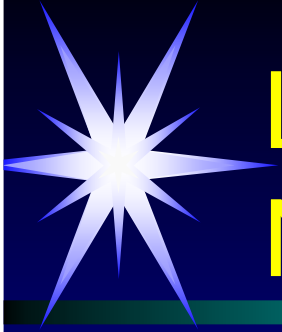
They can also be used to treat patients in the prone and lateral positions.



# Field Placement

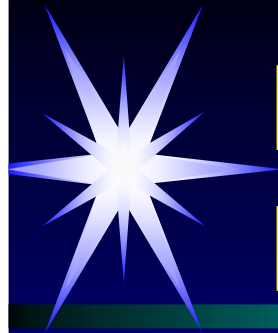
- Clinical Judgement (Surface anatomy based) verified by lead wire placement, radiograph taken for modification of field if necessary
- Simulator fluoroscopy based, unnecessary portions may or may not be shielded. Shielding may be done by Plain shielding blocks, customized Cerrobend blocks, Multileaf collimator, etc





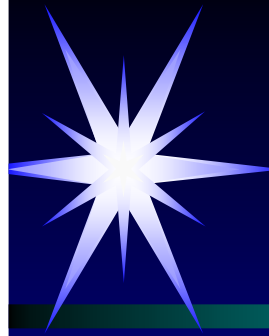
# LIMITATION OF DOSE TO NORMAL STRUCTURES

- Spinal cord
  - Cerrobend blocks
  - Electron beam irradiation to posterior cervical triangle
  - 2cm wide midline shield on skin in nasopharyngeal and oropharyngeal tumor
  
- Larynx
  - Inferior margin beneath hyoid bone
  - Midline shield



# LIMITATION OF DOSE TO NORMAL STRUCTURES

- Parotid glands
  - Parotid, skin, buccal mucosa....irradiated with U/L electron beam which spares opposite parotid and preserve salivary function
  - Electron beam 4times/week
  - Co-60 beam 1time/week
  - Spares skin enough that wet desquamation does not result from 5000-6000 rads in 5-6 weeks



# Mouth bite

- A **mouth bite** is used to push the tongue out of the treatment volume e.g. maxillary antral tumors
- A **tongue depressor** is used to push the tongue into the treatment volume e.g. oral tongue tumors
- Incorporated in the immobilization device



Guidelines

Delineation of the neck node levels for head and neck tumors: A 2013 update. DAHANCA, EORTC, HKNPCSG, NCIC CTG, NCRI, RTOG, TROG consensus guidelines <sup>☆</sup>

Vincent Grégoire <sup>a,\*</sup>, Kian Ang <sup>b</sup>, Wilfried Budach <sup>c</sup>, Cai Grau <sup>d</sup>, Marc Hamoir <sup>e</sup>, Johannes A. Langendijk <sup>f</sup>, Anne Lee <sup>g</sup>, Quynh-Thu Le <sup>h</sup>, Philippe Maingon <sup>i</sup>, Chris Nutting <sup>j</sup>, Brian O'Sullivan <sup>k</sup>, Sandro V. Porceddu <sup>m</sup>, Benoit Lengele <sup>n</sup>

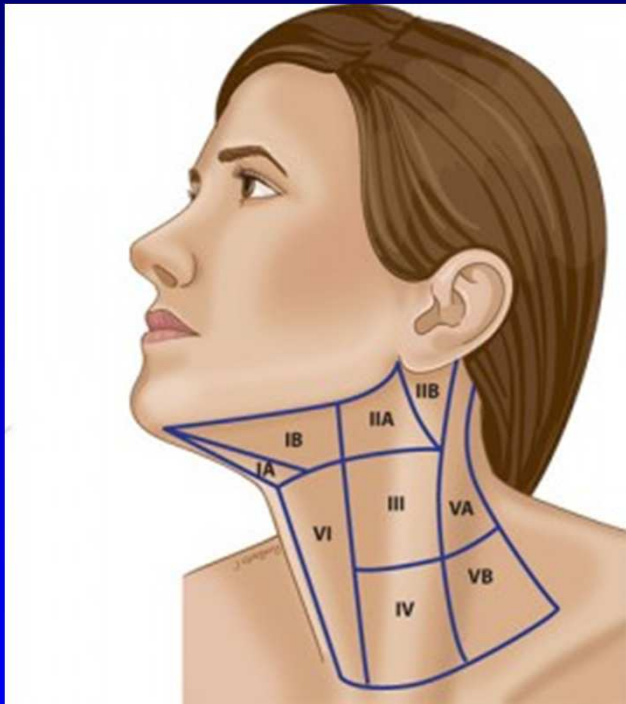


**TNM atlas for lymph nodes of the neck**

**Node levels modified from Robbins**

Group number	Terminology	Level	Terminology
1	Submental nodes	Ia	Submental group
2	Submandibular nodes	Ib	Submandibular group
3	Cranial jugular nodes	II	Upper jugular group
4	Middle jugular nodes	III	Middle jugular group
5	Caudal jugular nodes	IVa	Lower jugular group
		IVb	Medial supraclavicular group
		V	Posterior triangle group
6	Dorsal cervical nodes along the spinal accessory nerve	Va	- Upper posterior triangle nodes
		Vb	- Lower posterior triangle nodes
7	Supraclavicular nodes	Vc	Lateral supraclavicular group
		VI	Anterior compartment group:
		VIa	- Anterior jugular nodes
8	Prelaryngeal and paratracheal nodes	VIb	- Prelaryngeal, pretracheal, & paratracheal nodes
		VII	Prevertebral compartment group:
9	Retropharyngeal nodes	VIIa	- Retropharyngeal nodes
		VIIb	- Retro-styloid nodes
10	Parotid nodes	VIII	Parotid group
11	Buccal nodes	IX	Bucco-facial group
		X	Posterior skull group:
12	Retroauricular and occipital nodes	Xa	- Retroauricular & subauricular nodes
		Xb	- Occipital nodes

# Lymph Node Groups in Head and Neck Cancer



Level I Sub Mental (Ia) & Sub Mandibular (Ib) lymph nodes

Level II Upper jugular lymph nodes **above hyoid bone** (IIa and IIb)

Level III Middle jugular lymph nodes **between hyoid bone and cricoid cartilage**

Level IV Lower jugular lymph nodes **below cricoid**

Level V Posterior triangle lymph nodes

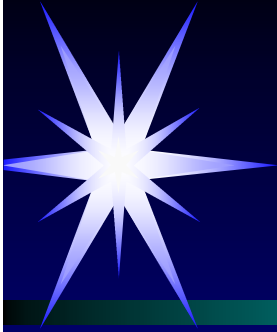
Level VI Pre-laryngeal and pre-tracheal lymph nodes

Level VII Retropharyngeal

Level VIII Parotid

Level IX Bucco facial nodes

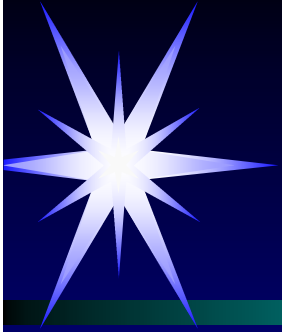
Level X Retroauricular (Xa) and Occipital (Xb)



# Which lymph node regions to irradiate in head and Neck Cancer? Site and stage wise

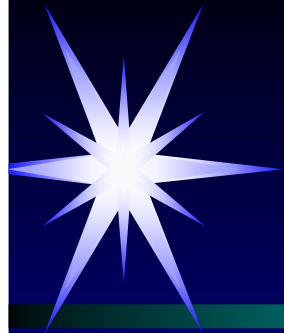
INDICATIONS	IRRADIATION
<b>Oral cavity</b>	
T2N0 with well-lateralized primary	Levels I and II on the same side
T2N1 with well-lateralized primary	Levels I to V on the same side
T2N0 with primary approaching midline, all T3N0 and T4N0	Levels I, II and III bilaterally
All others	Levels I to V bilaterally
<b>Oropharynx</b>	
T2N0 tonsil	Levels I and II on the same side
T2N1 tonsil	Levels I to V on the same side
T2N0 other sites	Levels I, II and III bilaterally
All others	Levels I to V bilaterally
<b>Nasopharynx</b>	
Squamous cell carcinoma T1 – T4 N0	Level II, retropharyngeal and upper posterior triangle
All undifferentiated carcinoma and squamous carcinoma with node involvement	Levels I to V
<b>Hypopharynx</b>	
All	Levels I to V bilaterally
<b>Paranasal sinuses</b>	
<b>Retropharyngeal nodes</b>	
Squamous carcinoma	Lateral pharyngeal nodes only
Squamous carcinoma N+ and undifferentiated carcinoma	Levels I to V on the same side
<b>Larynx</b>	
T1–2N0 glottic	No nodal irradiation
T3–4N0 glottic	Levels II and III bilaterally
T2N0 supraglottic	Levels II and III bilaterally
All others	Levels I to V bilaterally
Lymph node levels are defined as follows: level I, submandibular; level II, upper deep cervical; level III, middle deep cervical; level IV, lower deep cervical; level V, posterior triangle	





# Shoulder traction





# 2D Radiation Treatment Planning

A single patient contour, acquired using lead wire/ plaster strips is transcribed onto a sheet of graph paper, with reference points identified. Now a days CT contour on central slice is directly transferred to computer

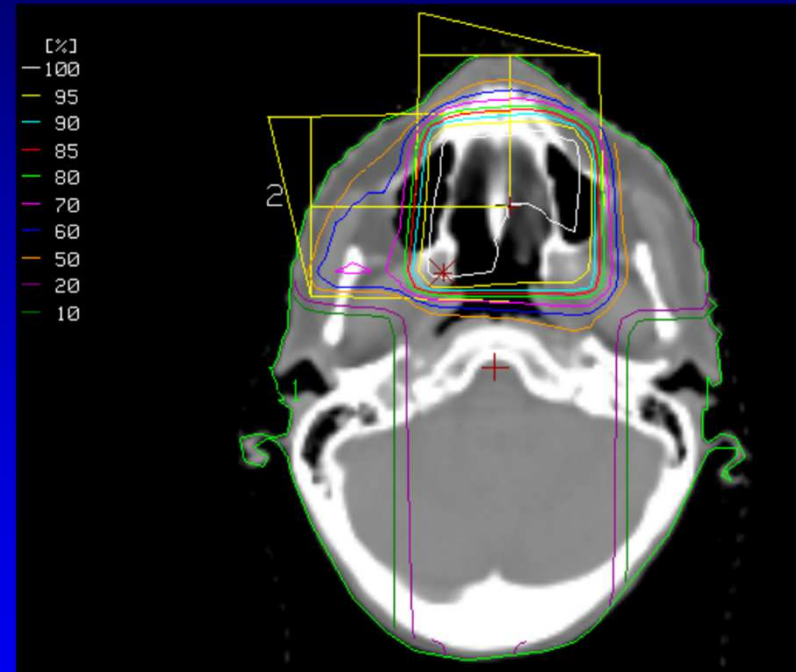
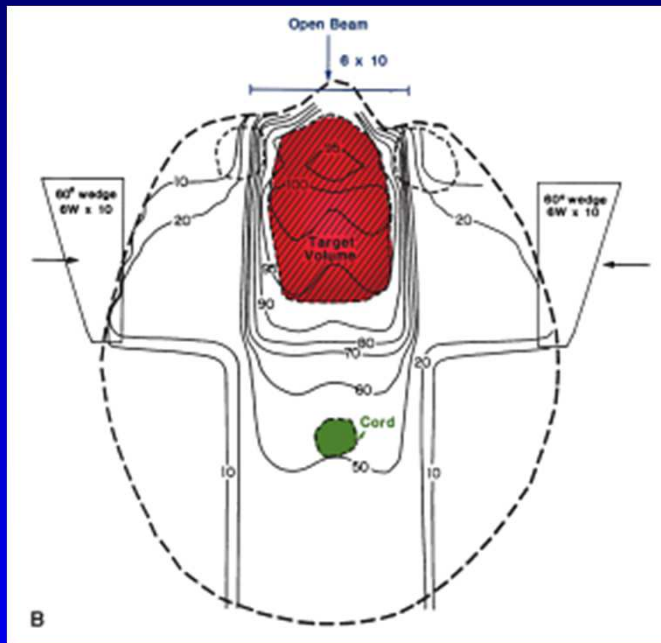
Uses forward planning to create radiation dose distributions, in which the radiation treatment fields are designated by a physician

Dose calculation is done manually/ computers

The treatment plan dose distribution shows dose to the tumor and normal structures on central slice

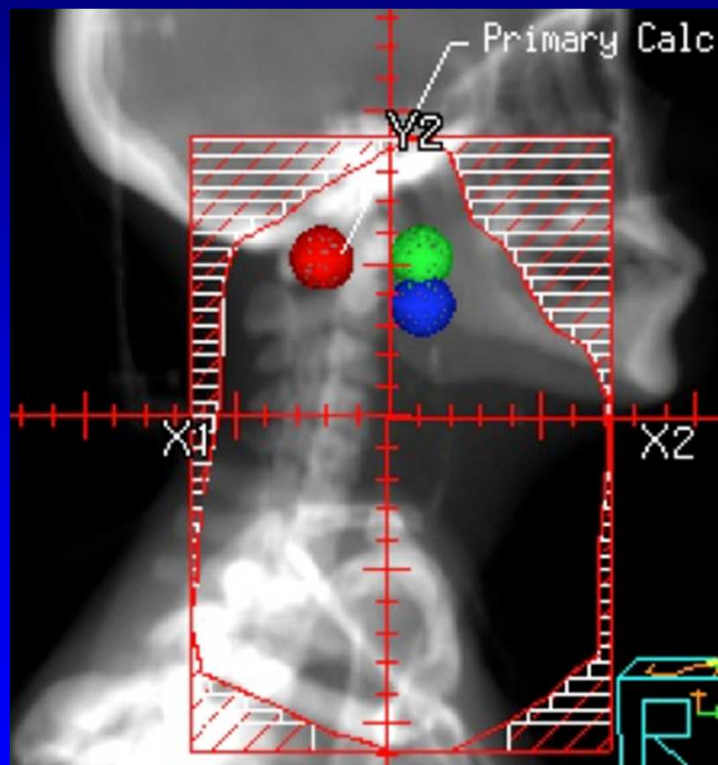


# 2D Radiation Treatment Planning



The treatment plan dose distributions show dose to the tumor and normal structures on central slice

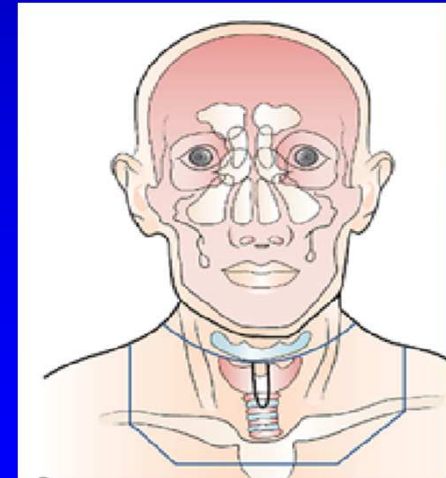
# Site wise planning in Head and Neck Cancer



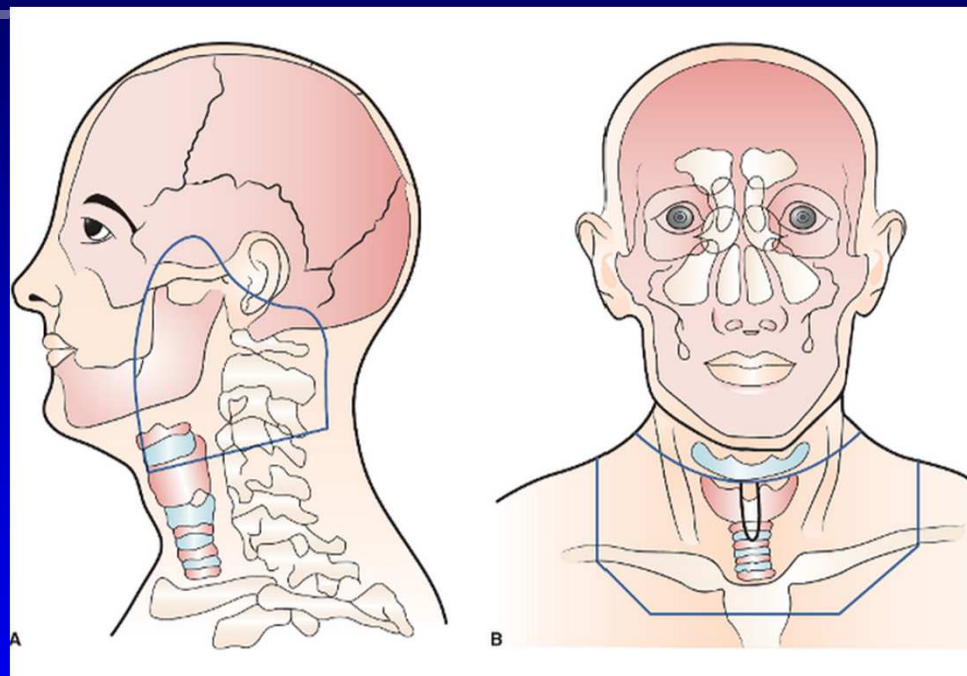
# Secondaries Neck with Unkown Primary



- *Borders of lateral fields*
- *Superior: includes nasopharynx and cranial base.*
- *Posterior: C2 vertebral spinous process.*
- *Anterior: two-thirds of tongue, half of mandible.*
- *Inferior: thyroid notch.*
- *Borders of anterior SCF field*
- *Superior: thyroid notch.*
- *Inferior: bottom of sternoclavicular joint.*
- *Lateral: two-thirds of clavicle.*

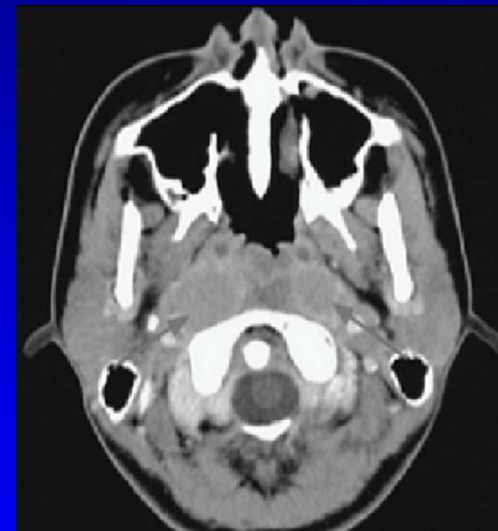
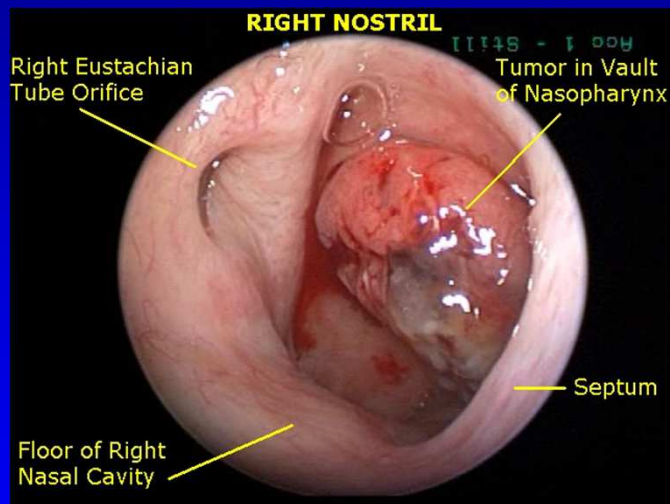


# Separate Anterior Lower Neck Field



Radiation therapy portals used starting to treat head and neck mucosal sites and upper cervical lymph nodes (A) and lower cervical and supraclavicular lymph nodes (B). The inferior border for lateral portals is placed at the superior anterior border of the thyroid cartilage, shielding the hypopharynx and larynx.

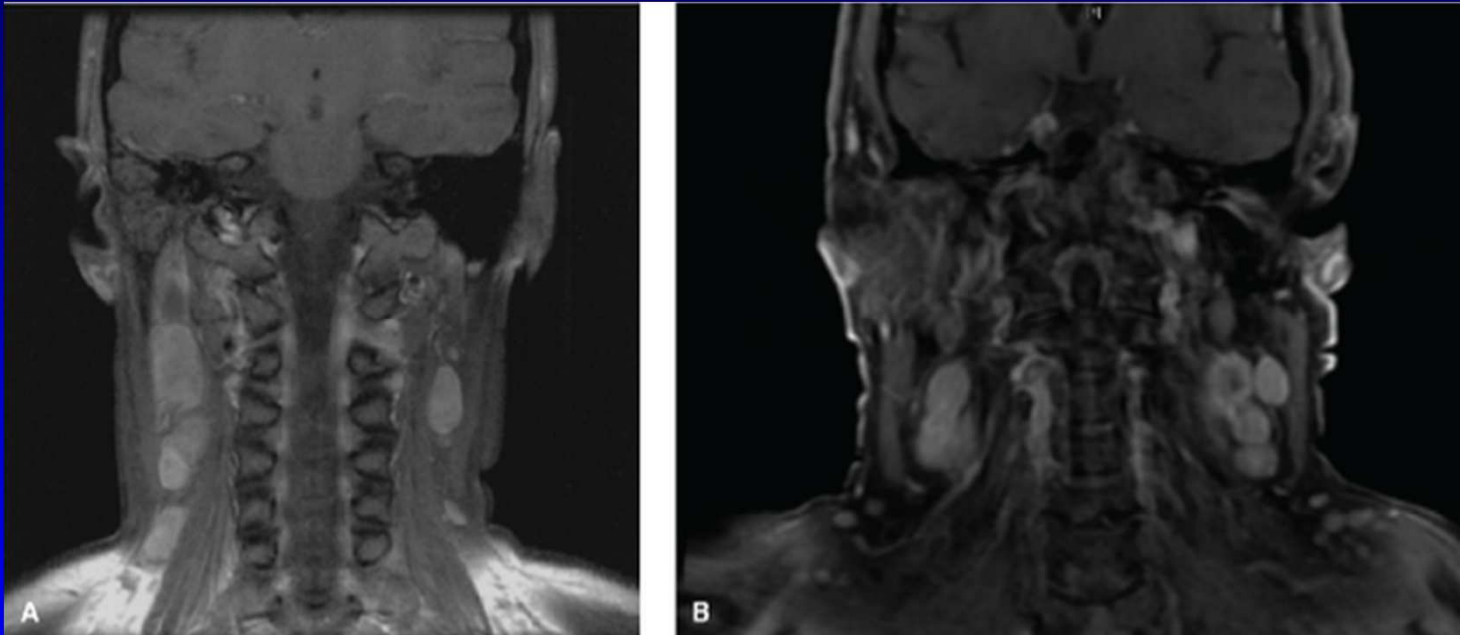
# Carcinoma Nasopharynx



Bilateral retropharyngeal lymph nodes involvement in nasopharyngeal carcinoma



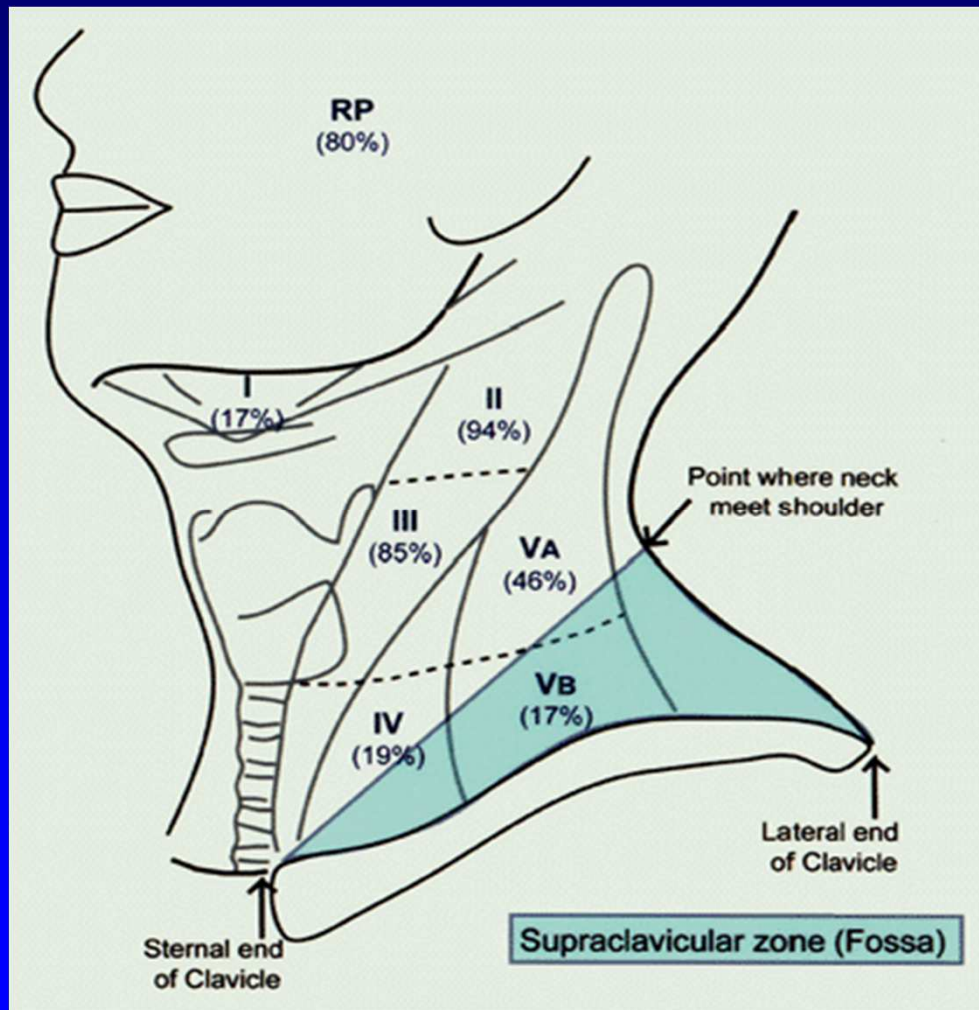
## Carcinoma Nasopharynx Bilateral Cervical Lymphnodes on MRI scan



Two examples of coronal magnetic resonance images showing bilateral cervical lymphadenopathy. There is orderly downward lymphatic spread toward the supraclavicular fossa

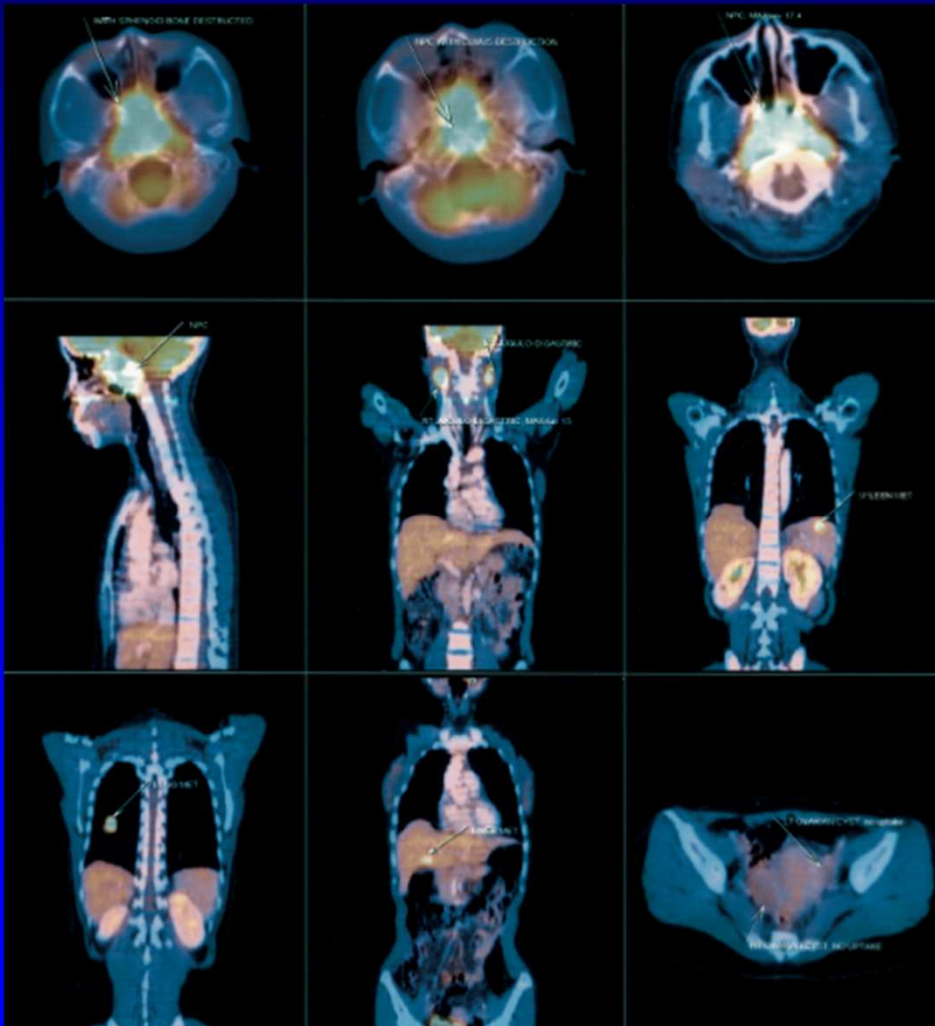


# Involvement of Neck Nodes in Carcinoma of Nasopharynx



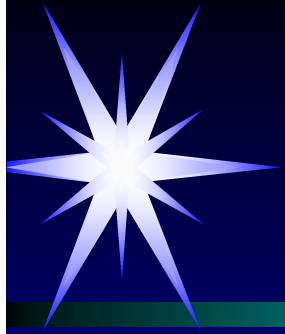
- Because of the high likelihood of cervical metastases, it is **recommended** electively treating all of the cervical lymphatics in N0 patients
- Any nodes that are palpable should be boosted with electron beam or posterior glancing photon fields to a total dose of 65 to 70 Gy (shielding spinal cord after 45 Gy)

# PET-CT for a patient with Nasopharyngeal Carcinoma

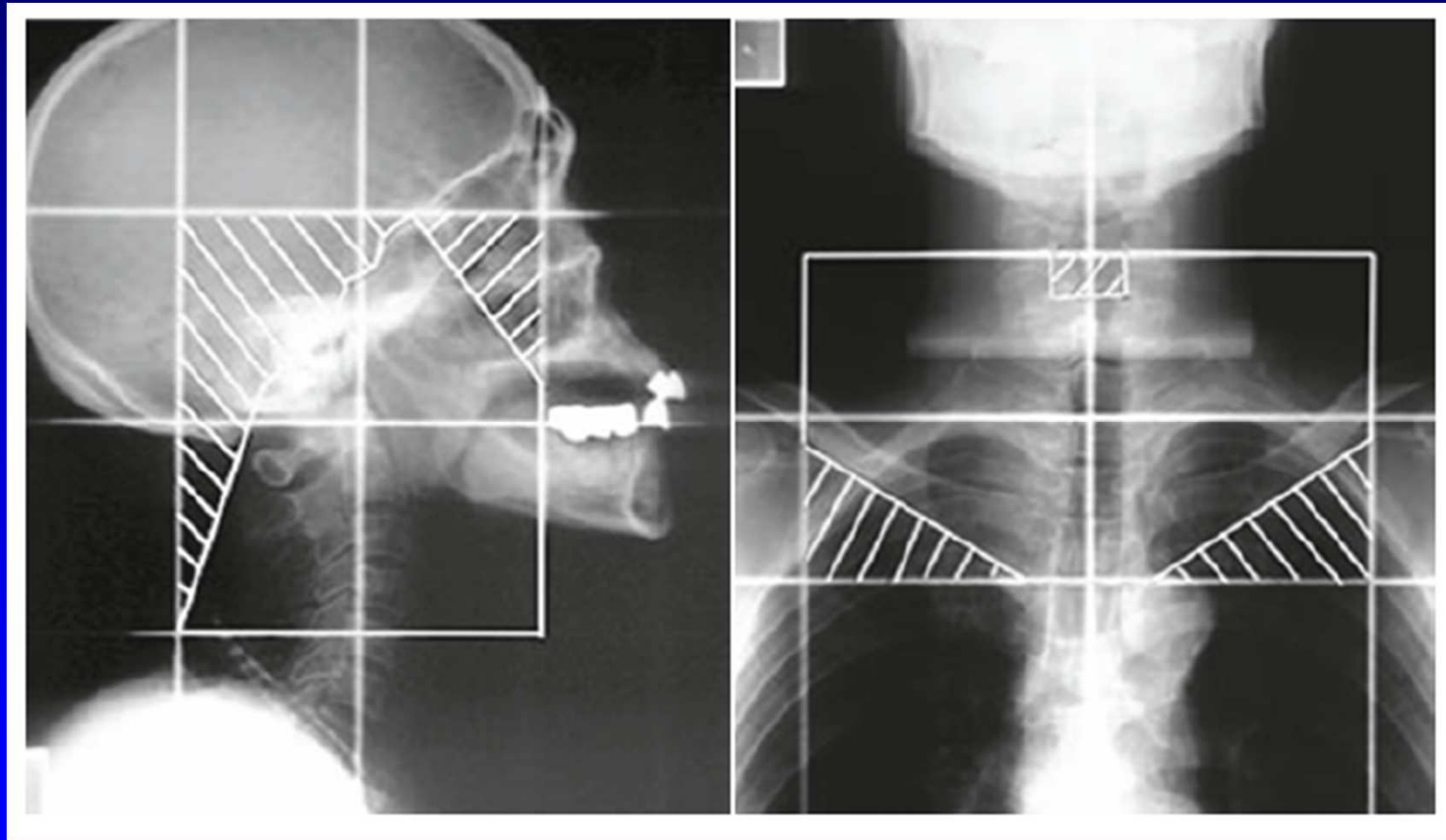


Physical examination and biochemistry did not show any sign suggestive of distant metastases. X-ray of chest was normal. PET-CT revealed multiple distant metastases in lung, liver, and spleen, in addition to extensive local infiltration and bilateral cervical lymph nodes.





# NASOPHARYNX



Simulation films for lateral and anterior SCF fields for nasopharyngeal cancer

# NASOPHARYNX

## Treatment Field Margins

*Borders of lateral fields (primary tumor + upper neck).*

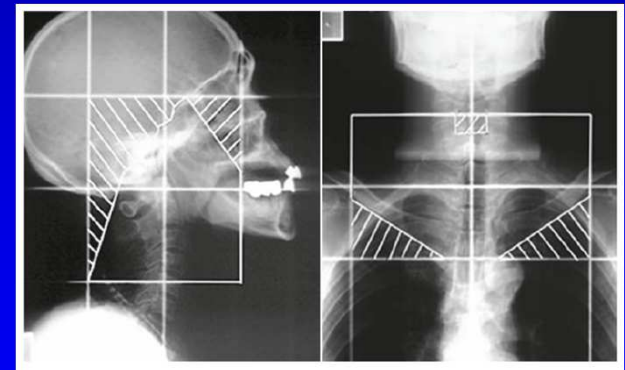
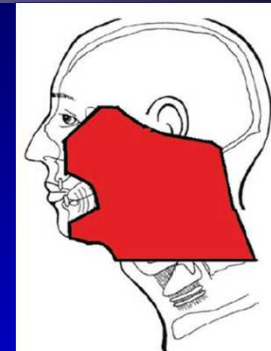
**Superior** cranial base including sphenoid sinus

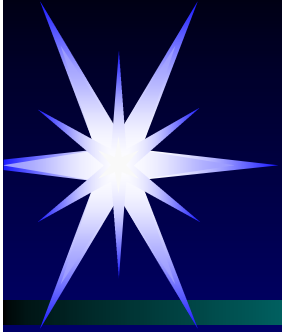
**Inferior** true vocal cords (to spare larynx)

**Posterior** spinous processes of vertebrae

**Anterior** 2–3 cm margin to tumor including pterygoid plate and posterior one-third of maxillary sinus.

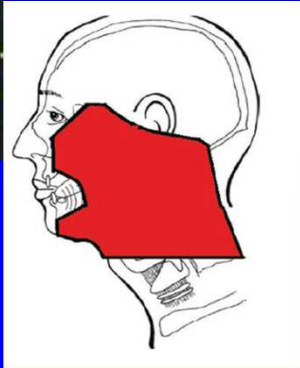
- **If supraclavicular LN (+)**, the upper mediastinal lymph nodes are covered by the anterior field by lowering the inferior border.

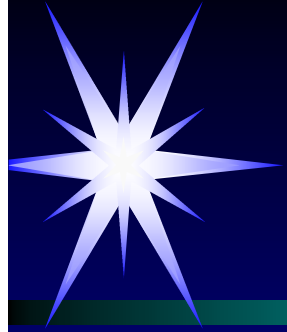




# Why are primary fields not rectangles or squares in Head and Neck Carcinoma ?

## Ca Nasopharynx





# NASOPHARYNX

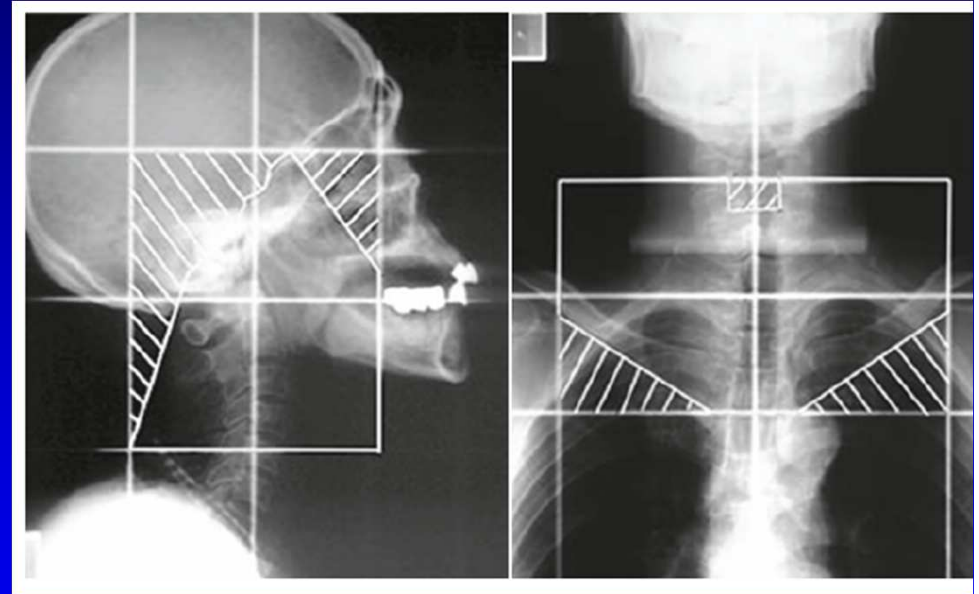
## Supraclavicular field

**Superior border** inferior border of lateral fields if collimator or couch angle is given to lateral fields.

0.3–0.5 cm gap if no angle is given.

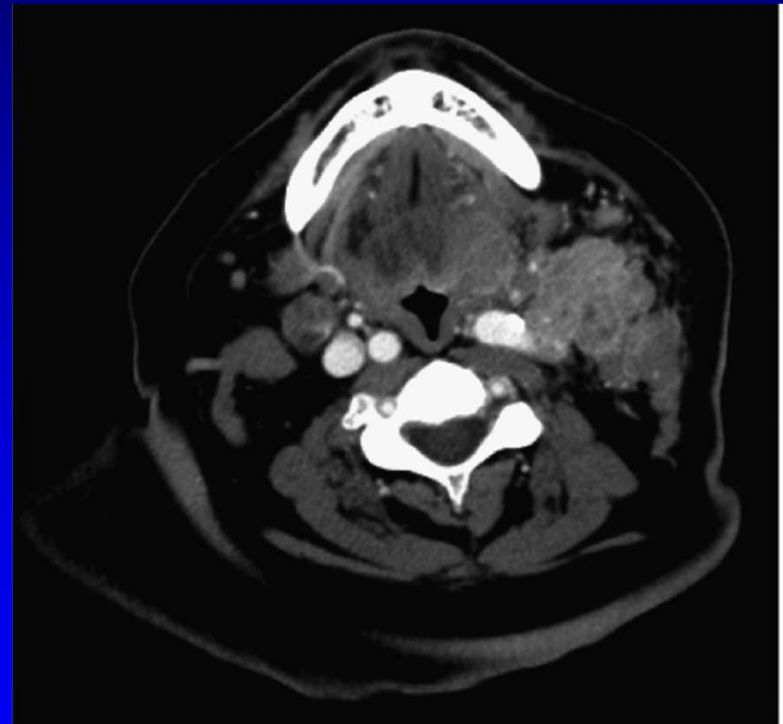
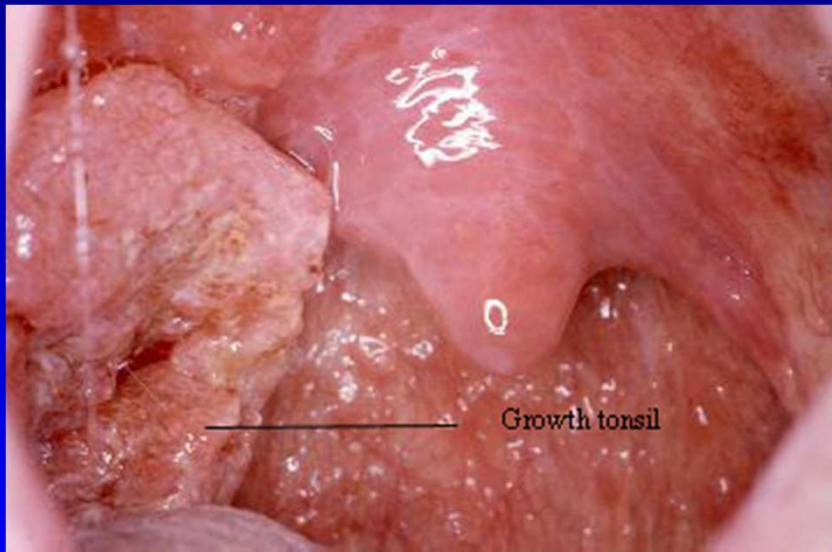
**Inferior border** bottom of sternoclavicular joint

**Lateral border** includes two-thirds of the clavicle.



Simulation films for lateral and anterior SCF fields for nasopharyngeal cancer

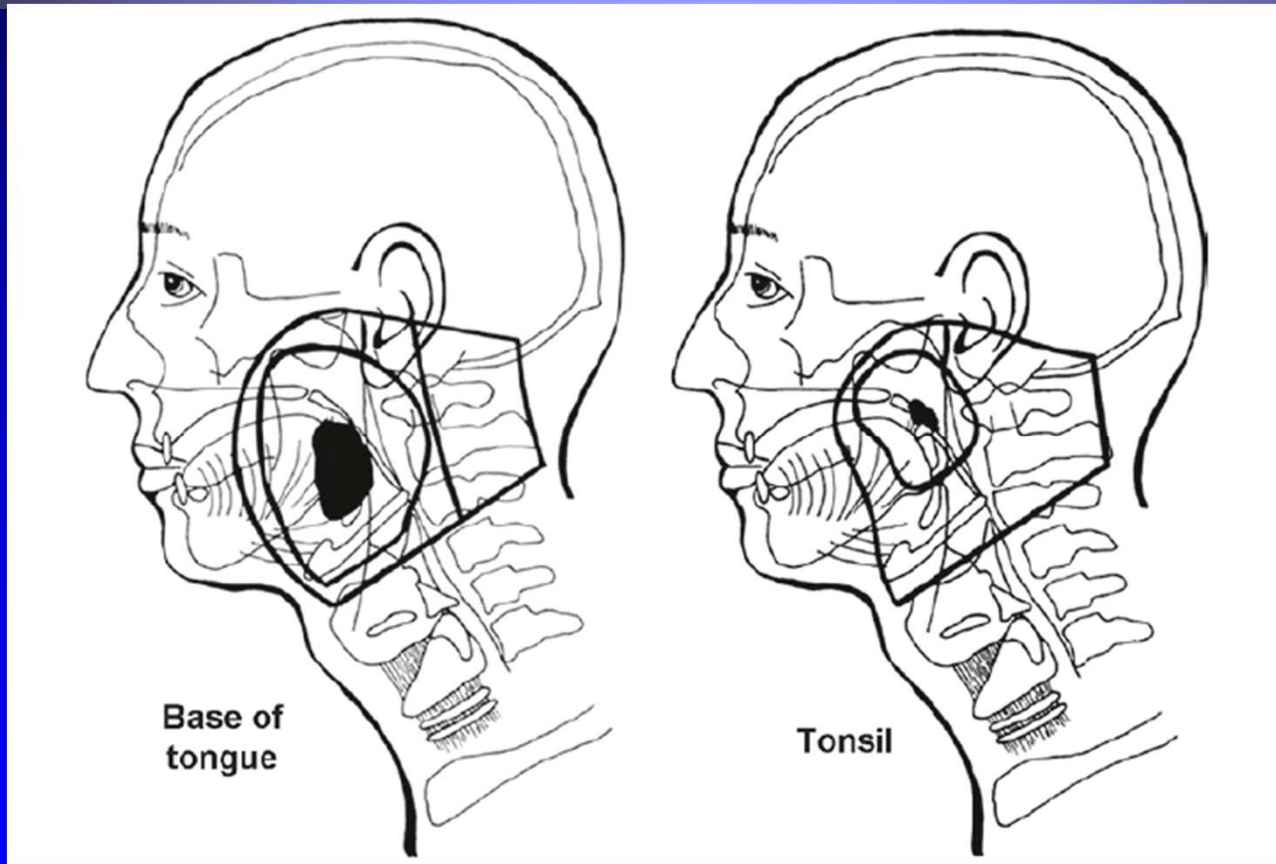
# Oropharyngeal cancer



Locally advanced oropharyngeal cancer  
with extensive ipsilateral cervical lymphadenopathy



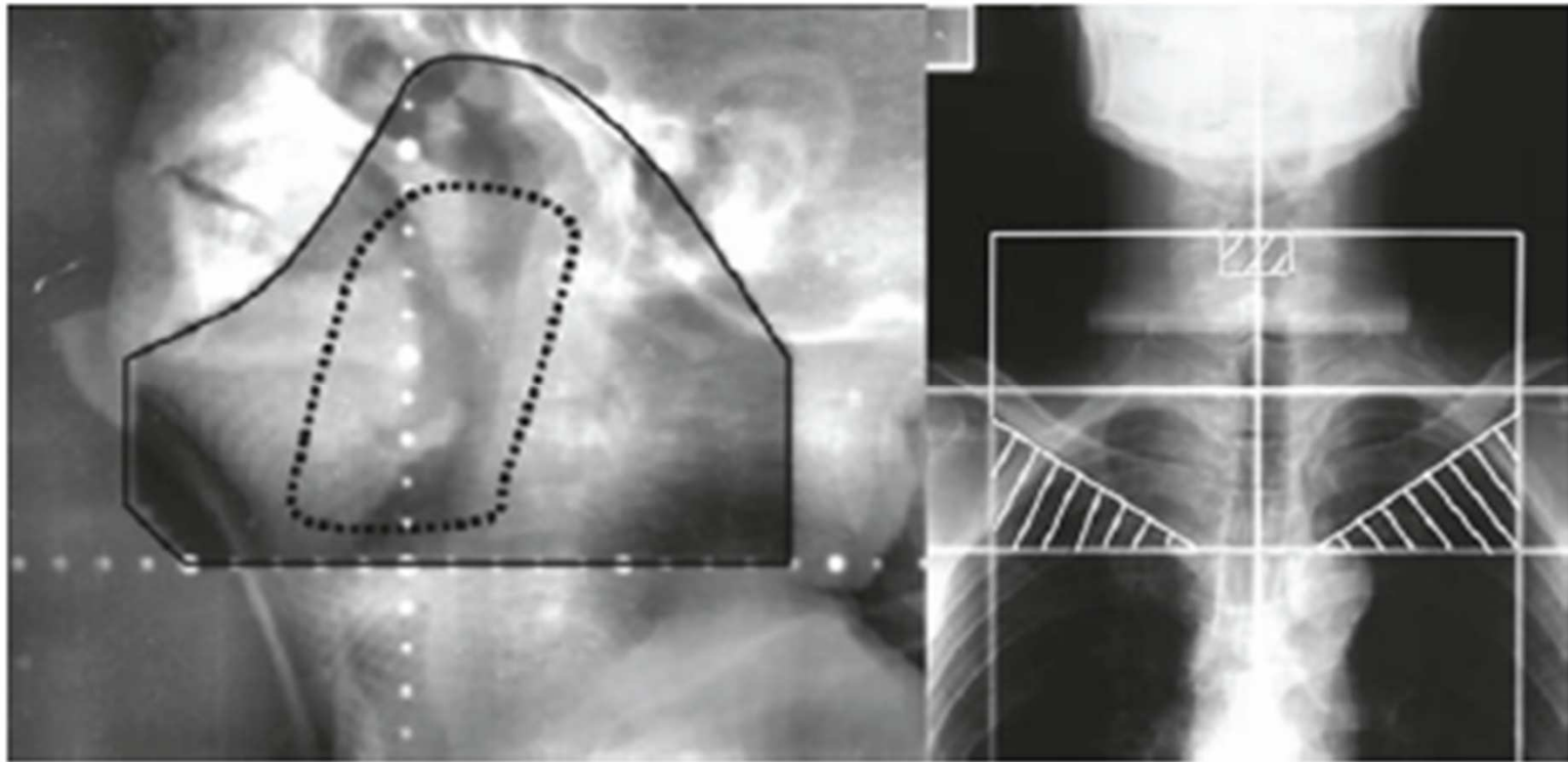
# OROPHARYNX



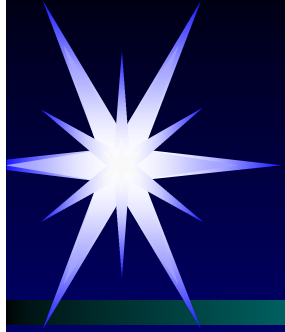
Lateral RT fields for oropharyngeal cancer



# Radiation Fields for Carcinoma Oropharynx



Conventional RT films for oropharyngeal cancer



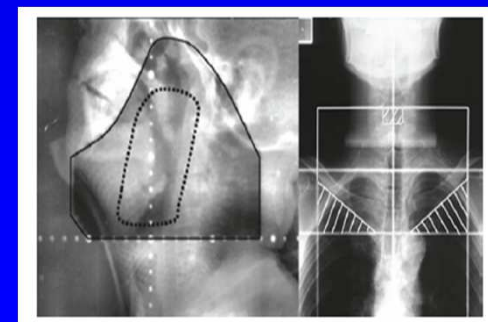
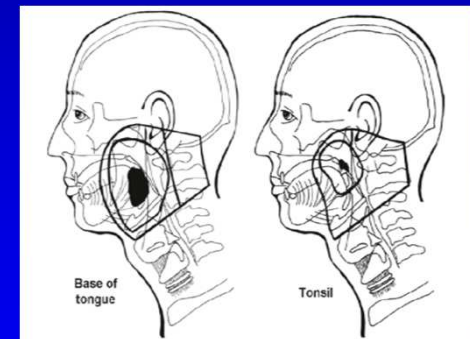
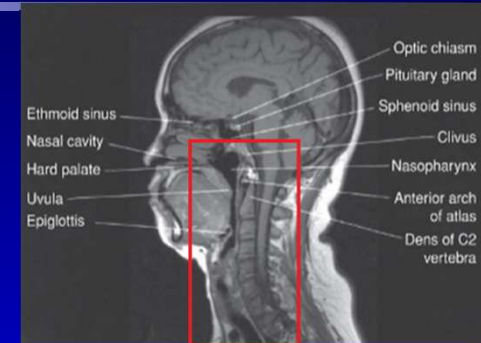
# OROPHARYNX

## Conventional Orthogonal Radiotherapy Fields

Two parallel-opposed lateral fields and supraclavicular anterior field

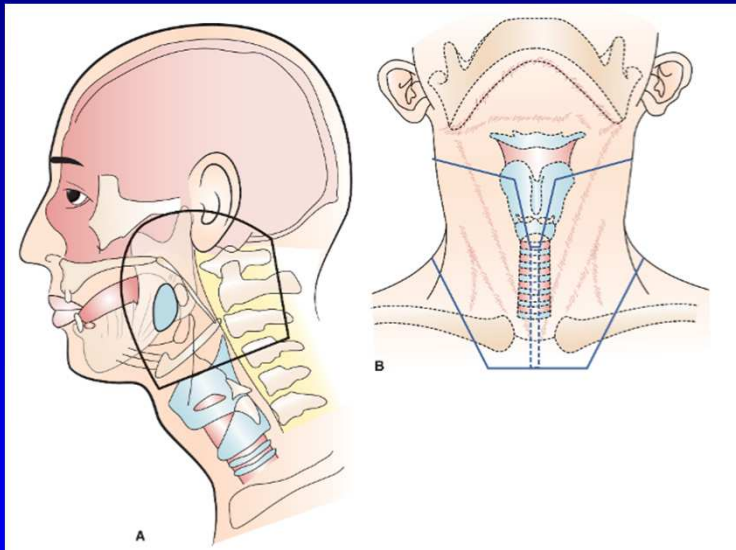
Borders of lateral fields (primary tumor + upper neck)

- *Superior cranial base*
- *Inferior whole neck by pulling shoulders as far down as possible (or match with anterior lower neck field at thyroid notch)*
- *Posterior spinous processes of vertebrae*
- *Anterior 2–3 cm margin to tumor*

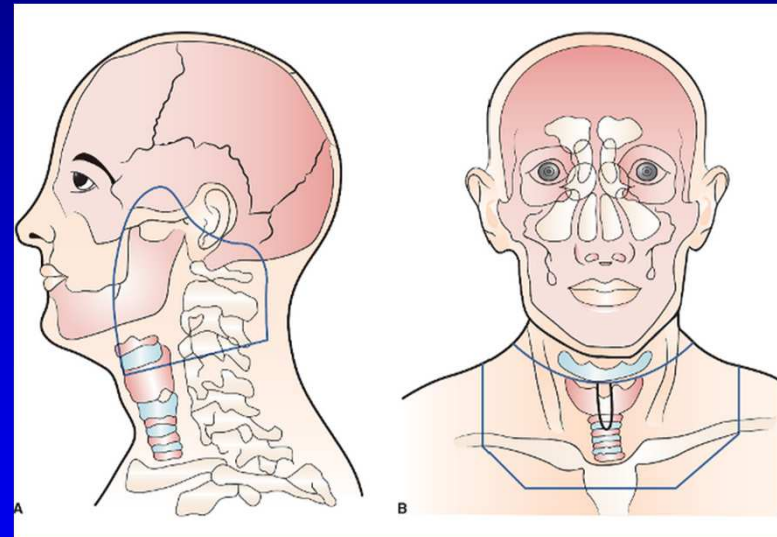




# Carcinoma Base of tongue lower Neck Field



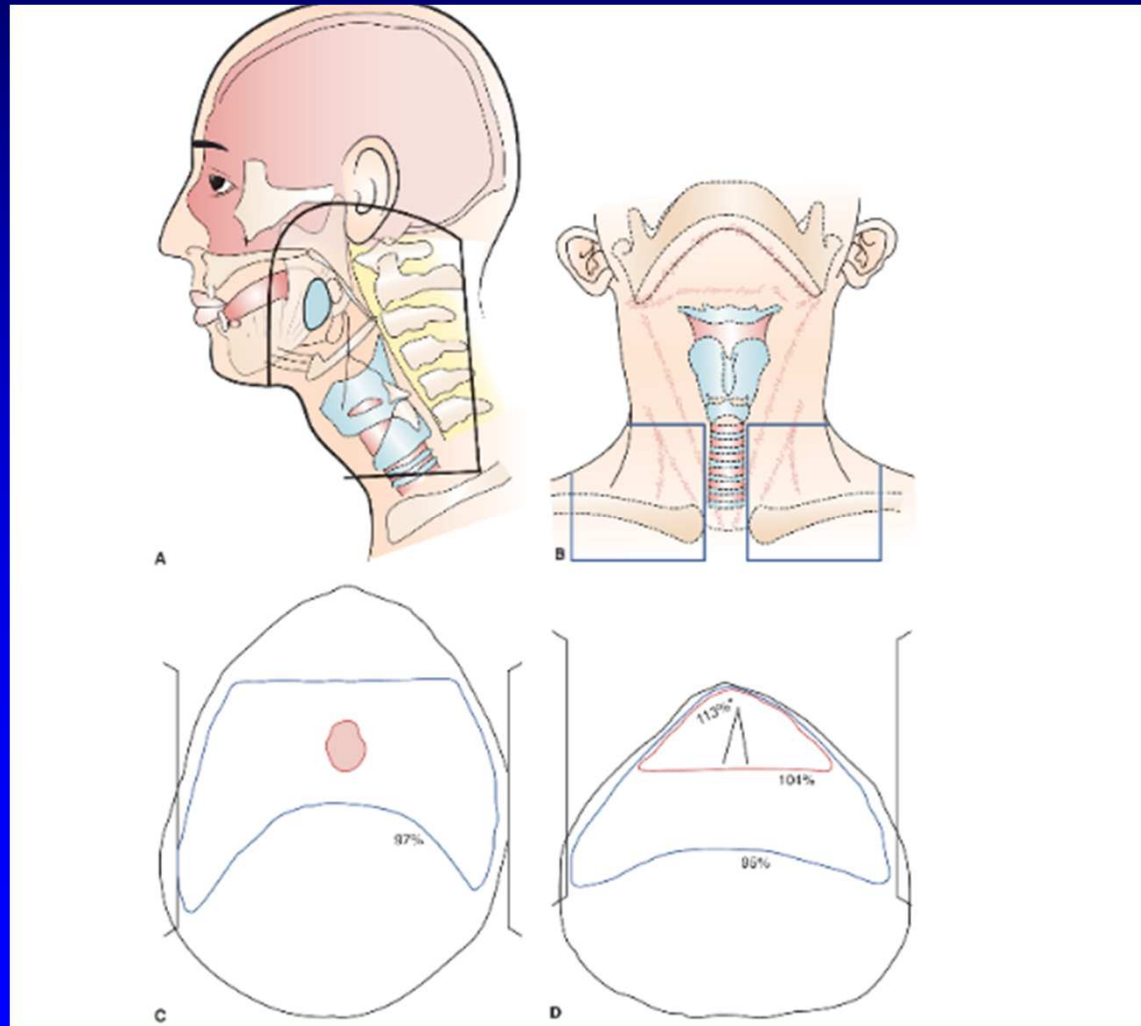
➤ N0 Neck



N+ve

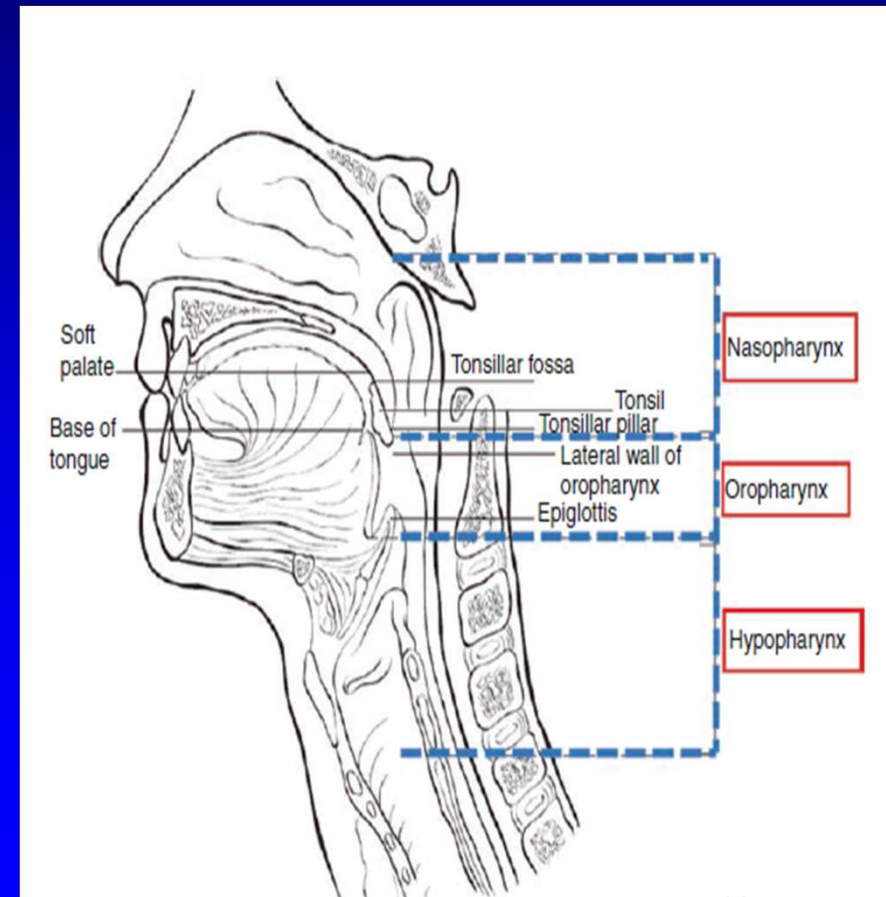
Medial 2/3<sup>rd</sup> of Clavicles included

# Treatment of Carcinoma base of Tongue

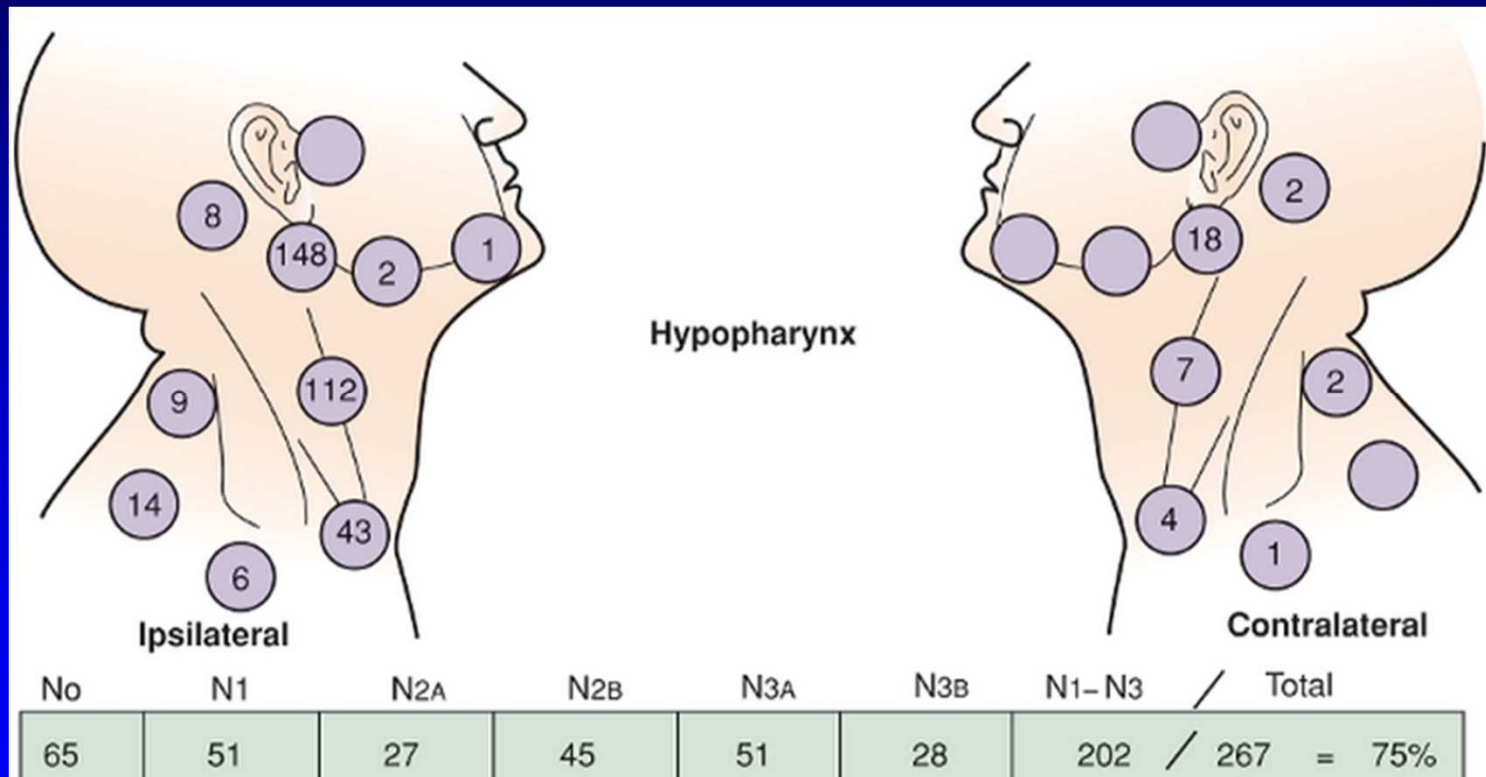


# Ca Hypopharynx

- ❖ Also known as **Laryngopharynx**
- “It is contiguous superiorly with oropharynx & inferiorly with the cervical esophagus”
- ❖ Superior border : Hyoid bone
- ❖ Inferior border : Cricoid cartilage
- ❖ Extends from C4 to C6
- ❖ Parts of Hypopharynx are:
  1. Bilateral Pyriform sinuses
  2. Postcricoid region
  3. Posterior pharyngeal wall

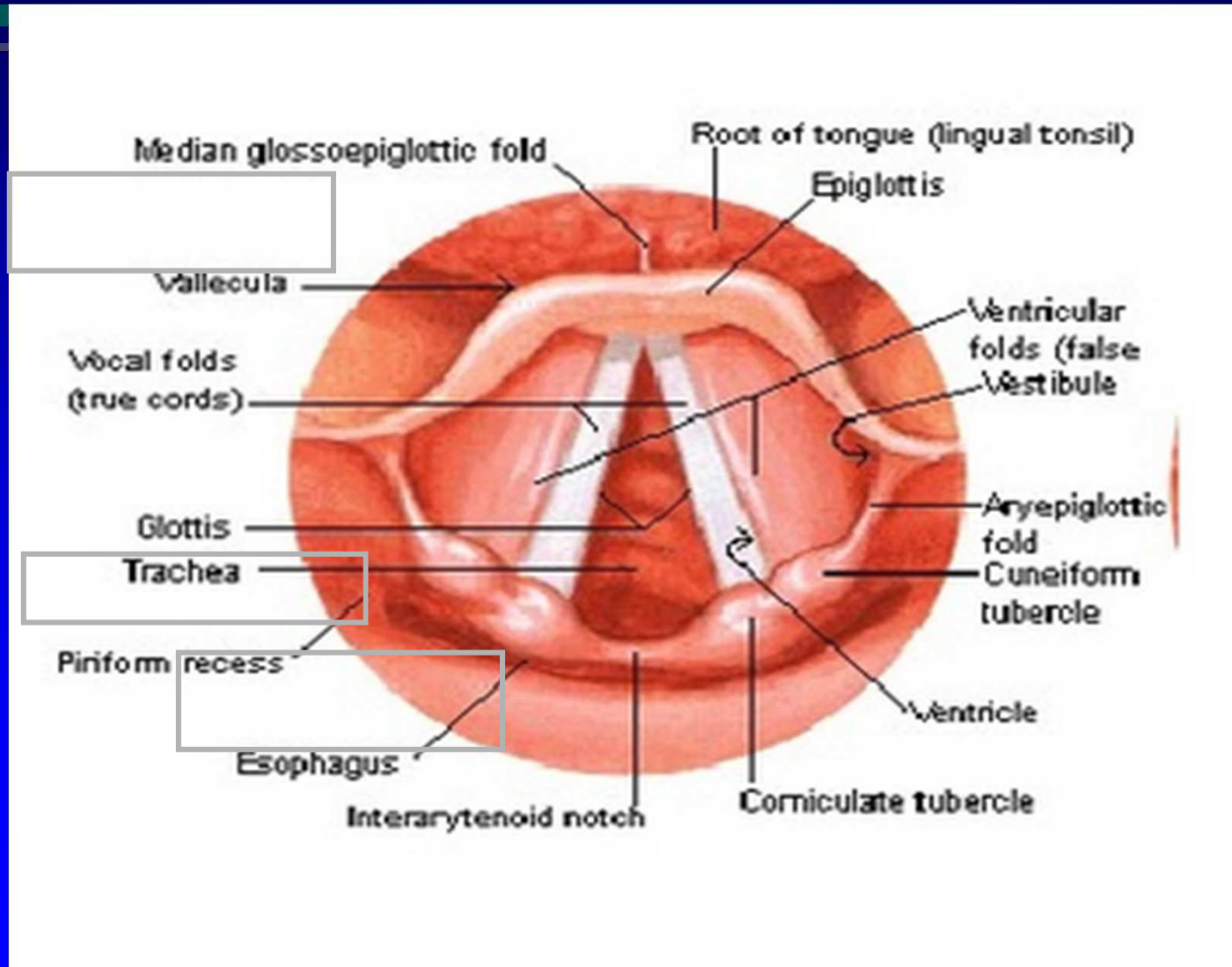


# Nodal distribution hypopharynx cancer

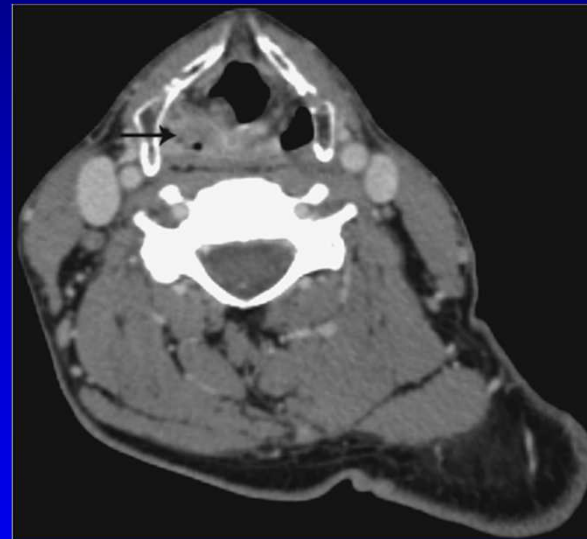
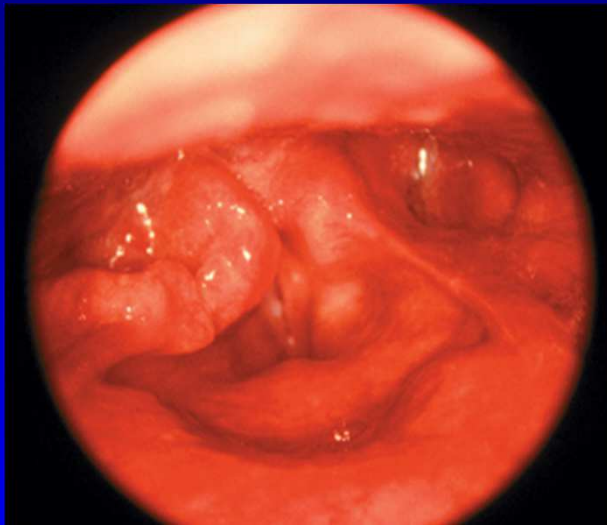


Nodal distribution hypopharynx cancer

# Ca Hypopharynx

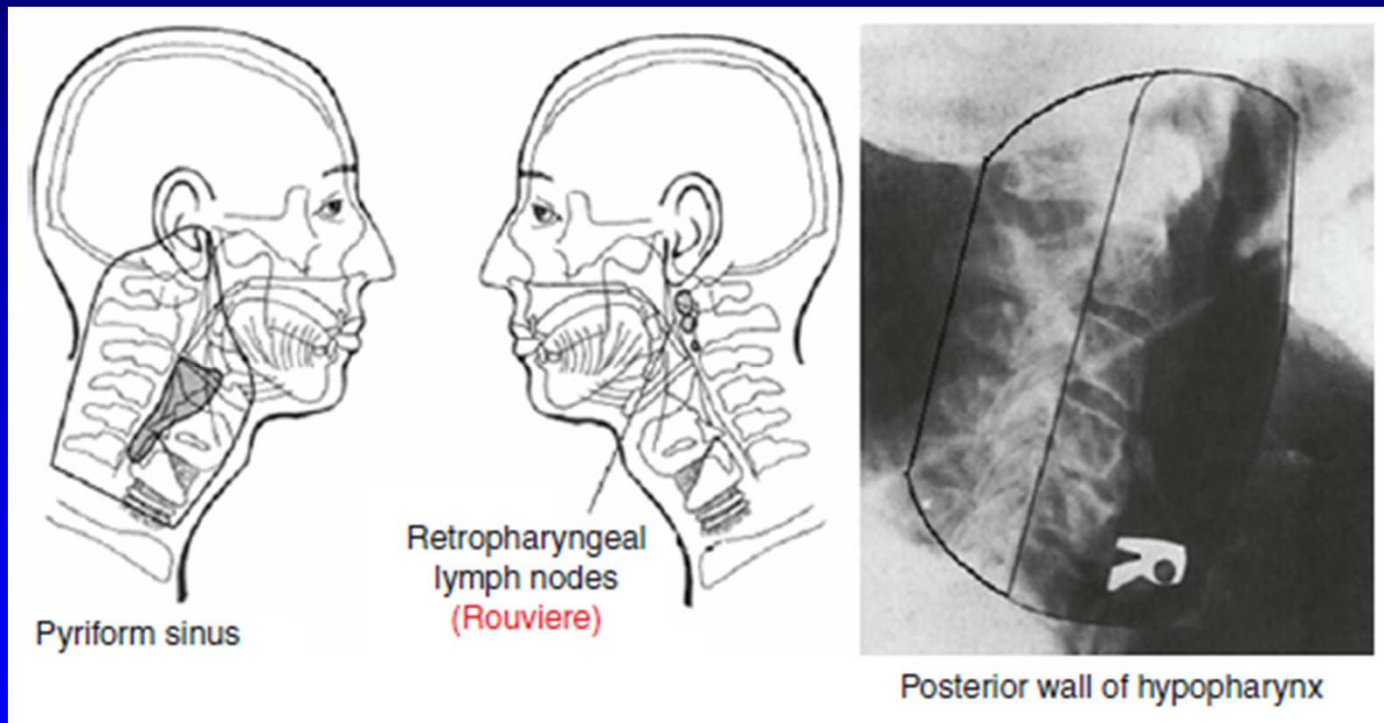


# T2 Carcinoma of Pyriform fossa with AE fold involvement





# Hypopharynx



Conventional RT fields for hypopharyngeal cancer

# Hypopharynx

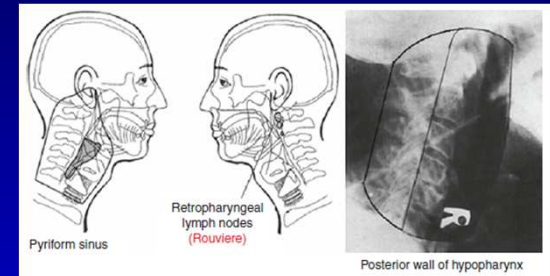
## ➤ Treatment Field Margins

**Superior:** mastoids and cranial base, including retropharyngeal lymph nodes

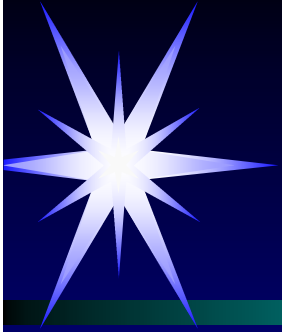
**Inferior:** whole neck, by pulling shoulders down as much as possible (at least 1 cm below tumor)

**Posterior:** spinous processes of vertebrae

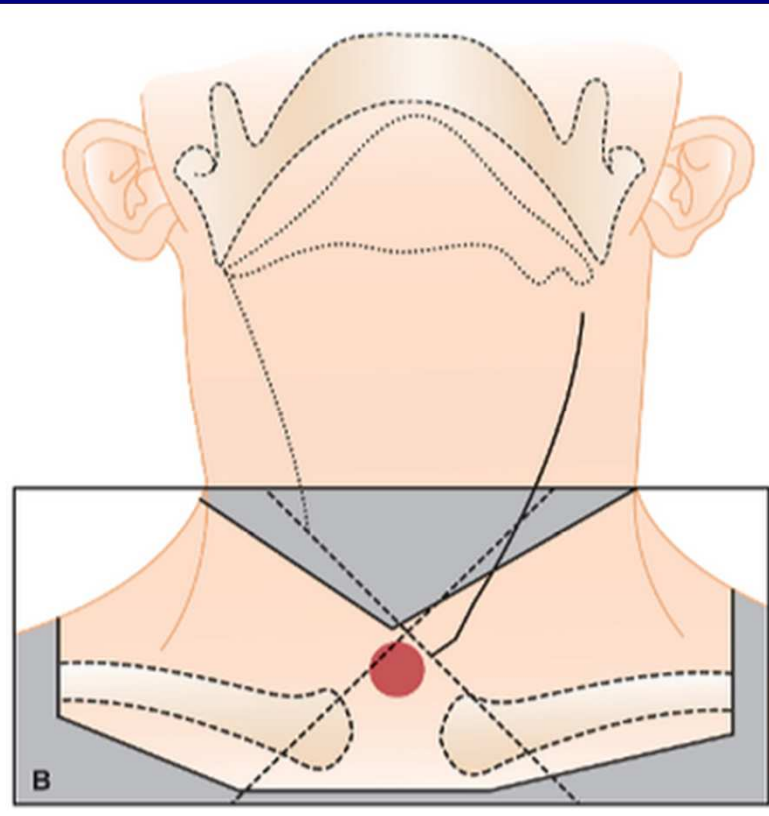
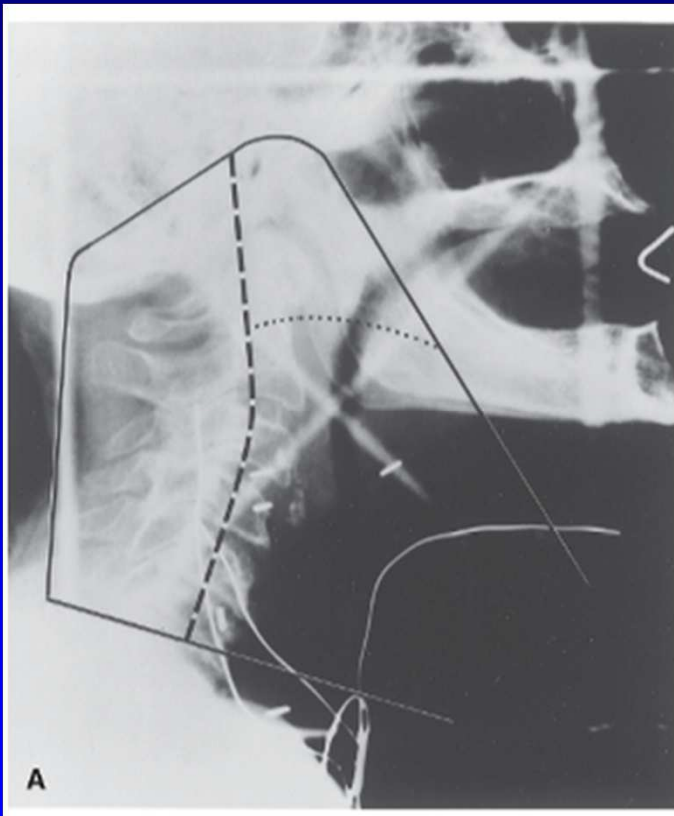
**Anterior:** 2–3 cm anterior to tumor (Ia and Ib lymphatics are left outside if not involved)



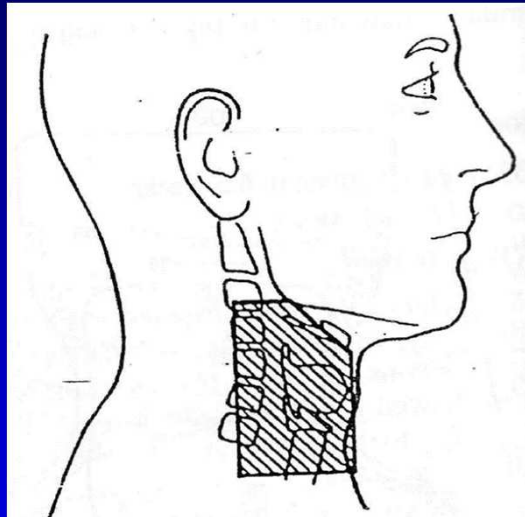




# Carcinoma Hypopharynx

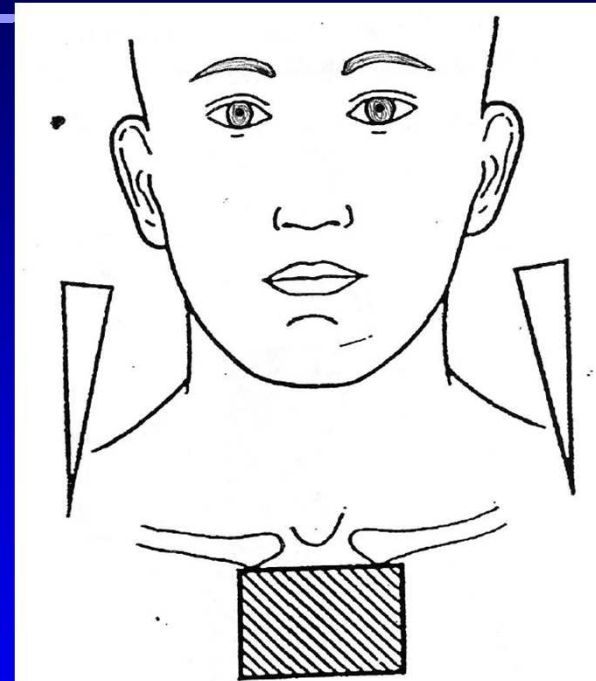


# Ca Hypopharynx



**POST CRICOID tumor  
without LN-**

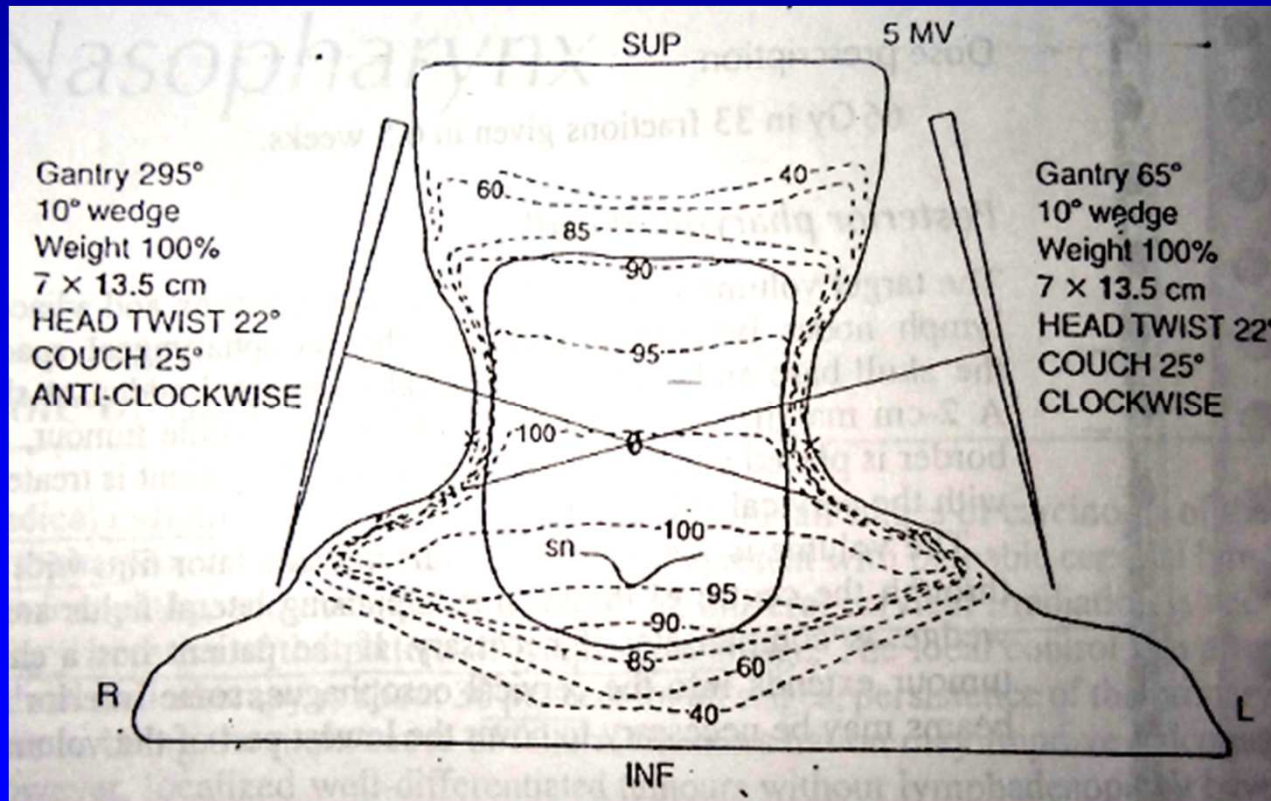
Target volume includes-  
Primary tumor & adjacent lymphatics,  
covering any inferior spread to cervical  
oesophagus with 2-3 cm margin



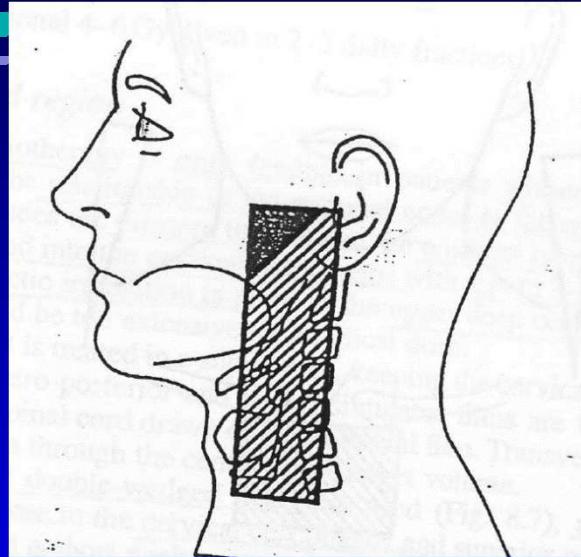
Two lateral double wedge fields are  
used , angled inferiorly to increase  
dose to cervical esophagus and  
superior mediastinal nodes

# Ca Hypopharynx

- 2 lateral wedged fields angled inferiorly for postcricoid tumors



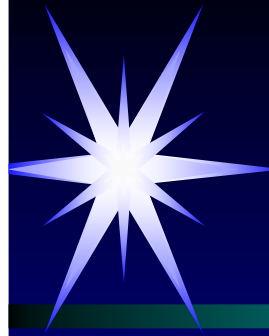
# Ca Hypopharynx



## **POSTERIOR PHARYNGEAL WALL tumour**

Target volume includes-

Whole Hypopharynx & adjacent deep cervical nodes bilaterally, including retropharyngeal space. 2 cm margin is allowed above and below visible tumor



# Ca Larynx

➤ Larynx **Supraglottis**



**Glottis** = True VC

Ant. and post. Commissure

**Subglottis**

**Epiglottis**

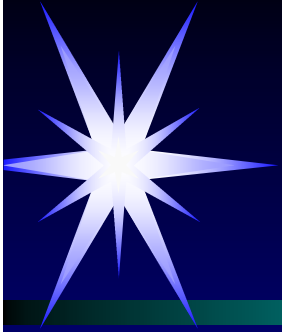
**False vocal cord**

**Ventricles**

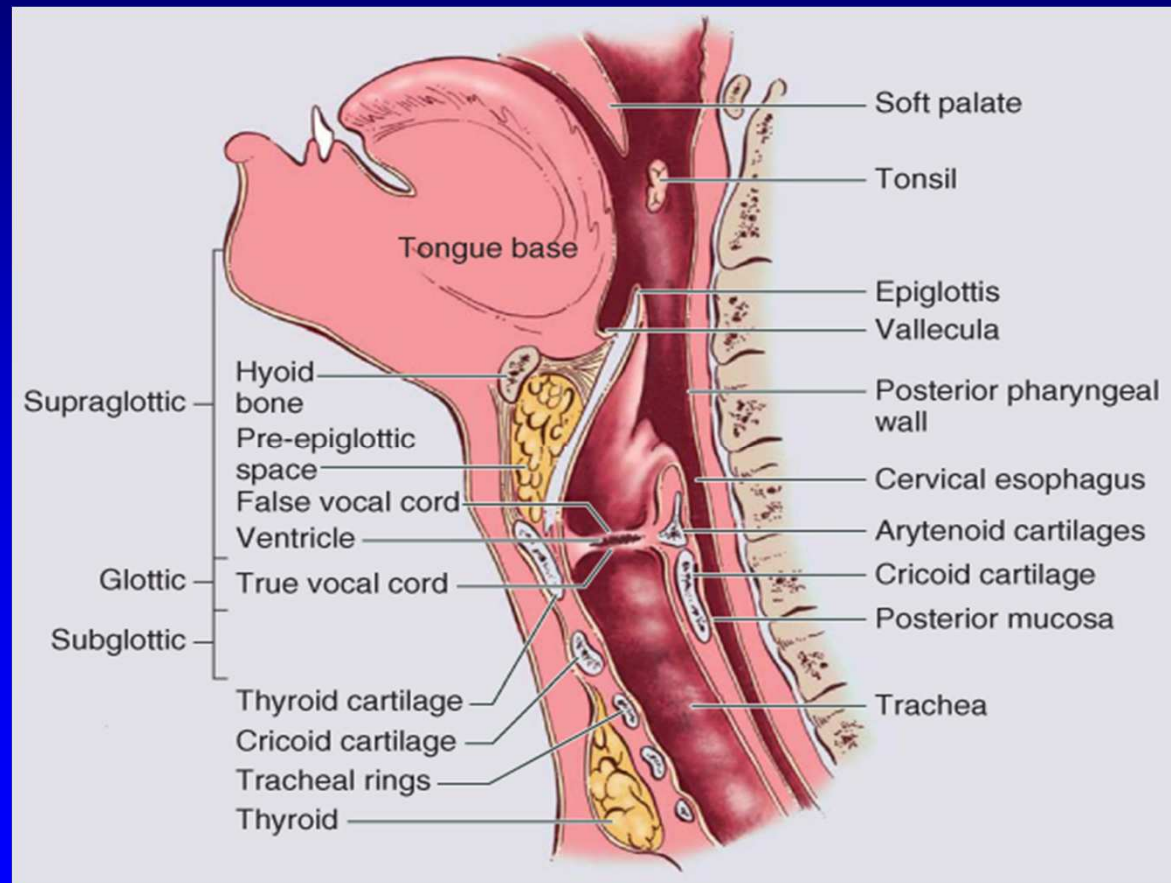
**Aryepiglottic fold**

**Arytenoids**

# Saggital-section of Larynx

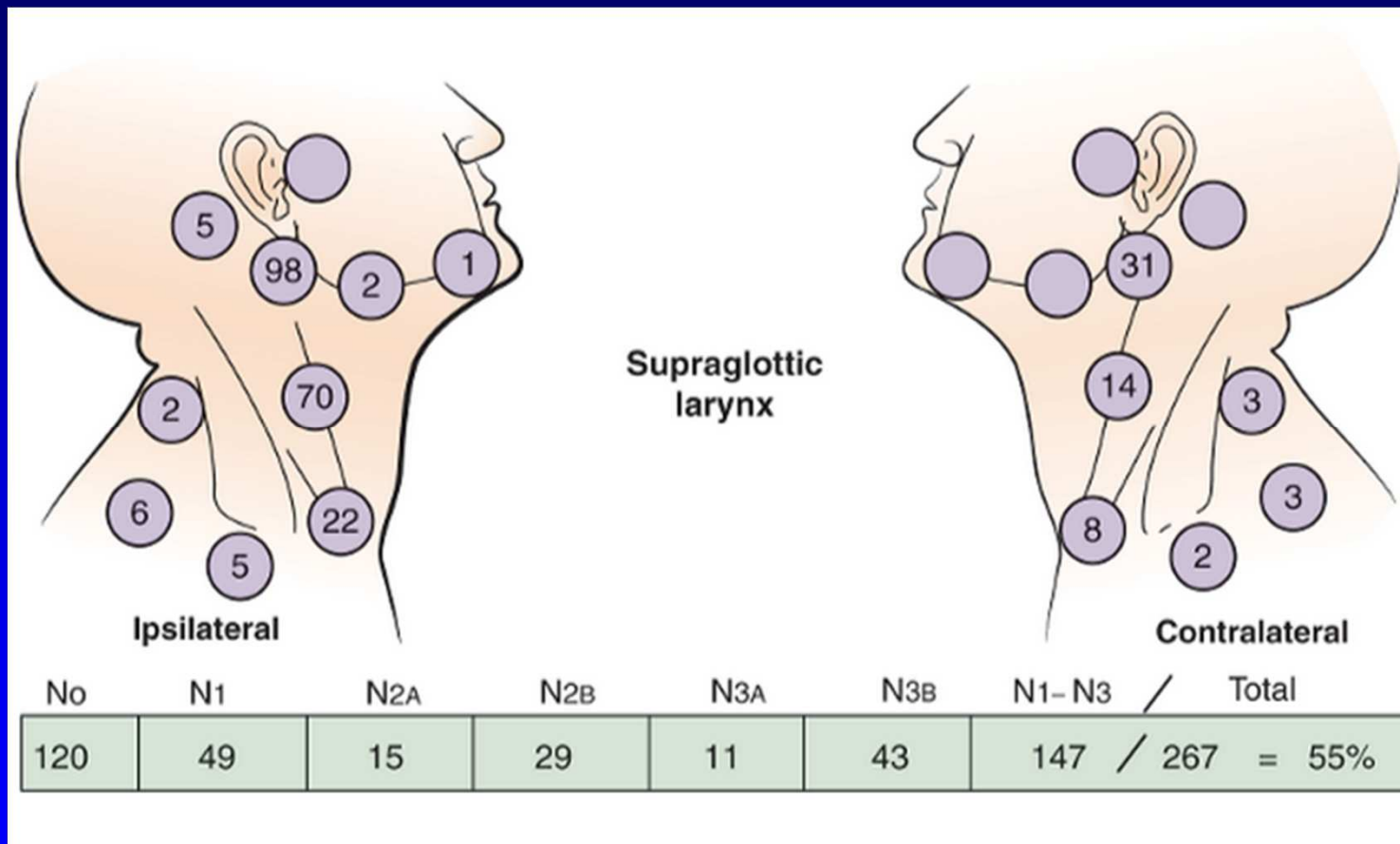


Larynx extends from the tip of epiglottis at the level of C3 to C6 vertebra below



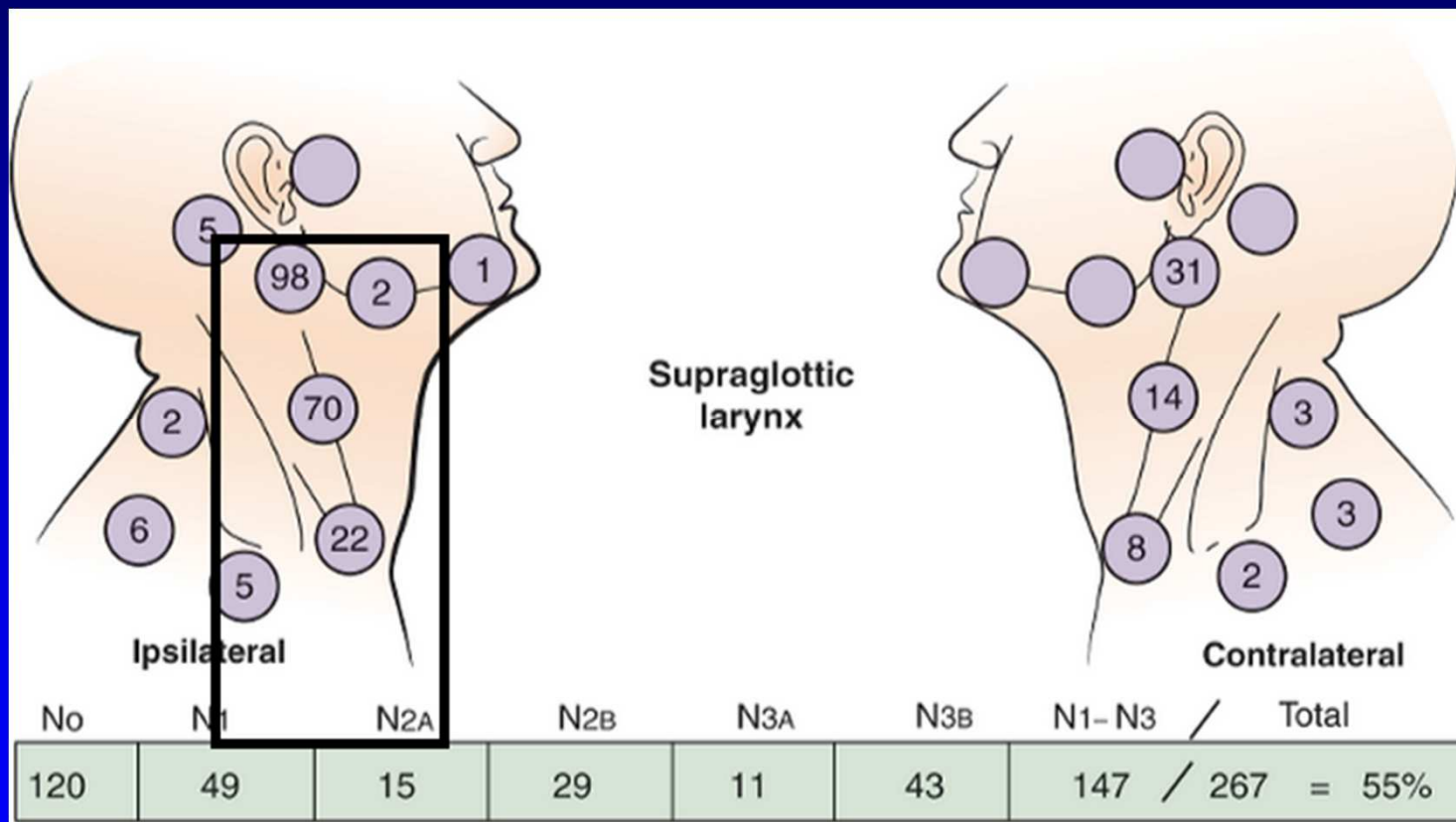


# Supraglottic Larynx



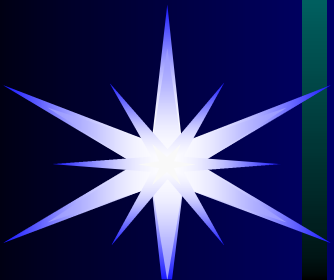
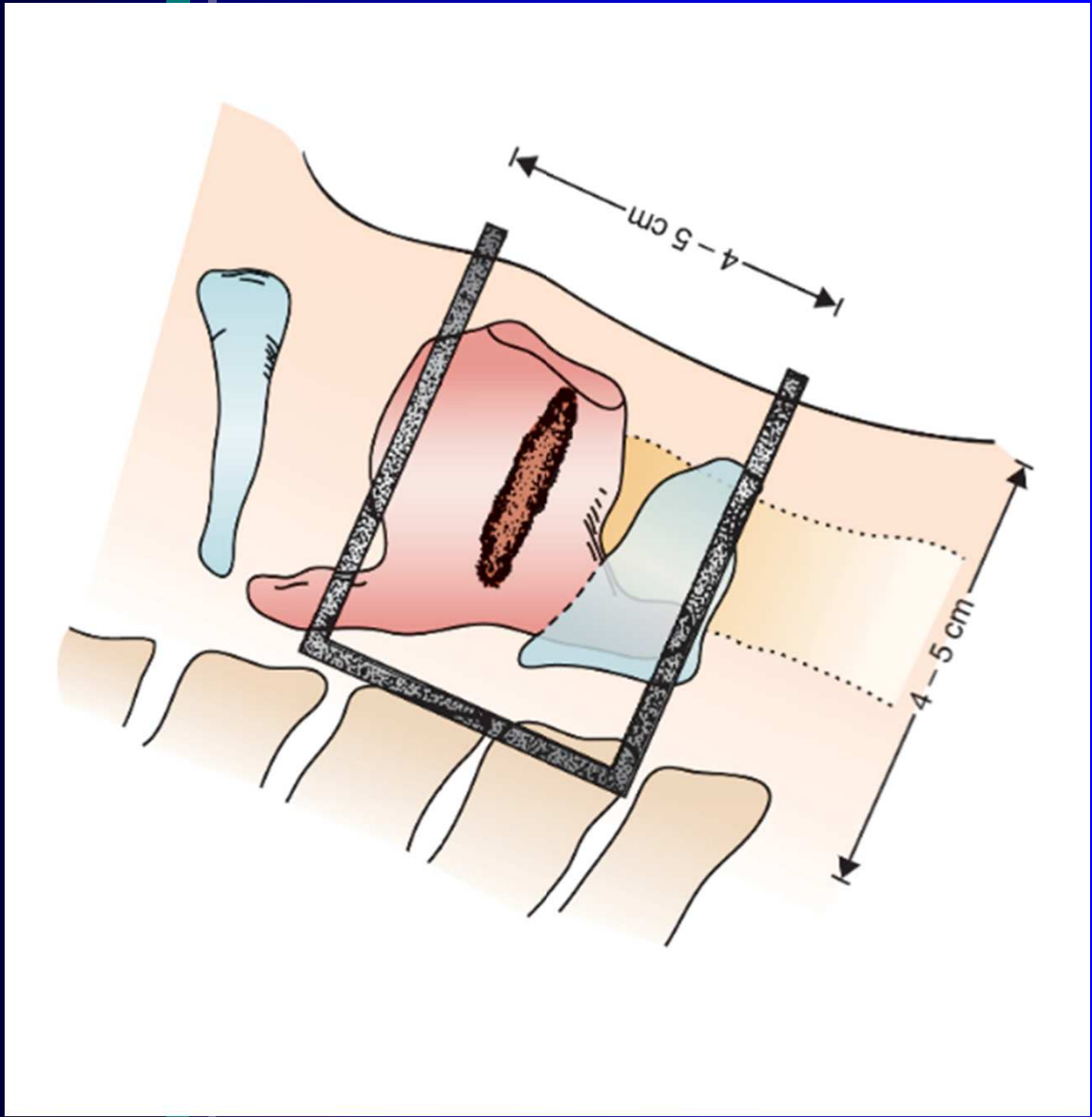
Nodal distribution on admission

# Supraglottic Larynx



Nodal distribution on admission





# Ca larynx Early Glottic Cancer

## T1–2 Glottic Laryngeal Cancer

*Superior: top of thyroid cartilage*

*Inferior: bottom of cricoid cartilage*

*Anterior: 0.5–1 cm fall-off to skin*

*Posterior: in front of vertebral bodies*

C3 vertebral level → hyoid bone

C4 vertebral level → top of thyroid cartilage

C6 vertebral level → cricoid cartilage

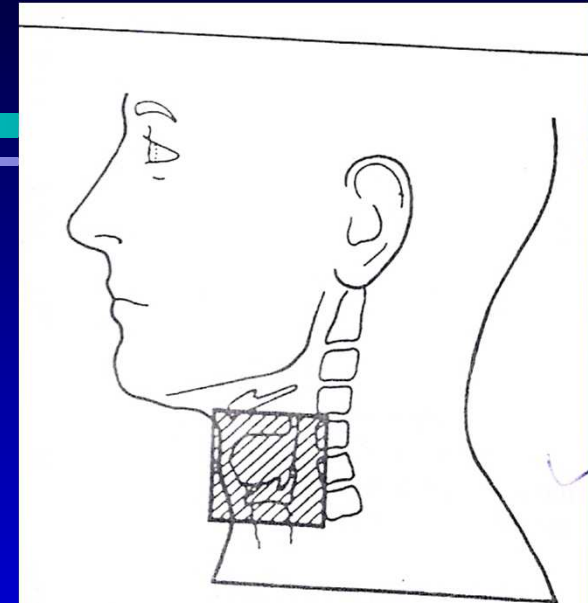
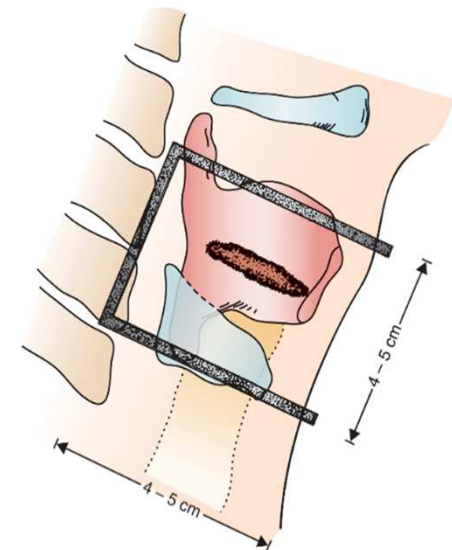
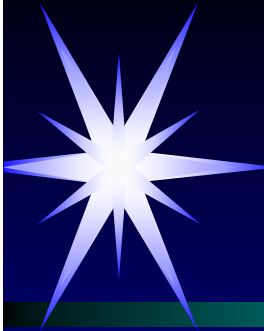


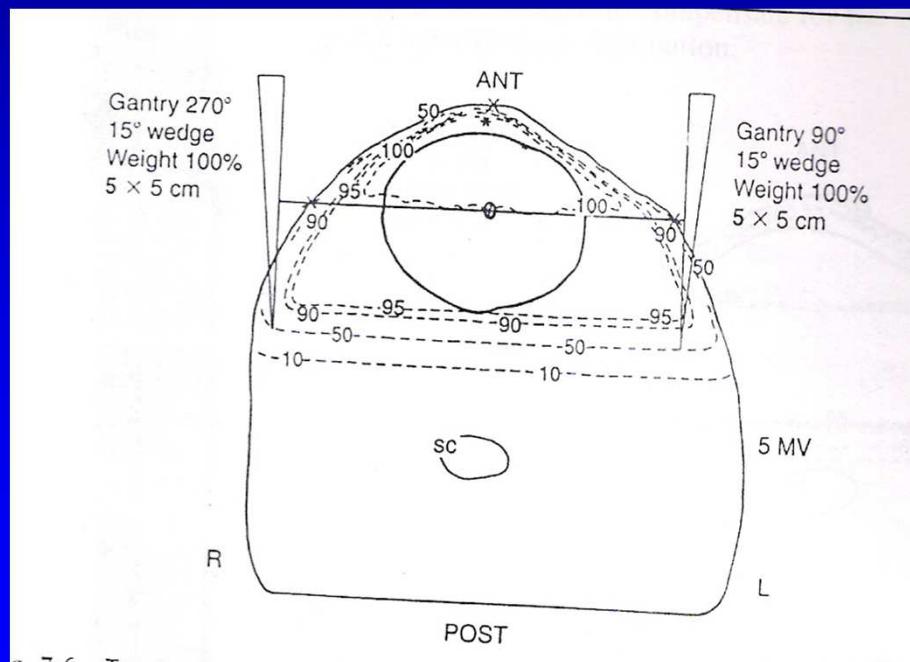
Fig. 7.1. Glottic cancer.



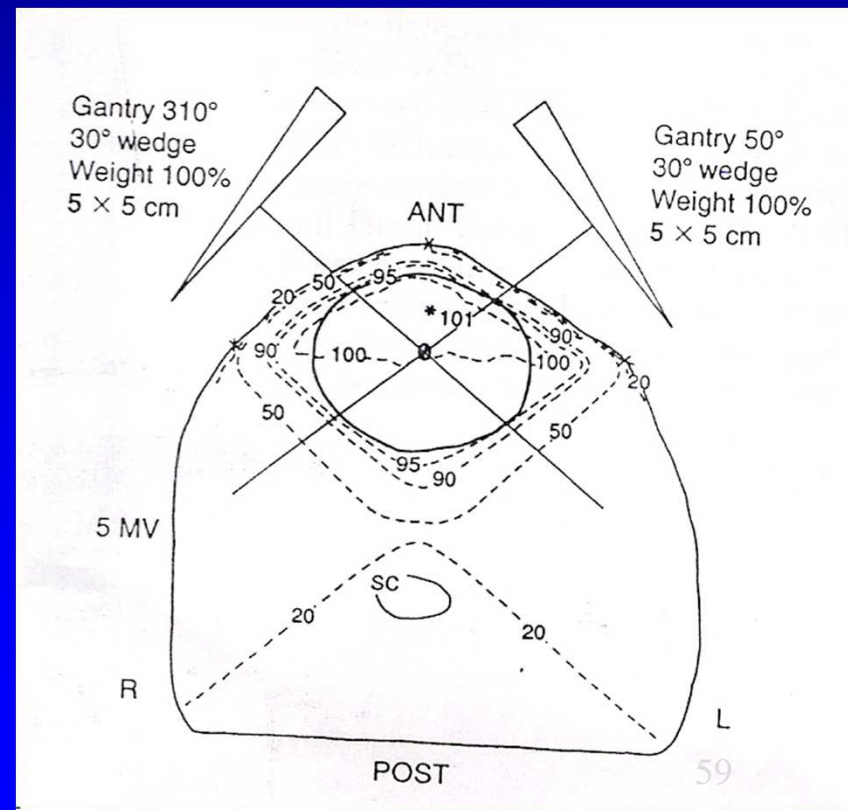


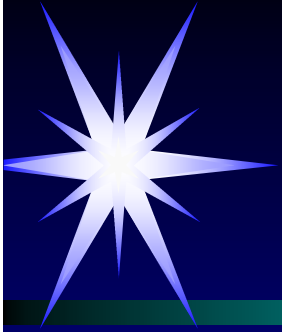
# Ca Larynx Glottis

2 opposed lateral wedged fields for T1 glottic tumor



2 anterior oblique fields for early glottic cancer





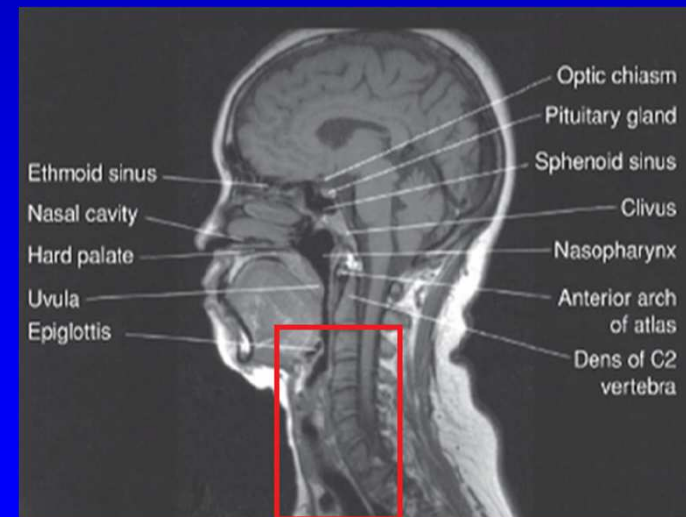
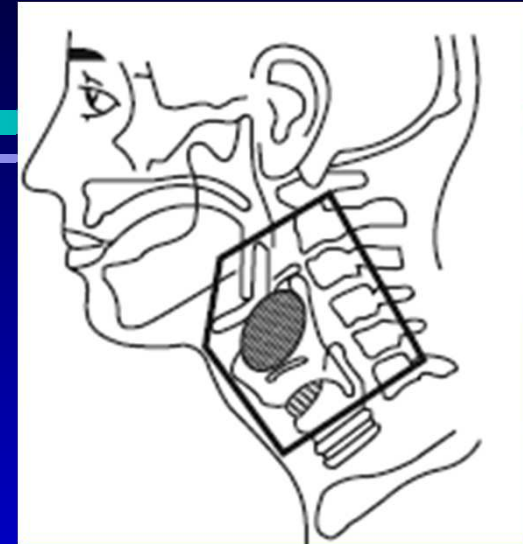
# LARYNX

## T3–4 Glottic and Supraglottic Laryngeal Cancer

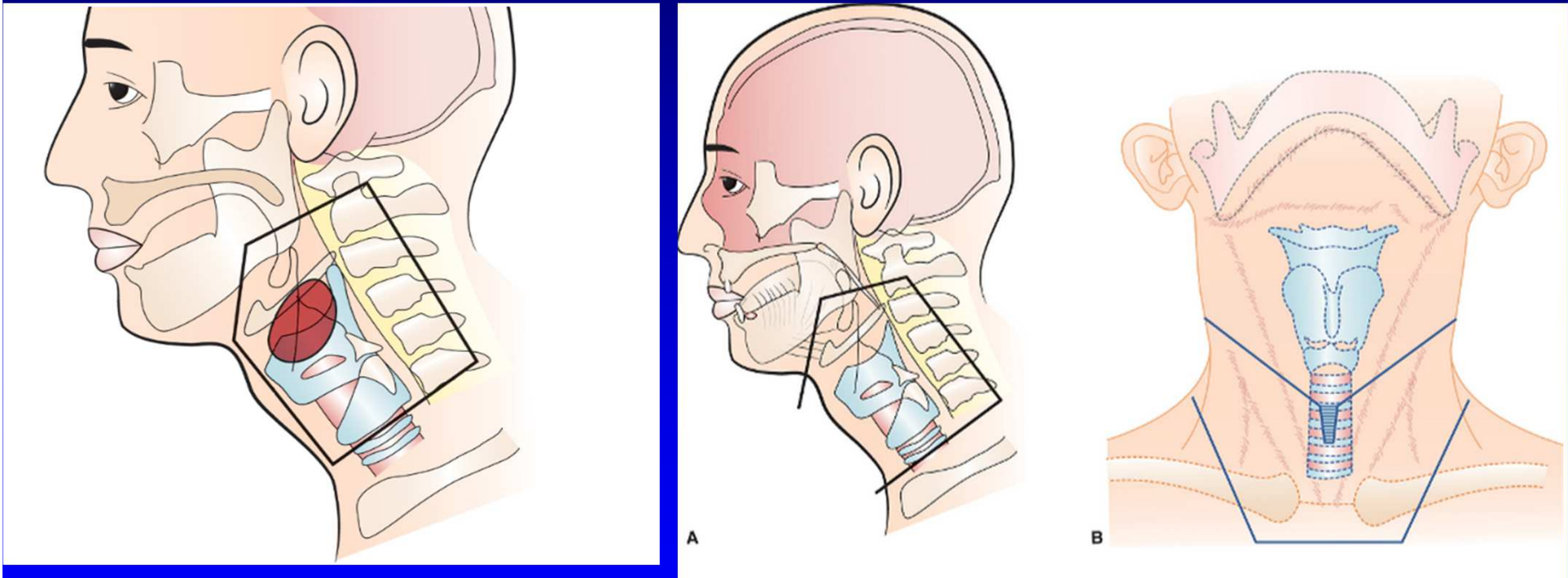
*Superior:* superior to mandibular angle

*Inferior:* bottom of cricoid cartilage

- Subglottic extension (+), shoulders should be pulled down as much as possible.
- If patient is operated, 1.5 cm superior to stoma (stoma is treated in supraclavicular field).
- Anterior:* 0.5–1 cm skin fall-off to neck and one-third of mandible
- Posterior:* usually spinous processes
- Lymph node (+); lymph node should be included



# Carcinoma Supraglottic Larynx T3/T4



The inferior border is placed at the bottom of the cricoid cartilage if the patient has no subglottic spread; in the presence of subglottic extension, the inferior border must be lowered according to the disease extent

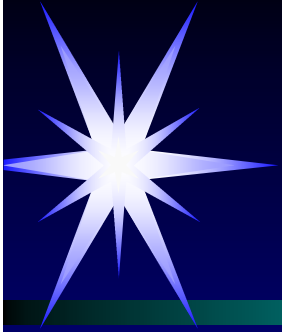
# Ca Larynx Subglottic Tumor

## Subglottic

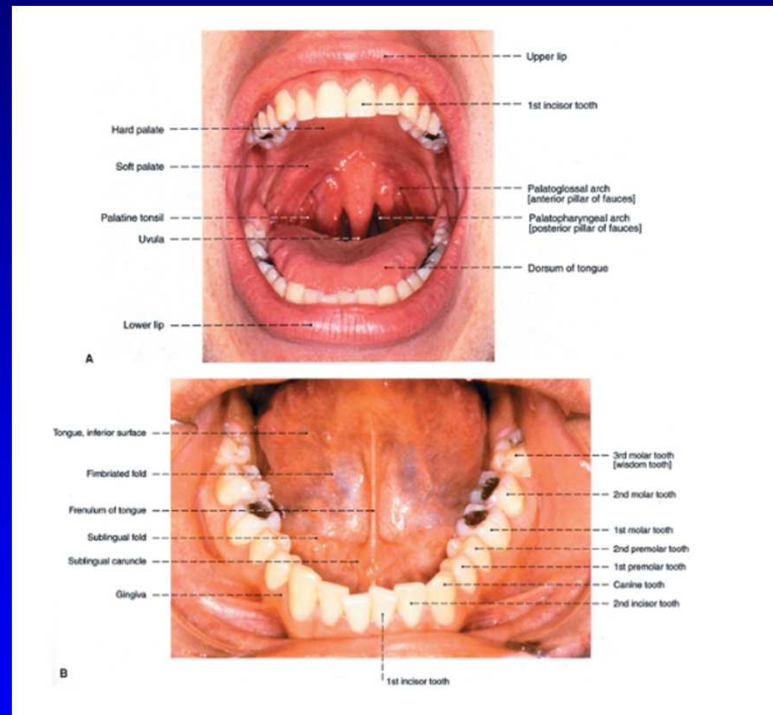
- ✓ Target volume = the primary site, the pre and paratracheal lymphatics, the lower deep cervical nodes and the superior mediastinum.
- ✓ 2 lateral wedged fields angled inferiorly by a couch twist of 30 degrees and an anterior wedged field extending down to cover superior mediastinum with lead blocks to shield the lung apices
- ✓ Posterior border of lateral field = in front of spinal cord
- ✓ OR 2 lateral fields + one anterior field to mediastinum with junction at least 1cm below primary tumor, BUT UNSATISFACTORY MARGIN AND POOR DEPTH DOSE



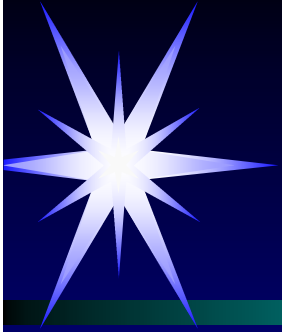




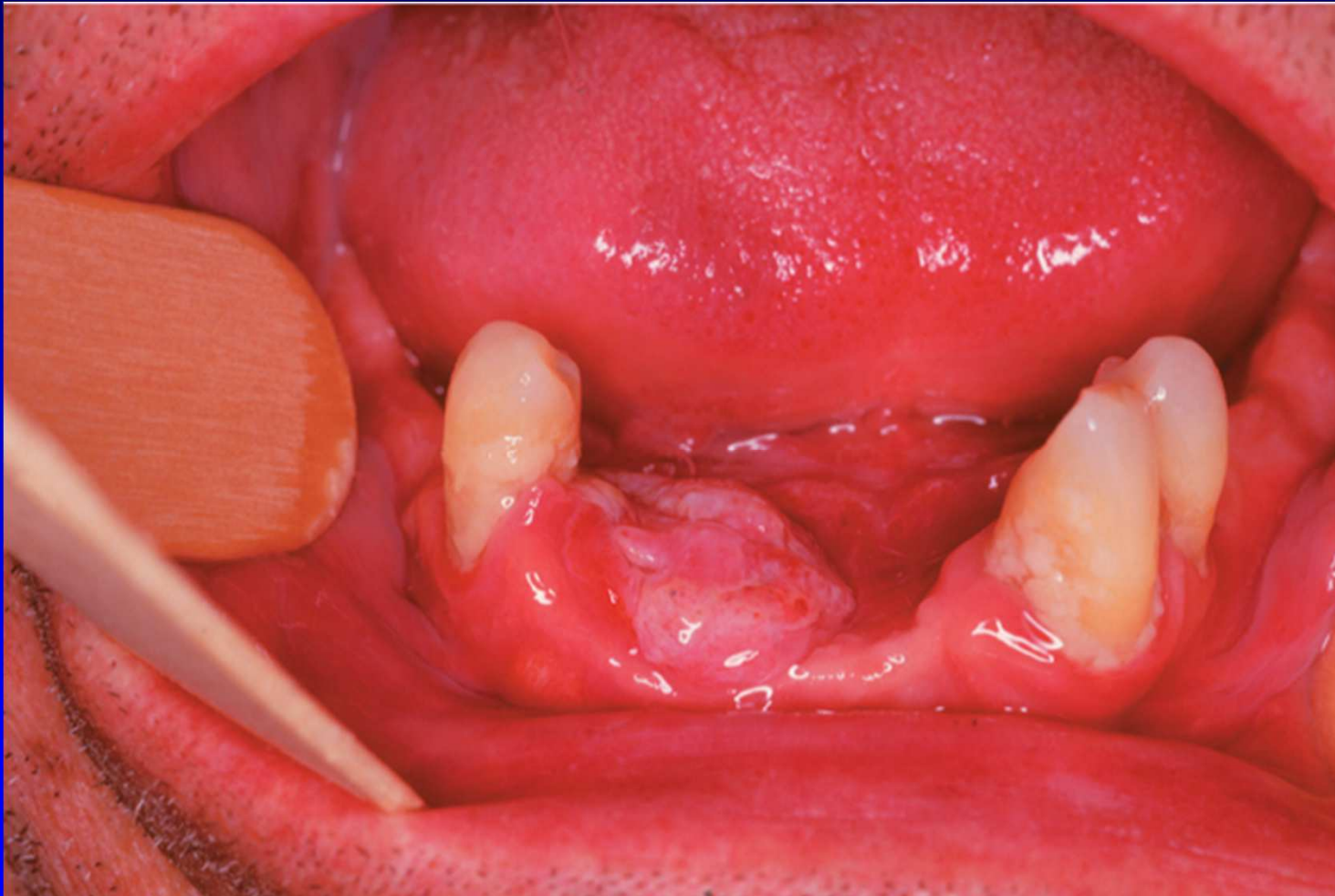
# Oral Cavity Anatomy







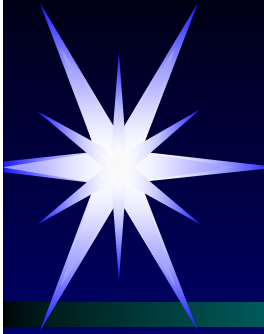
# Carcinoma Alveolus





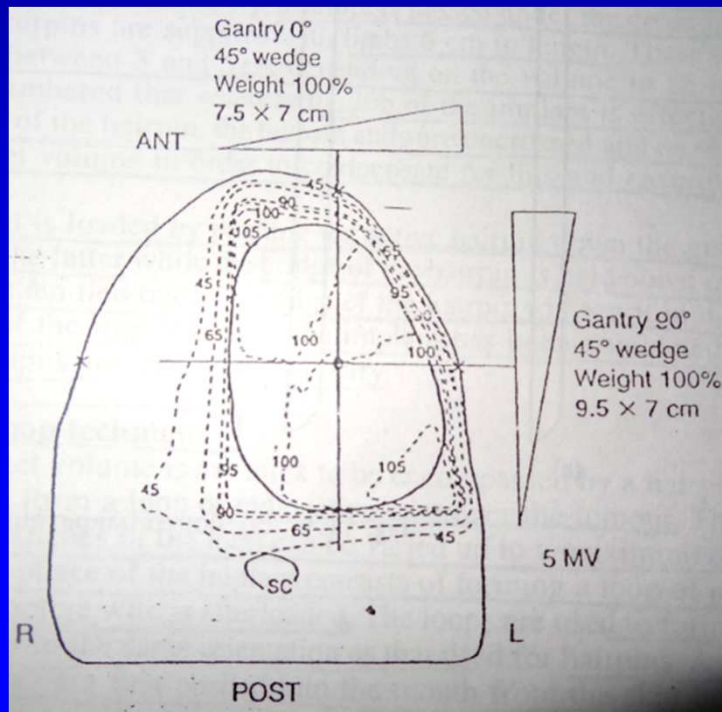
# Ca oral cavity

Tumor	Target volume
Tongue	primary tumor + 2cm margin + I/L submandibular and upper deep cervical nodes
Floor of mouth	Primary tumor + 2cm margin + submental, submandibular and upper deep cervical nodes
Buccal mucosa	Primary tumor + 2cm margin + I/L submandibular nodes
Lower alveolus	Affected side of mandible + submental, submandibular nodes
Retromolar trigone	Primary tumor + 2cm margin + I/L upper deep cervical nodes

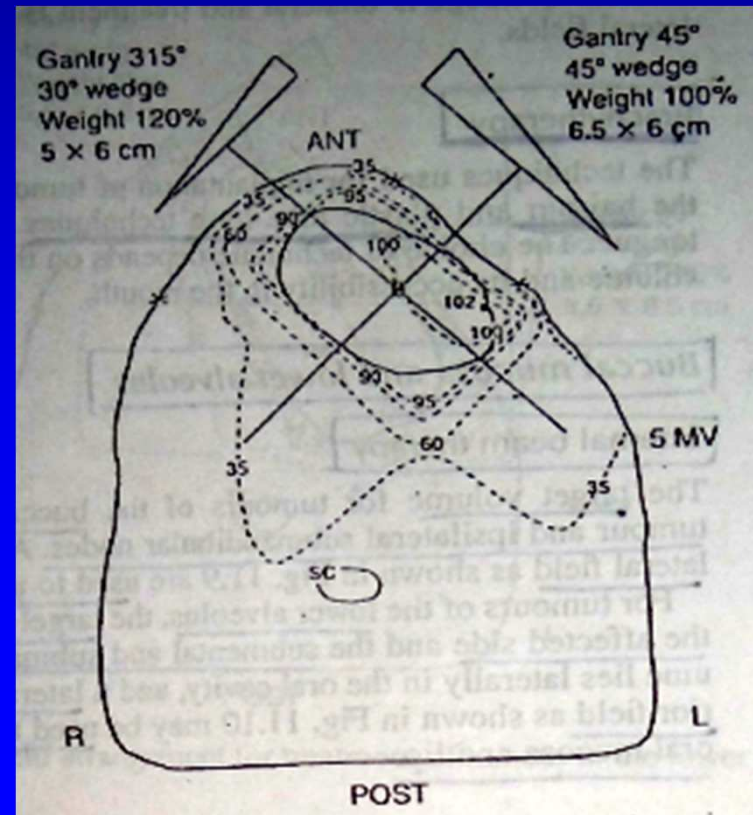


# Ca oral cavity

➤ Anterior and lateral fields used to treat early lateral tumors of tongue

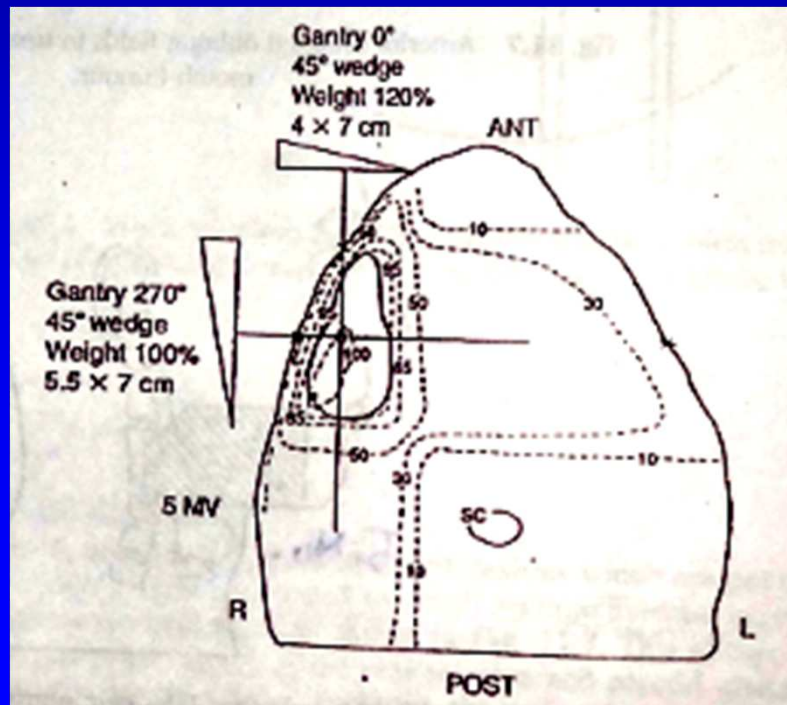


➤ 2 anterior wedged fields for anterior T1 and small T2 floor of mouth tumors

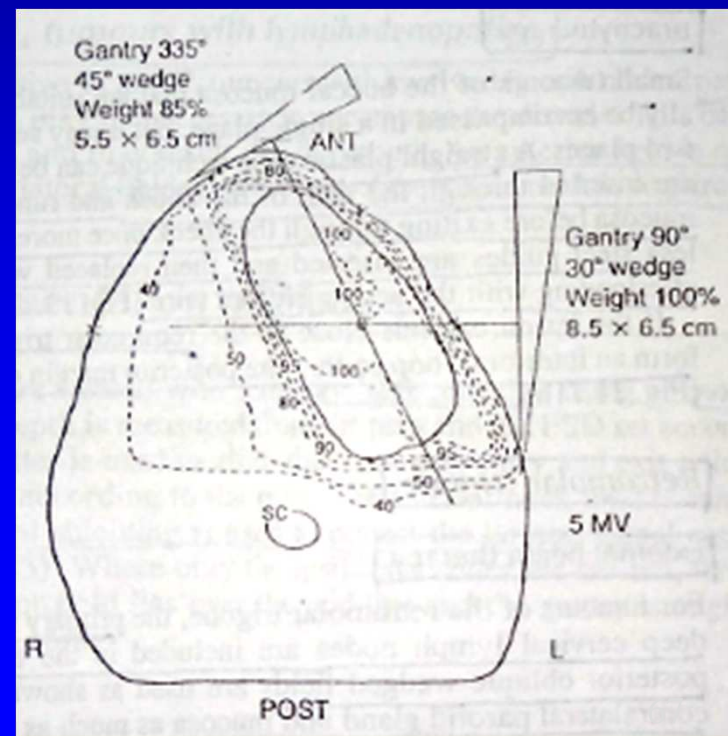


# Ca oral cavity

- Anterior and I/L field with wedges for small tumors of buccal mucosa



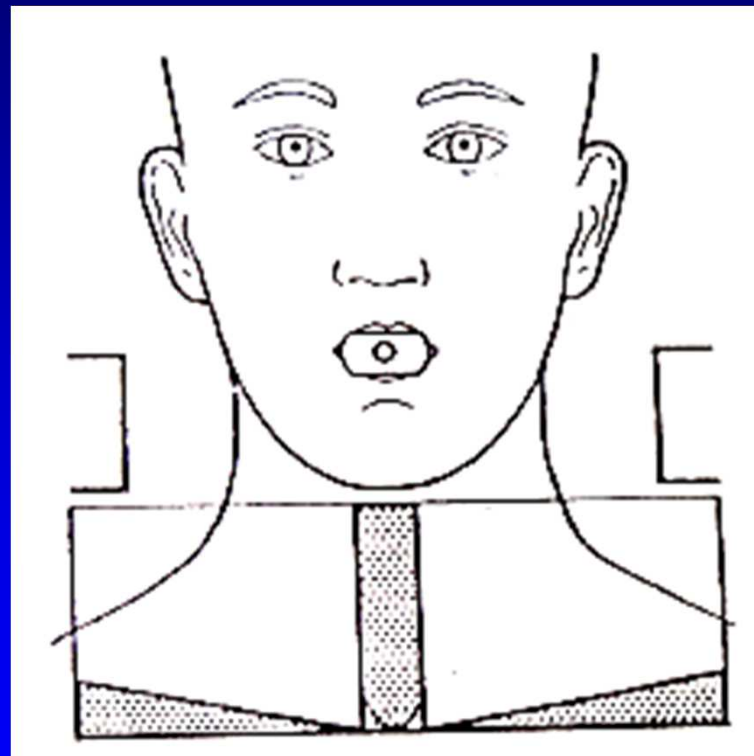
- Lateral field and oblique anterior field with wedges for tumors of lower alveolus

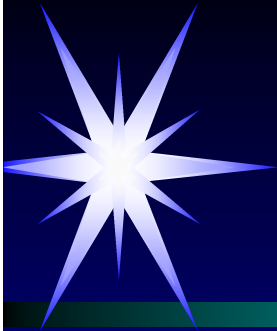




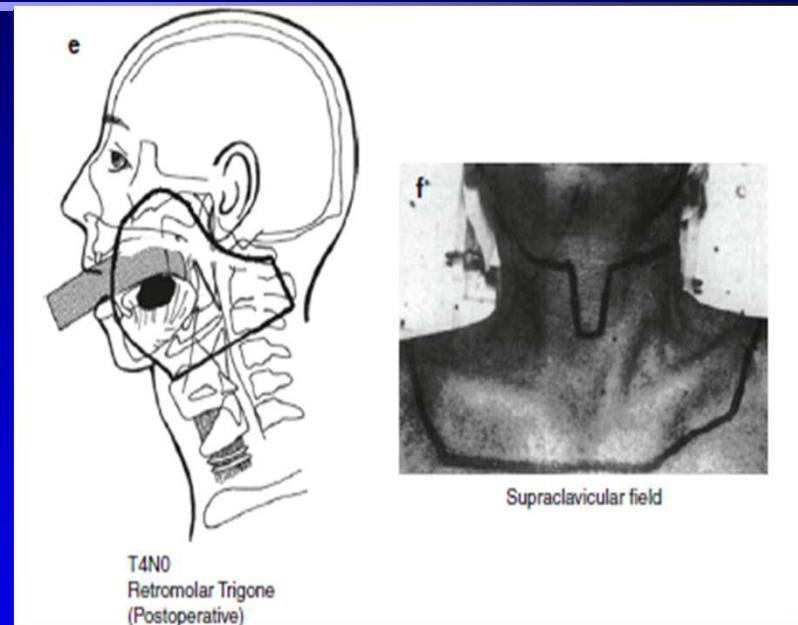
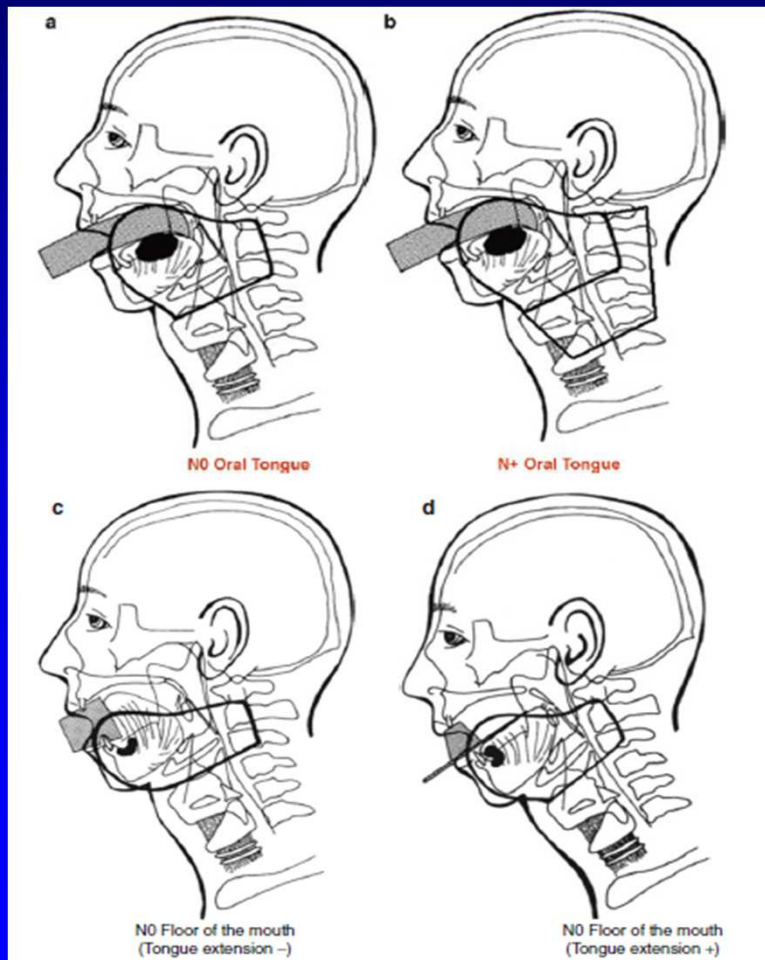
# Ca oral cavity

- Patients treated on MV machine using isocentric technique
- Anterior neck field matched below opposing lateral fields for T3N1 tumor of floor of mouth





# ORAL CAVITY



Conventional RT fields for oral cavity cancers

# Oral Cavity

## Conventional RT Fields

**Superior:** 2 cm above primary tumor.

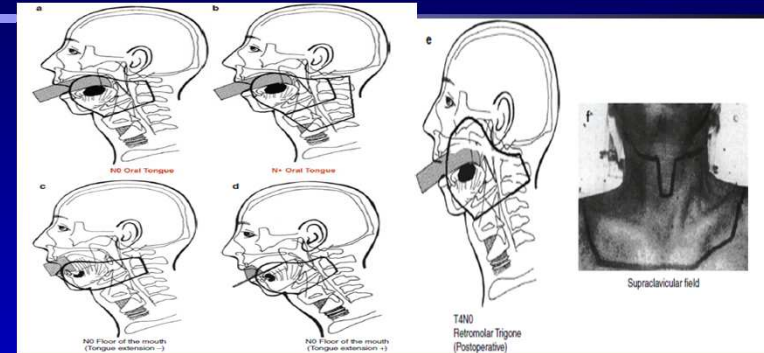
**Inferior:** below hyoid bone.

**Lymph node (+):** level III is included

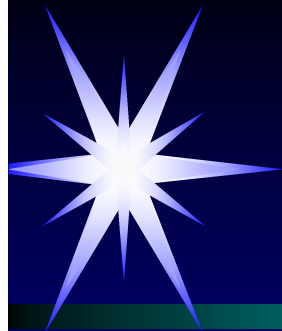
**Anterior:** 2 cm in front of primary tumor (usually in front of mandible).

**Posterior:** Back of vertebral corpuses.

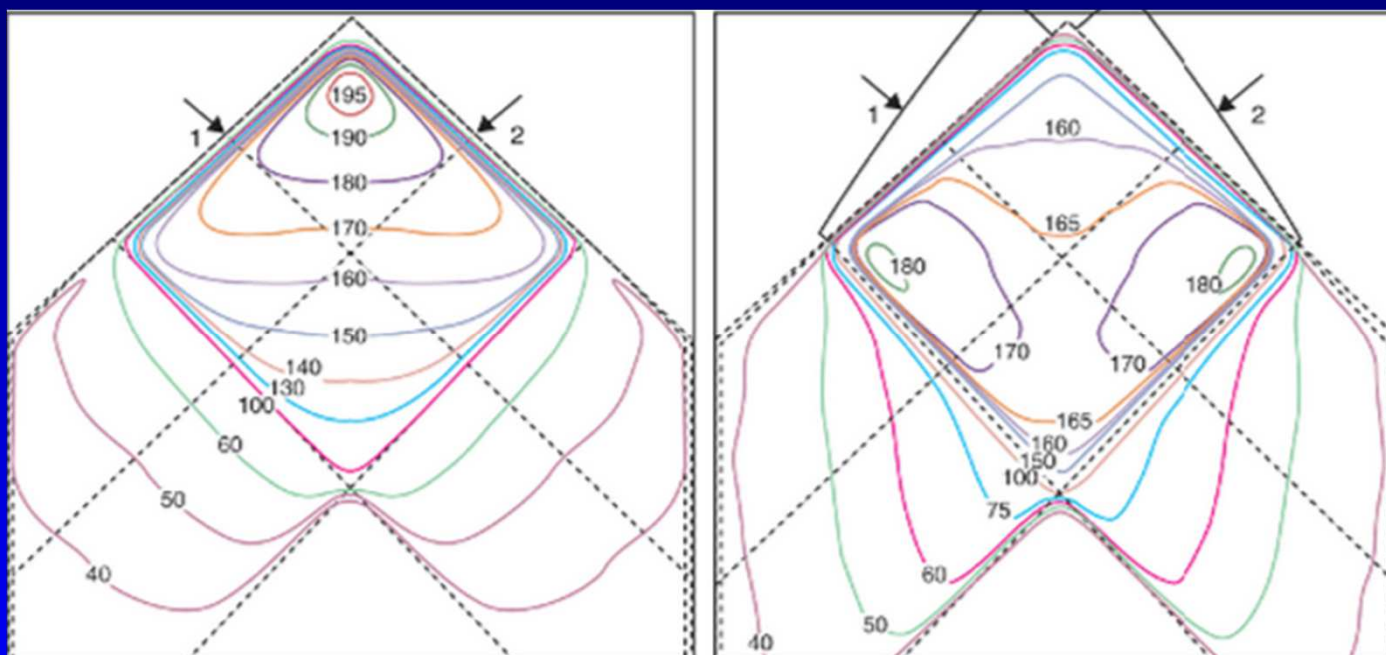
- • Lymph node (+): back of vertebral spinous processes.
- • Two lateral parallel–opposed fields are used.
- • Lymph node (+): neck and supraclavicular field is also treated.







# Isodose distribution with and without wedges

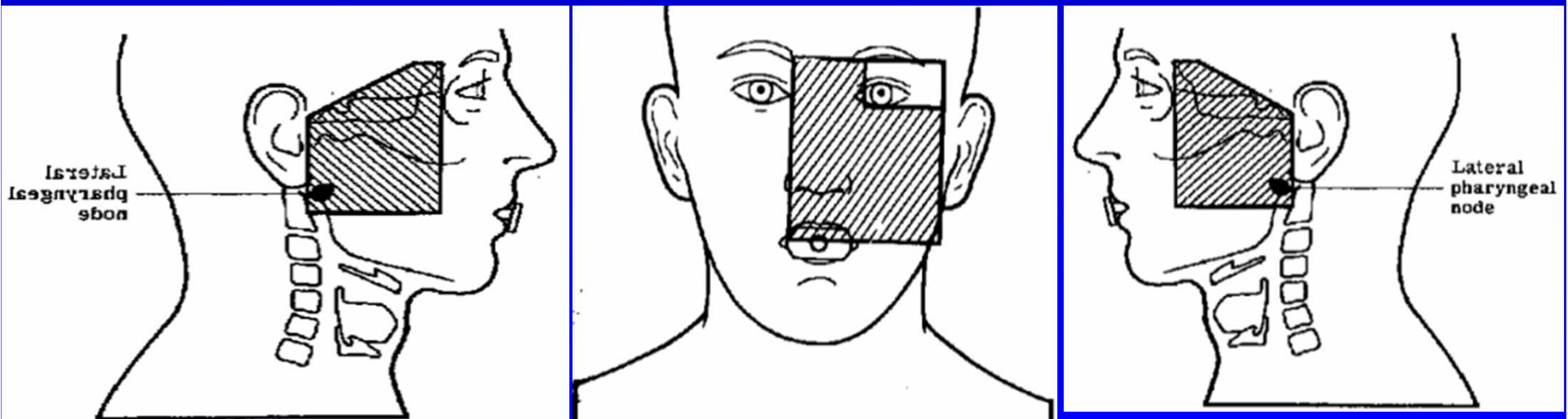


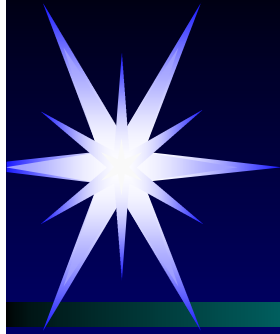
Isodose distribution for two angled beams. **A:** Without wedges. **B:** With wedges. Both: 4 MV; field size,  $10 \times 10$  cm; source-to-skin distance, 100 cm; wedge angle, 45 degrees.

# Ca maxillary antrum

## SUPRASTRUCTURE TUMORS

- **ONE anterior and TWO lateral fields**
  - lateral fields may have a 5-degree posterior tilt and 60-degree wedges [to minimise dose to contralateral eye]
- **Relative loading 1:0.15:0.15** [depending upon tumor location and photon energy]

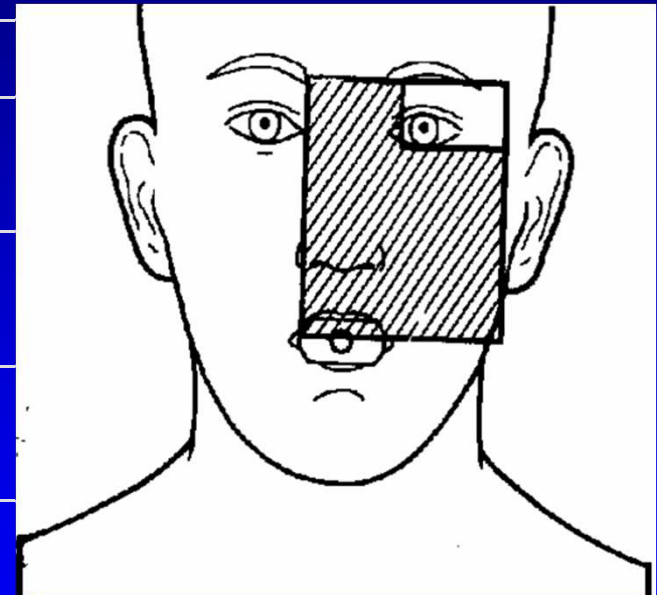


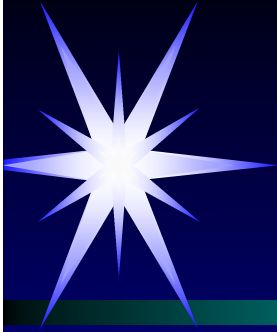


# Ca maxillary antrum

## RT Portal Suprastructure -Anterior Field

<b>UPPER</b>	<b>FIELD MARGIN</b>
<b>ORBIT INVOLVED-</b>	lies at supraorbital margin / above crista galli [encompass ethmoids]
<b>ORBIT UNINVOLVED</b>	inferior edge of cornea to cover orbital floor
<b>MEDIAL</b>	1-2 cm across midline to cover C/L ethmoid extension
<b>LATERAL</b>	1 cm beyond the apex of the sinus or falling off the skin when the tumor extends into soft tissue of cheek or infra temporal fossa
<b>INFERIOR</b>	1 cm below the floor of the sinus (angle of mouth)

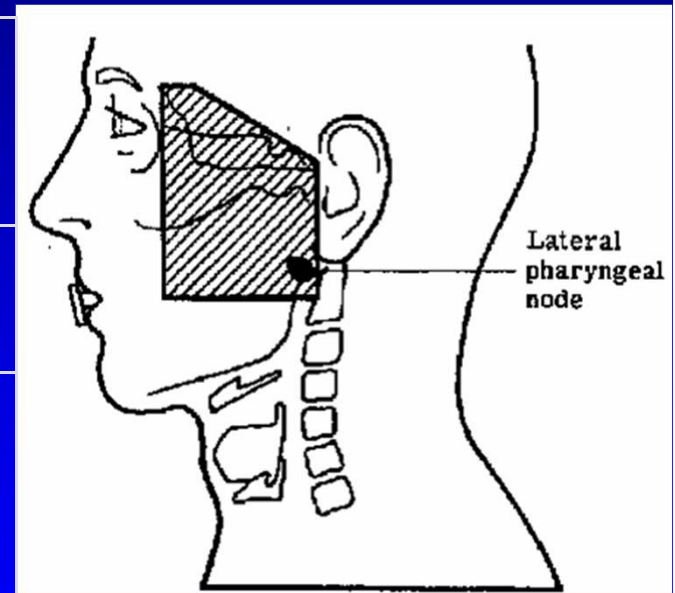




# Ca maxillary antrum

## LATERAL RT Portal For Supra Structural Tumors

Superior border	Follows the floor of the anterior cranial fossa
Anterior border	Behind the lateral bony canthus parallel to the slope of the face.
Posterior border	Covers the pterygoid plates & lateral pharyngeal node.
Inferior border	Corresponds to that of anterior portal



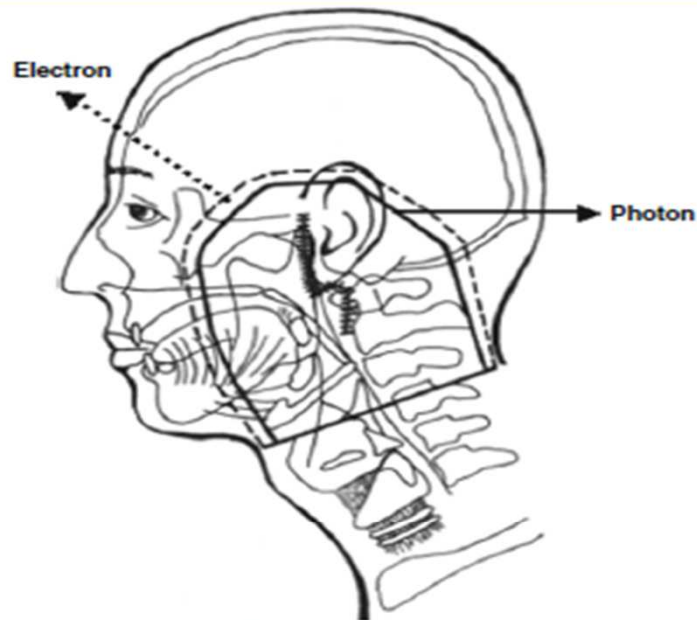


# Ca maxillary antrum

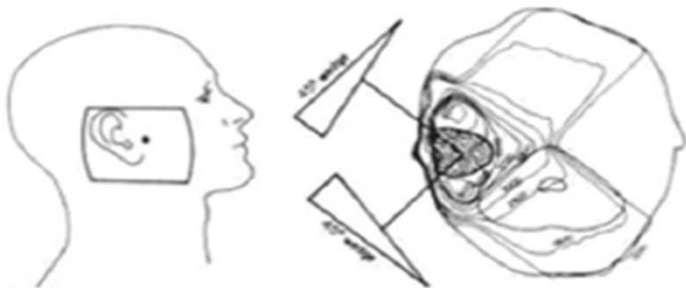
## INFRASTRUCTURE TUMORS

- Anterior and ipsilateral wedge pair [45° wedges] photon fields
- 5 degree inferior tilt to avoid beam into contralateral eye

# MAJOR SALIVARY GLANDS



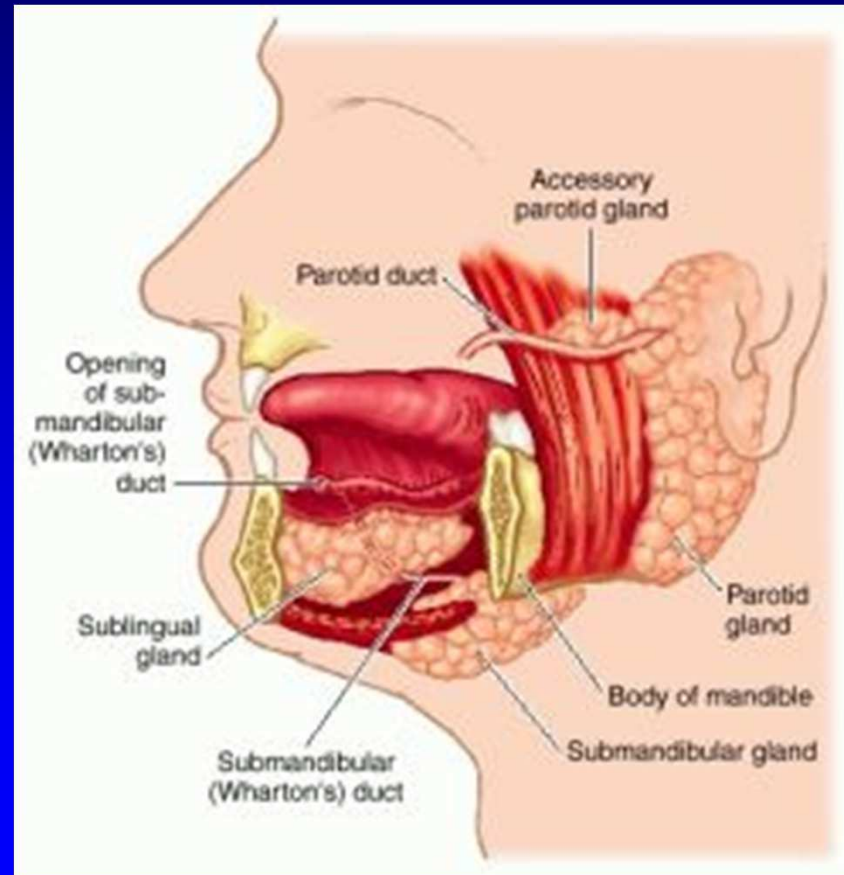
Parotid gland  
(postoperative)



A. Photon–electron combination for parotid gland cancers.

B. Double wedge technique for parotid gland cancer

# MAJOR SALIVARY GLANDS

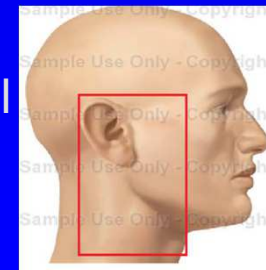
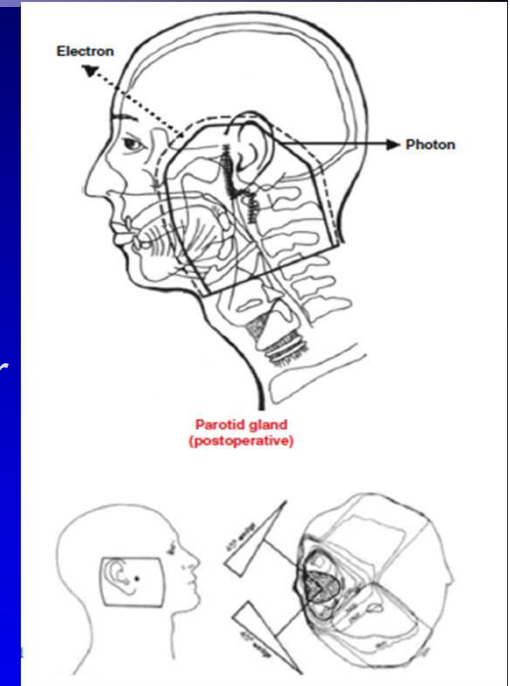




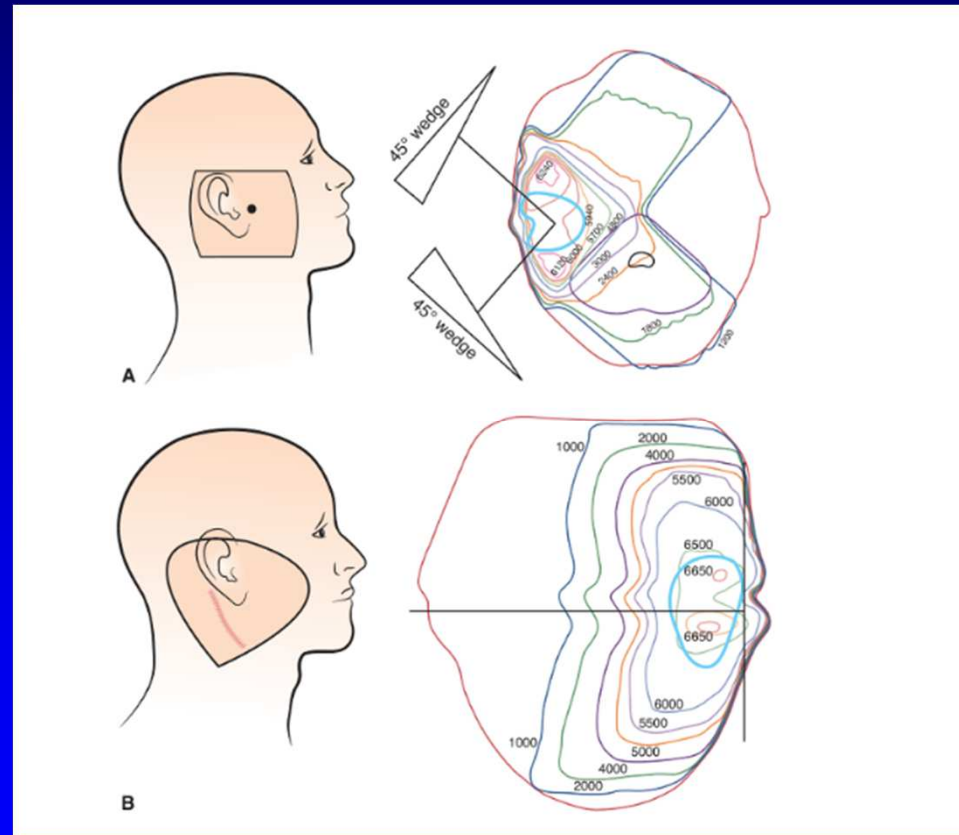
# Parotid Gland

## ➤ **Single field technique with photon–electron combination**

- This is a technique used to deliver a homogeneous dose distribution sparing the contralateral parotid gland.
- **Superior:** above zygomatic bone, including parotid and scar
- **Inferior:** above thyroid cartilage
- **Anterior:** anterior edge of masseter muscle
- **Posterior:** posterior to mastoid
- Lymph node (+) or neck irradiation is required: posterior to spinous processes
- **Anterior–posterior oblique double wedge technique**
- This technique allows dose homogeneity and the contralateral parotid gland sparing



# Carcinoma Parotid



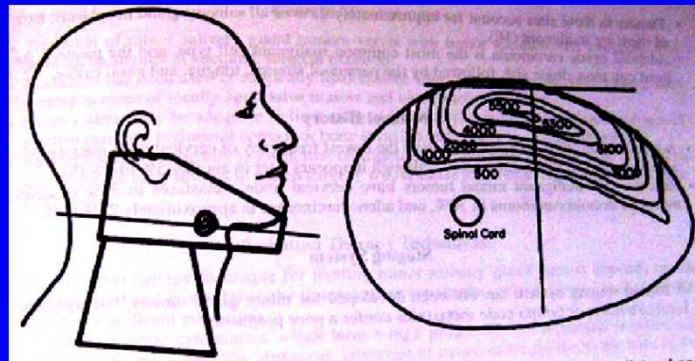
Conventional radiotherapy for parotid cancer. **A:** Unilateral wedge arrangement and isodose distribution using wedged pair. **B:** Ipsilateral 16-MeV electrons plus  $^{60}\text{Co}$  (4:1) electron beam field.

# MAJOR SALIVARY GLANDS

- **Submandibular gland RT field. *Single field is enough. Possible regions that should be***

included in RT portal: submandibular angle, neighboring oral cavity, pterygomaxillary fossa, cranial base, ipsilateral neck.

- *Superior border: hard palate;*
- *inferior border: hyoid bone;*
- *anterior border: anterior to mentum;*
- *posterior border: posterior to mandibular angle.*
- Four to six megavolt X-rays, Co-60 or 6–18 MeV electrons are used.



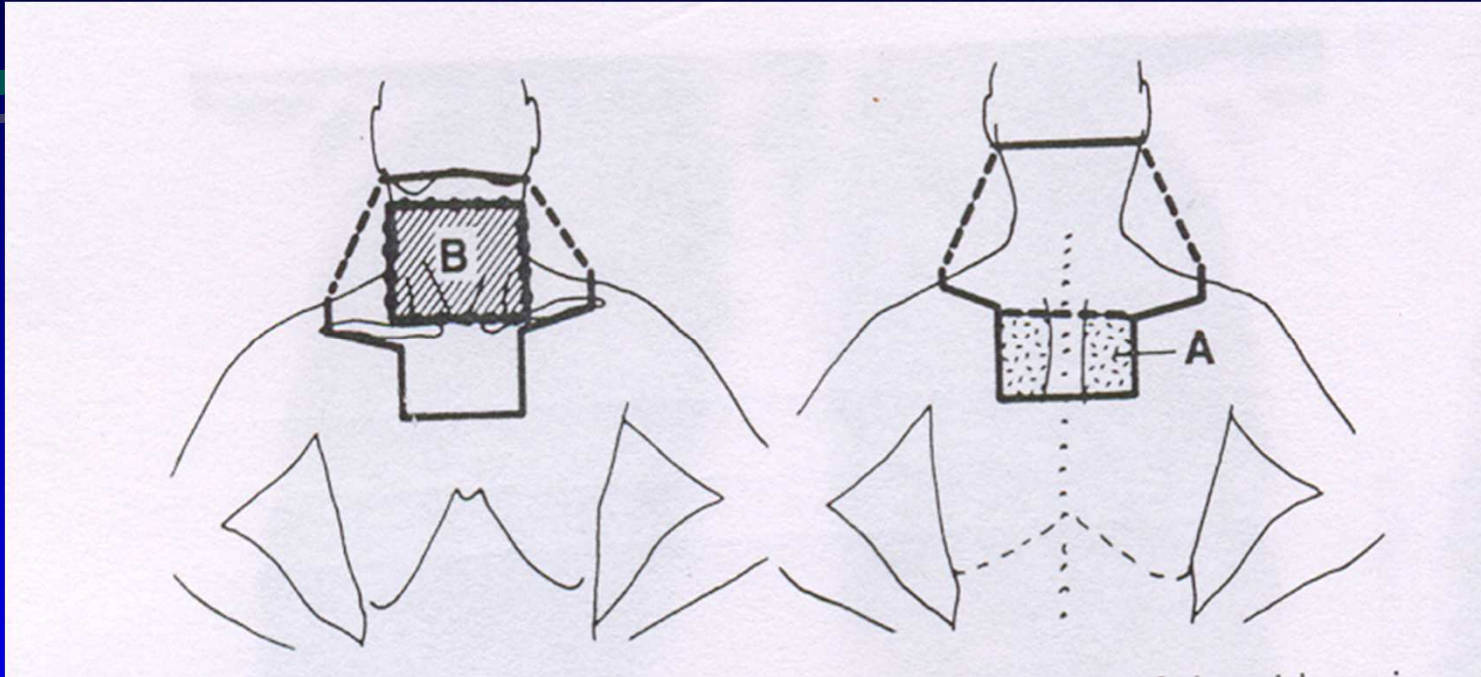


# RT in sublingual gland

## ➤ Portal margins

<b>Anterior</b>	<b>anterior aspect of mental symphysis</b>
<b>Posterior</b>	<b>posterior aspect of the ascending mandibular ramus</b>
<b>Superior</b>	<b>1cm above upper border of tongue</b>
<b>Inferior</b>	<b>Hyoid bone-thyroid notch interspace</b>

# Ca thyroid

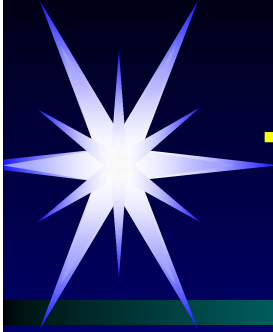


Phase I Field (up to 45 Gy)- chin to T4 vertebrae-AP/PA

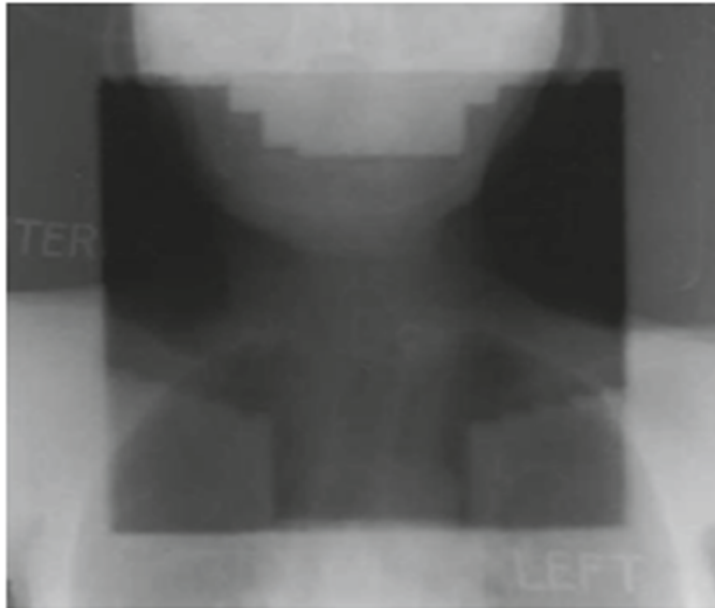
Phase II Field (after 45 Gy)-

A-post.medistinal field T1-T4 with central shielding to spare spinal cord

B-Anteroposterior field to primary site



# THYROID GLAND



RT portals for thyroid cancer

## *Borders of RT fields in thyroid cancers*

*Superior border: 1–1.5 cm above angle of the mandible.*

*Inferior border: includes upper mediastinal lymph nodes.*

*Lateral borders: two-thirds of the clavicle.*

In cases of mediastinal extension, the field is enlarged to include upper mediastinal lymphatics down to the carina. Anterior–posterior fields are recommended.

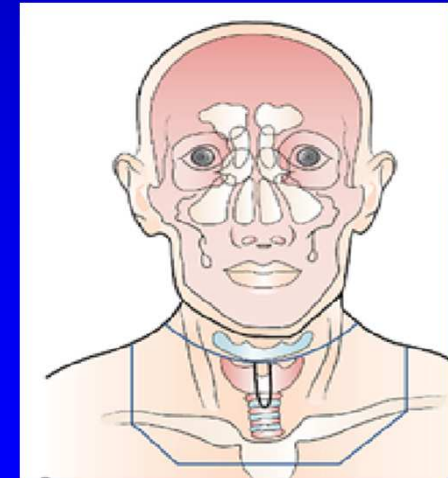
**Boost:** single electron field/two lateral fields with photons/two oblique fields with photons.



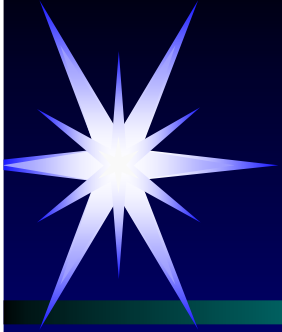
# Secondaries neck Unknown Primary



- *Borders of lateral fields*
- *Superior: includes nasopharynx and cranial base.*
- *Posterior: C2 vertebral spinous process.*
- *Anterior: two-thirds of tongue, half of mandible.*
- *Inferior: thyroid notch.*
- *Borders of anterior SCF field*
- *Superior: thyroid notch.*
- *Inferior: bottom of sternoclavicular joint.*
- *Lateral: two-thirds of clavicle.*

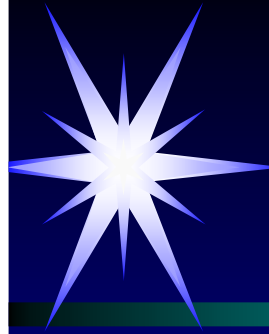






# Conclusion

- Two Dimensional Radiation Treatment Planning is the work involved in graphically displaying a dose distribution when one or more beams converge on the target volume
- Planning is done on a central slice
- Forward planning is done where radiation fields are decided by a radiation oncologist based on clinical judgment/ simulator fluoroscopy etc.
- Field placement in head and neck cancer depends on patient and tumor factors e.g. site, stage, etc.
- Use of Immobilisation devices, shoulder retractors, mouth bite, wedges/ shielding/ compensators etc. give better results
- 2D planning has the limitation of presuming that central slice is the representation of cranio-caudal extent of tumor



# References

- Google Search
- Standard Text Books of Radiation Therapy



THANKS

