Head & Neck Tumours
Part I

Dr. Khalid AL-Qahtani
MD,MSc,FRCS(c)
Assistant Professor
Consultant of Otolaryngology
Advance Head and Neck Oncology, Thyroid and Parathyroid, Microvascular Reconstruction, Skull Base Surgery
Thyroid and Parathyroid Glands
Thyroid Gland

- Anatomy
- Evaluation of Thyroid Nodule
- Thyroid Cancer: Types & Treatment
Thyroid Anatomy

- Shield shaped, may be H- or U-shaped
- 2 lateral lobes connected by an isthmus
- Isthmus at level of 2\textsuperscript{nd} to 4\textsuperscript{th} tracheal cartilages (may be absent)
- Rarely, small muscle (levator of the thyroid gland) attaches gland to hyoid bone
Lobes of Thyroid

- Each lobes measures approx 4cm high, 1.5cm wide, 2cm deep
  - Lobes have superior and inferior poles
- Superior pole: may extend as far as the oblique line of the thyroid cartilage
- Inferior pole: may extend inferiorly as far as the 5th or 6th tracheal rings
Attachments of Thyroid

- Firmly attached to larynx and trachea
- Elevated with deglutition
  - May allow to distinguish between thyroid nodule and other mass (LN, dermoid, branchial cleft cyst)
- Attached by anterior and posterior suspensory ligaments
  - Anterior -> anterior trachea to undersurface of thyroid
  - Posterior (Ligament of Berry) → lateral upper tracheal rings to bilateral thyroid lobes
### Arterial Blood Supply

- **Superior thyroid artery (STA)**
  - 1st branch of ECA
  - Followed by SLN until superior pole
  - Anastamoses with contralateral STA

- **Cricothyroid Artery**
  - Small branch off STA near superior pole to cricothyroid muscle
  - Anastamoses with contralateral artery
  - Cricothyroidotomy
Arterial Blood Supply Cont’d

- **Inferior thyroid artery (ITA)**
  - From thyrocervical trunk (1st part of subclavian at 1st rib)
  - Ascends anterior to vertebral artery
  - At C6 → ascending vertebral artery
  - Enters TE groove, runs next to RLN
  - Supplies posterior lateral lobes of thyroid
  - Anastamoses with STA near superior pole (Longitudinal branch)

*Fig. 128-3. Distribution of the thyroid arteries, posterior view.*
Venous Drainage

- 3 pairs of veins
  - Superior thyroid vein
    - Parallels course of STA on ant surface thyroid
    - Ascends to drain into internal jugular vein (IJV)
  - Middle thyroid vein
    - Direct lateral course from thyroid to IJV
    - Shortest of 3 veins
  - Inferior thyroid vein
    - Ant surface thyroid (opposite of ITA)
    - Vertical downward course to brachiocephalic v.

Figure 28-3. Superior thyroid and inferior thyroid arteries (left figure) and superior, middle, and inferior thyroid veins (right figure).
Thyroid Nodule - Evaluation

- Start with P/E, Hx
- Thyroid function tests
  - thyroxine (T4)
  - triiodothyronin (T3)
  - thyroid stimulating hormone (TSH)
- Serum Calcium, Calcitonin
- Thyroglobulin (TG)
Thyroid Nodule - Evaluation

- U/S
- Pre-operative Laryngoscopy
  - Assess RLN function / infiltration
  - Essential in revision cases (6.7% of patients with previous thyroid surgery had VC paralysis)
- Bx
- Other Imaging
Thyroid Imaging

- **U/S**
  - Often first modality, helps delineate architecture
  - Accessible, inexpensive, safe
  - Help locate nodule, assist with FNA
  - Micro-calcifications and central blood flow
    - Suggests CA
  - Not useful for large masses
Thyroid Imaging Cont’d

- **CT**
  - Useful for cervical lymphadenopathy
  - Dye can interfere with function testing and radioactive treatment for up to 8 weeks
  - Can provoke hyperthyroidism from dye
  - Recommended for FNA showing PTC
- **MRI**
  - Used less commonly
Thyroid Imaging Cont’d

• Scintigraphy
  – Hard to distinguish benign vs malignant nodule
  – 2D → difficult to localize lesion
Thyroid Biopsy

- **FNA**
  - Gold standard
  - Sensitivity $\rightarrow$ 65% to 98%
  - Specificity $\rightarrow$ 72% to 100%

- **Results**
  - Benign $\rightarrow$ adenoma, goitre, thyroiditis
  - Malignant $\rightarrow$ most common PTC
  - Indeterminate $\rightarrow$ FTC and Hurthle most common
  - Non-diagnostic $\rightarrow$ re-aspiration diagnostic in 50%
Thyroid Biopsy

• FNA Disadvantages
  – Inability to distinguish benign microfollicular adenomas from differentiated FTC
  – Inability to distinguish Hurthle cell lesion from adenoma or Hashimoto thyroiditis
  – Papillary Carcinoma
    • Slide preparation may mimic PTC findings
Management of the Thyroid Nodule

Serial exam

• Physical examination
  – Benign
  – Asymptomatic palpable nodule

• U/S
  – F/u a benign, non palpable nodule
  – F/u a cystic nodule for reaccumulation
Management of the Thyroid Nodule

• Trial of suppression of TSH
  – Benign or indeterminate FNA (controversial)
  – Maintain TSH level between 0.1 and 0.5 mIU/L per day
  – Decrease tumor volume up to 50% in 40% pts.
  – A shrinking tumor is not likely malignant
Malignant Thyroid Lesions

1. Well Differentiated (85%)
   - Papillary Thyroid Carcinoma (PTC)
   - Follicular Thyroid Carcinoma (FTC)
   - Hurthle Cell Carcinoma (HCC)

2. Poor differentiated malignant neoplasms
   - Medullary thyroid carcinoma (MTC)
   - Anaplastic thyroid carcinoma (ATC)

3. Other malignant tumors:
   - Lymphoma
   - Metastatic tumors
Malignant Thyroid Lesions

• Risk factors for Thyroid Cancer
  – Age (<20 or >60)
  – Male (Female > risk of nodules)
  – Rapid Growth
  – Invasive or compressive Symptoms
  – Previous Radiation exposure
  – Prior Thyroid disease
    • Goiter, Hashimoto, Grave’s, adenomas
  – Family Hx
Malignant Lesions

• Papillary Carcinoma
  – Ill defined margins
  – Histology = papillae and typical nuclear features
  – Psammoma bodies (concentric calcified layers)
  – Multicentric involvement of thyroid
  – Extra-thyroidal extension common
    • Muscle, RLN and Trachea
PTC Cont’d

- **Lymph node involvement in 30%**
- **Distant mets least common**
  - 1 - 25% during illness or 1 - 7% at Dx

- **Predisposing Factors**
  - Ionizing radiation
  - Familial (Cowden Syndrome = hamartomas, breast tumors and follicular / papillary tumors)
  - 5 - 10% of pts have +ve Family Hx

- **Clinical presentation**
  - Young females, palpable mass in thyroid or cervical LN (1/3rd have lymphadenopathy)
Follicular Carcinoma

- 13% of all thyroid carcinomas
- More aggressive, well differentiated compared to PTC
- 10 yr survival = 60% (PTC = 95%)
- More hypercellular
- Malignant lesion = capsular +/- vascular invasion
- No characteristic cytology
  - Impossible to dx on FNA, difficult with Frozen
FTC Cont’d

- Hematogenous spread more common than PTC
- Two variants: Minimally invasive vs Widely invasive
- Predisposing Factor
  - Radiation exposure
  - Goitre endemic areas
- Clinical Presentation
  - Solitary neck nodule or mass
  - Distant mets in 10 - 15% of cases
Hurthle Cell Carcinoma

- Subtype of FTC (15% of FTC’s)
- Like FTC, cannot exclude carcinoma vs adenoma based of FNA or frozen
- Clinical Presentation
  - Thyroid nodule or mass
  - 35 % will have distant mets during illness
  - Higher rate of nodal mets than FTC
Management WDTC

Surgical options
- Total thyroidectomy (>1.5cm)
- Thyroid lobectomy (<1.5cm)
- +/- Neck dissection
- Bailey’s
  - High risk patients  $\rightarrow$ total thyroidectomy
  - Low risk  $\rightarrow$ total thyroidectomy if gross nodules in contralateral lobe, otherwise lobectomy

Adjuvant Therapy
- Post-op I-131
- External beam RT
  - Tumors that do not pick up I-131
  - Advanced disease (mets, residual disease)
Medullary Thyroid Carcinoma

• Sporadic (80%)
  – More aggressive type
  – Late presentation (age 40 – 60)
  – Worst prognosis with spindle cell variant, increased CEA staining, decreased calcitonin staining
  – Early mets to regional lymph nodes (50%)
  – Larger tumors (>1.5cm) often have distant mets (70%)
Medullary Thyroid Carcinoma

- Familial (20%)
  - MEN IIA, MEN IIB, Non-endocrinopathic
  - Mutation in RET-protooncogene
  - Autosomal Dominant
  - Early presentation (birth – 20’s)

<table>
<thead>
<tr>
<th>TABLE 115.4. MULTIPLE ENDOCRINE NEOPLASIA SYNDROMES</th>
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<tbody>
<tr>
<td>Wermer syndrome (MEN type I)</td>
</tr>
<tr>
<td>- Parathyroid adenomas or hyperplasia, usually adenomas</td>
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<tr>
<td>- Pituitary tumors</td>
</tr>
<tr>
<td>- Pancreatic tumors</td>
</tr>
<tr>
<td>- Miscellaneous</td>
</tr>
<tr>
<td>- Carcinoid tumors</td>
</tr>
<tr>
<td>- Ovarian tumors</td>
</tr>
<tr>
<td>- Differentiated thyroid carcinoma</td>
</tr>
<tr>
<td>- Melanoma</td>
</tr>
<tr>
<td>Sipple syndrome</td>
</tr>
<tr>
<td>- Type IIA</td>
</tr>
<tr>
<td>- Parathyroid hyperplasia or adenoma</td>
</tr>
<tr>
<td>- Medullary thyroid carcinoma (100%)</td>
</tr>
<tr>
<td>- Pheochromocytoma (bilateral in 60%–75% of patients)</td>
</tr>
<tr>
<td>Type IIB</td>
</tr>
<tr>
<td>- Same as type IIA except for</td>
</tr>
<tr>
<td>- Presence of mucosal neuromas</td>
</tr>
<tr>
<td>- Marfanoid habitus with pectus excavatum</td>
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<tr>
<td>- No hyperparathyroidism</td>
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MEN, multiple endocrine neoplasia.
Treatment of MTC

- Total thyroidectomy with bilateral SLND
- Prophylactic surgery for relatives with RET mutation (preferably before age 7)
- No adjuvant therapy advocated
- Radiotherapy and chemotherapy for palliation (usually ineffective)
Anaplastic Thyroid Carcinoma

- Less than 5% of thyroid malignancies
- Highly aggressive and fatal
- Median survival 3 - 6 months
- Distant mets common (lung)
- Grossly, large and bulky tumors
  - Invade into surrounding tissue
- Clinical Presentation
  - Rapid expansion
  - Horner’s Syndrome (ptosis, miosis, enopthalmos, anhydrosis)
ATC Cont’d

• P/E
  – Firm, irregular mass fixed to surrounding structures
  – RLN involvement and VC paralysis common

• Tx (often palliative intent)
  – Surgery
  – Adjuvant RT
  – Chemotherapy
**Lymphoma**

- Rarely presents within thyroid gland
- Dx in 60’s
- Females > males
- Low - intermediate grade B-cell NHL
- Increased risk with Hashimoto
- Clinically
  - Rapidly expanding mass on background of Hashimoto
  - Hoarsness, dysphagia, VC paralysis, Horner Syndrome
- Tx
  - RT, Chemo
Post Op Complications

- RLN Injury
- Hypocalcemia
- Hematoma
Parathyroid Gland

- Embryology & Anatomy
- Evaluation of Hyperparathyroid
- Treatment of Hyperparathyroidism
Parathyroid Embryology and Anatomy

- **3rd Branchial Arch (endoderm) – inferior Parathyroid glands and the thymus**
- **4th Branchial Arch (endoderm) – superior Parathyroid glands**
**Parathyroid Anatomy**

- **Superior gland**
  - Most consistent location
  - superior to inferior thyroid artery
  - posterior to RLN
  - Posterior aspect of thyroid
  - Within 1 cm of RLN pierce cricothyroid membrane
Parathyroid Anatomy

- **Inferior gland**
  - inferior to inferior thyroid artery (usually found within 1-2 cm of ITA entrance into thyroid gland)
  - anterior to RLN
Aberrant Sites

- Seen in 15-20% of patients
- Bailey’s
  - Anterior mediastinum, usually thymus (3rd arch)
  - Posterior mediastinum (4th arch)
  - Aorto pulmonary window, middle mediastinum (3rd or 4th arch)
  - Retroesophagus, prevertebral
  - Tracheoesophageal
  - Intrathyroid
  - Carotid bifurcation
Parathyroid Blood Supply

- Inferior thyroid artery most common
- Rarely
  - superior parathyroid receives blood supply from both the ITA and STA, or
  - STA supplies both superior and inferior parathyroid glands

**FIGURE 115.1.** Variations in the blood supply to the parathyroid glands. Most of the time the blood
Parathyroid Lesions

- Benign
  - Parathyroid Adenoma
    - Most common cause of Hyperparathyroidism (80-90%)
    - Typically involve single gland
    - Superior and inferior glands affected equally
  - Primary Chief Cell Hyperplasia
    - 5 – 15% of cases, Women > Men
    - Proliferation of chief cells and oncocytes in multiple glands
    - Needs multiple gland sampling to distinguish from adenoma
Hyperparathyroidism

• Primary vs Secondary vs Tertiary
• Clinical Presentation
  – Primary often found on routine screening
  – Female:Male 3:1
  – Weakness, fatigue, depression
  – Muscle pain, Renal stones, gout
  – “Bones, Moans, Stones, Groans and Psych overtones”
HPT Cont’d

• Surgical Indications
  – Serum Calcium > 1.0 mg/dl above N
  – Hypercalciuria > 400mg/day
  – Cr Clearance < 30% of Normal
  – Bone Density T-score < -2.5
  – Age less than 50 without symptoms
  – Pts with difficult follow up / surveillance
HPT - Pre-Operative Work Up

- **U/S**
  - Operator dependant
  - Adenomas → usually solid

- **Sestamibi Scan**
  - Retained by abnormal parathyroid tissue but rapid clearance from normal thyroid tissue
  - Delayed images useful

- **CT / MRI**
  - Better visualization of anterior mediastinum
Surgical Principles

• Bloodless field to identify parathyroid
• Extreme care with RLN
• Avoid removal of normal parathyroids
• Intraoperative PTH
  – 10 minute post excision
    • Should be normal
    • Should be 50% decreased from baseline
Post-op hypocalcemia

- Seen in 20-30%
- Lowest levels seen in 1-3d post op
  - Ca (po and iv)
  - Vit D
  - Check Mg (especially in bone wasting HPT)
Parathyroid Carcinoma

- Rare
- 4th – 6th decade
- No sex difference of incidence
- Death caused by severe hypercalcemia, not tumor
- Metastatic disease → remove as much tumor as possible to lower serum calcium
- Biopsy leads to seeding
- Need wide margin, en bloc resection
Thank You