

Tumori del distretto cervico-cefalico

Dalla definizione dei volumi di trattamento
all'Adaptive Radiotherapy

Volumi di trattamento

laringe, ipofaringe, ghiandole salivari, cavo orale e
sede primitiva ignota

Daniela Alterio
ARC – Advanced Radiotherapy Center
Istituto Europeo di Oncologia , Milano



Volumi di trattamento

- **GROSS TUMOR VOLUME → CTV (CTV HIGH DOSE -CTV HD)**
DEFINIZIONE CLINICO-RADIOLOGICA DELL'ESTENSIONE TUMORALE
- **AREE AD ALTO RISCHIO → CTV HIGH RISK (CTV HR)**
- **AREE A BASSO RISCHIO → LOW RISK (CTV LR)**

Volumi di trattamento

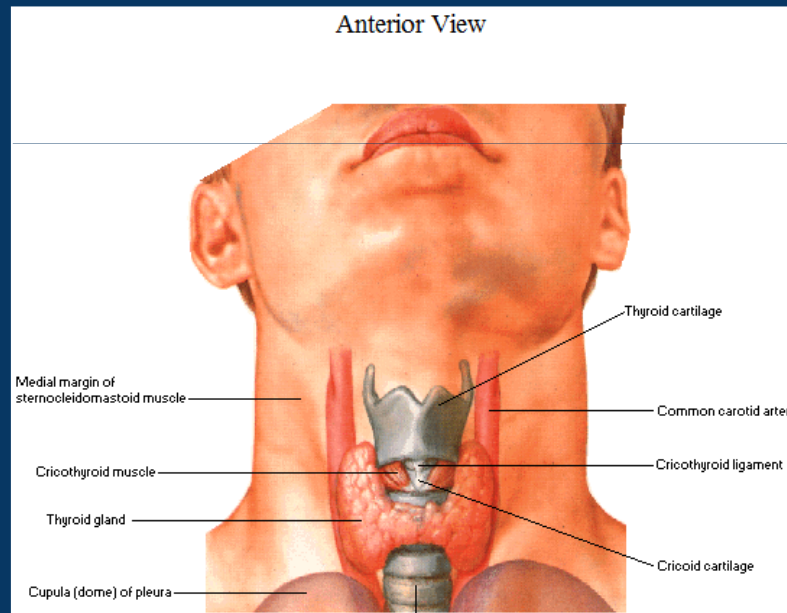
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Volumi di trattamento

- **GROSS TUMOR VOLUME → CTV (CTV HIGH DOSE -CTV HD)**
DEFINIZIONE CLINICO-RADIOLOGICA DELL'ESTENSIONE TUMORALE
- **AREE AD ALTO RISCHIO → CTV HIGH RISK (CTV HR)**
CONOSCENZA DELLE VIE DI DIFFUSIONE DELLA NEOPLASIA
- **AREE A BASSO RISCHIO → LOW RISK (CTV LR)**

LARINGE

Anatomia



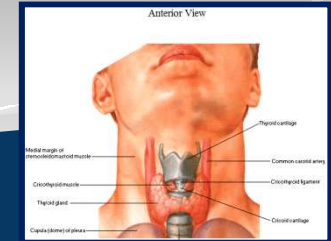
DEFINIZIONE DEL GTV

DEFINIZIONE DI T

- FIBROSCOPIA
- INDAGINI RADIOLOGICHE (TC ED RM)

DEFINIZIONE DI N

- ESAME OBIETTIVO
- ECOGRAFIA
- TC
- FDG-PET



FIBROSCOPIA

- DESCRIZIONE ACCURATA DELL'ESTENSIONE DI MALATTIA



FIBROSCOPIA

- DESCRIZIONE ACCURATA DELL'ESTENSIONE DI MALATTIA

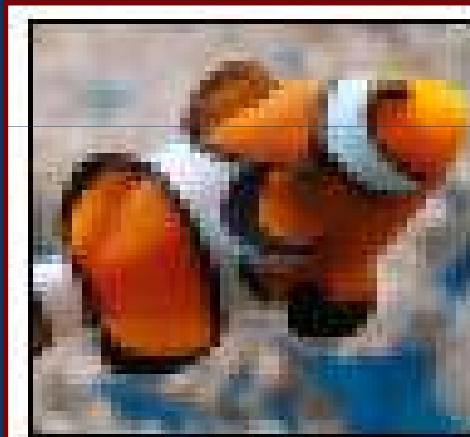
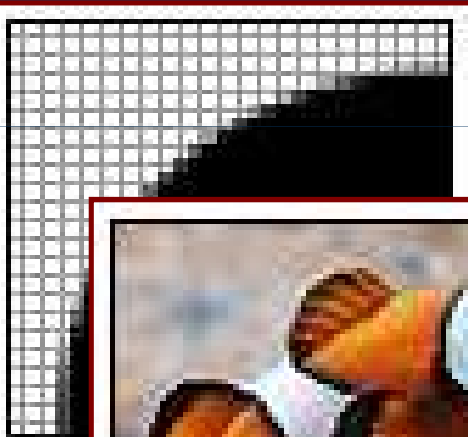
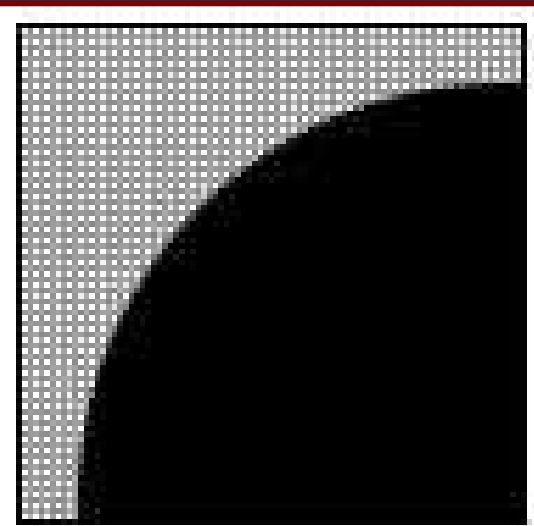


IMMAGINE HDTV

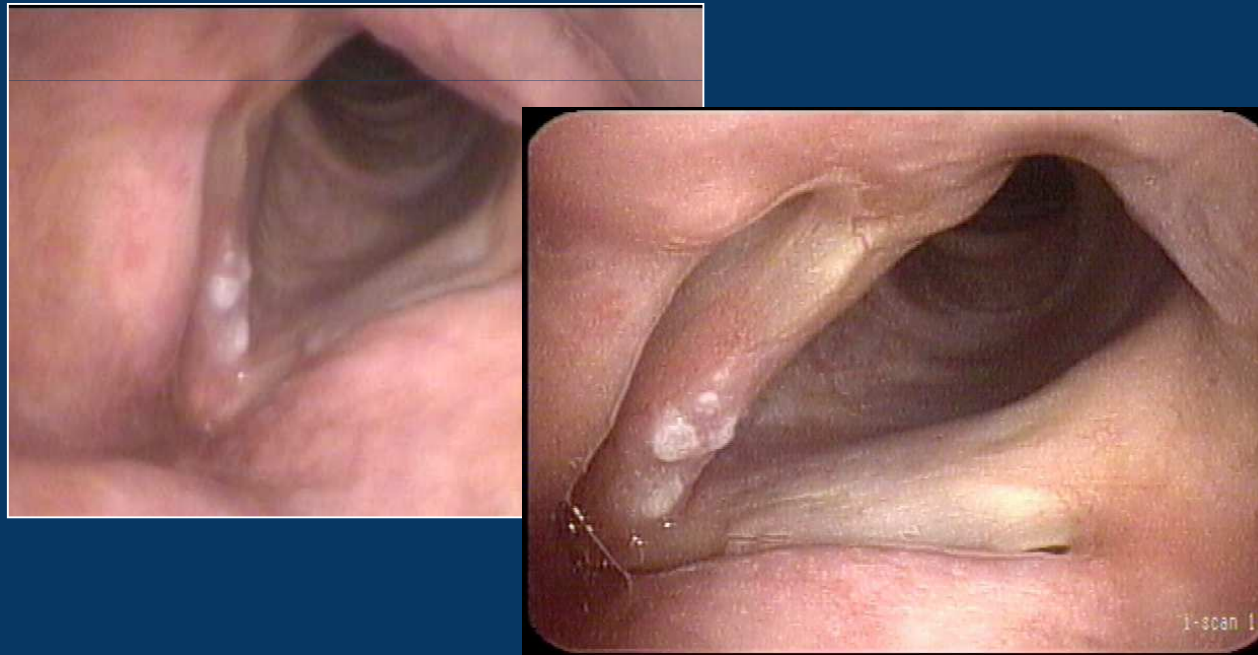


**IMMAGINE TV
CONVENZIONALE**



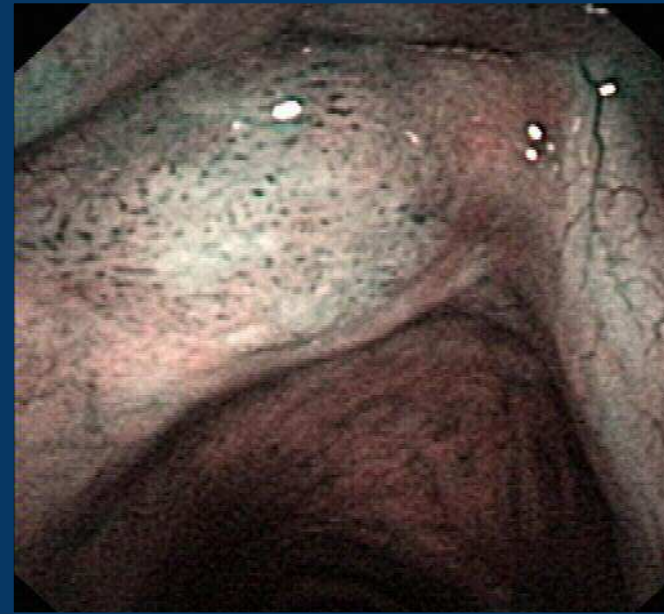
FIBROSCOPIA

- DESCRIZIONE ACCURATA DELL'ESTENSIONE DI MALATTIA
UTILIZZO I-SCAN



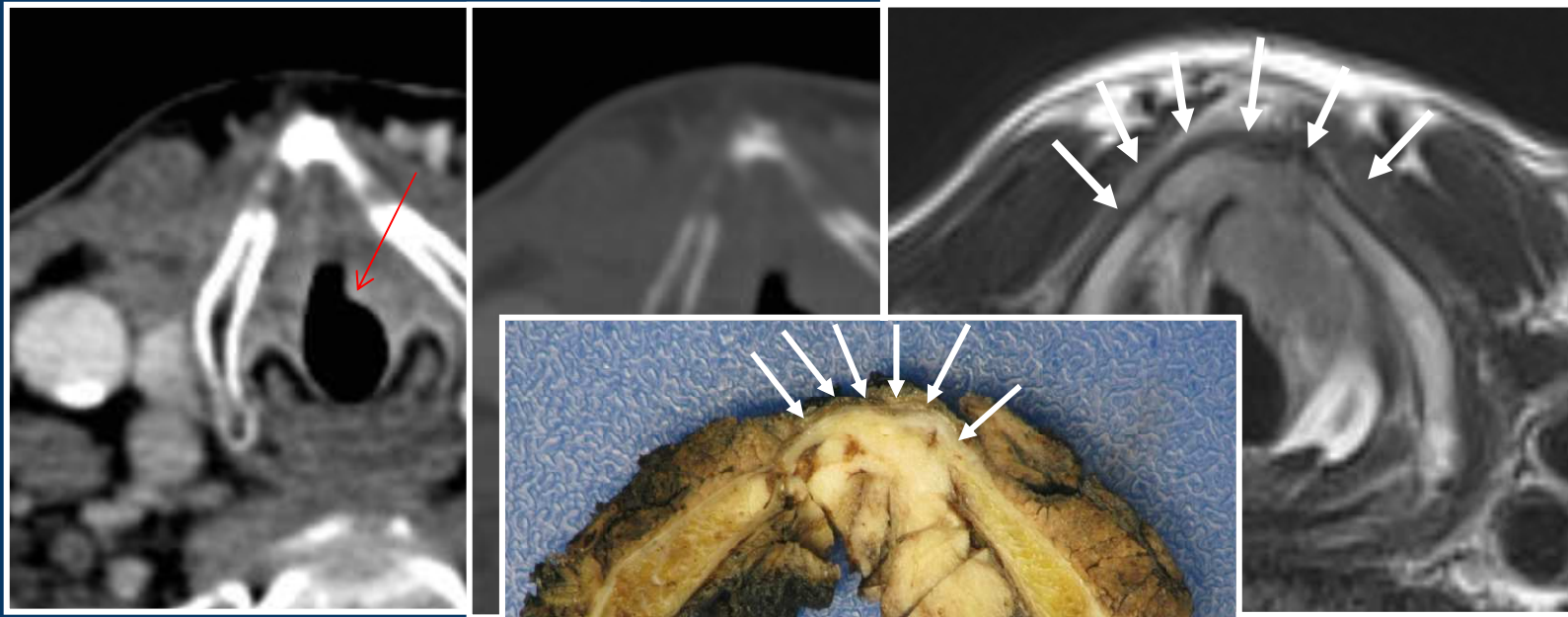
FIBROSCOPIA

- DESCRIZIONE ACCURATA DELL'ESTENSIONE DI MALATTIA
UTILIZZO NARROW BAND IMAGING (NBI)



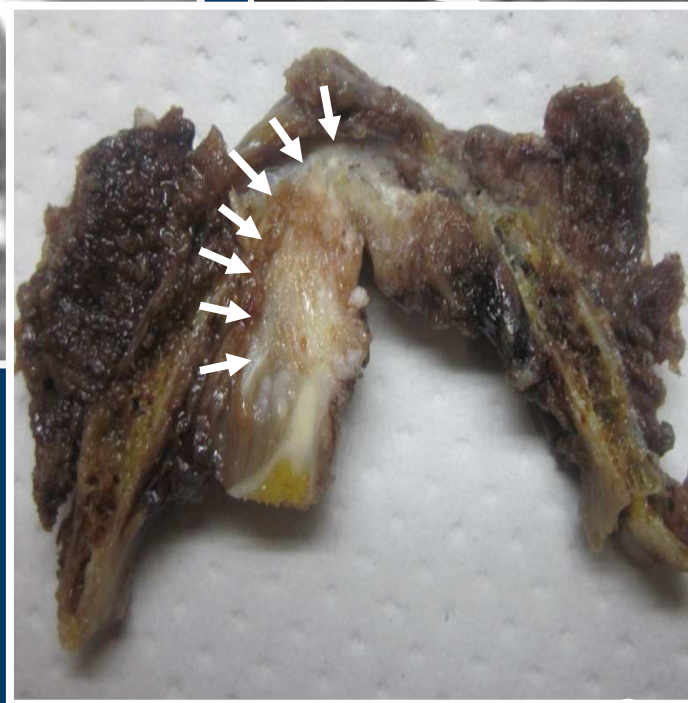
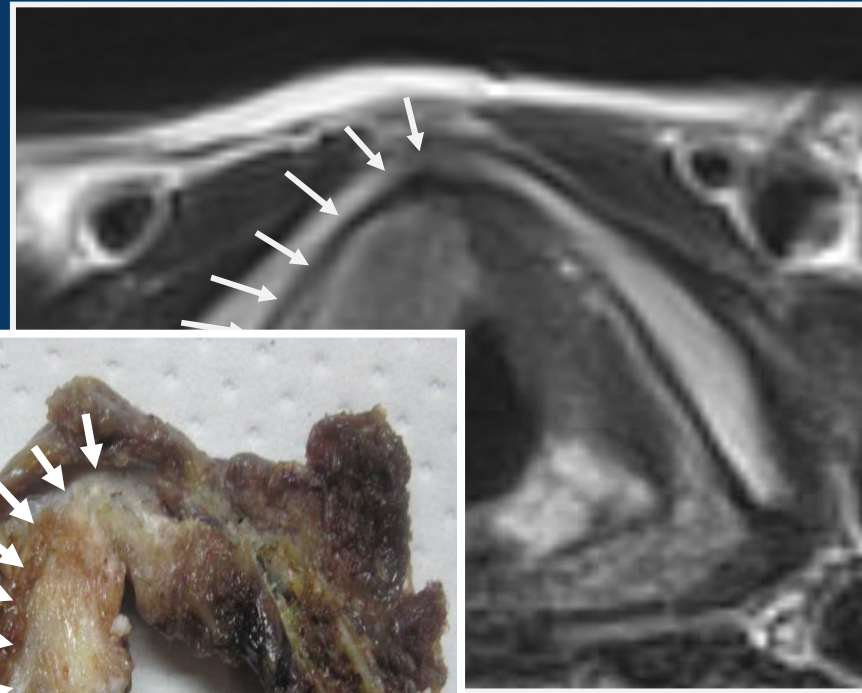
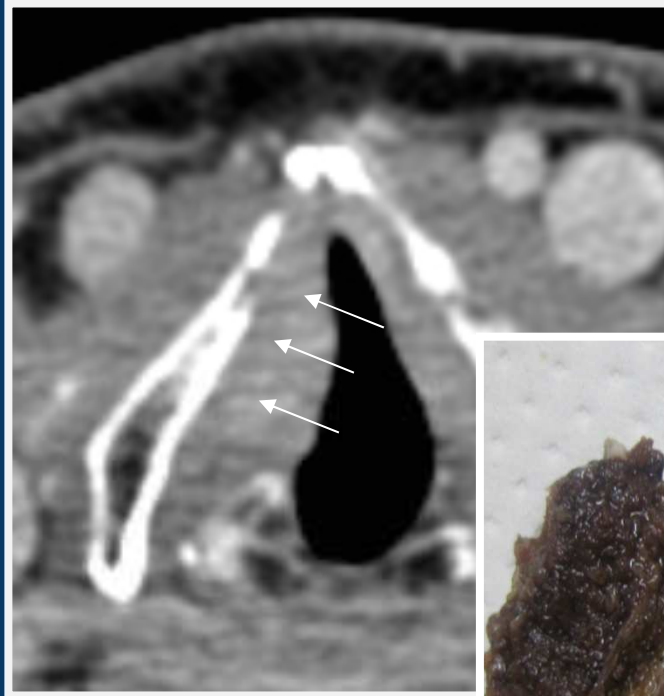
INDAGINI RADIOLOGICHE

TC

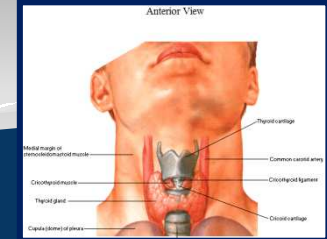


TC CON MDC

INDAGINI RADIOLOGICHE SPAZIO PARAGLOTTICO



Courtesy H&N Surgery Dept. IEO



Volumi di trattamento

Gross Tumor Volume → **CTV HD**

Clinical Target Volume HR

ANATOMIA FUNZIONALE

vie di fuga / resistenza della progressione tumorale

ANATOMIA FUNZIONALE



EVOLUZIONE DELLA TECNICA



Radiologo



Chirurgo



Radioterapista



Scheletro cartilagineo

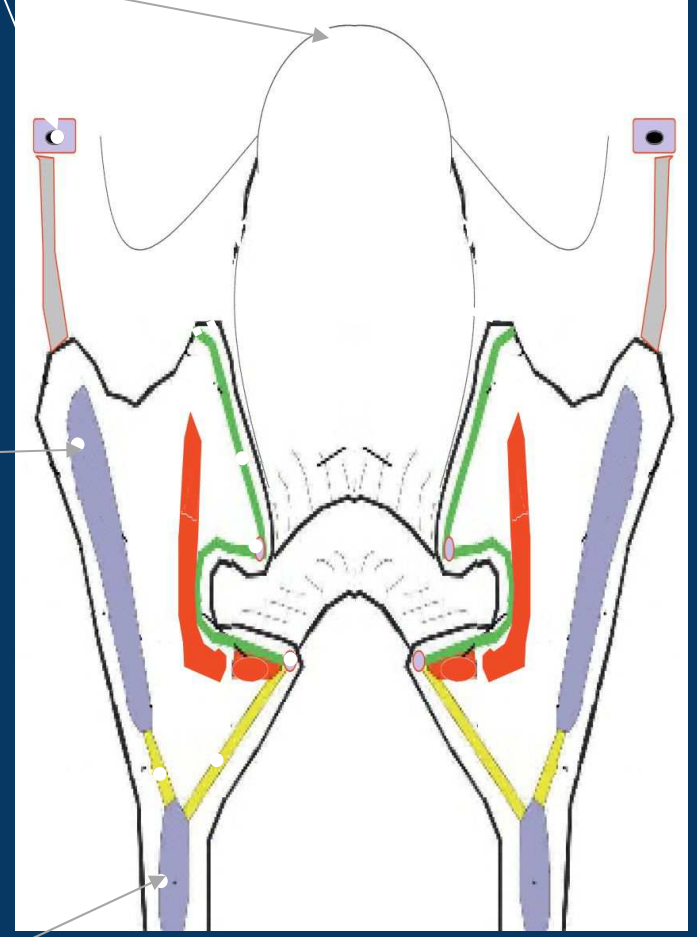
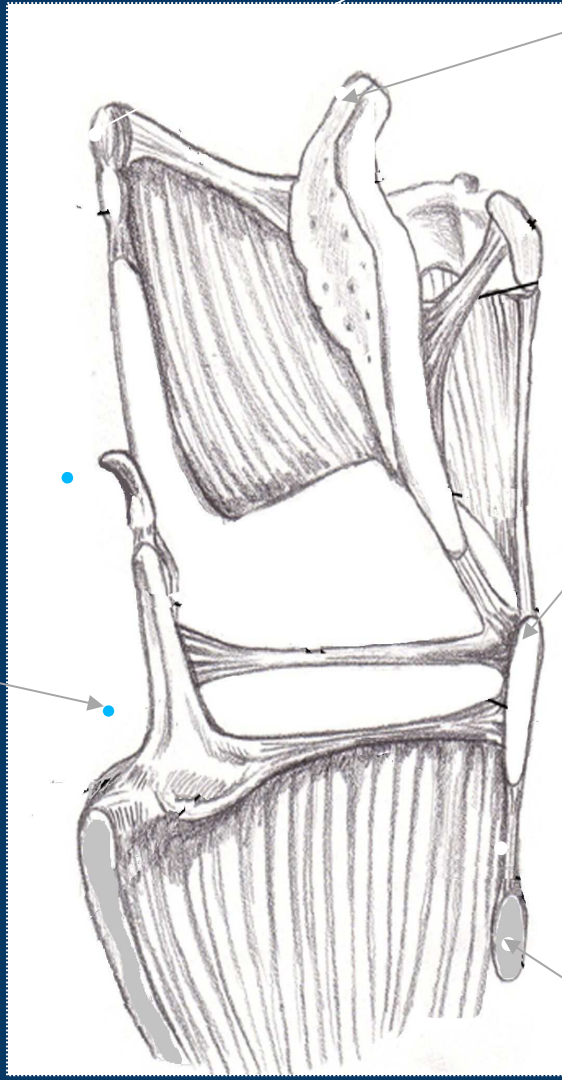
Osso ioide

Epiglottide

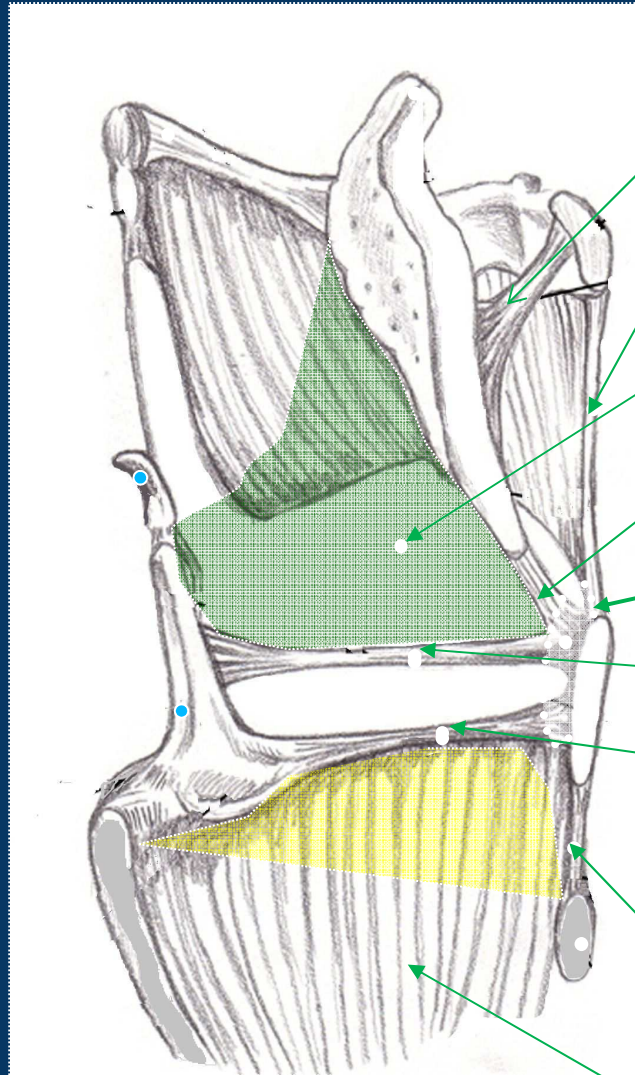
Cart. Tiroide

Cartilagine cricoide

Aritenoidi



Strutture connettivali



Legamento io-epiglottico

Membrana Tiro-ioidea

Membrana quadrangolare

Legamento tiro-epiglottico

Legamento di Broyles

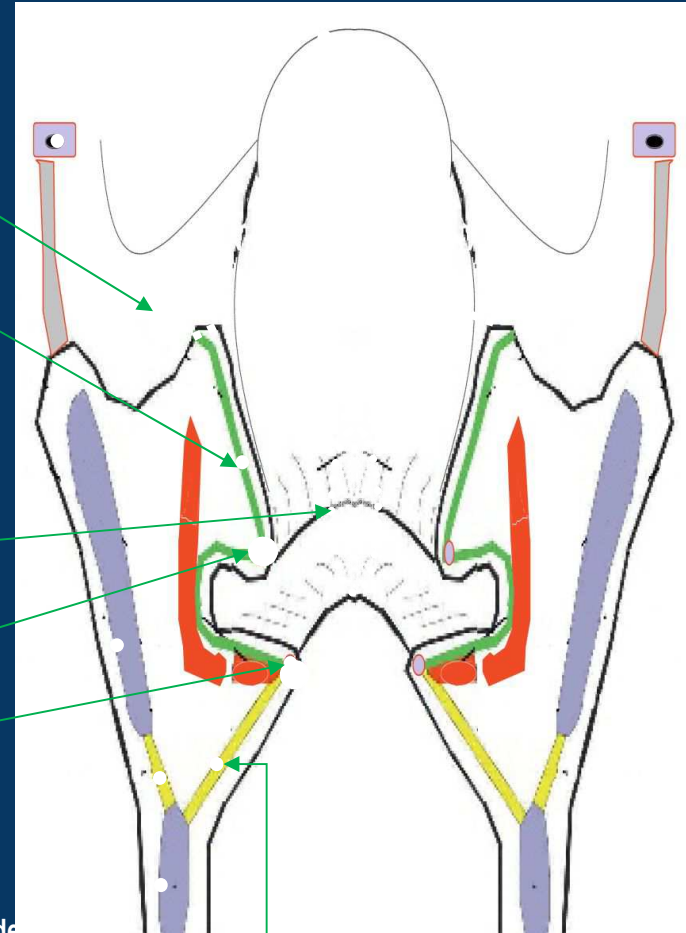
Legamento del ventricolo

Corda voale

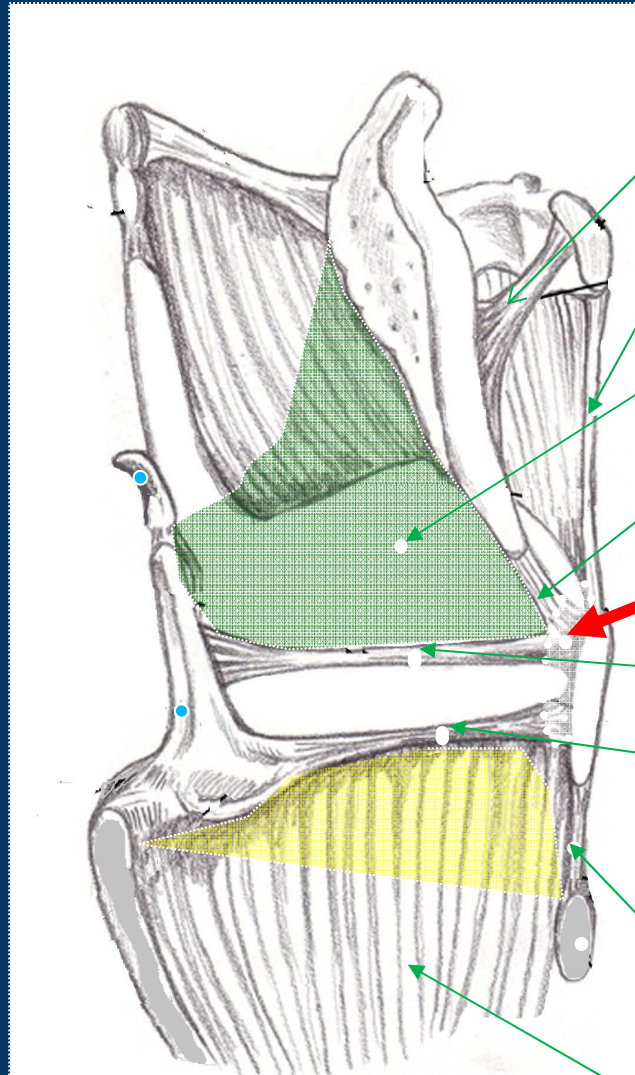
Legamento crico-tiroideo

Condensazione anteriore del cono elastico

Cono elastico



Strutture connettivali



Legamento io-epiglottico

Membrana Tiro-ioidea

Membrana quadrangolare

Legamento tiro-epiglottico

Legamento di Broyles

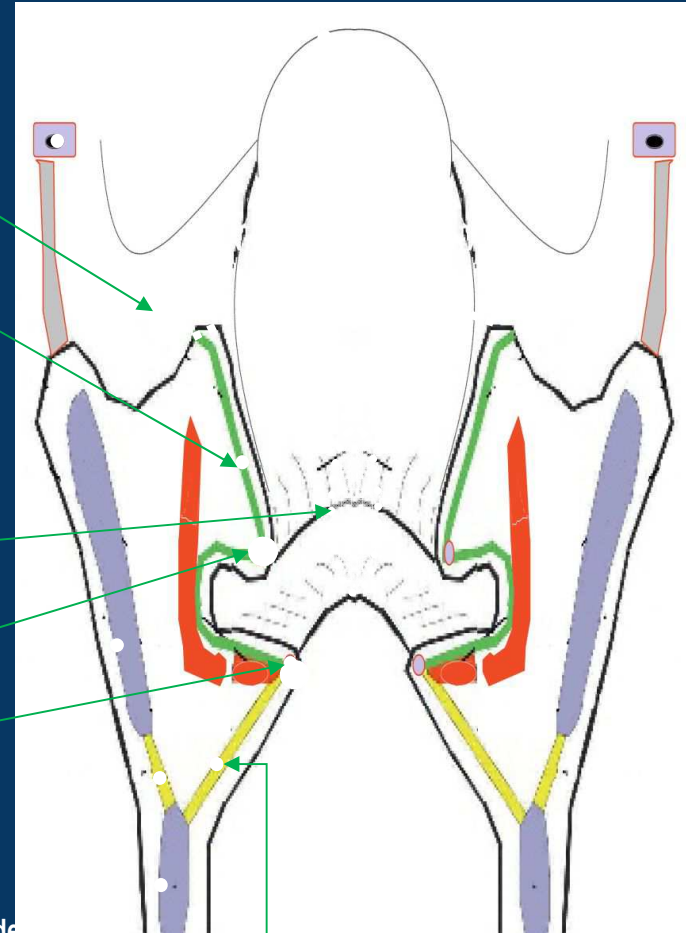
Legamento del ventricolo

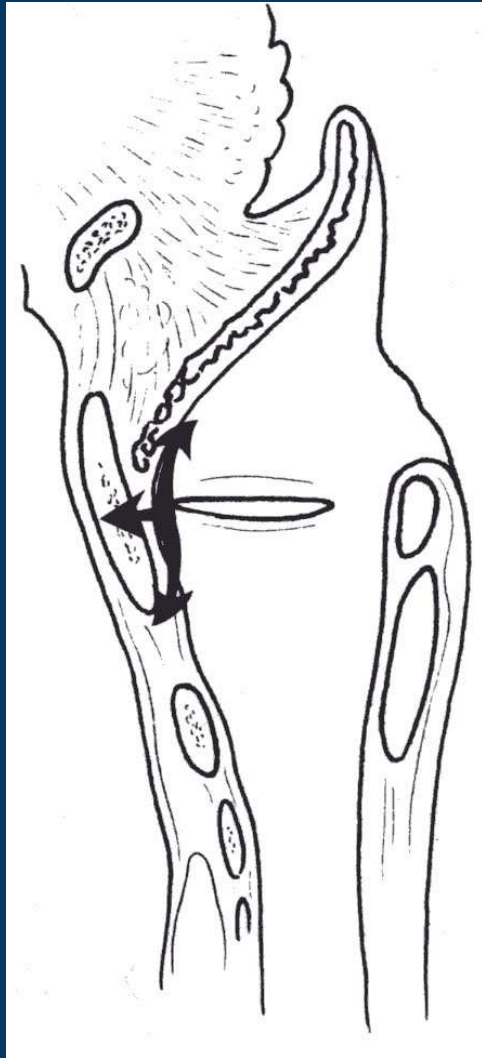
Corda voale

Legamento crico-tiroideo

Condensazione anteriore del cono elastico

Cono elastico



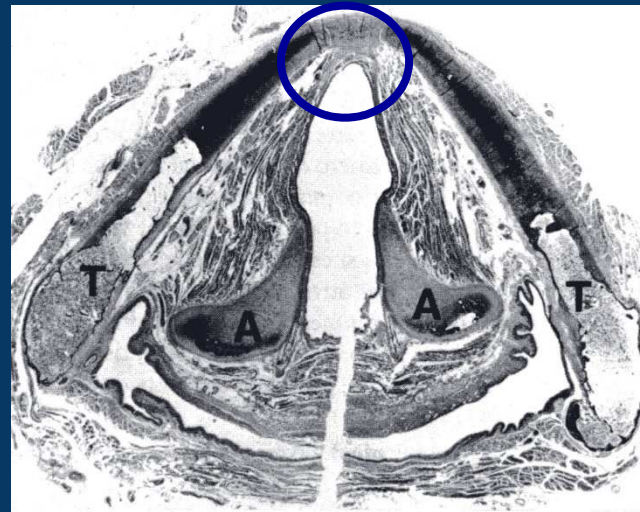


LEGAMENTO DI BROYLE

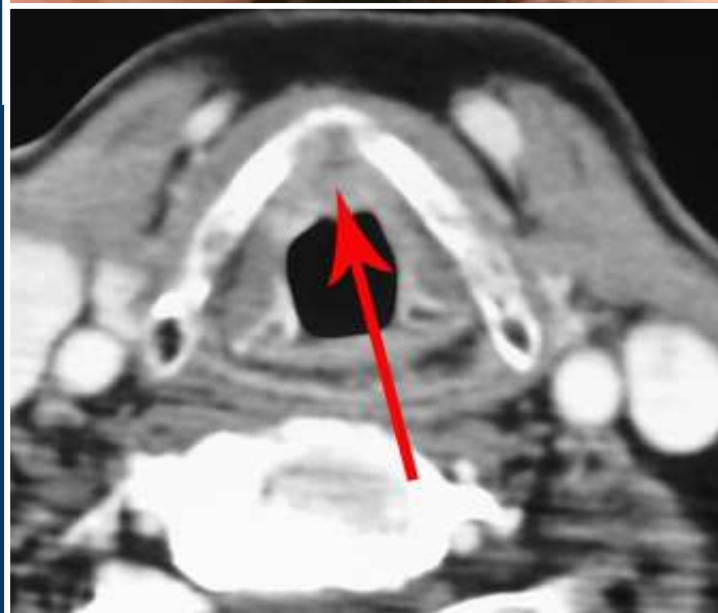
No pericondrio e strato sottomucoso

Inserzione del legamento vocale e tireoepiglottico

No pericondrio

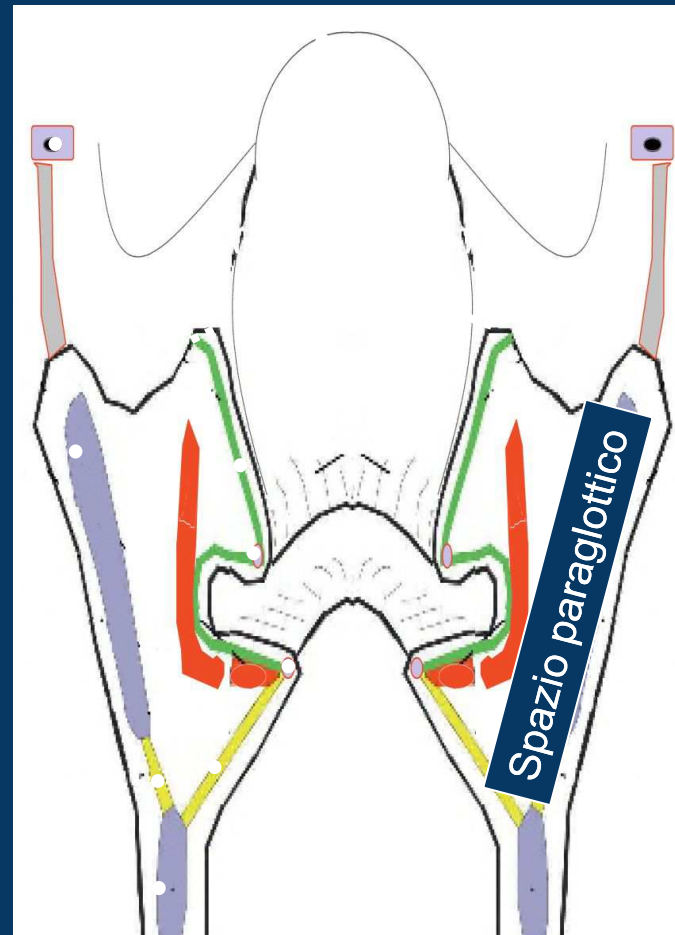
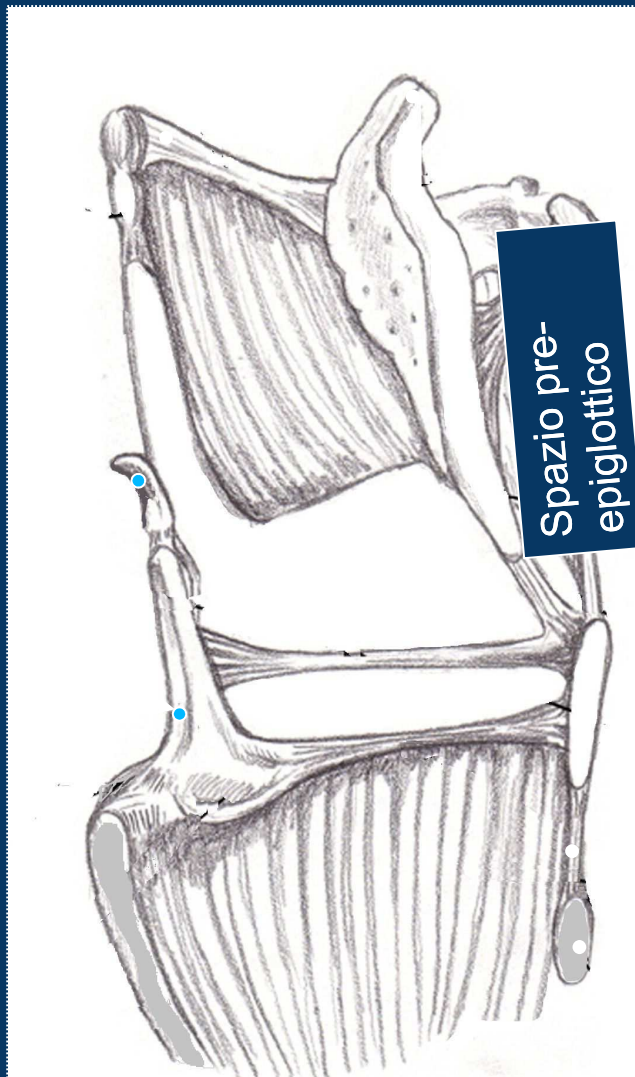


NEOPLASIE DELLA COMMISSURA ANTERIORE



Courtesy H&N Surgery Dept. IEO

Spazi

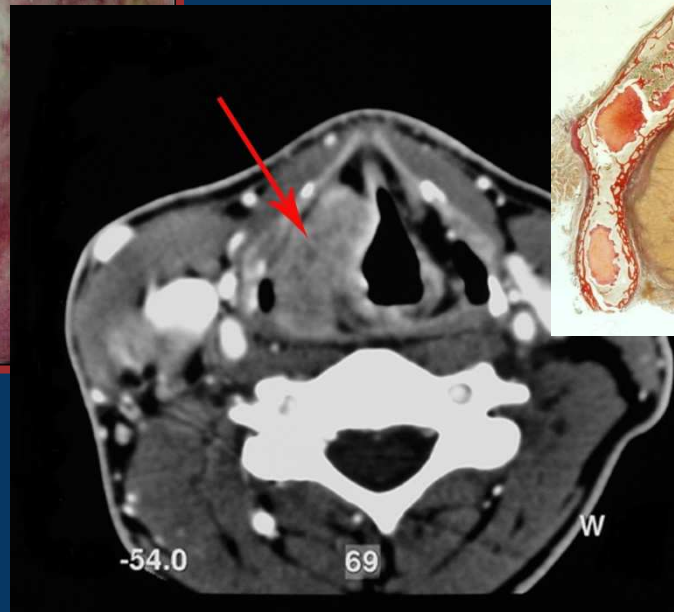
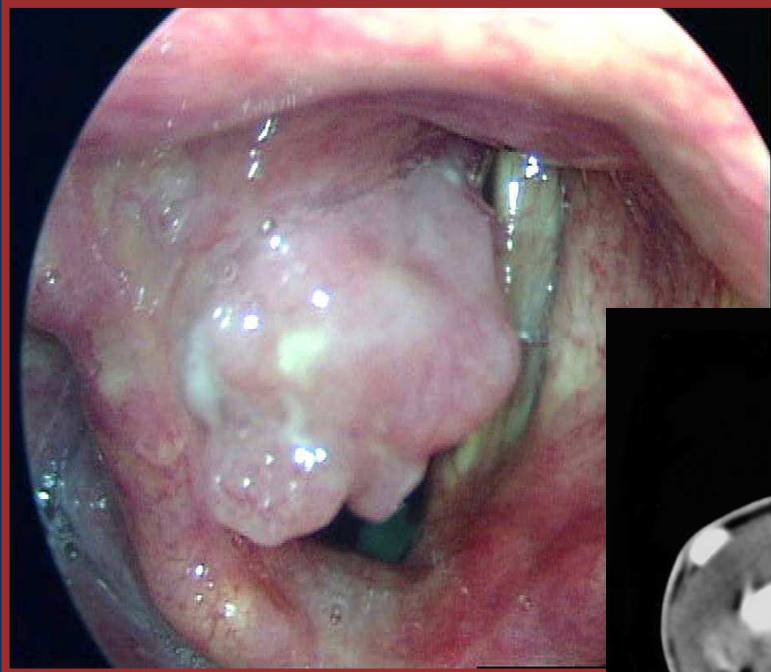


SPAZIO PRE-EPIGLOTTICO



SPAZIO PARAGLOTTICO SUPERIORE

Continuità dello spazio pre-epiglottico con lo spazio paraglottico superiore attraverso il ventricolo



PUNTO CRITICO

Spazio paraglottico / spazio-membrana cricotiroidea

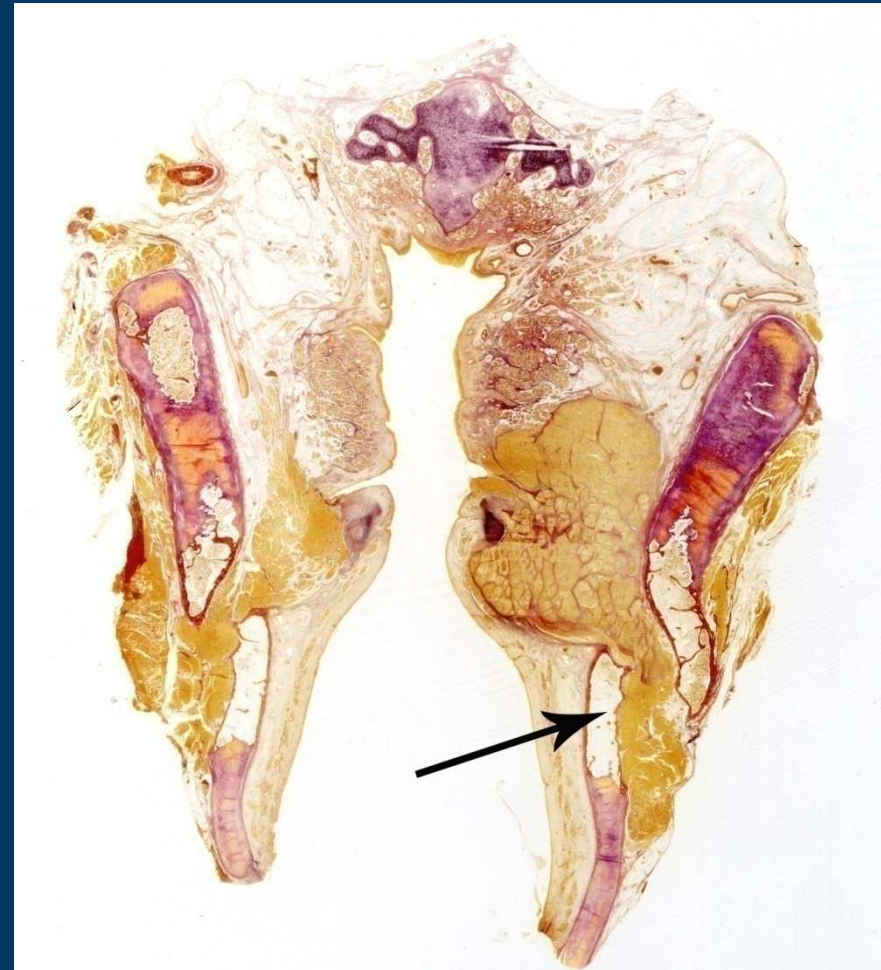
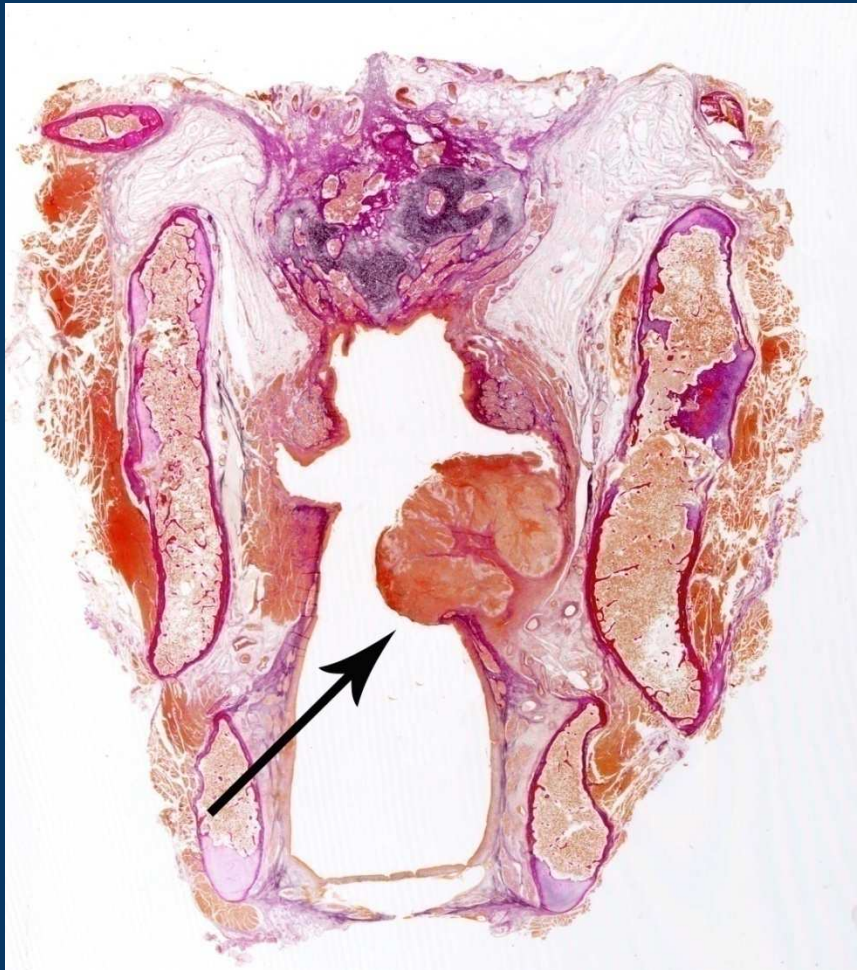
T2



T3



T4



Tratto da Pratical Guide to neck dissection Lucioni

CONTOURING CTV High Risk



Cancer/Radiothérapie 14 Suppl. 1 (2010) S43–S51



Disponible en ligne sur
 ScienceDirect
www.sciencedirect.com

Elsevier Masson France

www.em-consulte.com



Cancer de l'hypopharynx et du larynx : proposition de sélection
et délimitation des volumes cibles microscopiques péri-tumoraux
(aires ganglionnaires exclues)

Hypopharynx and larynx cancers: propositions for the selection and the delineation
of peritumoral microscopic disease volumes (lymph nodes excluded)

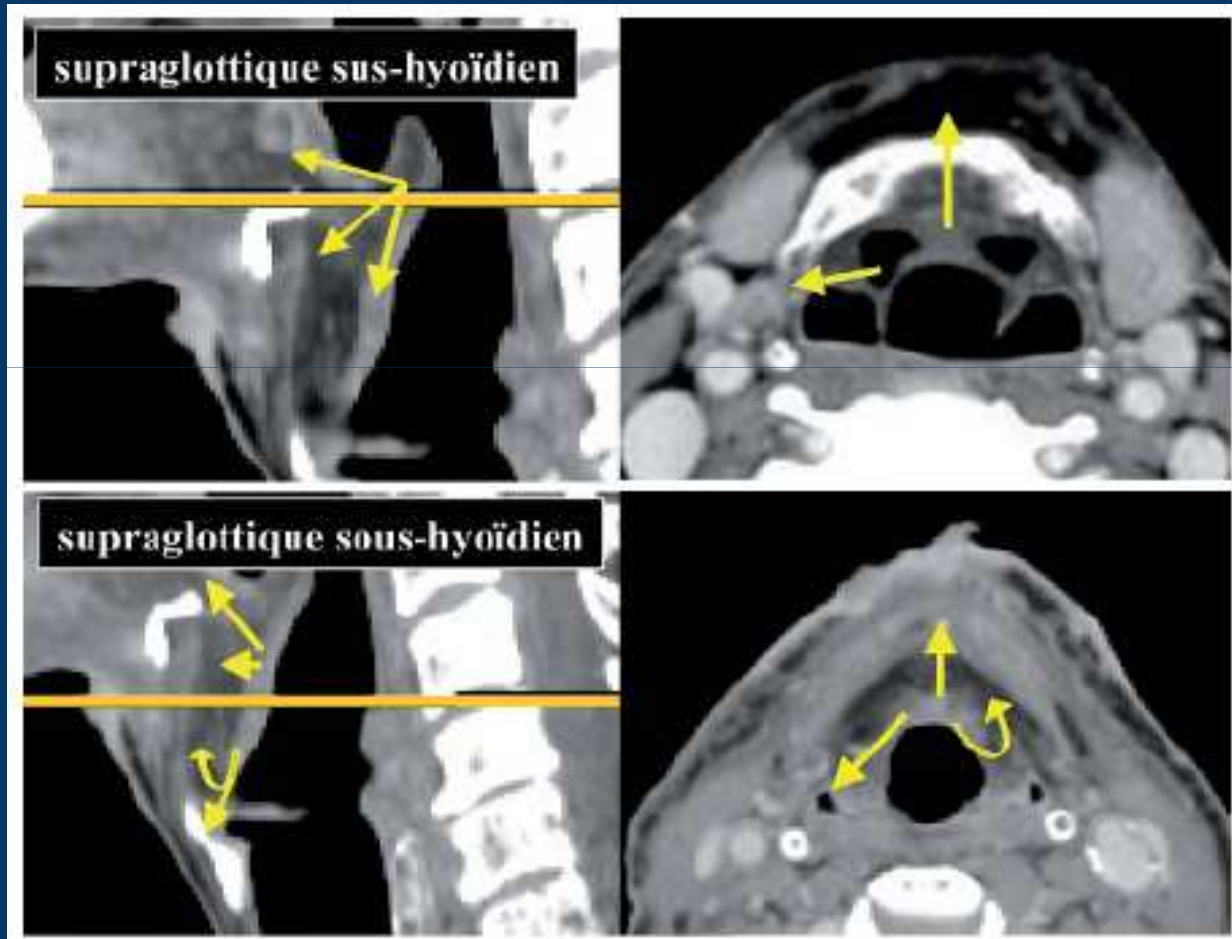
M. Lapeyre^{a,*}, C. Bailly^b, I. Toledano^a, A. Montalban^c, M. Russier^c

^a Département de radiothérapie, centre Jean-Perrin, 58 rue Montalembert, BP 5026, 63011 Clermont Ferrand cedex 1, France

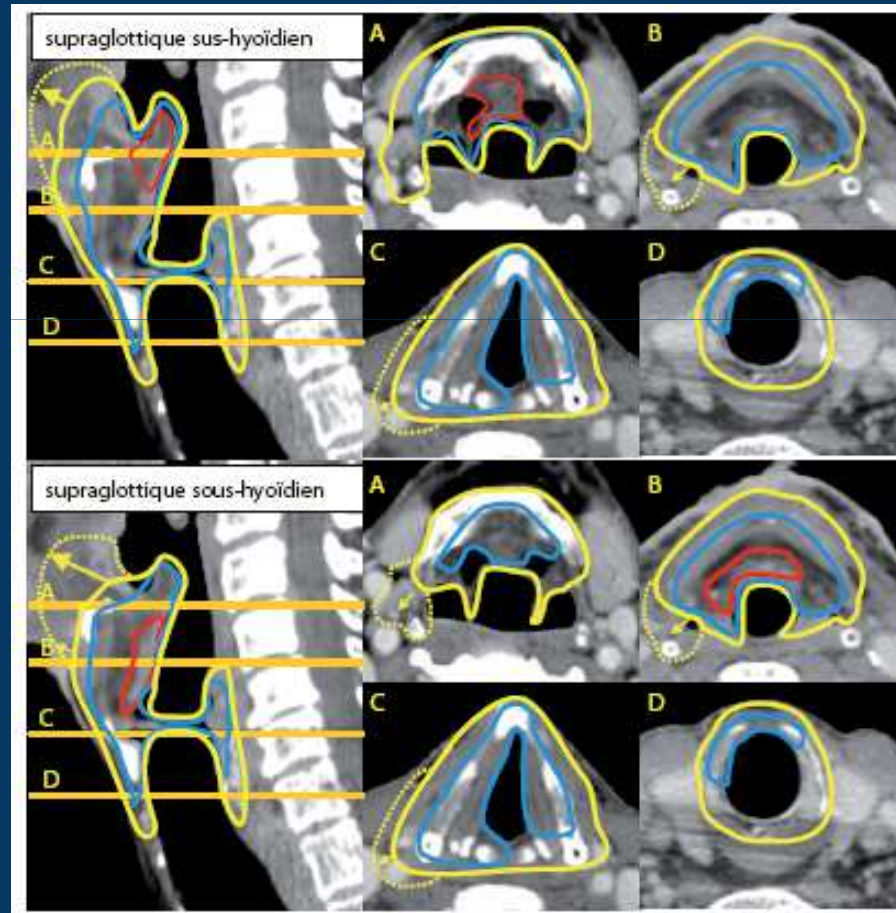
^b Département de radiodiagnostic, centre Jean-Perrin, 58 rue Montalembert, BP 5026, 63011 Clermont Ferrand cedex 1, France

^c Département de chirurgie ORL, centre Hospitalier universitaire, hôpital Gabriel-Montpied, 58 rue Montalembert, 63003 Clermont Ferrand cedex 1, France

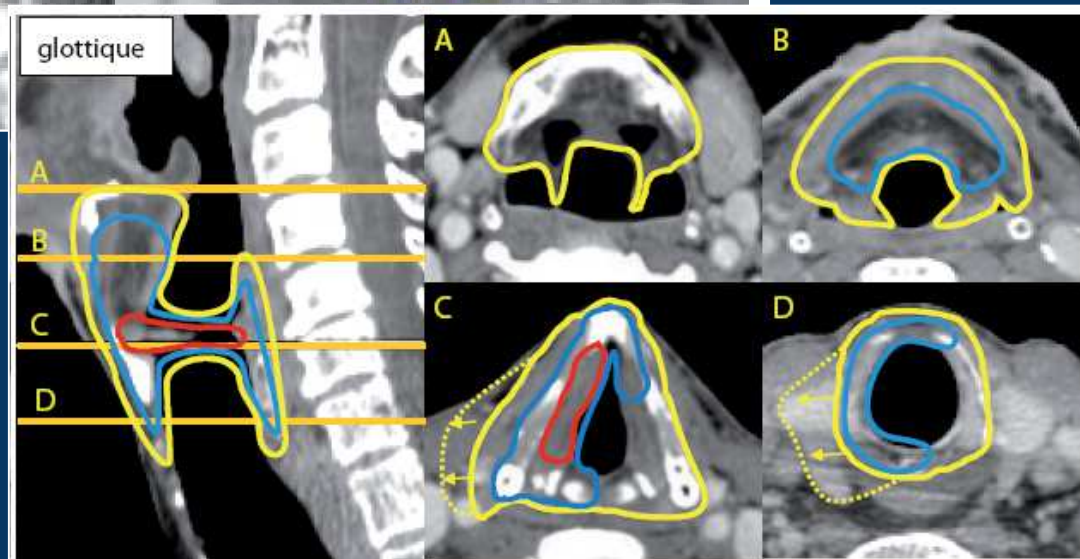
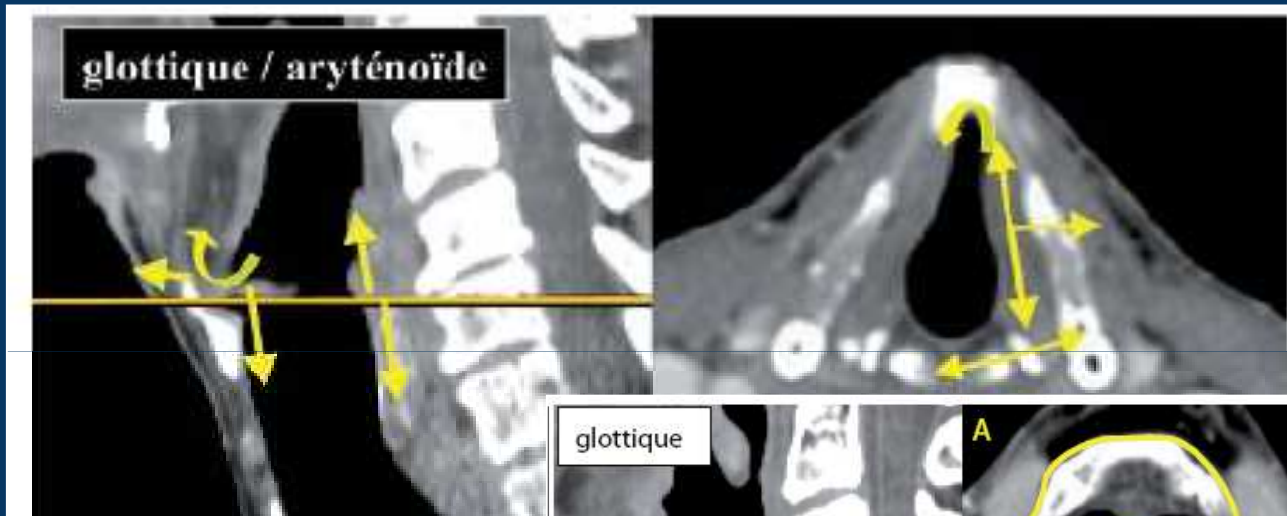
Laringe sovraglottica



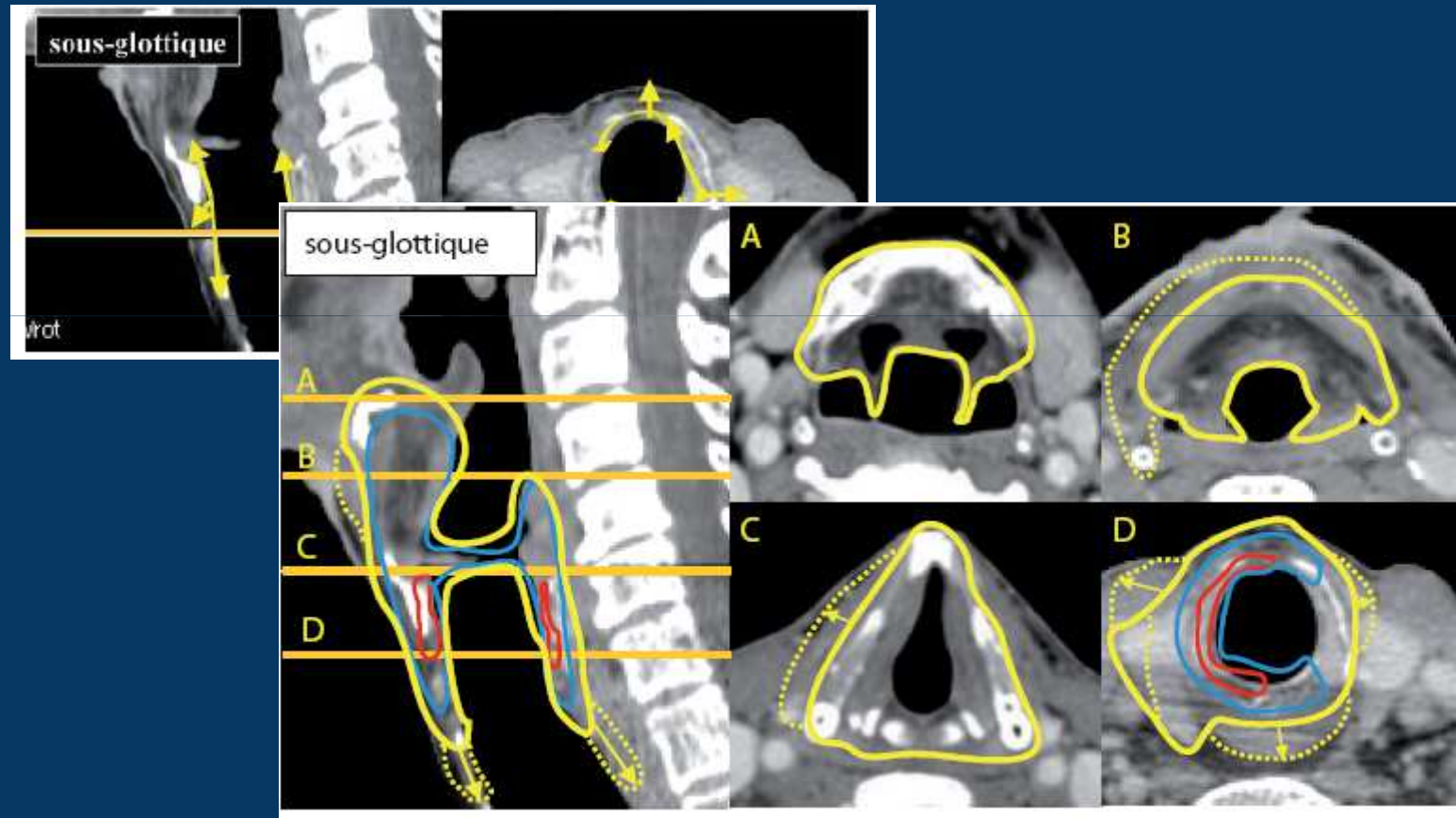
Laringe sovraglottica



Laringe glottica

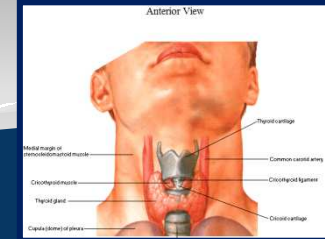


Laringe sottoglottica



MIGLIORAMENTO DEI RISULTATI ONCOLOGICI

?



STAZIONI LINFONODALI

- II – III- IV LIVELLO
- VI LIVELLO IN CASO DI
 - NEOPLASIA SOTTOGLOTTICA
 - SCONFINAMENTO TESSUTI MOLLI ANTERIORI
 - INFILTRAZIONE DELLA TIROIDE

Vorwerk and Hess *Radiation Oncology* 2011, 6:97
<http://www.ro-journal.com/content/6/1/97>



REVIEW

Open Access

Guidelines for delineation of lymphatic clinical target volumes for high conformal radiotherapy: head and neck region

Hilke Vorwerk^{1,2*} and Clemens F. Hess¹

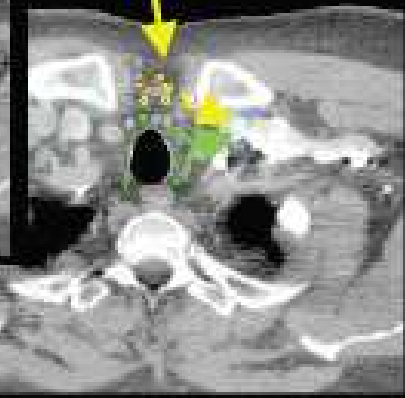
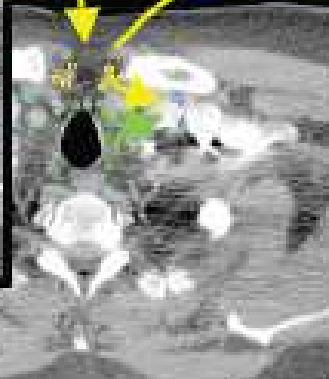
**LN cervicales anteriores
superficiales (VI)**



LN infrahyoidei (VI)

**LN jugulares mediales
(III)**

**LN jugulares inferiores
(IV)**



Verweij and Hess, *Radiation Oncology* 2014, 4:97
<http://www.radiationoncology.com/content/4/1/97>

**RADIATION
ONCOLOGY**

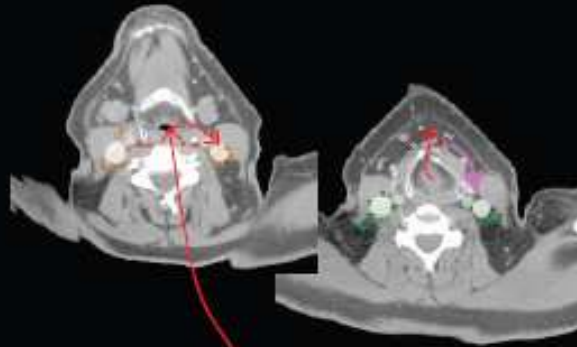
REVIEW

Open Access

Guidelines for delineation of lymphatic clinical target volumes for high conformal radiotherapy: head and neck region

Hille Vorwerk^{1,2*} and Clemens F. Hess¹

Drainage from the supraglottic endolarynx

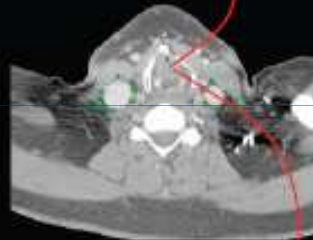


LN infrahyoidei (VI)

LN ventrales jugulares superiores (IIA)

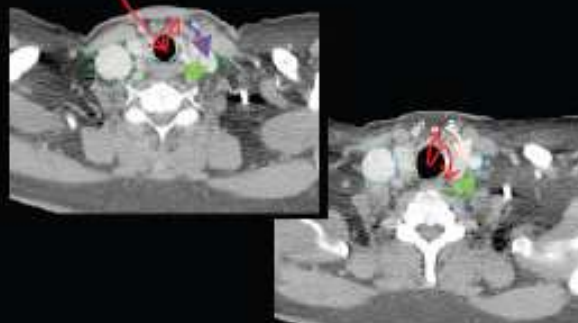
LN jugulares mediales (III)

Drainage from the glottic endolarynx



✗ crossing the sides!

Drainage from the subglottic endolarynx



LN prelaryngeales (VI)

LN pretracheales (VI)

LN paratracheales (VI)

LN jugulares mediales (III)

LN jugulares inferiores (IV)

Verwer et al. *Head Neck* 2014; 36: 437
<http://www.jco.org/content/36/3/437>

RADIATION ONCOLOGY

REVIEW

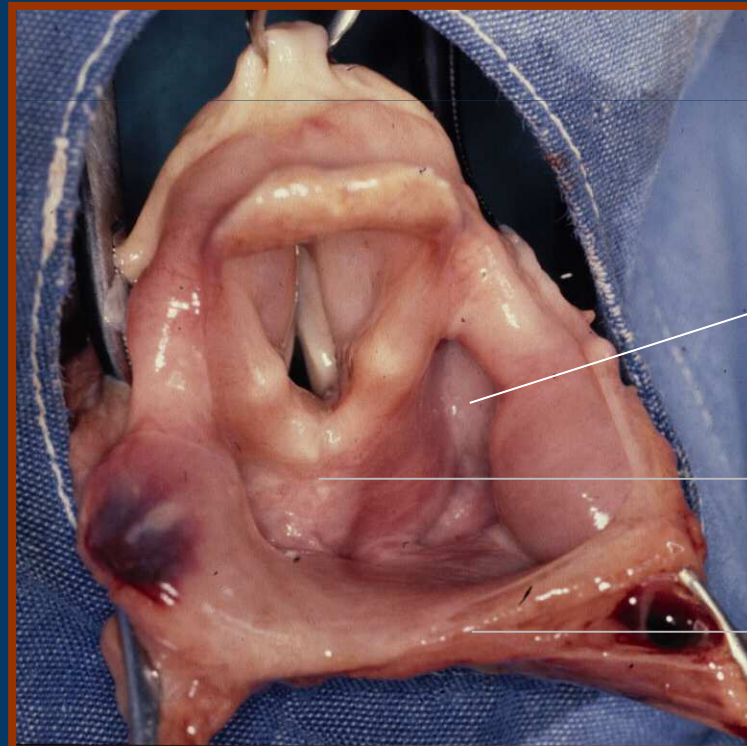
Open Access

Guidelines for delineation of lymphatic clinical target volumes for high conformal radiotherapy: head and neck region

Hille Vorwerk^{1,2*} and Clemens F. Hess¹

IPOFARINGE

- SOTTOSEDI



Seno piriforme

Area retrocricoidea

Parete posteriore
del faringe

DEFINIZIONE DEL GTV

DEFINIZIONE DI T

- FIBROSCOPIA
- INDAGINI RADIOLOGICHE (TC ED RM)

DEFINIZIONE DI N

- ESAME OBIETTIVO
- ECOGRAFIA
- TC
- FDG-PET

Caratteristiche dell'ipofaringe

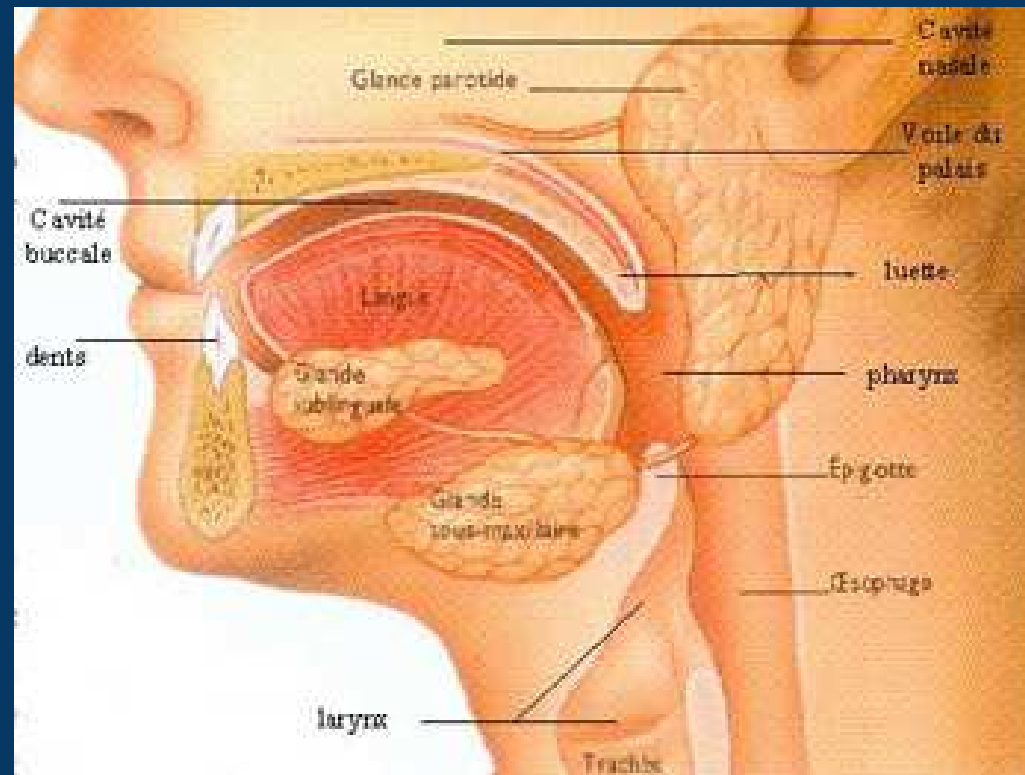
- No barriere anatomiche
- Precoce infiltrazione dello spazio pre e paraglottico
- Precoce metastatizzazione linfonodale
- **LINFONODI**
 - II, III, IV LIVELLO
 - PRE-LARINGE E PARATRACHEALI
 - V LIVELLO E PARAFARINGEI(SOPRATTUTTO PARETE POSTERIORE)

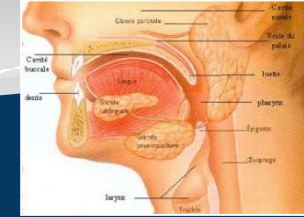
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 - II, III, IV LIVELLO
 - PRE-LARINGE E PARATRACHEALI
 - **V LIVELLO E PARAFARINGEI**
(SOPRATTUTTO PARETE POSTERIORE)

GHIANDOLE SALIVARI

Anatomia





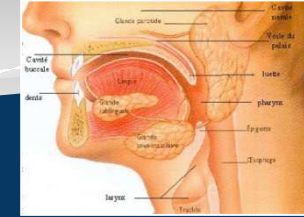
DEFINIZIONE DEL GTV

DEFINIZIONE DI T

- ESAME OBIETTIVO
- INDAGINI RADIOLOGICHE (ECOGRAFIA, TC E/O RM)

DEFINIZIONE DI N

- ESAME OBIETTIVO
- ECOGRAFIA, TC E/O RM



Volumi di trattamento

Gross Tumor Volume —————> **CTV HD**

Clinical Target Volume HR (loggia ghiandolare)

ANATOMIA FUNZIONALE

NEUROTROPISMO

RECIDIVA LUNGO IL DECORSO DEI N. CRANICI

- Caso Clinico

Sig. G.G. 50 aa

7.2009 Asportazione massa parafaringea sin +
svuotamento LC omolaterale

Istol. Carcinoma ex-adenoma pleomorfo infiltrante i tessuti
moli. Estesa infiltrazione perineurale

RTP post-operatoria

RECIDIVA LUNGO IL DECORSO DEI N. CRANICI

1.2011 Bradicardia ed ipotensione ingravescenti con
 episodi di perdita di coscienza

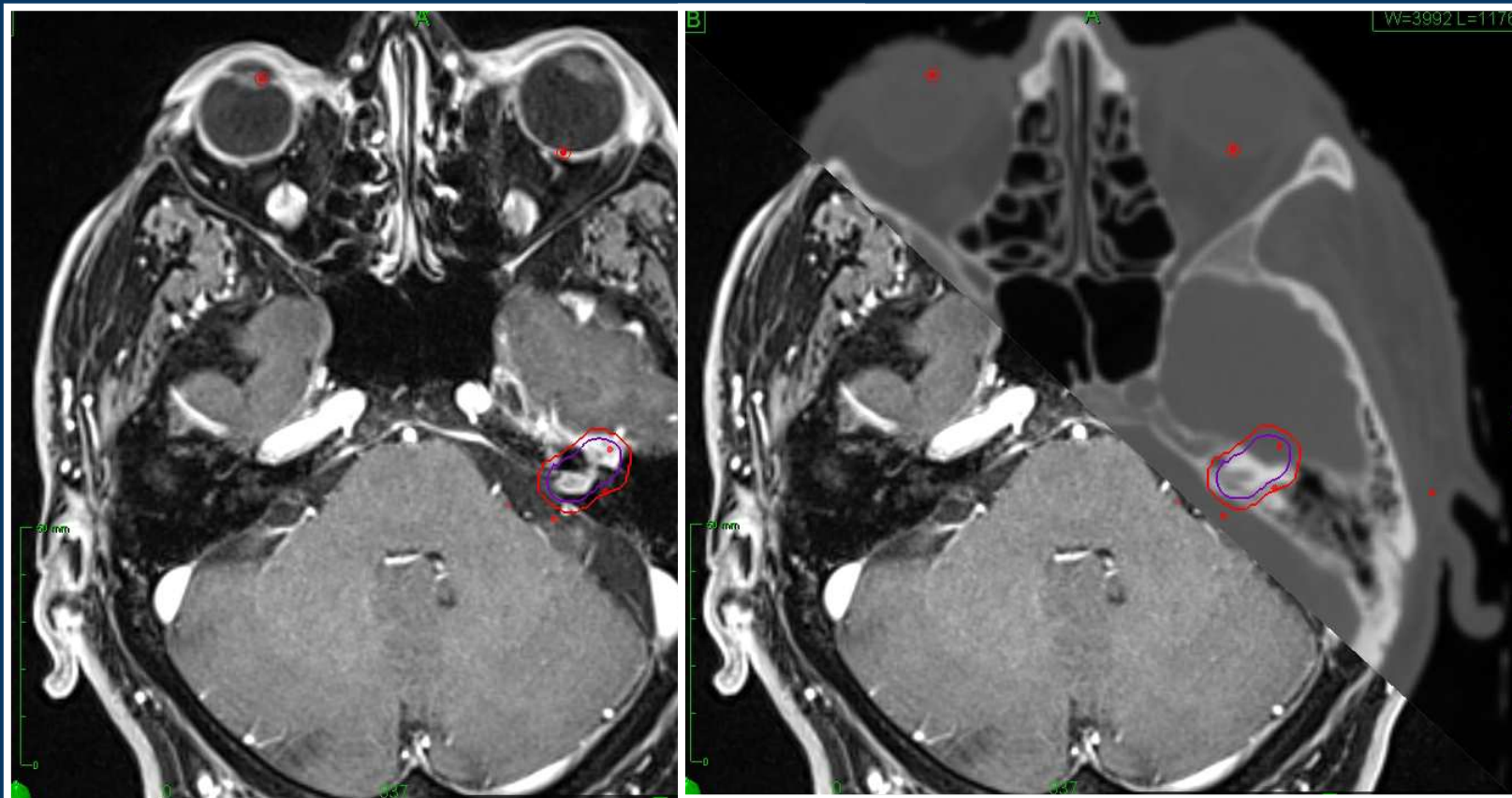
RM e FDG-PET : negative

6.2011 RM: infiltrazione neoplastica dei n. misti di sin.
 ispessimento del n. faciale

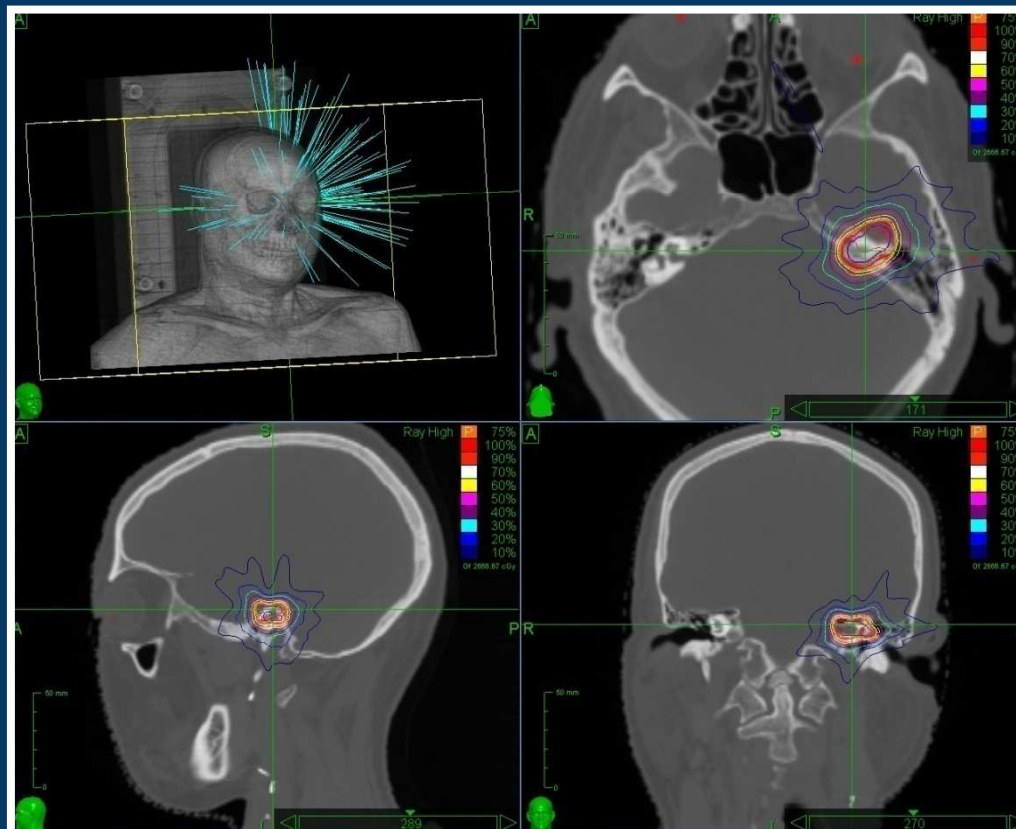
RTP sull'infiltrazione del IX-X-XI (51 Gy IMRT) con
miglioramento del quadro clinico e risposta radiologica

RECIDIVA LUNGO IL DECORSO DEI N. FACIALE

- Vertigine ed acufeni



RECIDIVA LUNGO IL DECORSO DEI N. FACIALE



Trattamento radiante
Cyberknife

20 Gy in 5 frazioni
Prescrizione 75%

Controllo a 3 mesi SD
Controllo dei sintomi con
Desametasone 2 mg

INFILTRAZIONE NERVOSA

Caso clinico

Sig.ra M.B. M, 67 aa

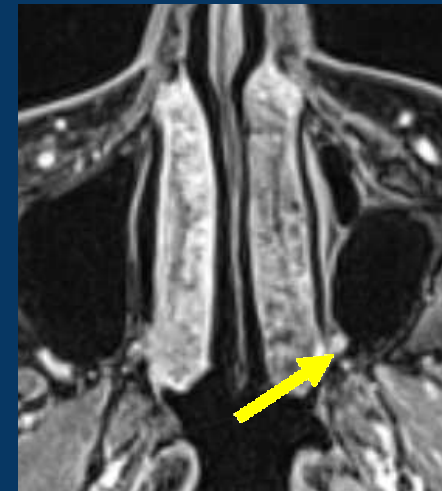
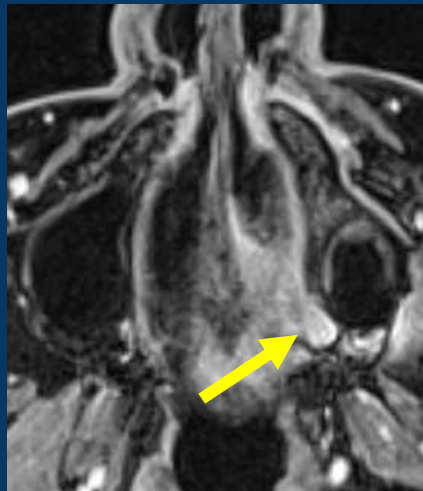
9.2012 In seguito a bonifica dentaria in previsione di implantologia
riscontro di ulcerazione dell'emipalato duro di sin di 15x6 mm

Biopsia: ca adenoideo cistico

INFILTRAZIONE N. PALATINO

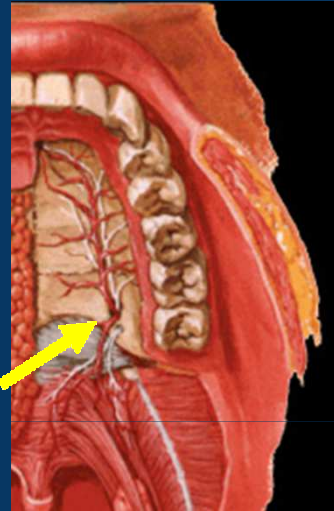


Diffusione lungo il n. grande palatino
fino alla fossa pterigopalatina

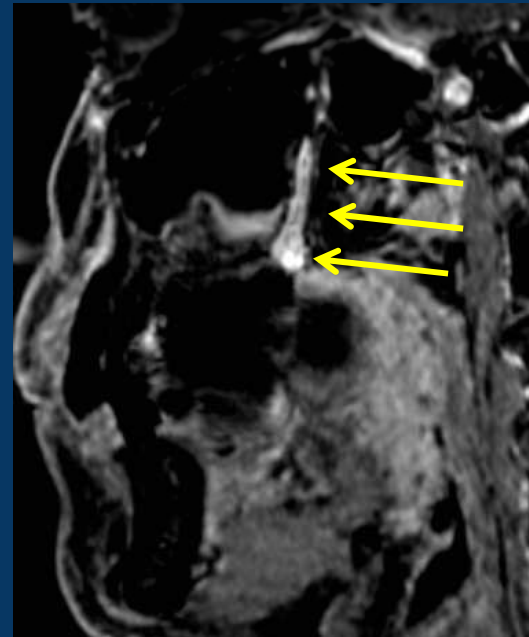
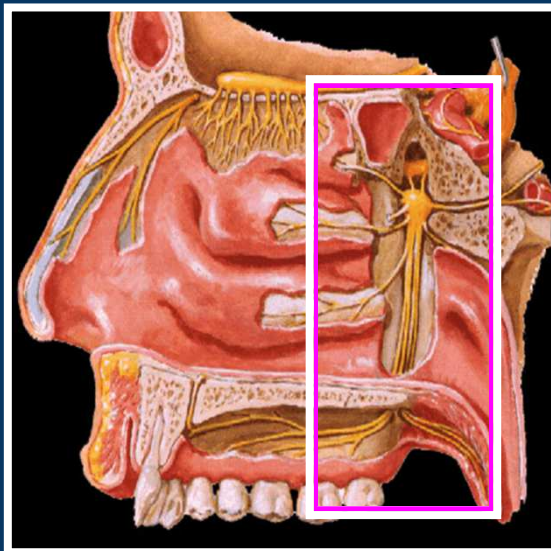


Courtesy Dr. Preda L Radiology Dept IEO

INFILTRAZIONE N. PALATINO



Diffusione lungo il n. grande palatino
fino alla fossa pterigopalatina



NEUROTROPISMO

DECORSO DEI NERVI CRANICI



Oral Oncology xxx (2013) xxx-xxx

Contents lists available at SciVerse ScienceDirect

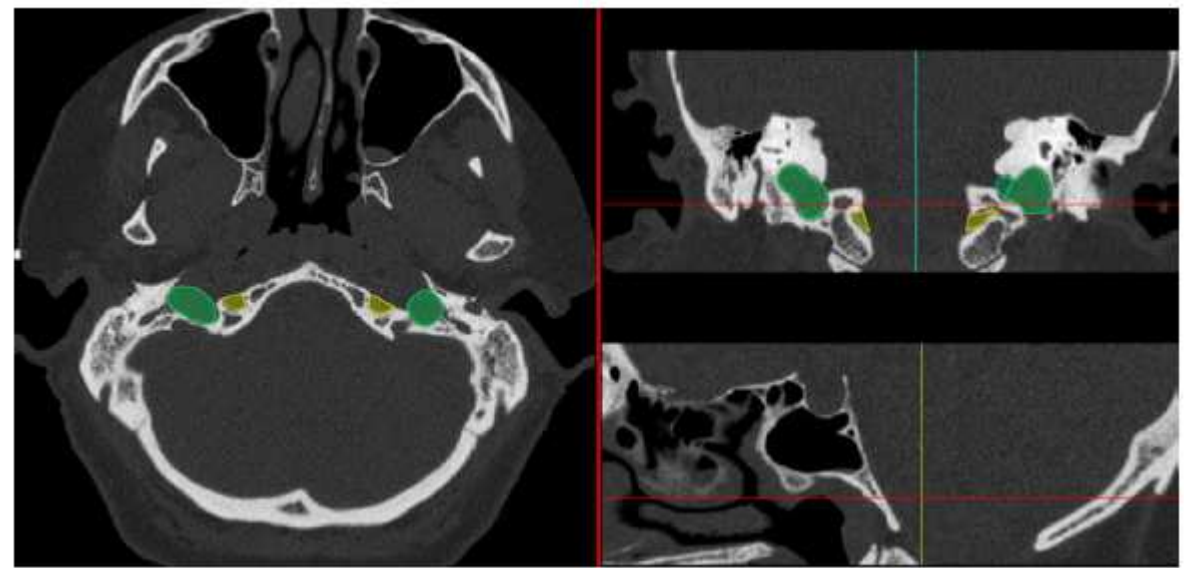
Oral Oncology

ELSEVIER journal homepage: www.elsevier.com/locate/oraloncology

Clinical validation and applications for CT the lower cranial nerves for head and neck

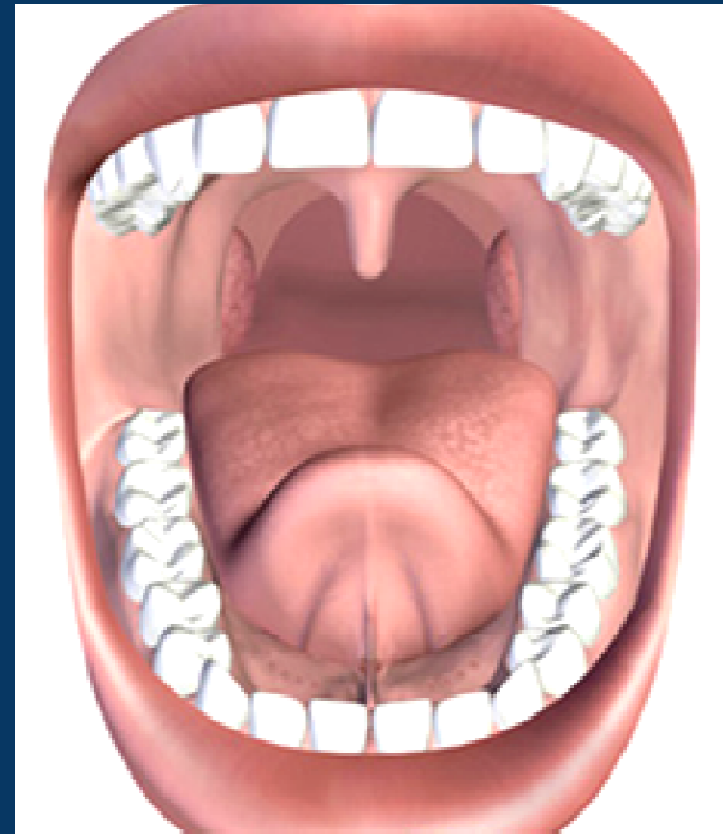
Waleed F. Mourad^{a,b,*}, Brett M. Young^c, Rebekah Yot Rania A. Shourbaji^a, Spiros Manolidis^d, Mauricio Gán Majid A. Khan^f, Daniel Shasha^a, Adriana Blakaj^b, Jon Shalom Kalnicki^b, Louis B. Harrison^a

^a Department of Radiation Oncology, Beth Israel Medical Center, New York, NY, United States
^b Department of Radiation Oncology, Montefiore Medical Center, Albert Einstein College of Medicine, Philadelphia, PA, United States
^c Department of Neuroradiology, Duke University Medical Center, Durham, NC, United States
^d Department of Otolaryngology, Beth Israel Medical Center, New York, NY, United States
^e Department of Neuroradiology, Beth Israel Medical Center, New York, NY, United States
^f Department of Neuroradiology, University of Mississippi Medical Center, Jackson, MS, United States

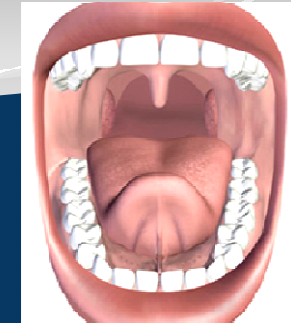


CAVO ORALE

- Vestibolo
 - Labbra, guance
 - Arcate alveolo-dentarie
 - Fornici gengivali
- Cavo orale propriamente detto
 - Arcate alveolo-dentarie
 - Palato duro
 - Corpo linguale
 - Solco alveolo-linguale



DEFINIZIONE DEL GTV



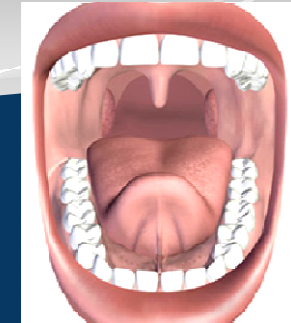
DEFINIZIONE DI T

- ESAME OBIETTIVO
- INDAGINI RADIOLOGICHE (TC –DENTAL SCAN- E RM)

DEFINIZIONE DI N

- ESAME OBIETTIVO
- ECOGRAFIA E/O TC E/O RM

DEFINIZIONE DEL GTV



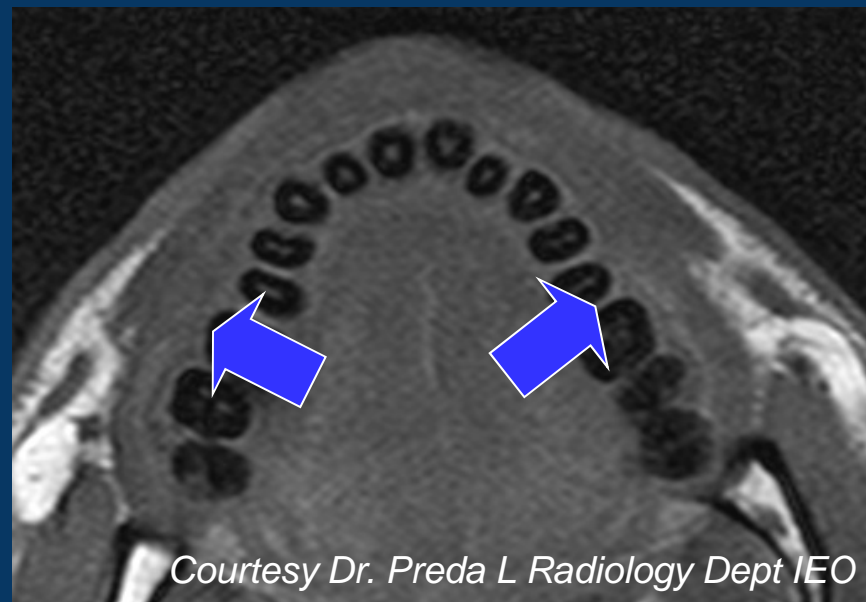
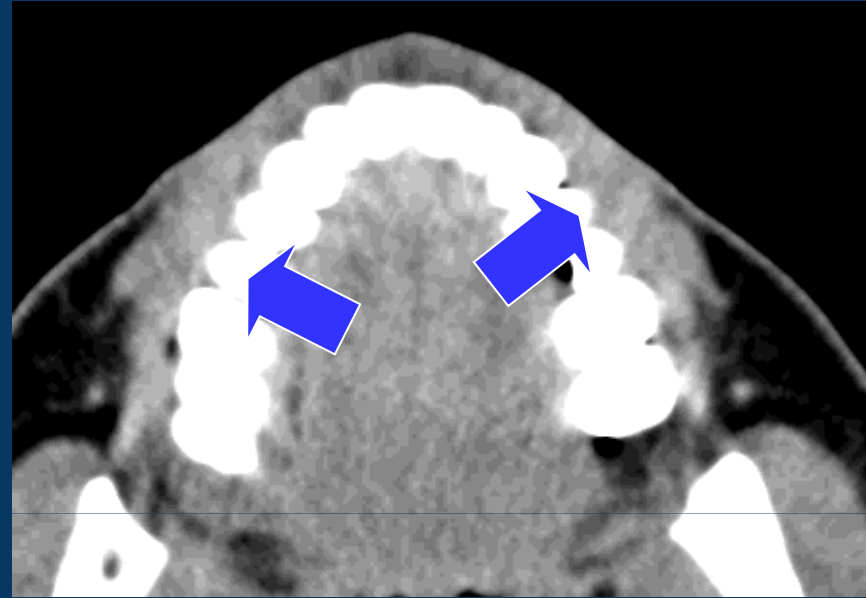
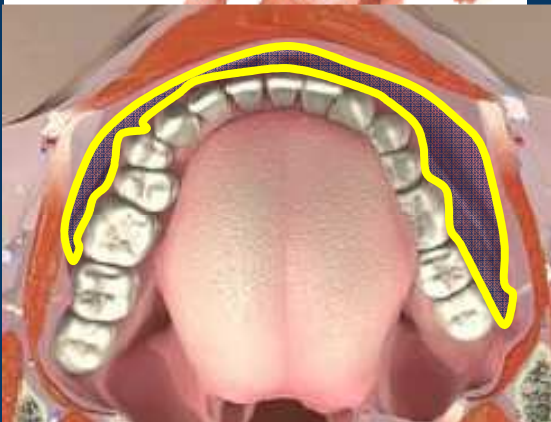
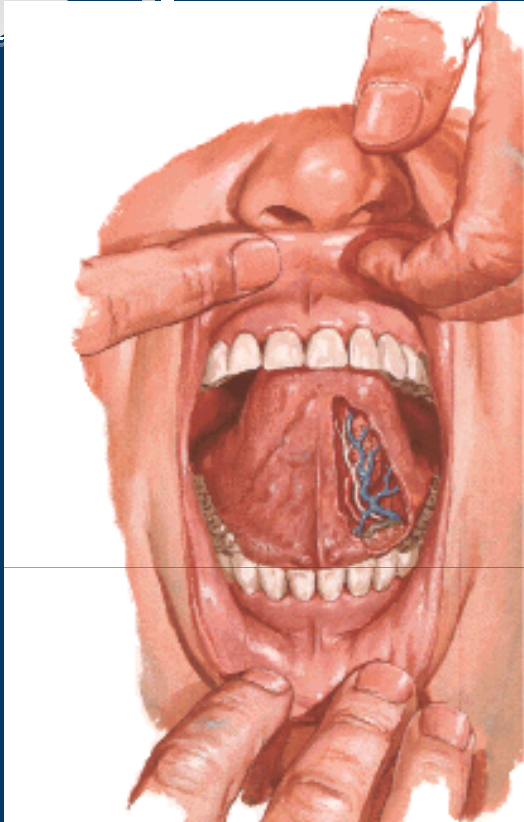
DEFINIZIONE DI T

- ESAME OBIETTIVO
- INDAGINI RADIOLOGICHE (TC –DENTAL SCAN- E RM)

DEFINIZIONE DI N

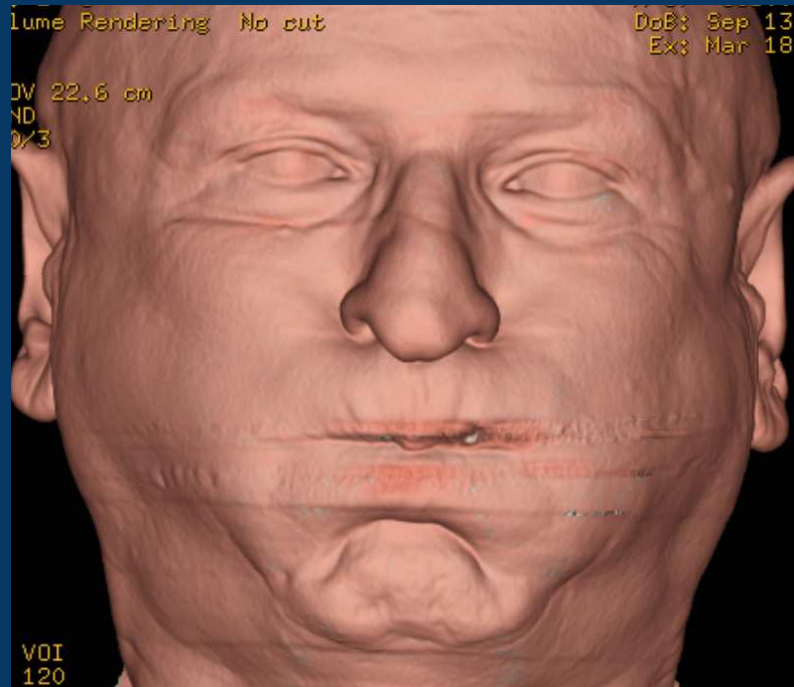
- ESAME OBIETTIVO
- ECOGRAFIA E/O TC E/O RM

Vestibolo



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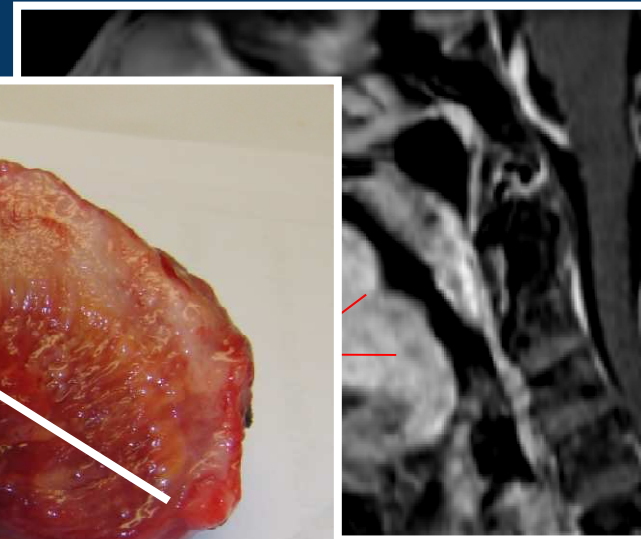
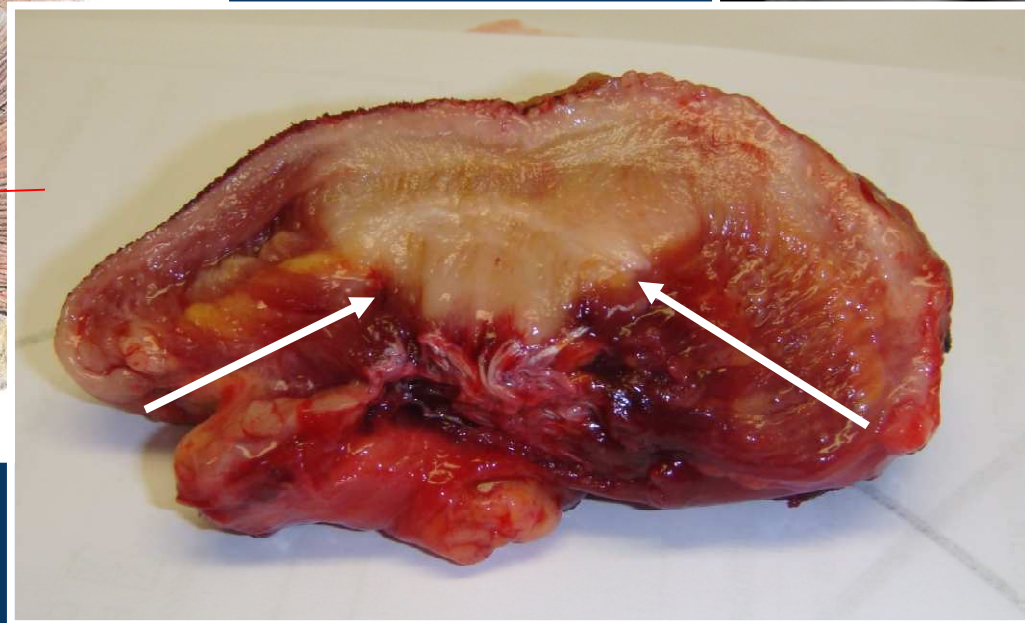
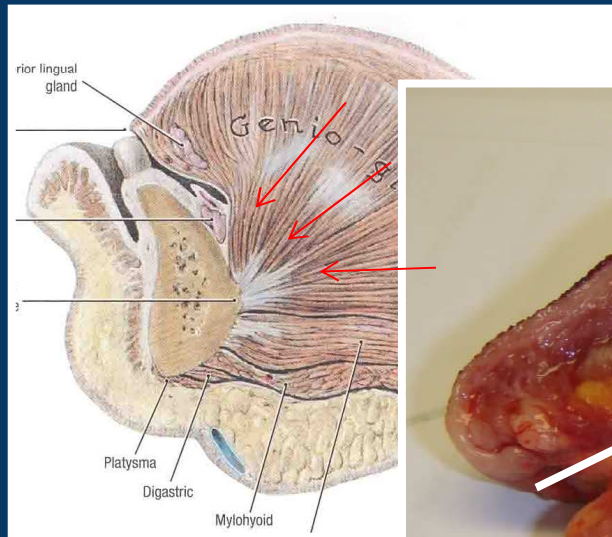
LESIONI SUPERFICIALI



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CAVO ORALE

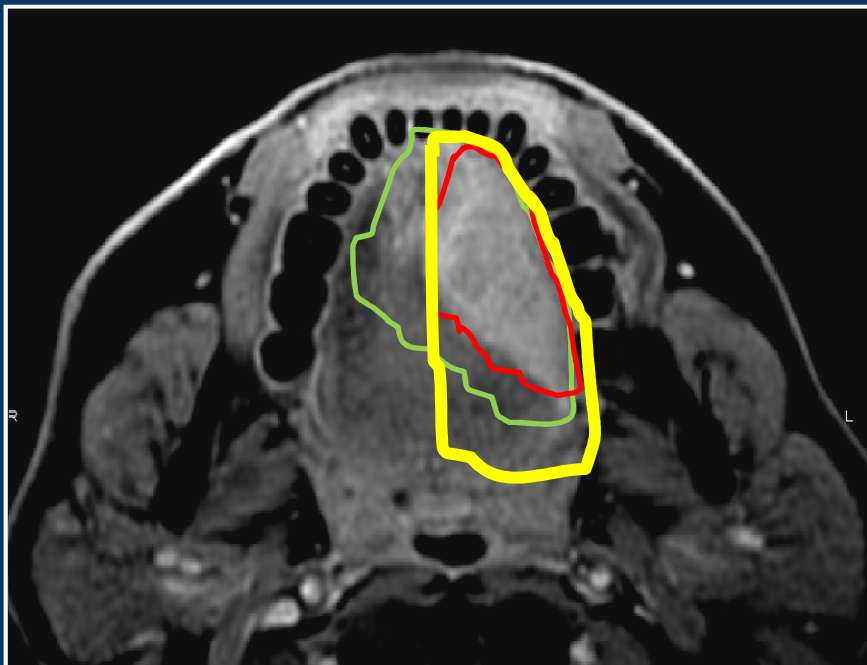
COMPARTIMENTO



CHIRURGIA COMPARTIMENTALE



CHIRURGIA COMPARTIMENTALE

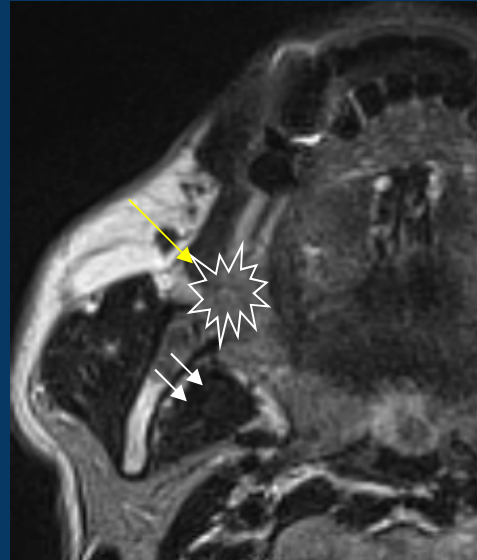


Trigono retromolare

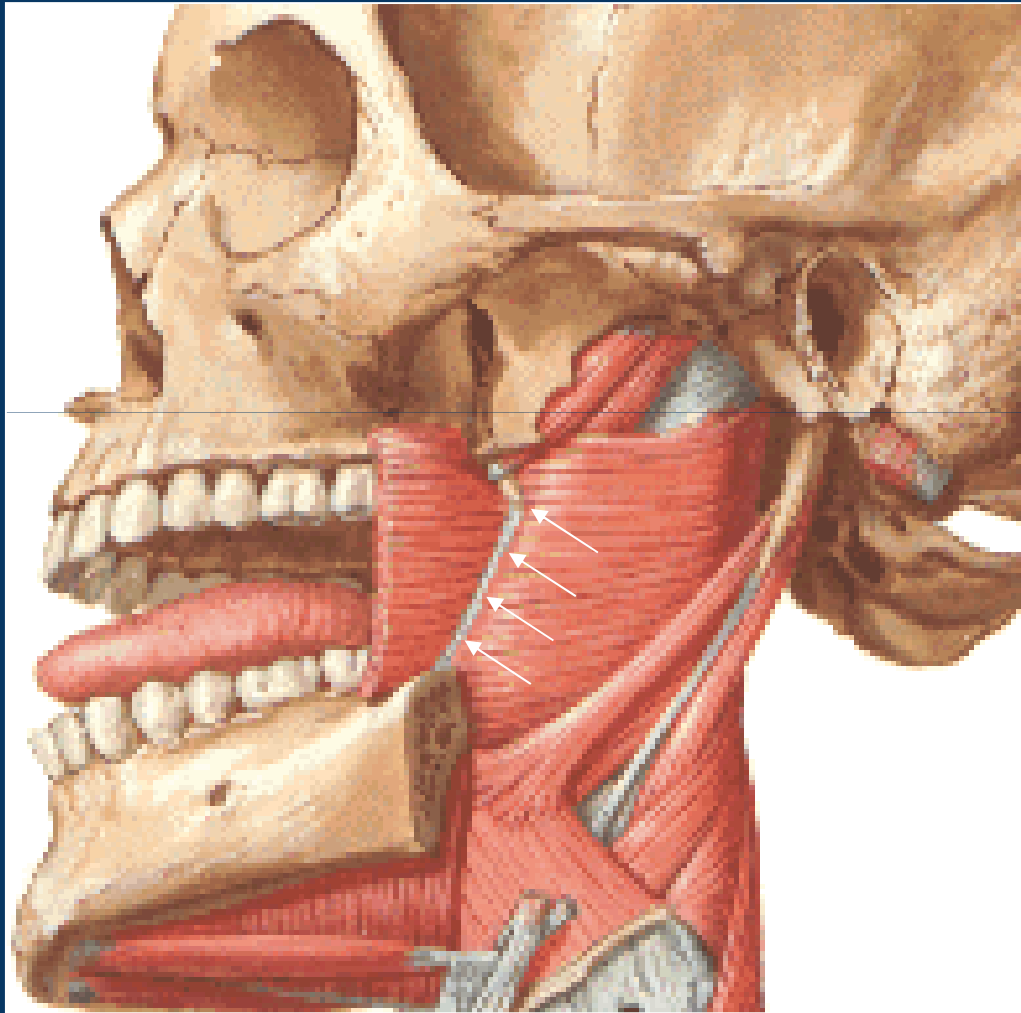


Estensione pluricompartimentale

- Osso (mandibola)
- Spazio vestibolare
- Regione tonsillare (orofaringe)
- M. pterigoideo mediale (sp. masticatorio)
- Fossa pterigo-palatina (rafe pterigo-mandibolare)



rafe pterigo-mandibolare



TRIGONO RETROMOLARE

- Caso clinico

Sig.ra V.A. F 40 aa

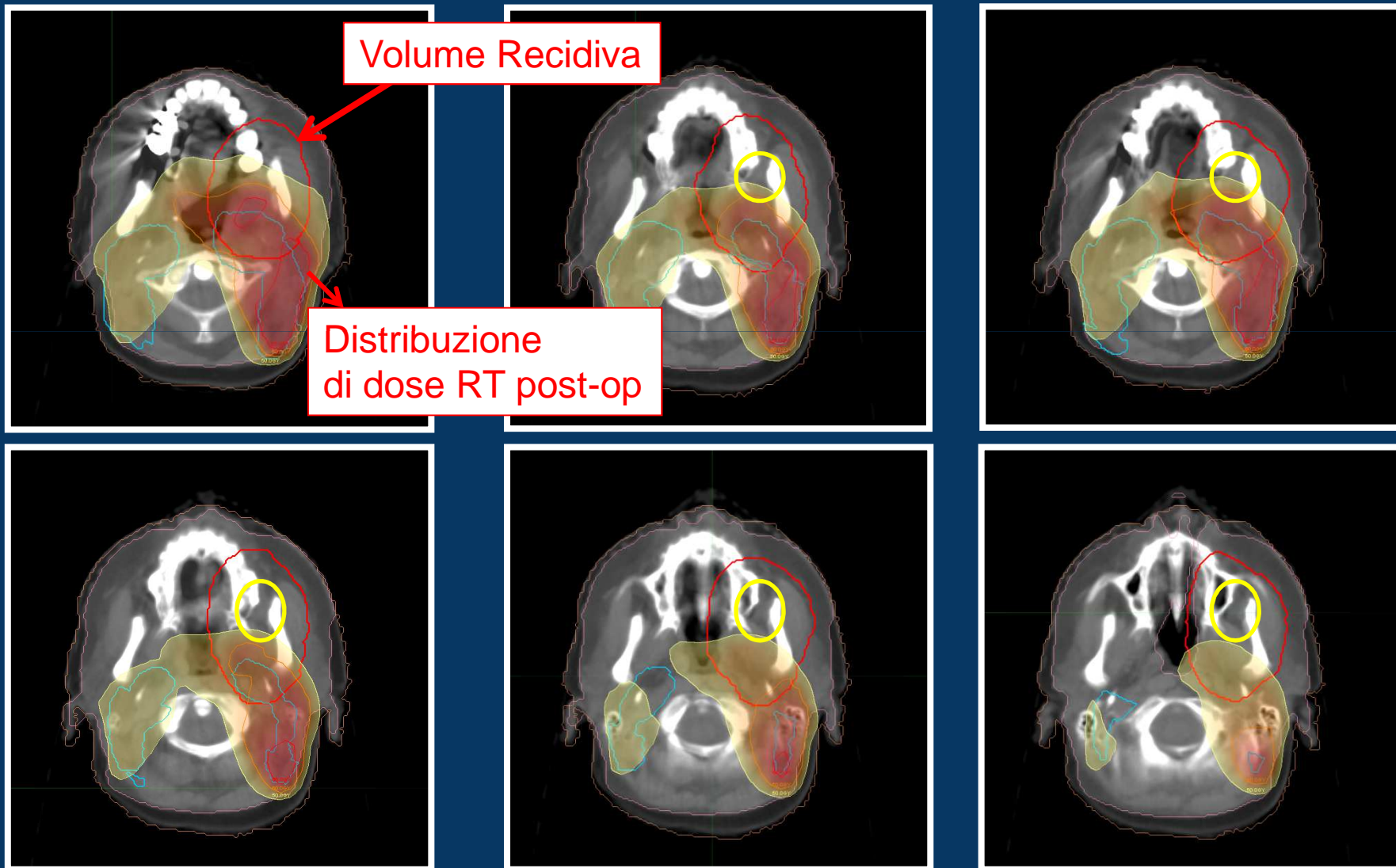
2011 Intervento chirurgico per asportazione della cresta alveolare e trigono retromolare dx ,
emimandibulectomia dx + svuotamento linfonodale LC

Istologico: Ca squamoso pT2 pN1

RTP post-operatororia fino alla dose di 64 Gy

2013 Recidiva locale

TRIGONO RETROMOLARE



TRIGONO RETROMOLARE

- Caso clinico 3

Paziente M.G F 83 aa

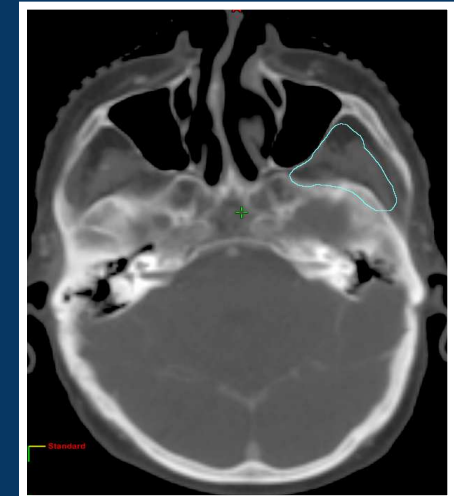
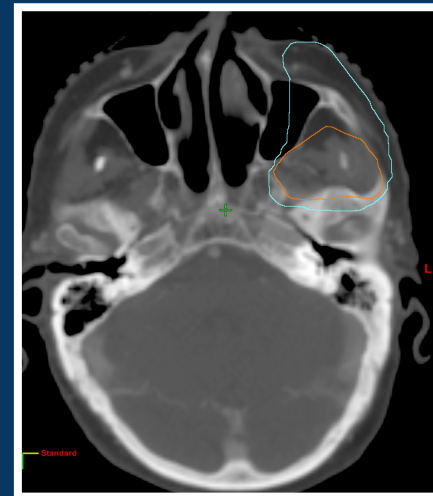
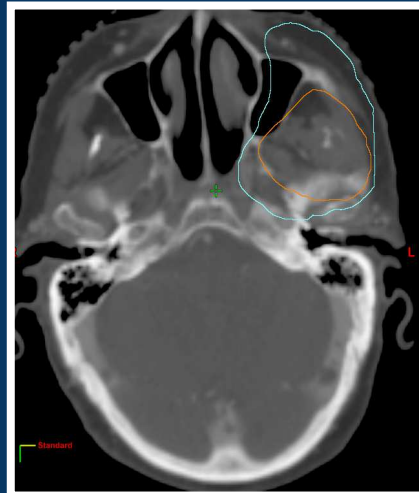
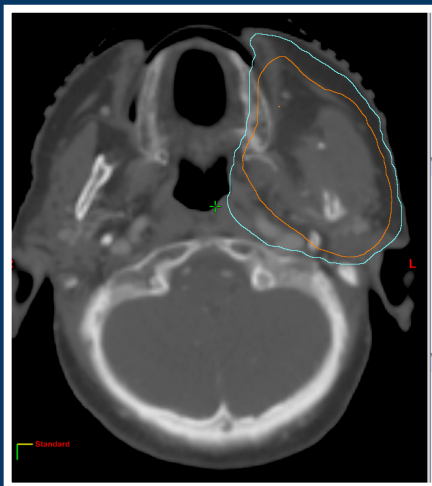
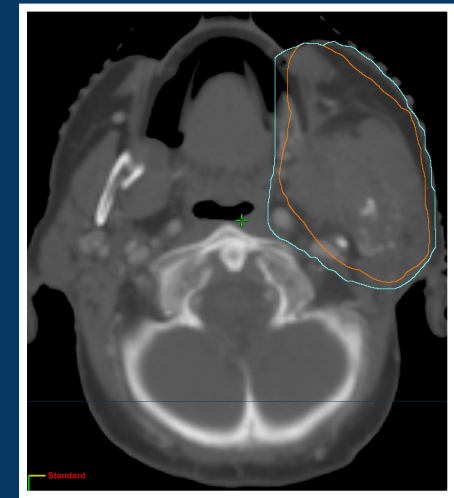
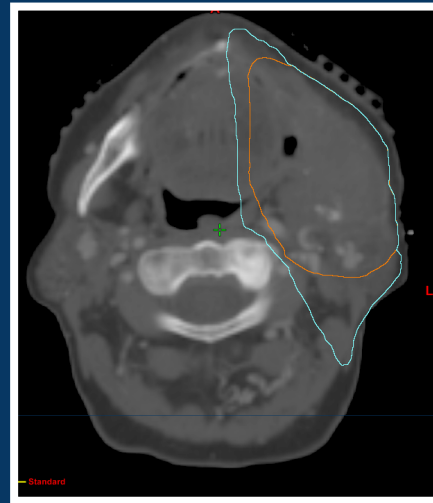
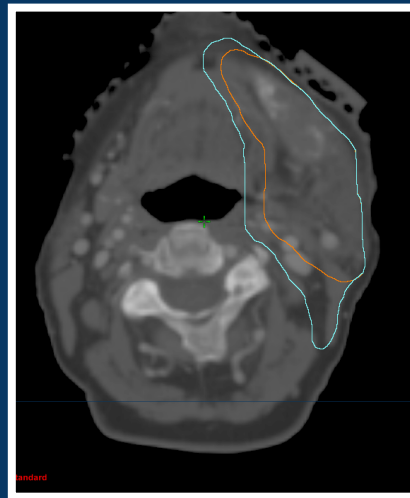
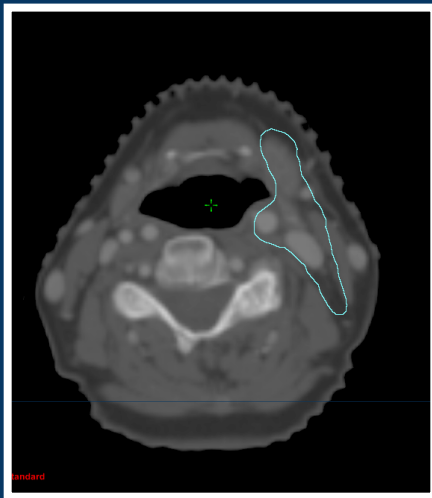
5.2012 Neoplasia dell'emimandibola sin, nella porzione orizzonale e branca montante della mandibola. Infiltrazione della muscolatura pterigoidea

TRIGONO RETROMOLARE

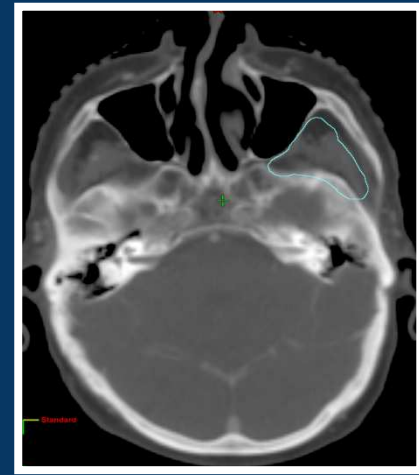
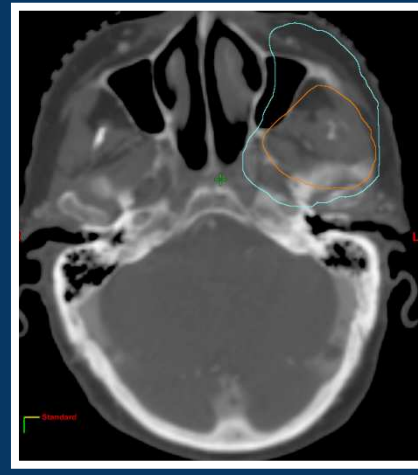
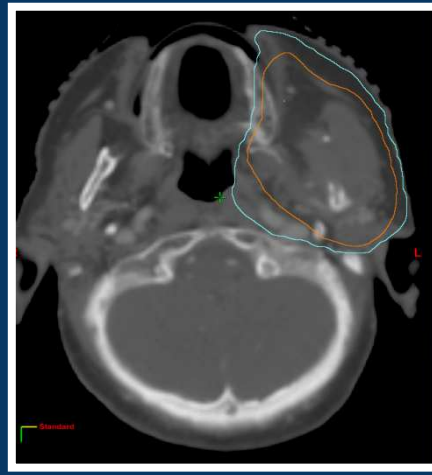
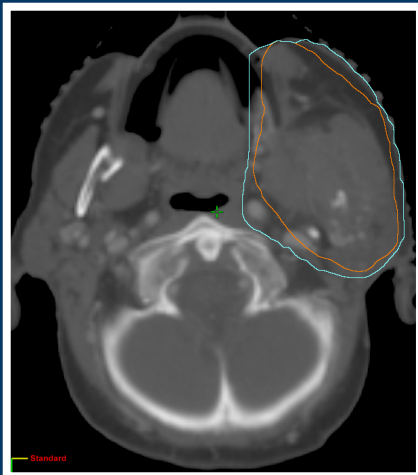
- Caso clinico 1



TRIGONO RETROMOLARE



TRIGONO RETROMOLARE



INFILTRAZIONE NERVOSA

- Caso clinico

Paziente S.F. 53aa, M

1.2010 Asportazione neoformazione labbro inferiore
e ricostruzione con lembo

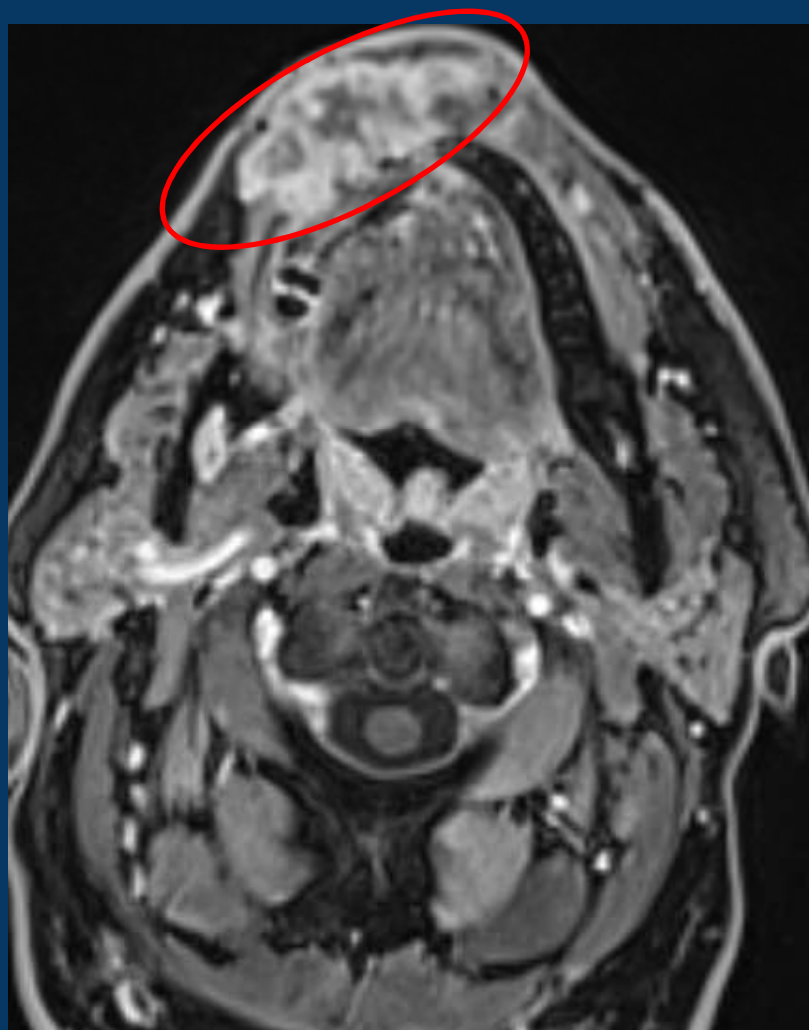
Istologico: Melanoma desmoplasico
neurotrofo

4.2010 Linfoadenectomia LC bilaterale

Istologico: metastasi da melanoma desmoplasico
pN2b

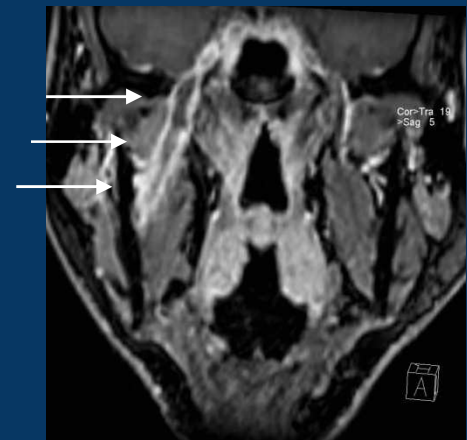
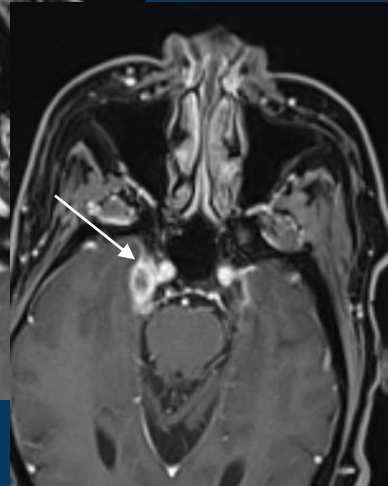
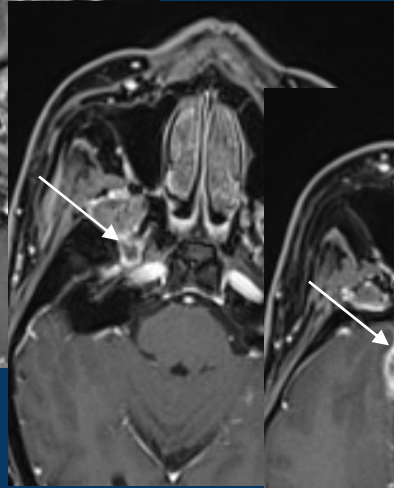
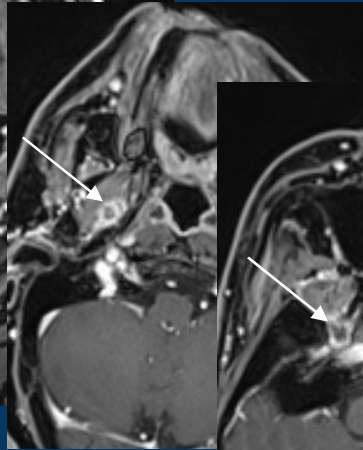
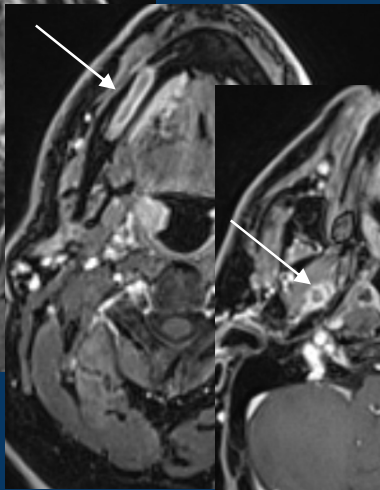
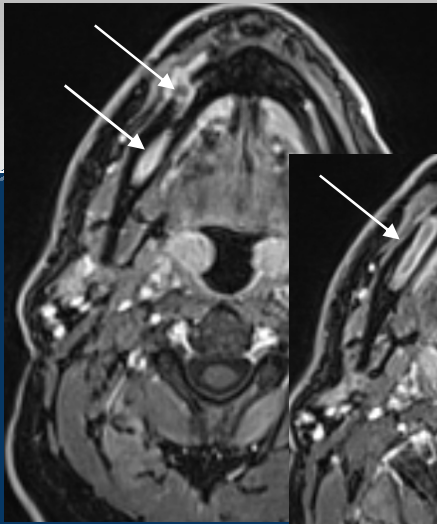
Nessun trattamento adiuvante per rifiuto del paziente

4. 2011 RECIDIVA LOCALE



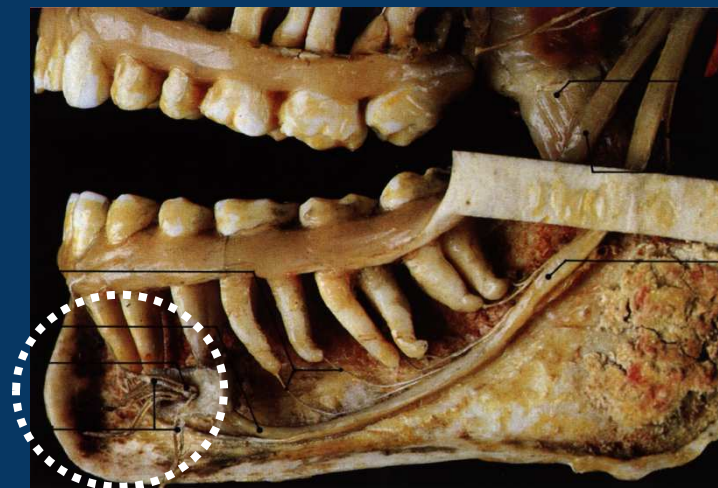
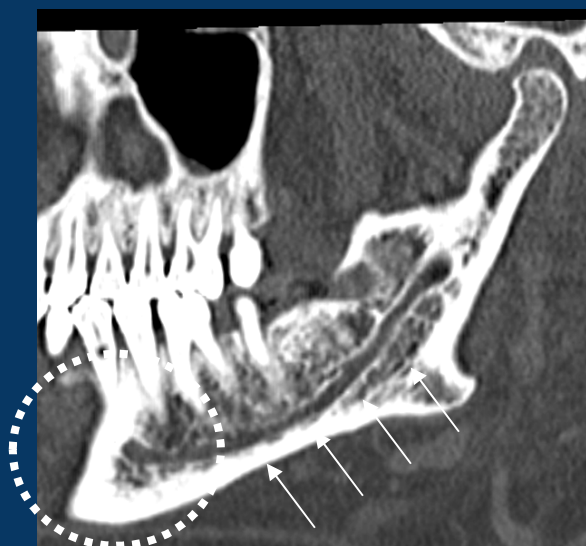
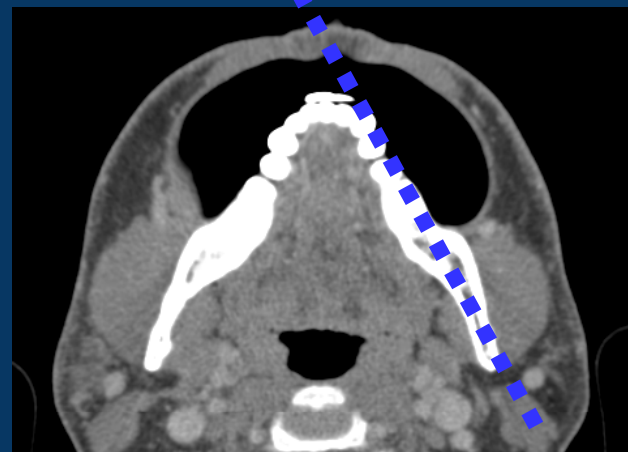
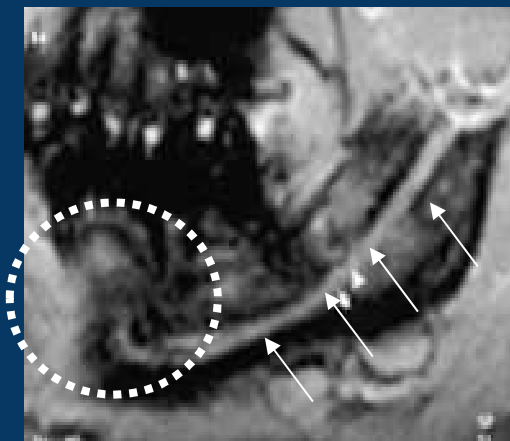
Courtesy Dr. Preda L Radiology Dept IEO

INFILTRAZIONE N. MANDIBOLARE



Courtesy Dr. Preda L Radiology Dept IEO

DECORSO N. MANDIBOLARE



Courtesy Dr. Preda L Radiology Dept IEO

FOCUS PRIMITIVO IGNOTO

- STAGING
 - ESAME OBIETTIVO
 - FIBROSCOPIA
 - RM
 - FDG-PET
 - BIOPSIE IN NARCOSI E TONSILLECTOMIA



FOCUS PRIMITIVO IGNOTO

- pN1 senza extracapsularietà → Solo chirurgia
- >pN1 oppure extracapsularietà → Chir + RT (RT/CT → Chir)

RADIOTERAPIA

LINFONODI MONOLATERALI /BILATERALI ?

SEDI MUCOSE: SI/NO?

QUALI SEDI MUCOSE?

QUALE DOSE PER LE SEDI MUCOSE?

FOCUS PRIMITIVO IGNOTO e IMRT

- MDAnderson EXPERIENCE

Studio retrospettivo 52 pz IMRT, 1998-2005

- Volumi di trattamento

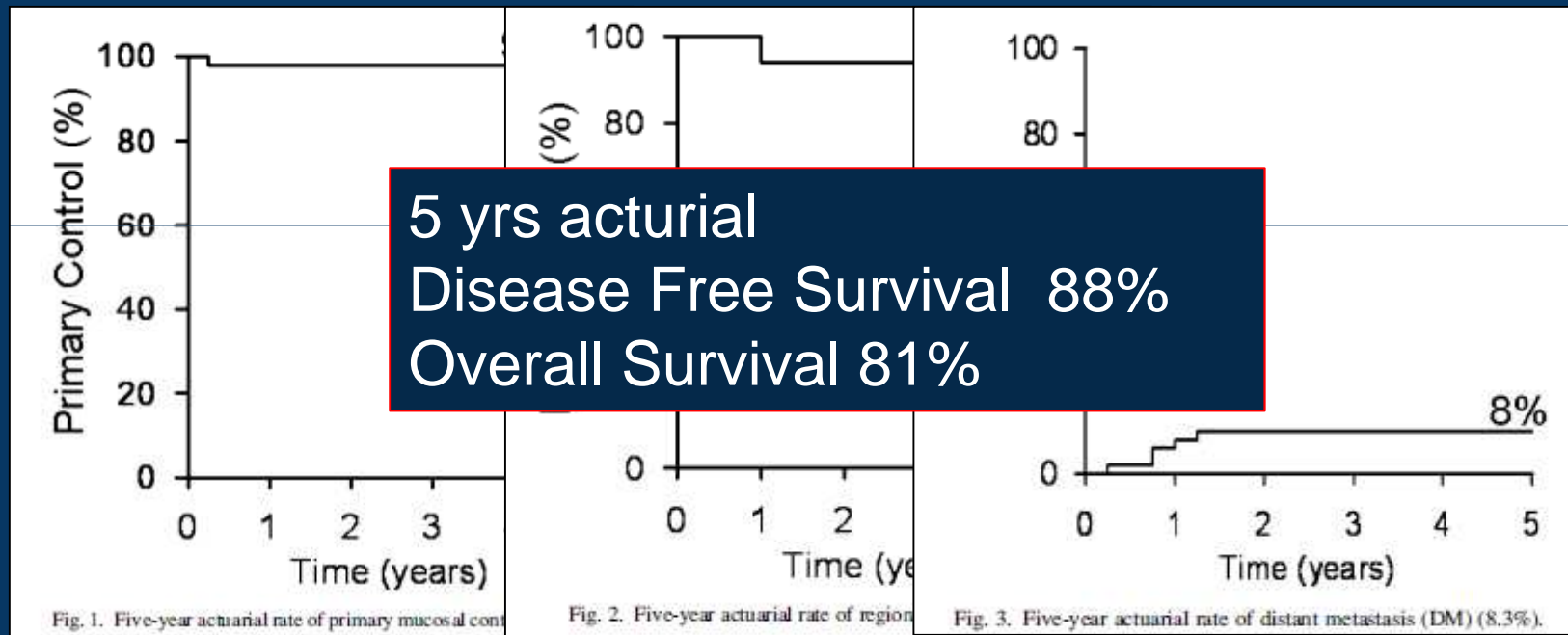
- N collo comprendono i retrofaringei bilateralmente
- Livello II-V del collo omolaterale
- Nei casi N0 controlaterali, se il primitivo è improbabile essere rinofaringe, valutare no RT collo controlaterale, livelli II-IV
- IB omolaterale solo se N+ in II e III livello
- IB e V controlaterale no RT se cN0

FOCUS PRIMITIVO IGNOTO e IMRT

- Dosi (IMRT SIB in 30 frazioni)
 - N+ dose mediana 66 Gy (2.2 Gy/die) **CTV HD**
 - pN+ dose mediana 60 Gy (60-66) Gy **CTV HR**
 - Collo omolaterale 54-60Gy **CTV LR**
 - Mucosa dell'asse faringeo 54 Gy 1.8 Gy/die (33% esclusa laringe ed ipofaringe di cui tutti e 13 i non fumatori) **CTV LR**
 - Collo controlaterale N0 54 Gy **CTV LR**

IMRT E FOCUS PRIMITIVO IGNOTO

Median follow up 3.7 anni



Tossicità
Esofagea Grado 3 → 2 pz

FOCUS PRIMITIVO IGNOTO e IMRT

- Dana-Farber Cancer Institute EXPERIENCE
Studio retrospettivo 24 pz IMRT, 2004-2008

- Volumi di trattamento
 - Asse faringeo
 - Linfonodi del collo bilaterali
 - IB controlaterale escluso se N0

FOCUS PRIMITIVO IGNOTO e IMRT

- Dosi (IMRT SIB in 30-32 frazioni)
 - N+ dose mediana 70 Gy (2 Gy/die) **CTV HD**
 - N- collo omolaterale adiacenti ad N+ e pN+ 64 Gy **CTV HR**
 - N- basso rischio e collo controlaterale 60 Gy **CTV LR**
- **Asse mucoso 60-64 Gy → 60 Gy → 56 Gy**

FOCUS PRIMITIVO IGNOTO e IMRT

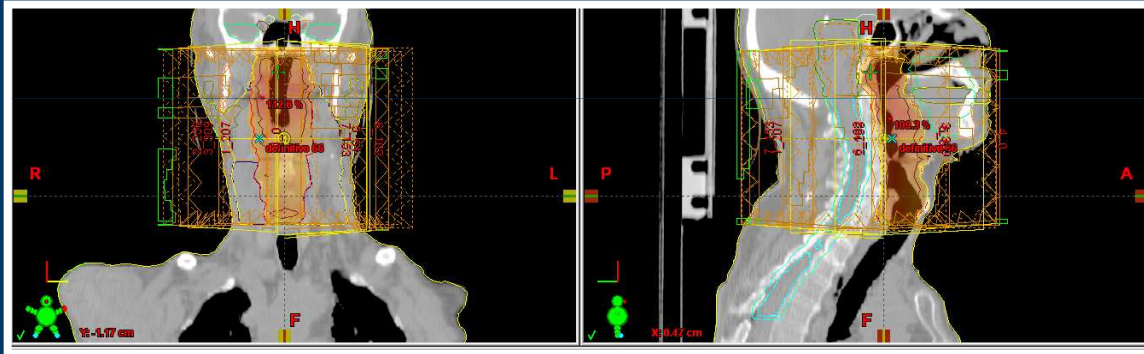
Table 4. Summary of HNCUP outcomes for patients treated with IMRT

Institution	Patients (<i>n</i>)	N stage			Chemotherapy		2-y LRC rate (%)	2-y DMFS rate (%)	2-y OS rate (%)	Stricture rate (%)
		N1	N2	N3	Induction	Concurrent				
Iowa	18	0	17	1	0	6 (33)	89	88	74	NR
Ghent	23	3	16	4	0	3 (13)	96	76	75	NR
MSKCC	21	9	9	3	0	14 (67)	90	90	85	14
Present study	24	2	20	2	7 (29)	22 (92)	100	96	92	46

- CT CONCOMITANTE
- HPV
- NON FUMATORI

RT MUCOSA

- RIDUCE COMPARSA DI T PRIMITIVO (23 vs 13%)
- ELEVATA TOSSICITA'



CAMPI DI TRATTAMENTO

- No laringe (University of Florida, Mendenhall)
- HPV + SOLO OROFARINGE?
- DOSE ASSE MUCOSO 54-56 Gy

CONCLUSIONI

- Esame obiettivo
- Conoscenza di anatomia radiologica
- Conoscenza della storia naturale della malattia

**MIGLIOR
DEFINIZIONE
DEI VOLUMI
BERSAGLIO**

Grazie per l'attenzione