Neck Dissection

- 1880 Kocher proposed removing nodal metastasis using Y shaped incision
- Crile described classical radical neck dissection popularized by Hayes Martin.

**CLASSIFICATIONS**

- Academy's Committee for Head and Neck Surgery and Oncology publicized standard classification system which included →
- Based on 4 concepts
  - RND is the standard basic procedure for cervical lymphadenectomy against which all other modifications are compared.
  - Modifications of the RND which include preservation of any non-lymphatic structures are referred to as modified radical neck dissection (MRND)
  - Any neck dissection that preserves one or more groups or levels of lymph nodes is referred to as a selective neck dissection (SND)
  - An **Extended Neck Dissection** refers to the removal of additional lymph node groups or non-lymphatic structures relative to the RND

**ACADEMY CLASSIFICATION**

1) Radical neck dissection (RND) – Level I to V + SCM + SAN + IJV
2) Modified radical neck dissection (MRND) – Type I(Save SAN), II(Save SAN and IJV), III (all 3)
3) Selective neck dissection (SND)
   - Supra-omohyoid type
   - Lateral type
   - Posterolateral type
   - Anterior compartment type
4) Extended radical neck dissection

- Other Classifications include
  - Medina Classification
  - Spiro’s Classification
- Remember type I, II, III of MRND was not specifically named by committee but by Medina.
- Type III also known as **Functional Neck Dissection**. Neck dissection of choice for N0 neck

**PREOP ASSESSMENT**

- Patient informed about the possible complications of neck dissection.
- Elective tracheostomy not needed if unilateral neck dissection carried out unless combined with removal of primary.

**POSITION**

- Sand bag and head ring placed with head turned to opposite side.
INCISIONS

- **McFee** is only incision with **bony landmarks** – Submandibular Component i.e. First limb begins over mastoid, goes down to hyoid, again superiorly to submental area.
- Supraclavicular Component i.e. Second limb – 2cm above clavicle, laterally from anterior border of trapezius to midline.

1) Crile’s or Y shaped incision
2) Schobinger incision
3) McFee Incision
4) Horizontal T or Hetter’s Incision
5) Modified Schobinger’s
6) Utility incision
7) Apron incision
8) Half Apron
9) Conley’s incision
10) Double Y incision
11) H incision

**MC FEE INCISION**

<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good blood supply from medial and lateral aspects</td>
<td>Difficult to perform in short neck patients</td>
</tr>
<tr>
<td>Flap necrosis chances rare (Used for irradiated necks)</td>
<td>Dissection under central bipedicled flap is tedious with intensive retraction required by assistant for proper exposure</td>
</tr>
<tr>
<td>Central bipedicled flap has good vascularity and covers most length carotid vessels and protect</td>
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CRILE’S INCISION

The incision begins from the mastoid process in a curvilinear fashion up to the tip of the hyoid, extending superiorly to the submental area. The vertical limb starts behind the carotid artery and goes down to the middle portion of the clavicle in a lazy ‘S’ fashion.

<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
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<tbody>
<tr>
<td>Easy to perform</td>
<td>Trifurcation point is prone for delayed healing</td>
</tr>
<tr>
<td>Maximum exposure to operative field</td>
<td>Vertical limb of this incision overlies carotid artery. Compromised healing results in exposure of carotid vessels with disastrous results</td>
</tr>
<tr>
<td></td>
<td>This incision is prone to produce unsightly scar. This later forms contracture band</td>
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RADICAL NECK DISSECTION

- Level I to V with Sternocleidomastoid, Spinal Accessory nerve, Internal Jugular Vein removal.

INDICATIONS

1. Significant operable neck disease including (N₂ᵇ, N₂ᶜ, N₃).
2. Extensive cervical involvement or matted lymph nodes with gross extra capsular spread and invasion into the SAN, IJV or SCM.
3. Salvage neck dissection in case of recurrent disease.
4. Access prior to pedicled flap reconstruction.
5. Occult primary.

- Blood supply to cervical skin – from above below and sides with watershed in the middle of neck.

CONTRAINDICATIONS

- Medically unfit
- Untreatable primary
- Distant metastasis
- Involvement of Common carotid artery, Prevertebral fascia, muscles along brachial plexus and extension to skull base.

RAISING THE FLAPS

- After preparing skin, incision of choice marked using marker pen and then placed.

Major corners of consternation (anxiety) are:

- Lower end of IJV
- Junction of lateral border of clavicle with lower edge of trapezius.
- Upper end of IJV
- Submandibular triangle

**Minor corners of consternation are**

- Retropharyngeal nodes
- Para pharyngeal nodes
- Chaissaignac’s triangle

- Appropriate access will usually mean ear is left uncovered and ear lobe can be retracted up using sutures for gaining adequate access to parotid and skull base.
- Dissection done in subplatysmal plane with No 10 blade. It is important to keep platysma in skin flap as it provides important blood supply and strength to wound in the postoperative period.
- Removed only if invaded
- **Rake retractor** used or double skin hooks used to retract platysma.
- During dissection in upper neck preserve facial nerve’s Marginal mandibular nerve and cervical branch (may lead to weakness of lower lip).
- Both nerves curve downwards below and in front of the angle of the mandible across the facial vessels about one finger's breadth below the mandible. The **Marginal Mandibular Nerve** then runs immediately superior to the Submandibular gland while the **Cervical Branch** runs lateral and inferior to this gland. Both of the nerves then curve upwards again to reach their destination.
- Easiest way to save these nerves is expose the capsule of the lower part of the Submandibular gland. The fascia can then be elevated as a flap over the mandible taking the nerve with it and the flap is then sutured superiorly.
- A less reliable method of protecting them is to ligate and divide the facial vessels on the Submandibular gland and lift them over the mandible.

**LOWER END OF THE INTERNAL JUGULAR VEIN**

- Basic principle of cancer surgery that the main vein draining the primary tumour being removed should be divided first.
- This step may reduce the number of systemic metastases because small tumour emboli released by manipulating the tumour are unable to find their way into general circulation.
- Some have argued that ligation of the internal jugular vein should be left as late as possible since this can reduce bleeding.
- **Jugular Vein** – Jugular vein is a continuation of the sigmoid sinus. It exists the skull in the posterior compartment of the jugular foramen. At its origin exists the superior bulb which is deep to the floor of the tympanic cavity. At its termination the **Internal Jugular Vein** has an inferior bulb. The vein runs in the carotid sheath & joins the **Subclavian Vein** to form **Brachiocephalic Vein**. The thoracic duct joins the vein at the intersection with the subclavian in Chassaignac’s triangle.
- **Chassaignac’s triangle** – formed by the Longus Colli, Scalenum Anterior with **Subclavian Artery** at the base. The **Apex** is formed by the tubercle of the lateral process of C6 (Chassaignac’s tubercle).
- Lower end of IJV approached by dividing SCM.
- Carotid sheath opened to expose IJV
Ligature of Silk or Vicryl placed after identifying minimum 2cm of vessel.
Make sure Vagus not included in ligation.
3 ligatures used, 2 at lower end and one at upper end.
Tansfixation suture on lower end is known as **HOUSEMAN's SUTURE** (since, if it fails in the early hours of the morning following surgery, it is the houseman who knows about it first)
The bleeding injured vessel should be identified and occluded temporarily with pressure or arterial clamps and the defect repaired using 6.0 Ethilon.
The danger of tearing the lower end of the vein is not blood loss, but air embolism.
On the left side, the thoracic duct passes medial to the jugular vein, then posterior to it and finally curves a round to enter the junction of the internal jugular vein and the subclavian vein.
Once IJV tied, the dissection extends laterally to approach **Chaissaignac's triangle**.
**Chaissaignac's triangle** is the triangle between Longus Colli & Scalenus Anterior, their attachments to the tubercle of C6 (Chaissaignac's or Carotid Tubercle) which forms apex and the subclavian artery is the base.
Look for and avoid the thoracic duct and/or branches of the jugular lymph duct in Chaissaignac's triangle.

**SUPRACLAVICULAR DISSECTION**
The Omohyoid Muscle is divided without any clamping and is retracted in an upwards direction.
It should not bleed if cut through the tendon and at this point the **Transverse Cervical Artery and Vein** may be encountered and should be ligated.
Medial to the Omohyoid muscle, the fascia over the fat pad lateral to the internal jugular vein should be incised and then the prevertebral fascia may be exposed by sharp or blunt dissection with a swab in an upward direction.
Here, the **Phrenic Nerve** is identified as it runs over **Scalene Anterior** from lateral to medial.
It lies behind the prevertebral fascia and is safe as long as this layer is not breached. Even brachial plexus is protected by this fascia.
Only bipolar diathermy used in this area.
Chaissaignac's triangle cleared off disease now.
Once the supraclavicular dissection has been completed towards the anterior border of trapezius, the operation continues in an upwards direction to dissect the posterior triangle.

**DISSECTION OF THE POSTERIOR TRIANGLE**
This dissection continues up the anterior border of trapezius to the mastoid tip.
It is important before dissecting the posterior triangle that the **SAN** is identified.
There are a number of ways to identify the nerve. It exits the lateral border of the SCM Muscle at the junction of its upper third with the lower two-thirds. This is known as **Erb's point** and can be identified 1 cm above the point where the **Greater Auricular Nerve** winds around the muscle on its way to supply the parotid fascia.
Once identified, the nerve may be mobilized and preserved in case of MRND.
Ascending branches of the **Transverse Cervical Artery** and **Vein** run up the anterior border of the trapezius and make a bloodless dissection along this part of the muscle difficult.
Every attempt should be made to preserve shoulder function and even if the Accessory Nerve has to be divided, it is wise to preserve the branches to trapezius from the third and fourth cervical nerves.

It is essential that the fascia is preserved on the floor of the posterior triangle if these nerves are to be preserved.

If there are nodes involved in the Upper Spinal Accessory Chain, then it is wise not to preserve the nerve.

Clips are placed on the Sternomastoid Muscle and a tunnel is formed so that the nerve can be followed and dissected free of the muscle up to level II to the point where it lies on top of the internal jugular vein.

At this point it is prudent to divide the upper end of the Sternomastoid muscle to facilitate further identification of the upper end of the Internal Jugular Vein prior to its ligation.

The level of transection of SCM is at the angle of the jaw and would normally include the lower pole of the parotid gland.

With an assistant now placing a Langenbeck retractor under the digastric muscle, the upper end of the internal jugular vein is identified, the accessory nerve may be transposed laterally, the upper end of the transected Sternomastoid muscle is passed under the nerve and its division completed to facilitate ligation of the upper end of the Internal Jugular Vein.

DIVISION OF UPPER END OF INTERNAL JUGULAR VEIN

Its position may be located by palpating the transverse process of C2 over which it lies, but with the neck extended to the contralateral side, this landmark is usually just in front of the vein.

The vein is mobilized, and using right-angled Lahey forceps, nonabsorbable sutures are placed to facilitate its ligation and two sutures above and one below the point of division along with transfixing sutures will usually suffice.

It is not usually necessary to remove the posterior belly of the digastric muscle unless wider access into level II is required

Before tying any ligatures, the Vagus and Hypoglossal Nerves should be identified and preserved.

The Hypoglossal Tunnel is a particularly useful landmark when tumour is stuck near the carotid bifurcation.

The Occipital Artery crosses the Posterior Part of the Internal Jugular Vein and this should also be ligated now to prevent further troublesome bleeding.

The critical steps in radical neck dissection of the lower neck are as follows.

1. Divide the lower end of Sternomastoid in corner
2. Isolate and ligate the internal jugular vein.
3. Look for and avoid the thoracic duct and/or branches of the jugular lymph duct in Chassaignac's triangle.
4. Divide and retract the Omohyoid muscle upwards.
5. Mobilize the fat pad overlying the prevertebral fascia.
6. Identify and preserve the brachial plexus and phrenic nerve.

The critical steps in radical neck dissection of the upper neck are.

1. Divide the upper end of the Sternomastoid in corner three.
2. Retract the posterior belly of digastric upwards.
3. Identify and ligate the internal jugular vein.
4. Identify and preserve the vagus and hypoglossal nerve.
5. Deal with the retropharyngeal and Parapharyngeal nodes.

**DISSECTION OF THE SUBMANDIBULAR TRIANGLE**

- This dissection represents the fourth corner of consternation
- The fat is divided in the Submental area and this displays the anterior belly of the digastric muscle.
- The anterior part of the submandibular gland is then identified and is dissected to the posterior border of the mylohyoid muscle.
- The upper border of the submandibular gland is freed by tying and dividing the vessels, including the facial artery, that cross the lower border of the mandible.
- The mylohyoid muscle is retracted in a forward direction to reveal the submandibular duct and, at this point, the lingual nerve is pulled down in a curve.
- The latter is freed by dividing the fascia around the submandibular ganglion with a knife.
- The lingual nerve is identified, and two artery forceps are placed below it to divide the branch to the submandibular ganglion.
- The submandibular duct is tied and divided and during both of these manoeuvres, the hypoglossal nerve is kept under constant direct vision to avoid any damage.

**CLOSURE**

- Two large drains (12 FG) are placed through the posterior flap and securely tied.
- Drains should never cross the carotid sheath, be cut to the correct length and kept well away from any microvascular anastomosis.
- Finally, make a check for any chylous leak, any bleeding from the veins accompanying the hypoglossal nerve.
- The wound is closed in two layers with an absorbable Vicryl stitch to the platysmal layer and the skin then closed using either interrupted or continuous sutures ofEthilon or staples.

**RADICAL NECK DISSECTION AS A COMBINED PROCEDURE**

- Laryngeal cancer
- Pharyngeal cancer
- Oral cancer
- Oropharyngeal Cancer

**COMPLICATIONS**

- Major and minor
- Early, intermediate and late
- Local and systemic
- General and specific.

**GENERAL COMPLICATIONS**

- Anesthetic Complications
- Postoperative Atelectasis
- Pneumonia
- Deep vein thrombosis
- Urinary retention

**LOCAL COMPLICATIONS**

- Hemorrhage
- Wound infection
- Carotid artery rupture (due to necrosis of arterial wall usually if post op radiotherapy given)
- Chylous fistula (If the leak is mild, i.e. less than 100 mL a day, conservative management will almost always succeed, for major leaks need reexploration)
- Pneumothorax
- Nerve injuries (These are the Lesser Occipital, Greater Auricular, Transverse Cutaneous Nerve Of The Neck, Supraclavicular Nerves and probably some Motor Branches to the Trapezius)
  - A number of other nerves may be damaged by accident.
  - They include:
    - The Facial Nerve or its Mandibular or Cervical Division;
    - The Hypoglossal and Lingual Nerves;
    - The Vagus, Sympathetic Trunk, Phrenic Nerve or Brachial Plexus.
- Cerebral Edema (3 fold rise in ICP)

**EXTENDED RADICAL NECK DISSECTION**

- The additional lymph node groups include the Retropharyngeal & Parapharyngeal lymph nodes, the Parotid Nodes, or lymph nodes in levels VI or VII.
- The nonlymphatic structures that may be removed include Part of the Mandible, The Parotid Gland, part of the Mastoid Tip, Prevertebral Fascia and Musculature, The Digastric Muscle, The Hypoglossal Nerve, The External Carotid Artery as well as Skin.

**MODIFIED RADICAL NECK DISSECTION**

<table>
<thead>
<tr>
<th>MODIFIED RADICAL NECK DISSECTION</th>
<th>INDICATIONS</th>
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| Type I – Removal of Level I to V + IJV + SCM but preservation of Spinal Accessory Nerve | 1. Operable palpable neck disease (usually N1, N2a, N2b) not involving SAN.  
2. Occasionally for N0 neck |
| Type II - Removal of Level I to V + SCM only | Same as for Type I particularly for a second side operation when there is need for microvascular anastomosis OR histology dictates no need for IJV resection eg. Differentiated Thyroid cancer. |
| Type III – Removal of only Level I to V lymph nodes | 1. N0 neck  
2. Differentiated thyroid cancer  
3. Skin cancers like Melanoma, SCC & Merkel Cell Ca |
**SELECTIVE NECK DISSECTION**

- Selective Neck Dissection consists of preservation of one or more lymph node groups and all three nonlymphatic structures.

<table>
<thead>
<tr>
<th>Selective Neck Dissection Type</th>
<th>Levels Dissected</th>
<th>Main Indications</th>
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<tbody>
<tr>
<td>Supraomohyoid</td>
<td>I – III</td>
<td>T1-T4 N0 SCC oral cavity</td>
</tr>
</tbody>
</table>
| Extended supraomohyoid       | I – IV          | 1. Skin Ca (SCC, Melanoma) anterior to line of tragus.  
                                      2. Performed in Conjunction to superficial parotidectomy |
| Lateral                      | II – IV         | T2-T4, N0 SCC larynx, Oropharynx and Hypopharynx. |
| Posterolateral               | II – V plus Post. Auricular | Skin Ca (SCC, Melanoma) posterior to line of tragus |
| Anterior / Central           | VI              | 1. Differentiated Thyroid Ca  
                                      2. Subglottic, Hypopharyngeal SCC |
| Superior Mediastinal         | VII             | 1. Differentiated and Medullary Thyroid Ca  
                                      2. Subglottic, Laryngeal, Hypopharyngeal SCC  
                                      3. Cervical Oesophageal Ca |