THYROID CANCER IN CHILDREN

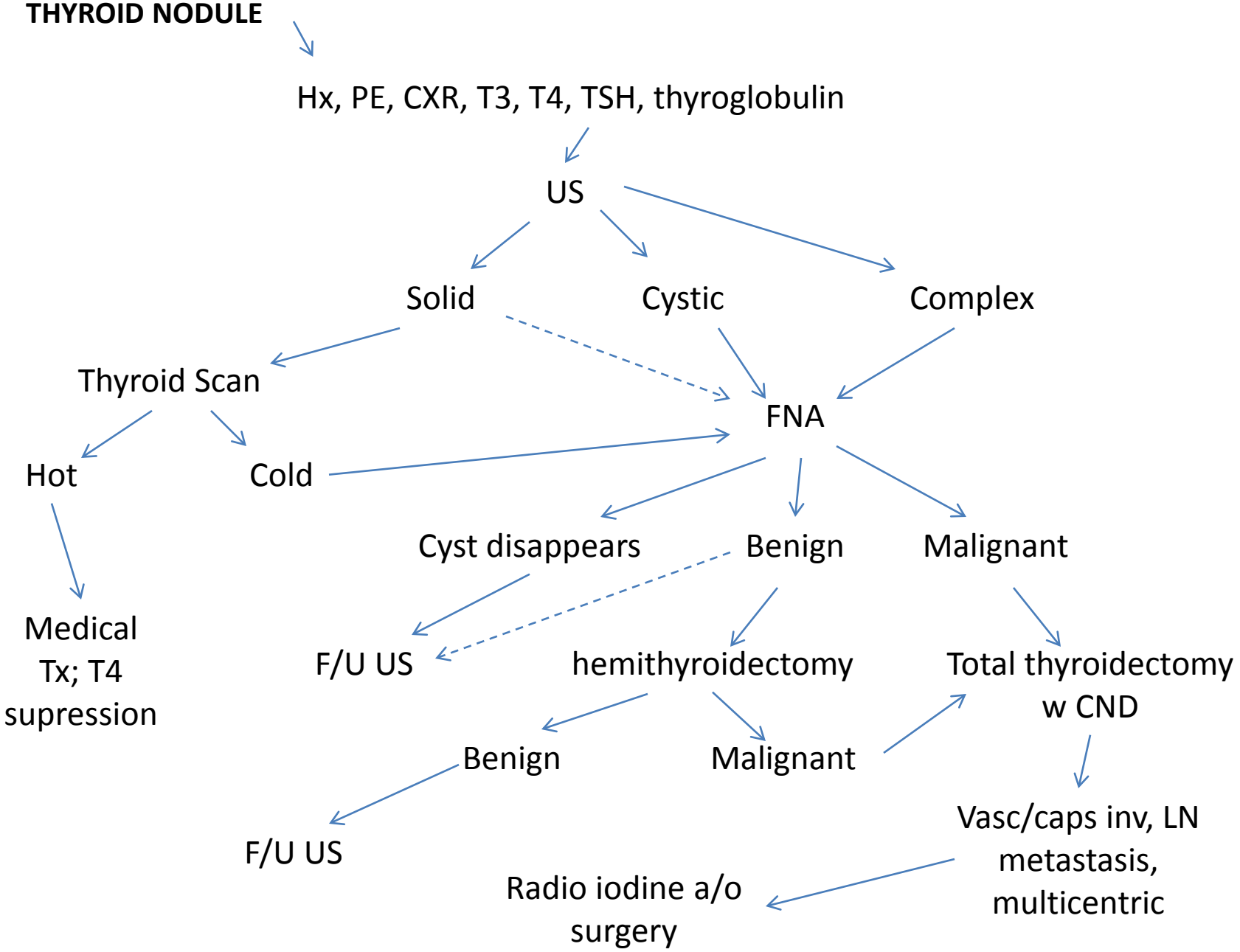
Humberto Lugo-Vicente MD FACS FAAP
Professor Pediatric Surgery
UPR School of Medicine

Thyroid nodules

- Rare
- Female predominance
- 4-fold as likely to be malignant
- Hx
  - Radiation exposure?
  - Previous malignancy?
  - Family hx thyroid ca
- MEN

1. J Ped Surg 43(5): 826-830, 2008

J Pediatr Surg 33(8):1302-1305, 1998



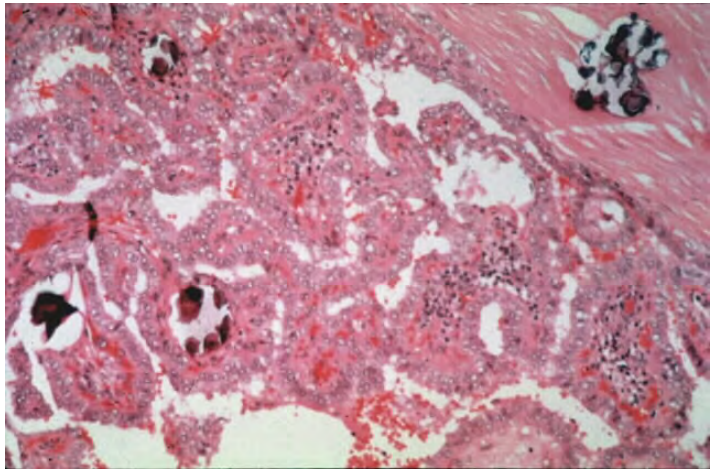
Epidemiology of Thyroid CA

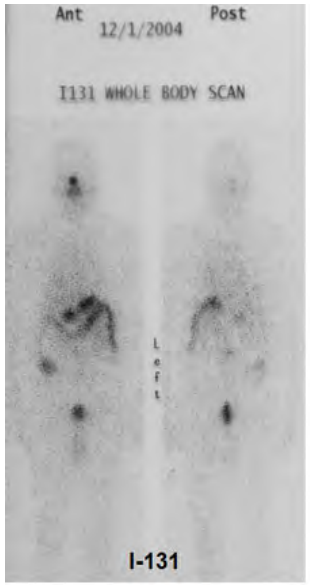
- Mean age 16 y/o
- Female predominance
- Incidence – 0.5/100,000/year (20x radiation exp)
  - Papillary 90%
  - Follicular 8%
  - Medullary 2%
  - Rare types <01.%
- Average tumor size 2.5 cm
- Positive lymph node 33-90%

1. Laryngoscope 115(2):337-40, 2005
2. Pediatr Endocrinol Rev. 2:230-5, 2003

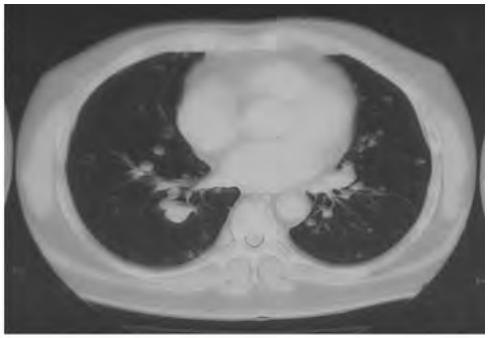
Papillary

- Most common >90%
- Arise from follicular cells
- Types: sporadic/ionizing radiation
- Multicentric
- Spread to regional nodes via
  - Intrathyroidal lymphatics
  - Extrathyroidal lymphatics
- Metastasis
  - lung
  - Bone
- Psammomas
- Prognosis is excellent

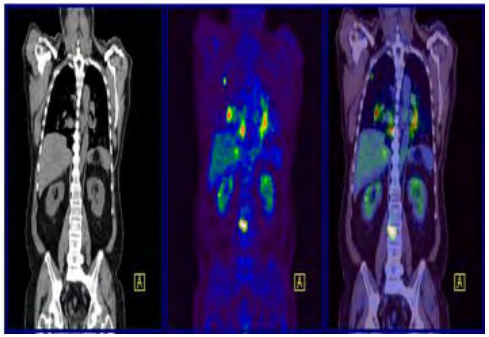




Tg elevated
I-131 -ve
PET +ve



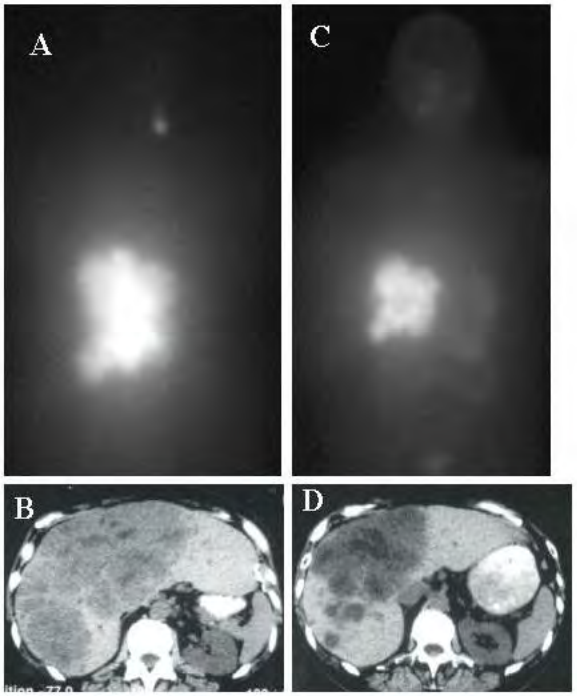
CT

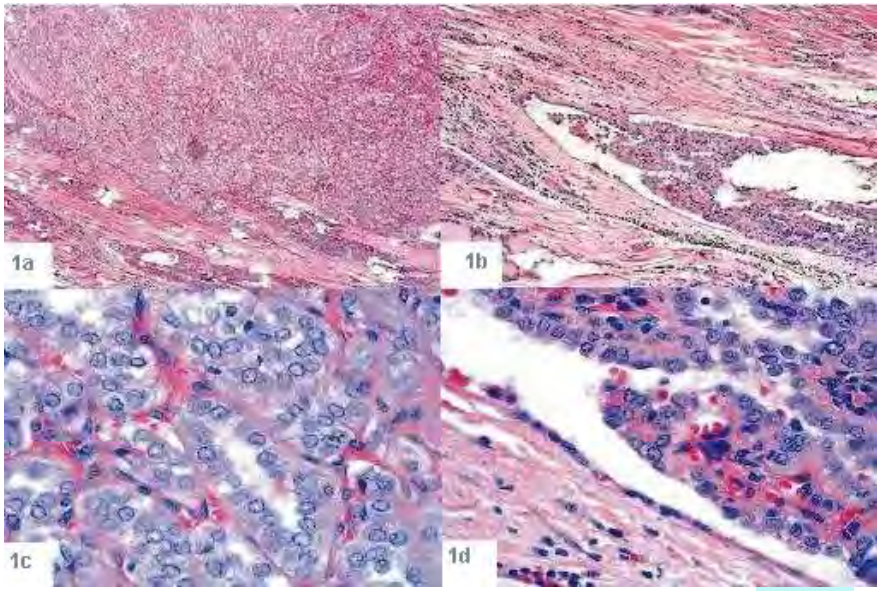


PET-CT

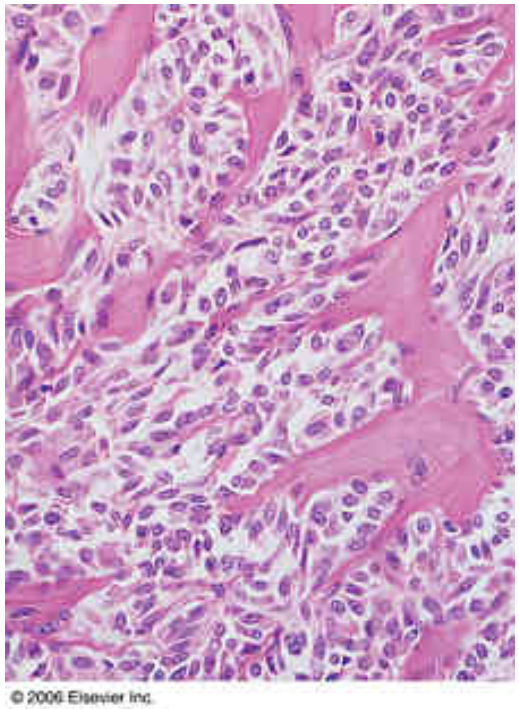
Follicular

- Common in iodine def areas
- More aggressive
- Difficult to differentiate from normal thyroid tissue or benign follicular adenoma in FNA
- Marked tendency to
  - Invade vascular system (1b) & capsule (1d)
  - Metastasis to regional nodes, bone, liver and lung (hematogenous)
- Metastasis have marked avidity for I-131





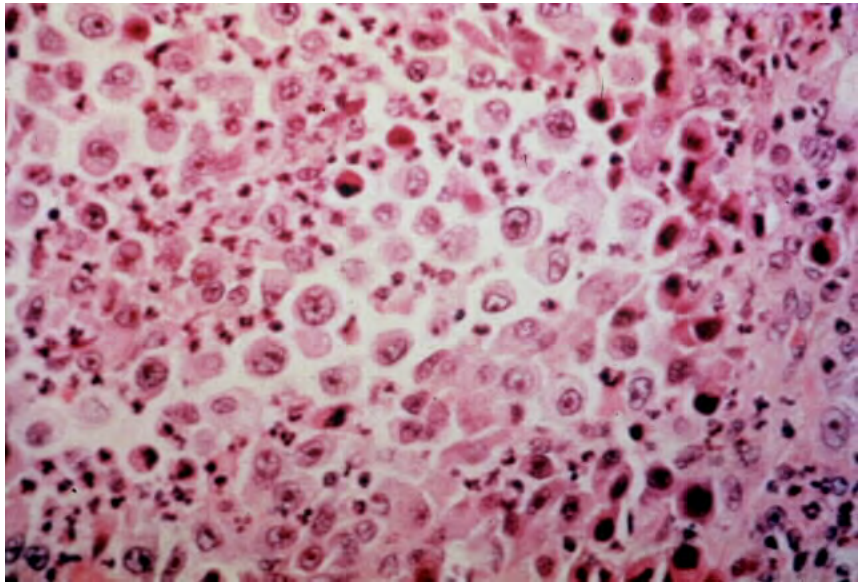
Medullary



- 2-5%, solid, amyloid stroma
- Origin - parafollicular C-cells
- Types
  - Sporadic – most common in adults
  - Family Hx of MTC (variant of MEN2)
  - MEN IIA or IIB syndromes - most common in children
- Calcitonin (marker)
- More aggressive, lethal tumors
- Genetic testing detect mutation in RET gene
- Prophylactic thyroidectomy

Rare types

- < 1%
- Hurtle cell
  - Angio or cap invasion to different benign from CA
- Lymphomas
- Sarcomas
- Anaplastic
- Tx
  - Total thyroidectomy
  - Chemotherapy



Preop Preparation

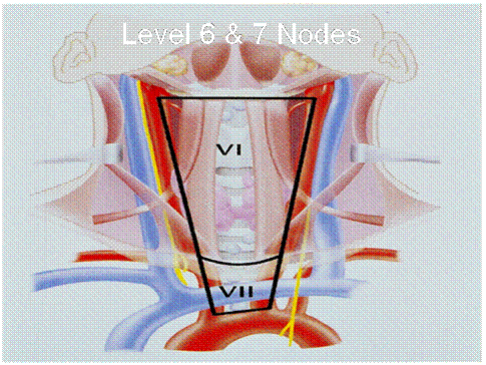
- Euthyroid
- Evaluate vocal cord function
  - Reoperation
- Best CV condition
- Discuss reason for surgery with parents
  - Vocal cord paralysis
  - Hoarseness
  - Loss of voice
  - Hypoparathyroidism
  - Infection
  - Hemorrhage
  - Keloid
- Pregnant child w + CA
  - 2nd trimester

Management of suspected CA

- Lobectomy with isthmusectomy
  - Standard of care
- Lumpectomy/partial thyroidectomy
  - Small lesion in the isthmus
  - Hot Lesions
- Lesion in isthmus
  - Resection of isthmus along with the anterior third of each lobe

Management of + CA

- Total thyroidectomy with central node compartment dissection
- CND
  - From hyod to superior medistinum
  - Laterally to carotid sheath

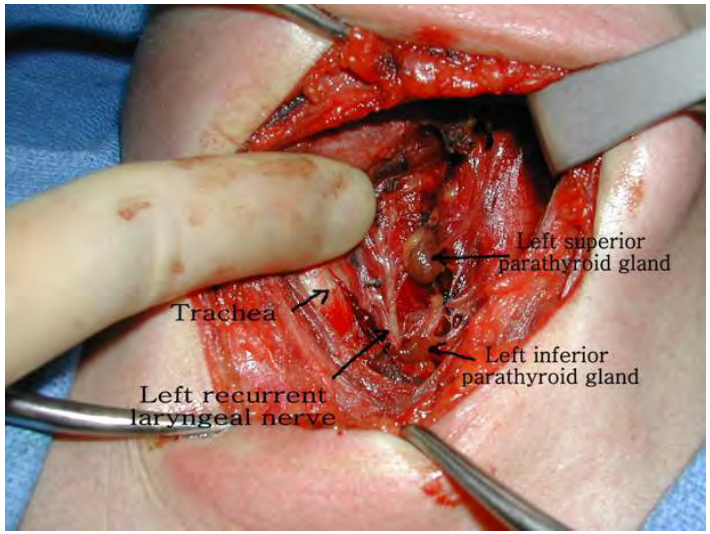


- Routine selective or modified lymph node dissection for palpable cervical lymph nodes
  - reduces the incidence of local recurrence
  - Reduce morbidity of a 2nd surgery

1. J Pediatr Surg 40(8):1284-8, 2005
2. J Pediatr Surg 40(11):1696-700 , 2005
3. Clin Nucl Med. 33(5):319-20, 2008

Postop Complication

- Recurrent nerve palsy
- External branch laryngeal nerve palsy
  - High pitch voice
- Hypocalcemia
  - Transitory
  - Permanent
- Hematoma
- Hypertrophic neck scar



Stage

- Stage 1
  - Confined to gland
- Stage 2
  - Involving regional lymph nodes
- Stage 3
  - Invading adjacent tissues i.e. trachea, muscle
- Stage 4
  - Distant metastasis

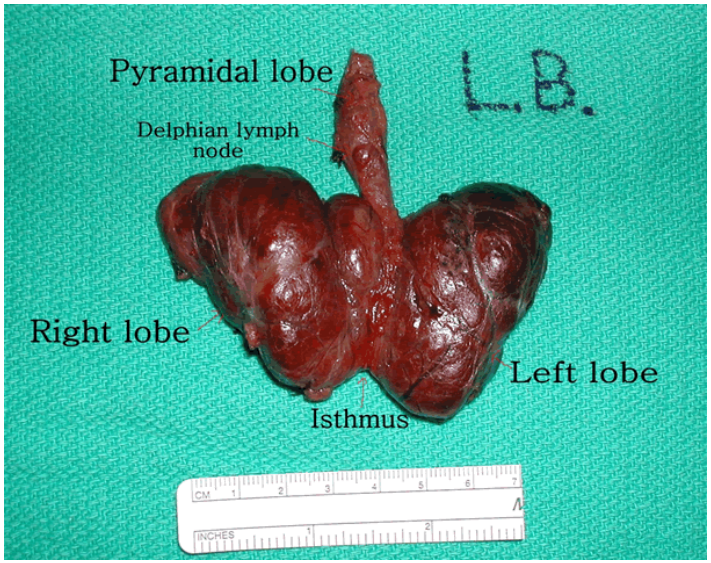
Postop Management

- Consider ablation I-131 tx
  - Multifocal disease
  - Local metastasis
  - Distant metastasis
  - Vascular or capsular invasion
- I-131 dx/ablation scan 4-6 weeks in hypothyroid condition
- Effect of therapy is evaluated by
  - radioiodine whole-body scans
  - serum thyroglobulin levels

1. Clin Nucl Med. 30(6):387-90, 2005
2. J Nucl Med. 48(6):879-88, 2007

Adverse prognostic factors

- Large tumor > 3 cm
- Younger age (< 15 y/o)
- Presence of local metastasis
- Presence of distant metastasis
- Aneuploid DNA



1. Eur J Cancer. 40(11):1655-9, 2004

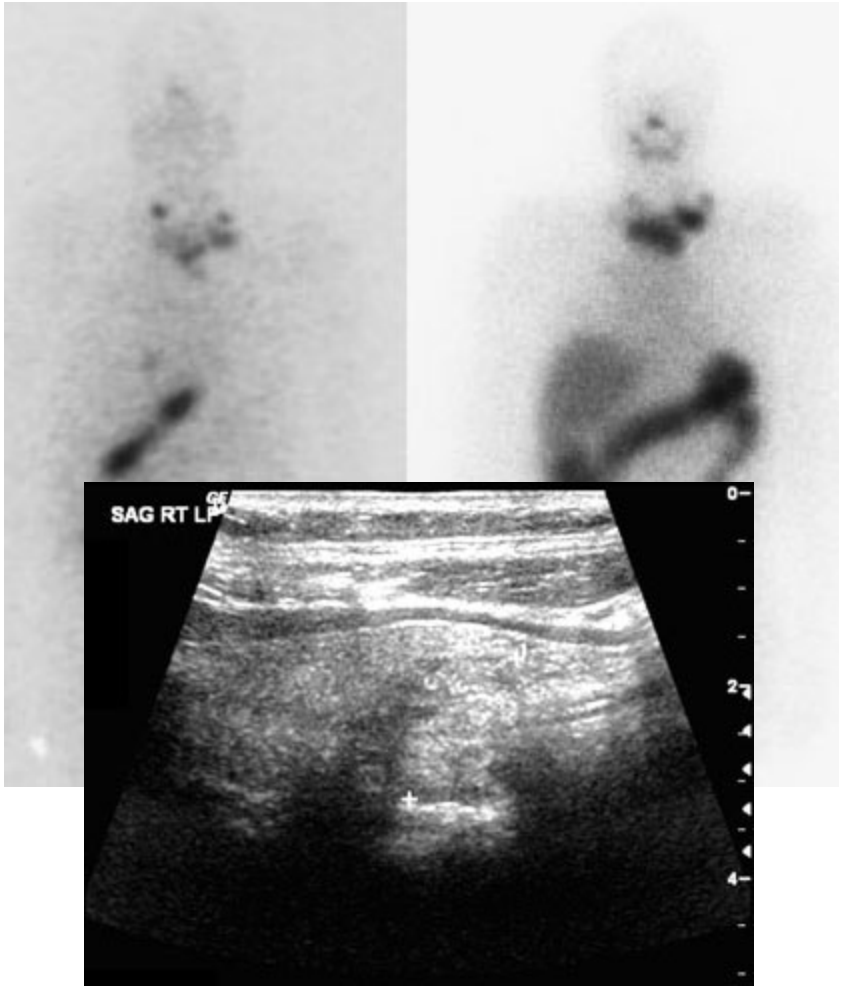
Factors predictive of recurrence

- Recurrence rate is higher in children (47%)
- Cause-specific mortality is very low
- Risk factors for recurrence
  - radiation-induced thyroid CA
  - cervical lymph nodes involvement
  - Multiple thyroid nodules involvement
  - Age < 10 y/o

1. J Pediatr Surg. 39(10):1500-5, 2004
2. World J Surg. 28(11):1088-92, 2004
3. World J Surg. 28(12):1187-98, 2004
4. J Pediatr Surg. 40(8):1284-8, 2005
5. J Pediatr Surg. 40(11):1696-700, 2005

Diagnosing a Recurrence

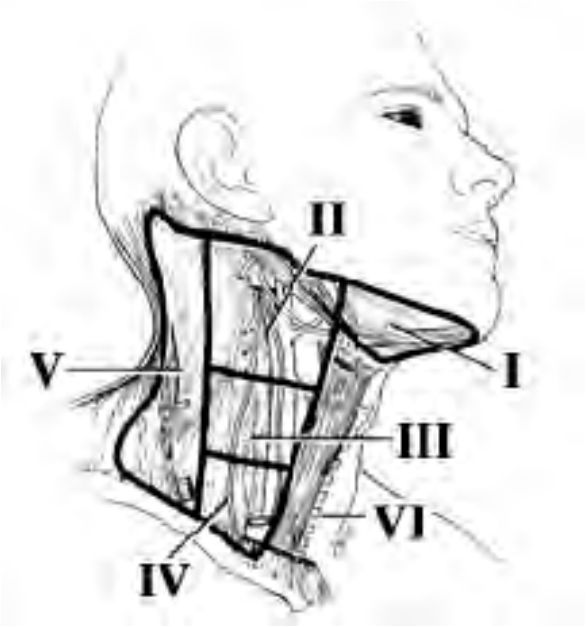
- I-131 whole body scan
- Ultrasound
- High thyroglobulin levels for diff CA
  - hTG increase also with iodine deficiency
- High thyrocalcitonin levels for MTC



1. J Pediatr Endocrinol Metab. 19(9):1175-8, 2006

How to manage Recurrences

- Surgery
  - Most effective if disease is amenable to resection
- I-131 ablation
  - For any other case
  - Not useful for MTC



Belarus experience: Chernobyl

- 740 cases pediatric thyroid CA < 15y/o
- Variables associated with nodal or distant recurrence
  - Tumor stage
  - Young age
  - Presence of sx
  - Multifocal
  - N1 status
  - Lack of neck lymph node dissection
  - Extent of surgery
- Cure occurs with
  - Total thyroidectomy + CND followed by radioiodine therapy

1. Ann Surg. 243(4):525-32, 2006

Prognosis PTC

- Despite metastasis in the lymph nodes and even the lungs, the prognosis for patients with papillary carcinoma is very good
- Total thyroidectomy and positive 131I therapy are recommended for childhood and adolescent thyroid carcinoma with pulmonary metastasis

1. Eur J Pediatr Surg 16(1):8-13, 2006

MTC - MEN

- Familial autosomic dominant
- MEN I
  - pituitary, parathyroid, and pancretic islets
- MEN II
  - MEN IIA
    - MCT, pheochromocytoma and hyperparathyroidism
  - MEN IIB
    - MCT, pheochromocytoma, marfanoid habitus and neuromas

MEN II

- Most constant feature
  - MTC
- MTC in MEN II
  - TT with CND
- Prophylactic Thyroidectomy done for elevated chemical marker has a higher rate of curability than when the diagnosis is made clinically

1. N Engl J Med 353(11):1105-13, 2005
2. Surgery. 141(1):90-5, 2007
3. J Pediatr Surg. 42(1):203-6, 2007
4. J Pediatr Surg 34(4):568-71, 1999
5. J Pediatr Surg 33(6):846-8, 1998

Prognostic variables MTC

- Survival 5y-97%, 10y-88%, 20y-84%
- Factors decreasing survival
  - Advance tumor stage
  - MEN type IIB
  - High post-surgery calcitonin levels
  - Vascular & perineural invasion
  - Extrathyroidal extension
  - Presence of nodal metastasis

1. Laryngoscope 115(8):1445-50, 2005

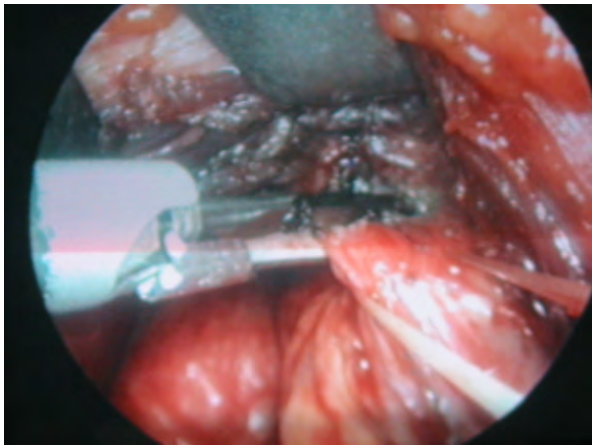
MTC in MEN II/FMTC – prophylactic TT

- lower incidence of persistent or recurrent disease in children who underwent prophylactic TT before 5-8 years of age and in children in whom there were no metastases to cervical lymph nodes
  - MEN IIB infancy
  - MEN IIA early childhood
- young patients identified by direct DNA analysis as carriers of a RET mutation characteristic of MEN-2A had no evidence of persistent or recurrent medullary thyroid carcinoma five or more years after TT
- Only TT needed, no need for CND

1. N Engl J Med 353(11):1105-13, 2005
2. Surgery. 141(1):90-5, 2007
3. J Pediatr Surg. 42(1):203-6, 2007
4. J Pediatr Surg 34(4):568-71, 1999
5. J Pediatr Surg 33(6):846-8, 1998

Minimally Invasive VA-Thyroidectomy

- Case series of 35 pts mean age 14 y/o
- Safe/feasible for benign/malignant disease
- Less postop pain
- Reduced hosp stay
- Better cosmetic results
- Open surgical experience is mandatory
- Harmonic scalpel makes a difference
- Best scenario
  - Prophylactic thyroidectomy
- Contraindicated
  - Papillary CA Nodule > 2cm
  - Neck lymph node with metastatic disease



J Ped Surg 43(5): 1259-1261, 2008