Neck Dissection: Why, Which, When and How?

Dr Jeeve Kanagalingam
Consultant Head and Neck Surgeon,
Tan Tock Seng Hospital,
Singapore
Choose well, cut well, get well...
Henry Butlin proposed enbloc removal of upper neck nodes with primary oral cavity cancers

‘Radical’ neck dissection first described by George Crile (1906)

60/132 patients enjoyed 3 year survival – 4 times better than control group

---

1 Butlin HI, Spencer WG, Disease of the tongue, 2nd ed. London: Cassell, 1900
2 Crile G. Excision of cancer of the head and neck. With special reference to the plan of dissection based on 132 patients. JAMA 1906;47:1780–1786
History – selective neck

- Solis-Cohen proposed removal of uninvolved nodes during laryngectomy in 1901
- Functional Neck Dissection was described by Suarez in 1963\(^1\)
- Bocca popularised this, published outcome in 843 patients in 1984\(^2\)

---


---

CLINICAL REVIEW

Changing patterns in the management of metastatic cancer to cervical lymph nodes have created a large number of surgical options. This historical review of the evolution of neck dissection offers a perspective that helps to interpret current standards and to anticipate future modifications.

Henry T. Hoffman, MD, Section Editor

FUNCTIONAL NECK DISSECTION: FACT AND FICTION

Alfio Ferlito, MD, \(^1\) Javier Gavilán, MD, \(^2\) J. Graham Buckley, MD, \(^2\)
Ashok R. Shah, MD, FACS, \(^3\) Adam J. Miodorski, MD, PhD, \(^4\) Alessandra Rinaldo, MD\(^5\)

\(^1\) Department of Otolaryngology-Head and Neck Surgery, University of Udine, Policlinico Universitario, Piazzale S. Maria della Misericordia, 33100 Udine, Italy. E-mail: a.ferlito@univud.it
\(^2\) Department of Otolaryngology, La Paz Hospital, Autonomous University, Madrid, Spain
\(^3\) Department of Otolaryngology-Head and Neck Surgery, Leeds General Infirmary, Leeds, UK
\(^4\) Head and Neck Surgeon, Memorial Sloan-Kettering Cancer Center, New York, NY
\(^5\) Department of Otolaryngology, SREM Laboratory, Jagiellonian University, Krakow, Poland

Accepted 15 January 2003

Neck dissection is a valuable method for treating clinical, subclinical, and subpathologic metastases from cancer of the head and neck. So much has been written and said about the subject that it is necessary to distinguish the fact from the fiction. If you think you have discovered something new, it is because you did not read enough. This popular statement is particularly valid for the neck dissection.

Jacob Da Silva Solis-Cohen (1858–1927) of Philadelphia, America’s first head and neck surgeon,\(^6\) mentioned the necessity of removing the lymphatics of the neck during total laryngectomy (1892). In 1901, Charles Henry Crile (1864–1943) of Cleveland, Ohio, developed “partial” and “radical” neck dissection operations, which involved removal of the primary tumor en bloc with the neck dissection.\(^7\) In 1908, he published the results of treatment of 132 head and neck cancers of which 60 patients enjoyed a 5-year survival—four times better than a comparable group with cervical metastases who did not have a neck dissection.\(^8\) This landmark article established the basis for effective treatment of such lesions by describing a block resection of the cervical lymph nodes-bearing tissues, either in continuity with the primary tumor or as a secondary operation for subsequent metastasis. The long...
Why do a neck dissection?

- Eradicate disease
  ‘When a single nodal metastasis exists at presentation or subsequently develops, the cure rate halves’

- Stage the neck to guide further treatment and prognostic information

- Surgical access to primary tumour or for microvascular anastomosis

---

Incidence of nodal metastases depends mainly on the site and the size of the primary tumour
- 1% for early glottic tumours, 80% for nasopharyngeal carcinomas

The majority of tumours will metastasise in a predictable manner but certain tumours will fast track to remote sites
- nasopharyngeal cancers to level V
- tongue cancers to jugulo-omohyoid nodes
- pattern of spread will be disrupted by previous surgery or radiotherapy

Tumour biology
Tumour biology

- Possibility of bilateral nodal disease should be considered especially when the primary site involves
  - Tongue base
  - Nasopharynx
  - Supraglottic larynx
Tumour biology

<table>
<thead>
<tr>
<th>Location</th>
<th>Metastasis Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral cavity, anterior to circumvallate papillae</td>
<td>I-III, rarely to IV-V</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>Mainly II, then III-IV, low rate to I, rarely V</td>
</tr>
<tr>
<td>Supraglottic larynx &amp; hypopharynx</td>
<td>Mainly II, then III-IV, rarely I-V</td>
</tr>
<tr>
<td>Nasopharynx</td>
<td>Widespread II-V</td>
</tr>
</tbody>
</table>

Therapeutic dissections

\[ n = 776 \]


Elective dissections

n = 343

Oral cavity tumours

Oral cavity: tumours > 4 mm thick predict mets

False negative rate of patients predicted by thickness not to have metastases rises significantly once tumour is more than 4 mm thick

Predictive Value of Tumor Thickness for Cervical Lymph-Node Involvement in Squamous Cell Carcinoma of the Oral Cavity

A Meta-analysis of Reported Studies

Shao Hui Huang, MSc1,2, David Hwang, MB2, Gina Lockwood, MMath3, David P. Goldstein, MD4,5, and Brian O’Sullivan, MD2,4
Nasopharyngeal carcinoma
“an exception that proves the rule”

- 43 radical neck dissection specimens post-RT
  - In 70% there was more tumour bearing nodes than expected
  - 70% nodes involved had extra-capsular spread
  - 27.5% had tumour along XI nerve
  - 70% nodes were in posterior triangle

Which neck dissection?

- Radical Neck Dissection
- Modified Radical Neck Dissection
  - Type I spare XI nerve
  - Type II spare XI and IJV
  - Type III spare XI, IJV and SCM
- Selective Neck Dissection
  - Supra-omohyoid (I-III)
  - Anterolateral (I-IV)
  - Lateral (II-IV)
  - Posterolateral (II-V)
  - Central (VI)

When to do a neck dissection?

Head and neck squamous cell carcinoma

- **N+ neck**
  - If primary disease is to be resected
  - After definite radiotherapy, if there is residual nodal disease
  - (After radiotherapy, if neck disease pre-treatment was bulky (N3) i.e. ‘planned neck dissection’)  

- **N0 neck (elective neck dissection)**
  - If primary disease is to be resected and the rate of ‘occult’ metastases is 20% or more

Clinical Nodal Metastasis

Yes

Perform comprehensive ND (MRND I) if SAN not involved. May consider selective ND in N₁ setting¹

No

Need to enter neck for resection of primary tumor²

Unreliable follow up

Risk of occult metastasis greater than 20-25%³

Observe neck

Yes

Perform elective selective ND¹

No

Yes

¹ Oral cavity - SOHND
  Oropharynx -
  LND or ALND
  Hypopharynx/larynx - LND

² Mandibulotomy, lateral pharyngotomy, supraglottic laryngectomy for example

³ Primary located in oropharynx, hypopharynx or supraglottic larynx. Oral cavity tumor greater than 2 mm thick
Why not observe the N0 neck closely?

60% of patients who recurred in the neck presented with N2 or greater disease.
77% had evidence of extracapsular spread.
Such patients required more extensive therapy than if they had undergone elective treatment.

When to do a neck dissection?

Differentiated thyroid cancer

- In N1a+, level VI (central compartment) neck dissection
- In N1b+, level II-V (posterolateral) and level VI neck dissection
- In N0 papillary thyroid cancer, if age > 45, male, >T2, offer elective level VI dissection

Medullary thyroid ca

- In N0, level VI-VII neck dissection
- In N0 and pT2-T4, or N1+ disease, add level IIa-Vb neck dissection

Guidelines for the management of thyroid cancer. British Thyroid Association 2007
When to do a neck dissection

**Salivary gland malignancy**

- If N+, modified radical neck dissection. XI may be difficult to preserve.
- If N0, consider level I-III and Va if high grade histology (e.g. high grade mucoepidermoid, undifferentiated, adenocarcinoma, SCC) T3-4, old age, SMG cancers and recurrent cancers.
How to do a neck dissection

Operative technique
Preparation

- Position the patient appropriately with a shoulder roll
- Tape away hair, shave as necessary
- Give IV antibiotics no less than 30 minutes before first incision (Cefazolin)
- Plan your incision
- Infiltrate with 1 in 100,000 adrenaline
Apron with lazy ‘S’
Hockey stick
Modified apron
McFee incision
Raising skin flaps

- Good retraction
- Hug the platysma and above veins
- Preserve Ext Jugular Vein for microvascular anatomosis
- In lateral neck dissection preserve Great Auricular Nerve
- Raise flaps to mandible, clavicle and trapezius for comprehensive necks
Identify and preserve marginal mandibular nerve

- Nerve is 1 cm inferior and posterior to the angle of the mandible
- Often retracted superiorly
- Deep to investing fascia but superficial to vein
- Hayes-Martin manoeuvre when oncologically safe
Level I dissection

- Dissect level Ia to contralateral digastric
- From medial to lateral, sequentially strip mylohyoid, anterior belly digastric then mylohyoid again
- Retraction of mylohyoid exposes lingual and hypoglossal nerves, ligate duct
- Dissect posteriorly to post belly of digastric, ligating facial artery at mandible and digastric
For selective neck dissections

- ‘Unsheath’ the sternocleidomastoid
- Identify accessory nerve anteriorly
- Preserve C2 root to accessory
- Dissected level IIb
  In all oral cavity and oropharyngeal tumours, in N+ larynx and hypopharyngeal tumours
- The posterior border of SCM and cervical plexus is the posterior limit of dissection
Unsheathing SCM
Accessory nerve

- Anteriorly nerve passes under branches of occipital artery to SCM
- Posteriorly erb’s point is a useful anatomical landmark
- Trace XI anteriorly under posterior belly of digastric
Stripping the IJV
Radical neck dissection

- Start at the anterior border of the trapezius and work laterally to medially.
- Sequentially work along the muscles of the floor of the posterior triangle – splenius capitis, levator scapulae, then the scalenes.
- Ligate the transverse cervical and divide the omohyoid.
- Observe for the brachial plexus between the posterior and middle scalenes.
- Divide the sternocleidomastoid (SCM) superiorly and inferiorly.
- Peel the phrenic nerve down, dividing the cutaneous roots of C3, C4, and C5.
- Separate the vagus and carotid from the internal jugular vein (IJV) before dividing and transfixing it.
**Draíns**

- Place large suction drains
- Drain lateral gutters and submental and submandibular areas
- Watch for chylous drainage
- Remove once ‘minimal drainage’
What can go wrong

- Skin flap necrosis
- Air embolus
- Bleeding
- Chyle leak
- Nerve damage
Post-op appearance
Thank you
Tumour biology

- Used oil-based medium injected pre-auricularly in 100 patients
- Nodal involvement examined in neck dissection specimens
- One-way only direction of lymphatic flow from level V to jugular chain

Tumour biology

- 2044 previously untreated HNSCC
- Location of metastases correlated with site and size of primary
- Clinical study and not pathological
- Findings later confirmed with pathological specimens by Byers
- 57% had cervical metastases
- Oral cavity, anterior tonsil pillar and soft palate, presence of metastases correlated with size of primary
- Tongue base, tonsil, supraglottic larynx and hypopharynx – no correlation
