NECK DISSECTION & NODAL STAGING

CHERIE-ANN NATHAN, MD, FACS
JACK W. POU ENDOWED PROF. & CHAIRMAN
DIRECTOR HEAD & NECK, FEIST-WEILLER CANCER CTR,
DEPT. OF OTOLARYNGOLOGY/HNS,
LSU HEALTH-SHV

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HISTORY

- 1906 : George Crile described the classic radical neck dissection (RND)
- 1933 and 1941 : Blair and Martin popularized the RND
- 1975 : Bocca established oncologic safety of the FND compared to the RND
- 1989, *1991*, and 1994: Medina, *Robbins*, and Byers respectively proposed classifications of neck dissections

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Proposed Classification, Ferlito et al, 2011	AAO-HNS Revised Classification, 2008
ND (I–V, SCM, IJV, CN XI)	Radical neck dissection
ND (I–V, SCM, IJV, CN XI, and CN XII)	Extended neck dissection with removal of the hypoglossal nerve
ND (I–V, SCM, IJV)	Modified radical neck dissection with preservation of the spinal accessory nerve
ND (II–IV)	Selective neck dissection (II–IV)
ND (II–IV, VI)	Selective neck dissection (II–IV, VI)
ND (II–IV, SCM)	NA
ND (I–III)	Selective neck dissection (I–III)

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RELEVANT ANATOMY

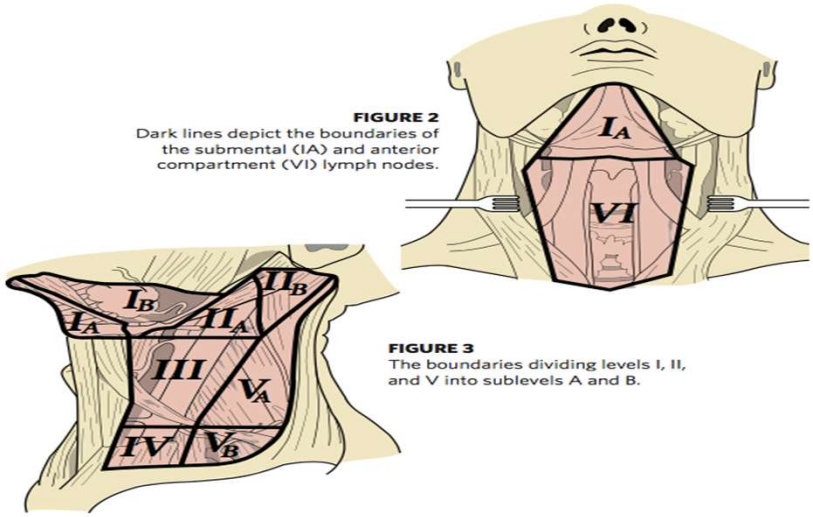

FIGURE 2
Dark lines depict the boundaries of the submental (IA) and anterior compartment (VI) lymph nodes.

FIGURE 3
The boundaries dividing levels I, II, and V into sublevels A and B.

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from www.entnet.org/academ

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Definition of cN0 neck

- Absence of palpable adenopathy on physical examination
- Absence of visual adenopathy on CT or MRI or PET

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Risk of micrometastases in the N0 neck

Specific cancers arising in selected mucosal sites have a low risk of metastases:

T1 glottic carcinoma

T1-2 lip cancers

Thin (<4 mm) oral cavity cancers

Most carcinomas of the UADT have a minimum of 15% risk of metastases

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Treatment options for the N0 neck

- Observation
- Neck dissection
- Radiation therapy
- Sentinel node dissection

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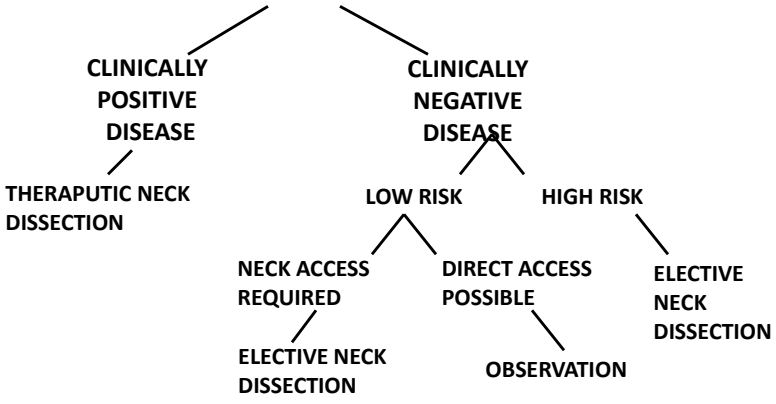
PRIMARY TREATED SURGICALLY



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PRIMARY TREATED WITH RADIOTHERAPY

- CLINICALLY POSITIVE NODES
  - LOW VOLUME DISEASE (N_1)
    - THERAPUTIC NECK IRRADIATION
      - SALVAGE NECK DISSECTION
  - HIGH VOLUME DISEASE (N_{2-3})
    - CXRT
      - SALVAGE NECK DISSECTION
- CLINICALLY NEGATIVE NODES(N_0)
  - LOW RISK
    - OBSERVATION
  - HIGH RISK
    - ELECTIVE NECK IRRADIATION

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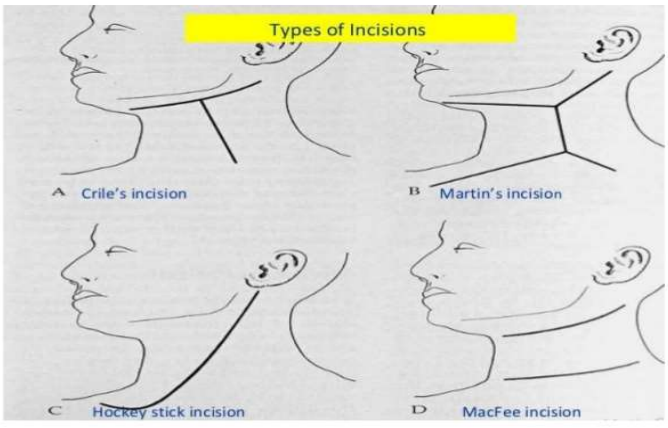
SURGICAL CONSIDERATIONS

Incisions



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Oral Cavity Cancer NO Neck

- T1-4,N0: 20-44% incidence of occult metastases
- T1-2: 15-20%
- A meta-analysis showed: A DSS advantage of END over observation
  (Fasunla AJ, Oral Oncol. 2011)

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Delayed Recurrence in OCC

- Two thirds of the patients who develop delayed metastases had N2 or N3 disease.

Andersen et al: Arch Otolaryngol Head Neck Surg. 2002

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The NEW ENGLAND JOURNAL of MEDICINE

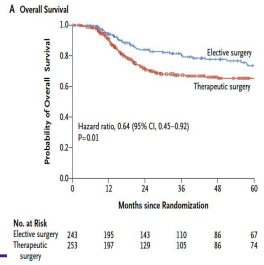
ORIGINAL ARTICLE

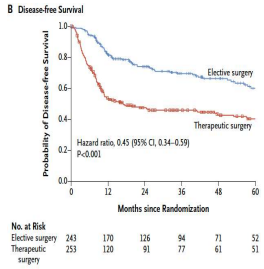
Elective versus Therapeutic Neck Dissection in Node-Negative Oral Cancer

Anil K. D'Cruz, M.S., D.N.B., Richa Vaish, M.S., Neeti Kapre, M.S., D.N.B.,

N Engl J Med 2015; 373:521-529

- **Randomized controlled trial, evaluating the effect on survival of elective node dissection versus therapeutic node dissection**
- **Absolute overall survival benefit of 12.5 % points and a disease-free survival benefit of 23.6 % points**





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Tumor thickness/Depth of Invasion

- The most common parameter to predict the risk of occult metastases: resulted in change in the staging system
- A meta-analysis showed that occult metastases are significantly more common when the thickness of the tumor is >4 mm *(Huang SH et al, Cancer, 2009)*

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Neck levels at risk

- Levels I, IIA and III are at the highest risk for metastases
- Metastases to sublevel IIB are rare in the absence of nodes in other levels
  - (Paleri V et al, Head Neck. 2008; Lea J et al, Head Neck. 2010)

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Level IV

- Incidence : as high as 15%, which may justify routine dissection of this level *(Byers, 1997, De Zinis LO, 2006).*
- Others demonstrate a low incidence *(Mishra, 2010, Bajwa, 2011)*
- Routine inclusion of level IV in SND may not be justified owing to the low incidence.

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Level V

- General consensus that level V should not be included *(Dias, 2006)*

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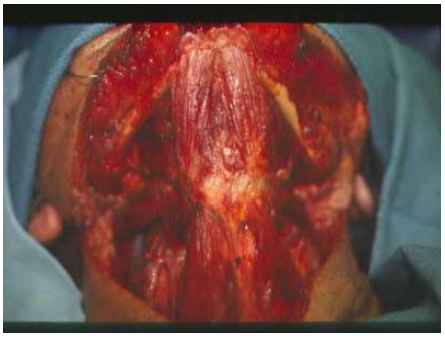
Oral cavity: contralateral metastases

- Floor of mouth
- Dorsal tongue, midline
- Ventral tongue



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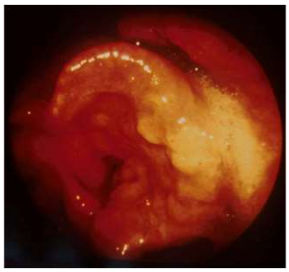
Larynx cancer metastases



- Supraglottis: rich lymphatic network with bilateral drainage levels II and III
- Glottis: sparse lymphatics unless disease extension (T2-4) with drainage to levels II-IV, and VI
- Subglottis: levels IV and VI

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Larynx cancer metastases

- Levels II, III and IV commonly involved while levels I and V rarely involved.
- SND (II-IV) is the procedure of choice for N0 with neck recurrence rates as low as 1.7%.

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Larynx cancer metastases: sub-level IIB

- IIB mets are uncommon (0-3%) in the N0 neck (Koybasioglu A, 2002; Coskun HH, 2004; Lim YC, 2006)
- Sparing IIB minimizes XI dysfunction
- IIB dissection is not indicated in N0 laryngeal cancer (Rinaldo, 2006).

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Larynx cancer level IV mets

- Mets to level IV in clinically N0 disease is low (Cosken, 2004; Elsheikh MN, 2006)
- Omission of level IV dissection lessens the risk of chylous fistula and phrenic nerve injury
- Patients with glottic and supraglottic cancer should receive a SND (IIA-III), termed super-selective neck dissection (SSND) *(Ferlito et al, 2006)*

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Oropharyngeal cancer metastases

- The risk of mets is high: overall incidence of 92%; 32% in patients with clinically N0 neck.
- Elective neck is indicated in the majority of the patients with a N0 neck.

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Oro- and hypopharyngeal cancer

- Data is lacking for risk of mets by neck level since non-surgical measures are often preferred.
- Emergence of transoral laser and robotic surgery, further refinements of neck surgery may be feasible.

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Oropharyngeal cancer

- Lymphatic drainage occurs to levels II-IV, the retropharyngeal nodes
- Dissection of levels II, III and IV would be appropriate for clinically N0 necks

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Oropharyngeal cancer

- The majority of the metastases are found in levels II and III *(Gross BC, 2013)*
- Sublevel IIB metastases occur in 2.5- 6% *(Villaret AB, 2007; Valeri B, 2008; Gross BC, 2013)*
- Among 348 patients Gross et al found sublevel IIB metastases in 2.5% of N0 necks and 25% of N+ necks

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Oropharyngeal cancer: surgical treatment of the primary

- Dissection of sublevel IIB is recommended in patients with N+ disease, T3-4 primary, and tonsil primary

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Oropharyngeal cancer

- Level IV metastases is rare in patients with clinically N0 neck (1% of the cases *(Lodder WL, 2008)*
- SSND of II and III may be appropriate for patients with clinically N0 disease

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Bilateral Nodes in OPSCC

- Prevalence of bilateral mets was less than 15% but only in T1 tumors of the BOT and soft palate and in T1 and T2 tumors of the tonsillar fossa *(Olzowy et al)*

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Oropharyngeal cancer

- Among patients with pathologic N+ disease: retropharyngeal metastases was 23%.
- The risk of retropharyngeal mets is negligible for T1-2, N0-N2a tonsil if negative CT/PET-CT (Moore et al).

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Hypopharyngeal cancer

- The inferior portion of the hypopharynx and postcricoid regions drain into the paratracheal, paraesophageal and supraclavicular nodes.
- Lymphatic drainage from the posterior hypopharyngeal wall is to the retropharyngeal and midjugular nodes.
- Levels II-IV at greatest risk, skip metastases outside of these levels was very rare 0.3% (Candela et al)

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Level VI

- Laryngeal, hypopharyngeal and (cervical) esophageal cancers: rate of metastasis ranges from 1 to 59%, depending on stage, subsite and extension
- It appears warranted to remove level VI in patients with N0 hypopharyngeal cancer

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Hypopharyngeal cancer

- The incidence of IIB mets was 13.3% for clinically N+ and 0% for clinically N0 necks (Sakai et al).
- IIB may be preserved in N0 hypopharyngeal cancer.

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Nasopharyngeal and sinus cancer

- NPC differs: neck dissection is only used for salvage of residual neck disease after (chemo)radiotherapy
- In SCC of the maxillary sinus, the rates of failure of the untreated N0 neck were high enough to warrant elective treatment especially for T3/T4 disease.

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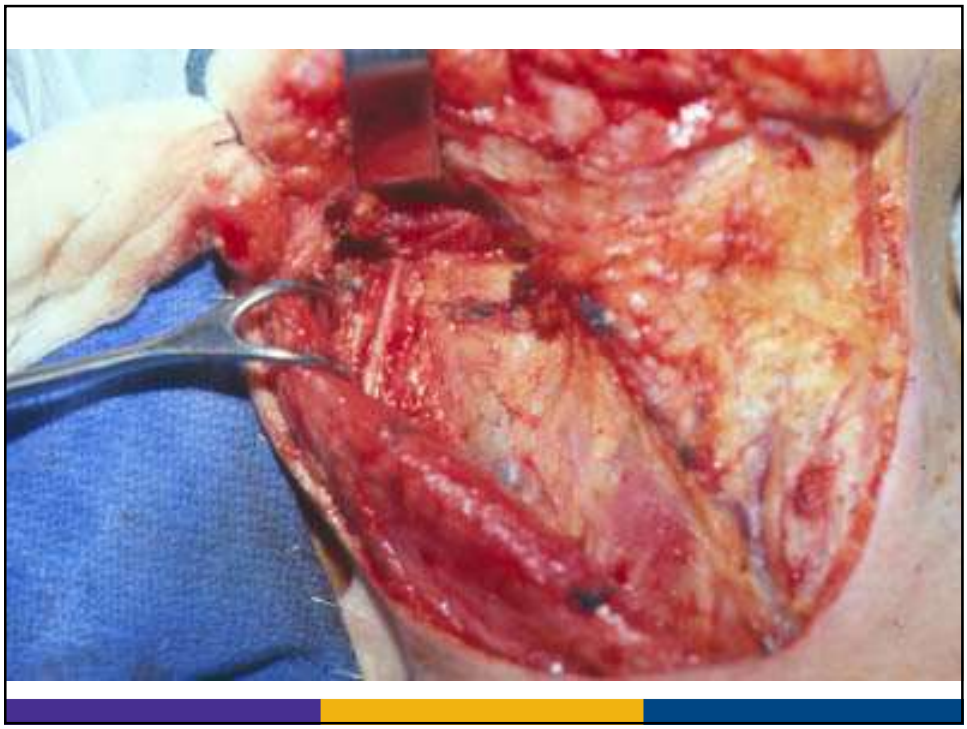

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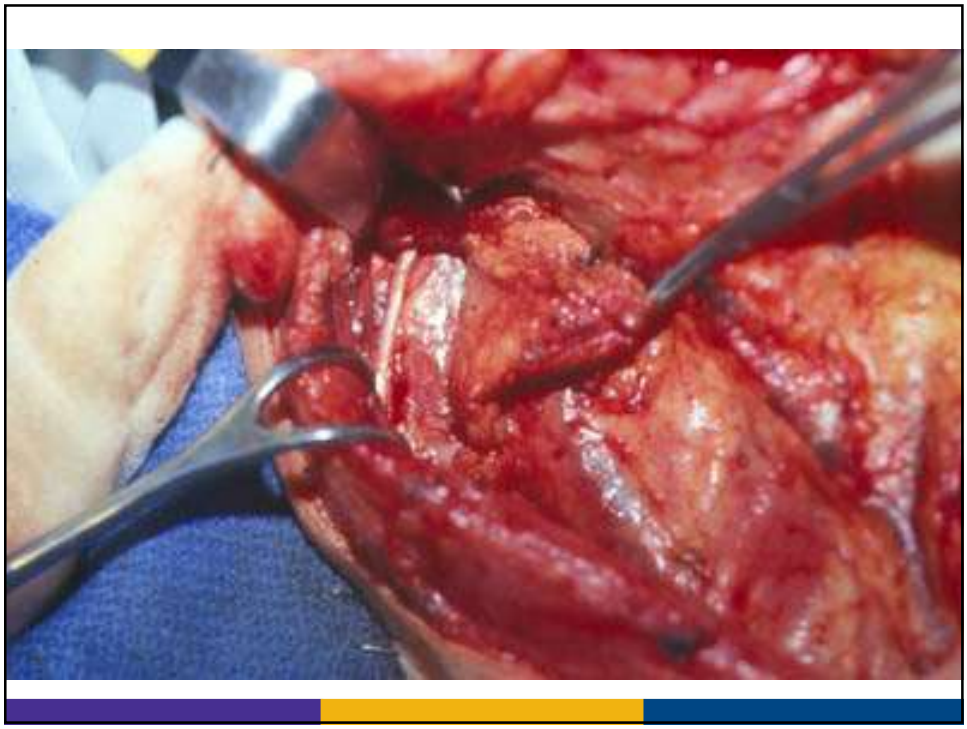

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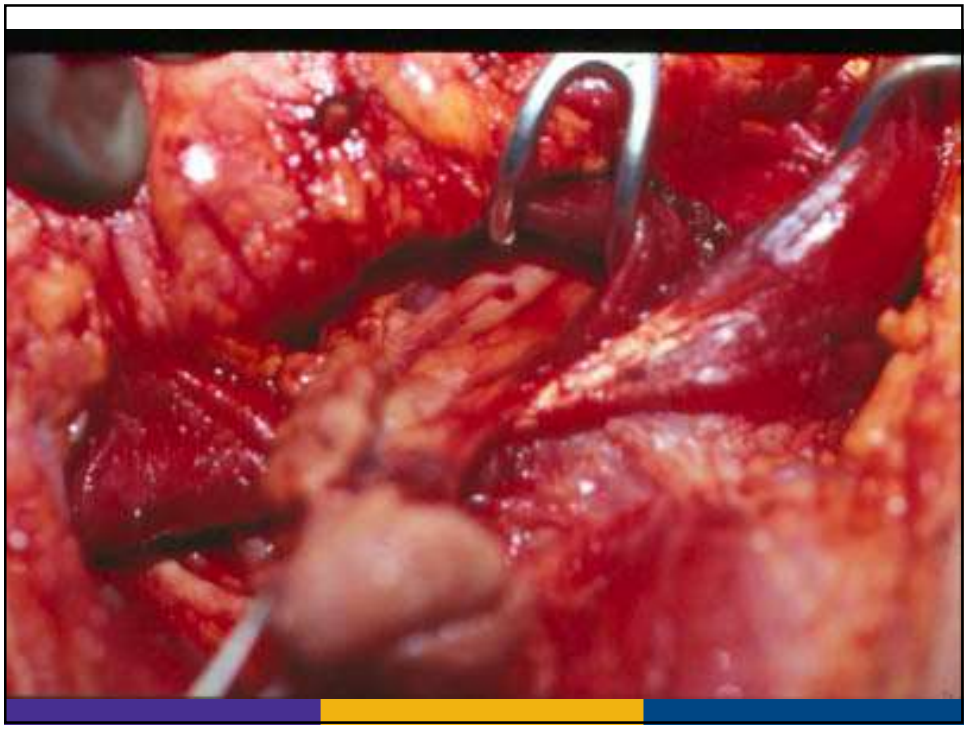

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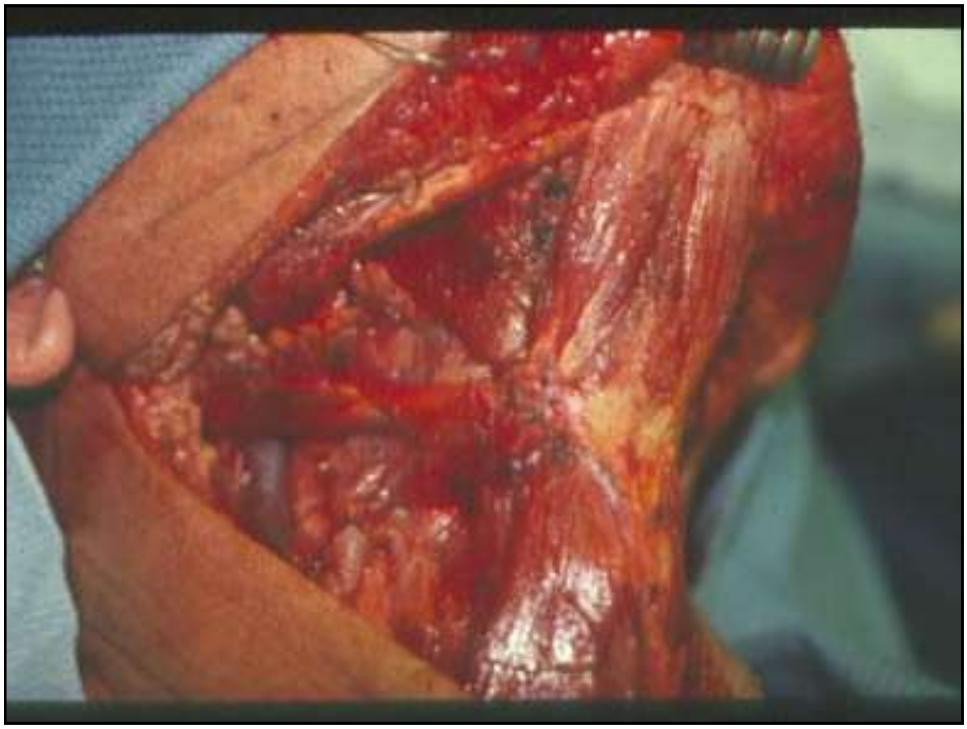

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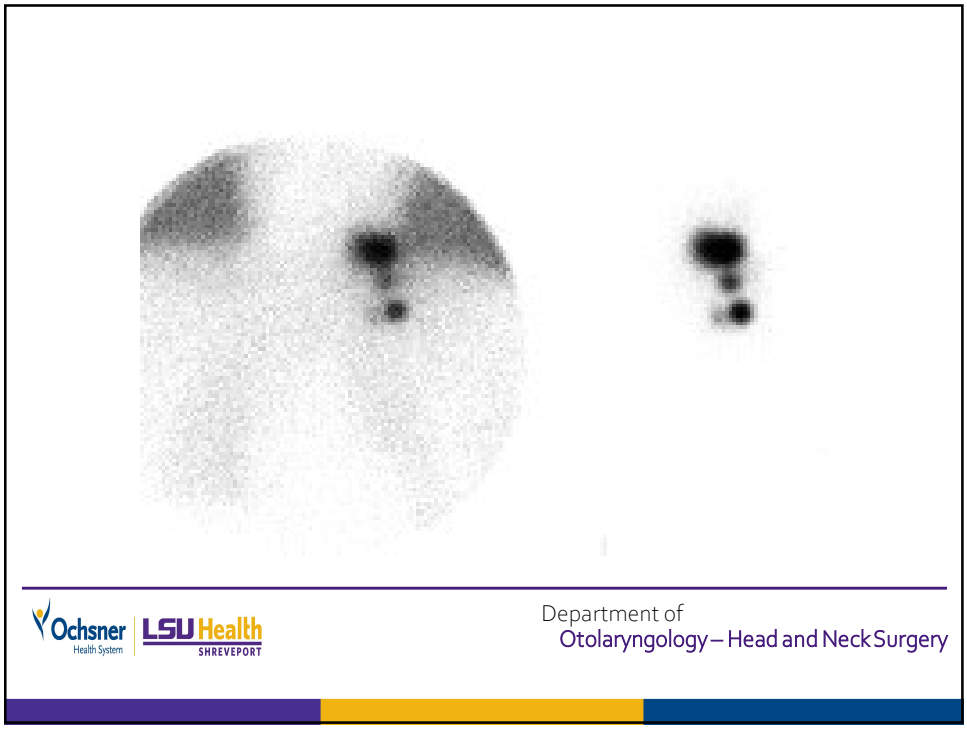
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Sentinel lymph node biopsy (SNLB) in oral cavity cancer

- SLNB has evolved as a possible alternative to the dilemma of observation versus END
- A decision analysis study identified the SNLB as the most cost-effective strategy in OCSCC (Govers TM et al, Oral Oncol. 2013)

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Sentinel lymph node biopsy v/s SSND

- In 34.4% (42/122) early OCSCC with a positive sentinel node, additional non-sentinel node mets were found in only 35%
- Furthermore, in the vast majority (93%) of the additional mets were in the same neck level
- Thus super-selective neck dissection may be a reliable alternative to sentinel biopsy

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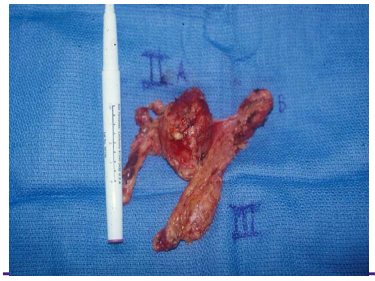
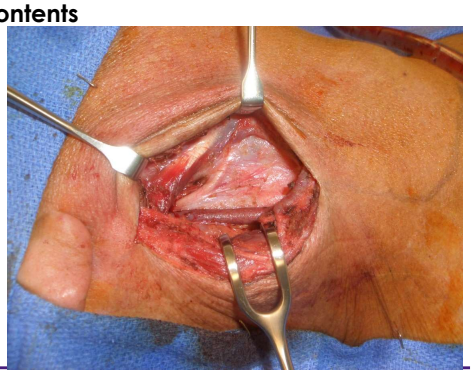
Super-selective Neck Dissection

An operative procedure designed to remove completely the fibroareolar tissue contents of <u>two or less</u> neck levels.





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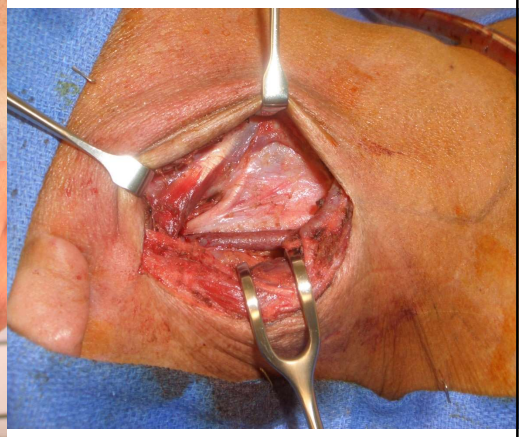
Super-selective neck dissection



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When to perform salvage post-CRT neck dissection

- Palpable lymphadenopathy at 8 weeks
- CT/MRI evidence of a discrete mass at 8 weeks
- Positive FDG/PET scan at 12 weeks or later
- Clinical evidence of recurrent adenopathy

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	20 th century	21 st century
Definitions	Elective, Therapeutic: planned salvage	Elective, Therapeutic: planned salvage
Classification	AAO-HNS nomenclature	**Symbols**
Extent	Radical and modified neck dissection	**Selective and super-selective neck dissection; sentinel node biopsy**

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AJCC 8th edition TNM staging – What's new?

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CHANGES TO 8th EDITION AJCC CLASSIFICATION

- Oropharyngeal cancer
- Oral cavity
- Nasopharynx
- Unknown primary
- Neck
- Cutaneous SCC

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OROPHARYNGEAL CANCER

OPSCC

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OPSCC: ***What changed ?***

- **The prognosis or behavior of HPV associated disease is not well reflected in the 7th edition**

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OPSCC: Clinical N-Stage

TABLE 3. Clinical N Category Human Papillomavirus-Associated (p16-Positive) Oropharyngeal Cancer, 8th Edition Staging Manual[a]

N CATEGORY	N CRITERIA
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	One or more ipsilateral lymph nodes, none larger than 6 cm
N2	Contralateral or bilateral lymph nodes, none larger than 6 cm
N3	Lymph node(s) larger than 6 cm

[a]Table 3 is used with the permission of the American Joint Committee on Cancer (AJCC), Chicago, Illinois. The original source for this material is the AJCC Cancer Staging Manual, Eighth Edition (2017) published by Springer Science and Business Media LLC (springer.com) (Amin MB, Edge SB, Greene FL, et al, eds. AJCC Cancer Staging Manual. 8th ed. New York: Springer; 2017, with permission[2]).

TABLE 4. Clinical N Category for Non-Human Papillomavirus-Associated (p16-Negative) Oropharyngeal Cancer, 8th Edition Staging Manual[a]

N CATEGORY	N CRITERIA
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, 3 cm or smaller in greatest dimension and ENE-negative
N2	Metastasis in a single ipsilateral lymph node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE-negative; or metastases in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE-negative; or metastasis in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE-negative
N2a	Metastasis in a single ipsilateral lymph node larger than 3 cm but not larger than 6 cm in greatest dimension and ENE-negative
N2b	Metastasis in multiple ipsilateral lymph nodes, none larger than 6 cm in greatest dimension and ENE-negative
N2c	Metastasis in bilateral or contralateral lymph nodes, none larger than 6 cm in greatest dimension and ENE-negative
N3	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE-negative; or metastasis in any lymph node(s) and clinically overt ENE-positive
N3a	Metastasis in a lymph node larger than 6 cm in greatest dimension and ENE-negative
N3b	Metastasis in any node(s) and clinically overt ENE-positive

Abbreviations: ENE, extranodal extension. [a]Table 4 is used with the permission of the American Joint Committee on Cancer (AJCC), Chicago, Illinois. The original source for this material is the AJCC Cancer Staging Manual, Eighth Edition (2017) published by Springer Science and Business Media LLC (springer.com) (Amin MB, Edge SB, Greene FL, et al, eds. AJCC Cancer Staging Manual. 8th ed. New York: Springer; 2017, with permission[2]).

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OPSCC: Pathological N-Stage

TABLE 5. Pathologic N Category Human Papillomavirus-Associated (p16-Positive) Oropharyngeal Cancer, 8th Edition Staging Manual[a]

N CATEGORY	N CRITERIA
NX	Regional lymph nodes cannot be assessed
pN0	No regional lymph node metastasis
pN1	Metastasis in 4 or fewer lymph nodes
pN2	Metastasis in more than 4 lymph nodes

[a]Table 5 is used with the permission of the American Joint Committee on Cancer (AJCC), Chicago, Illinois. The original source for this material is the AJCC Cancer Staging Manual, Eighth Edition (2017) published by Springer Science and Business Media LLC (springer.com) (Amin MB, Edge SB, Greene FL, et al, eds. AJCC Cancer Staging Manual. 8th ed. New York: Springer; 2017, with permission[2]).

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OPSCC : Clinical Staging

TABLE 6. Anatomic Stage and Prognostic Groups for *Clinical* TNM Grouping of Human Papillomavirus-Associated (p16-Positive) Oropharyngeal Cancer, 8th Edition Staging Manual[a]

	N CATEGORY			
T CATEGORY	N0	N1	N2	N3
T0	NA	I	II	III
T1	I	I	II	III
T2	I	I	II	III
T3	II	II	II	III
T4	III	III	III	III

[a]Any M1 is stage IV.

TABLE 8. Anatomic Stage and Prognostic Groups for *Clinical* and *Pathologic* TNM Grouping of Non-Human Papillomavirus-Associated (p16-Negative) Oropharyngeal Cancer, 8th Edition Staging Manual[a]

	N CATEGORY			
T CATEGORY	N0	N1	N2a,b,c	N3a,b
T1	I	III	IVA	IVB
T2	II	III	IVA	IVB
T3	III	III	IVA	IVB
T4a	IVA	IVA	IVA	IVB
T4b	IVB	IVB	IVB	IVB

[a]Any M1 is stage IVC.

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UNKNOWN PRIMARY

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UNKNOWN PRIMARY

- HPV-ISH, p16 IHC, and EBER-ISH recommended for all cervical nodes
- If evidence of HPV/ p-16 overexpression: p-16 positive oropharyngeal classification is applied and
- If EBV then nasopharyngeal classification is applied

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UNKNOWN PRIMARY : HPV & EBV Negative

When T is…	And N is…	And M is…	Then the stage group is…
T0	N1	M0	III
T0	N2	M0	IVA
T0	N3	M0	IVB
T0	Any N	M1	IVC

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NASOPHARYNX N-STAGE

7th edition

REGIONAL LYMPH NODES (N)

This site is different from other head and neck sites.

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Unilateral metastasis in cervical lymph node(s), 6 cm or less in greatest dimension, above the supraclavicular fossa, and/or unilateral or bilateral retropharyngeal lymph nodes, 6 cm or less in greatest dimension*
N2	Bilateral metastasis in cervical lymph node(s), 6 cm or less in greatest dimension, above the supraclavicular fossa*
N3	Metastasis in lymph node)* >6 cm and/or to supraclavicular fossa*
N3a	Greater than 6 cm in dimension
N3b	Extension to the supraclavicular fossa**

*Note: Midline nodes are considered ipsilateral nodes.

8th edition

N – Regional Lymph Nodes *(Nasopharynx)*

N1 Unilateral metastasis, in cervical lymph node(s), and/or unilateral or bilateral metastasis in retropharyngeal lymph nodes, 6 cm or less in greatest dimension, above the caudal border of cricoid cartilage

N2 Bilateral metastasis in cervical lymph node(s), 6 cm or less in greatest dimension, above the caudal border of cricoid cartilage

N3 Metastasis in cervical lymph node(s) greater than 6 cm in dimension and/or extension below the caudal border of cricoid cartilage

Note

Midline nodes are considered ipsilateral nodes.

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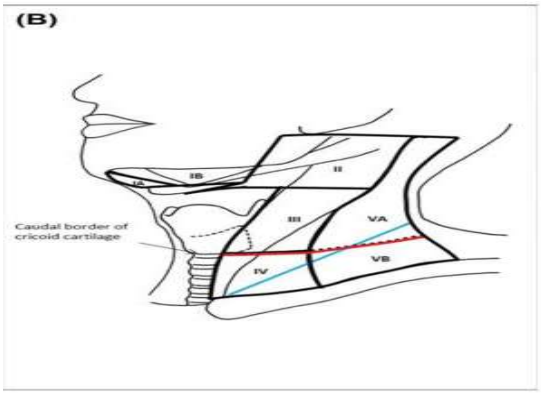
NASOPHARYNX N-STAGE



(B) replacing the supraclavicular fossa (blue) with the lower neck (i.e., below the caudal border of cricoid cartilage; red) as N3 criteria

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SUMMARY

- The evolution of neck dissection presents a variety of surgical options
- The principles of treating nodal disease remain the same
- Neck dissection following non-surgical treatment requires special consideration

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