**Palpable Abnormalities of the Thyroid: An Approach for the Primary Care Provider**

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**Neck examination:** masses in neck originating in thyroid appear at midline or connected to midline; visible from front; move with swallowing; examine neck by looking and feeling as child swallows; palpate gland from front or behind; each lobe approximately size of distal phalanx of thumb; ultra-sonography (US) — best objective tool for determining size and volume; available tables allow determination of whether lobes enlarged; provides echotexture, which assists in determining etiology (eg, Hashimoto thyroiditis [typically shows “moth-eaten” pattern]); radioactive iodine uptake (RAIU) and scan — “cold” nodule previously believed to be at risk for cancer; however, most cold nodules benign; RAIU indicated only for evaluating function in patients with suppressed thyrotropin (TSH); not useful for evaluation of anatomy or histology; fine needle aspiration (FNA) — differentiates benign nodule from cancer; study — linear relationships observed between thyroid volume and age, and between thyroid volume and body surface area; 95th percentile for volume of both lobes =6.2 mL/m²

**Childhood goiter:** in study of =5000 children ages 11 to 18 yr in southwestern United States (Rallison et al, 1964), =5% of girls and =4% of boys found to have palpable goiters; rate of 1% to 2% seen in studies of children <10 yr of age

**Causes:** most common — chronic lymphocytic thyroiditis or Hashimoto thyroiditis; Saxena et al (1962) found 23 of 32 children with goiter had lymphocytic thyroiditis; inflammatory causes — viral or subacute thyroiditis (de Quervain thyroiditis); bacterial or acute suppurative thyroiditis (has toxic presentation [eg, fever, left shift]; abscess present on lobe); colloid goiter — not well understood; histology shows large follicles filled with colloid or storage of thyroid hormone, often surrounded by flattened epithelium; patients always euthyroid; goitrogens — children with reactive airway disease or asthma who take expectorants and those taking amiodarone for cardiac arrhythmias at risk for iodine excess; some foods (eg, cassava, millet) implicated as causes; iodine deficiency — most common in women of reproductive age; “toxic” goiter — associated with hyperthyroidism; includes Graves disease, hyperfunctioning adenomas, and multinodular goiter; may present as goiter or goiter with nodule; infiltrative diseases — histiocytosis or cystinosis of thyroid gland; thyroid masses — cysts, benign tumors, and malignant tumors; may present as enlargement of thyroid gland with or without nodule

**Diagnosis:** first, assess thyroid function (measure TSH and free thyroxine [T₄]); perform US; order panel of antithyroid antibodies, including antithyroglobulin antibody (TgAb) and thyroid peroxidase antibody (TPOAb); order barium swallow for children with goiter who have difficulty swallowing or dysphasia; order pulmonary function tests for those with shortness of breath

**Management:** case example — 12-yr-old girl presented with enlarged palpable gland, no nodules, weight gain, and fatigue; free T₄ in normal range and TSH mildly elevated; highly positive for anti-TgAb and anti-TPOAb; Hashimoto thyroiditis diagnosed; treatment based on thyroid function tests (TFTs); case patient started on levothyroxine (initial dose 75 μg/day); TFTs should be rechecked in 6 to 8 wk; once correct dose established and patient euthyroid, monitoring required twice yearly or any time concerning clinical features manifest; goiter followed by physical examination (PE) rather than by US; repeat US and referral to specialist indicated if goiter enlarges or nodule appears

**Toxic goiter:** epidemiology — Graves disease accounts for =95%; hyperfunctioning adenomas or “hot” nodules, =3%; multinodular goiter, =2%; sometimes familial (associated with gain-of-function mutation of TSH receptor [constitutively active])

**Diagnosis of Graves disease:** perform TFTs; triiodothyronine (T₃) not useful with suspected hypothyroidism (last hormone to fall below normal); some hypothyroid patients have elevated TSH, but normal T₃; in hyperthyroidism, T₃ usually elevated first; Graves disease caused by antibody (thyroid-stimulating immunoglobulin [TSI]) that binds to TSH receptor and stimulates growth and hyperfunction; TSI first-line test for diagnosing hyperthyroidism due to Graves disease; TSH receptor antibody — second test; uses competitive inhibition method; correlation with clinical biochemistry required to determine whether stimulating or blocking antibody involved; imaging — usually unnecessary, except in cases that remain unclear after function and antibody tests; US indicated when size of patient’s thyroid difficult to determine by PE; RAIU — Iodine 123 (¹²³I), rather than ¹³¹I, used for diagnostic testing

5. Effectively manage postoperative pain in children who have undergone adenotonsillectomy.

**Educational Objectives**

The goals of this program are to improve the diagnosis and treatment of thyroid disorders, and to improve decision making with regard to tonsillectomy and adenoidectomy. After hearing and assimilating this program, the clinician will be better able to:

1. Diagnose a thyroid disorder through appropriate examination of the neck and laboratory testing.
2. List causes of and treatment options for goiter and thyroid nodules.
3. Recognize risk factors and ultrasonographic findings that indicate need for further screening for thyroid cancer.
4. Appropriately refer patients for tonsillectomy and/or adenoidectomy.

**Faculty Disclosure**

In adherence to ACCME Standards for Commercial Support, Audio Digest requires all faculty and members of the planning committee to disclose relevant financial relationships within the past 12 months that might create any personal conflicts of interest. Any identified conflicts were resolved to ensure that this educational activity promotes quality in health care and not a proprietary business or commercial interest. For this program, members of the faculty and planning committee reported nothing to disclose.
Thyroid nodules: incidence — Rallison et al found that 2.3% of adolescent girls and 1.3% of boys had palpable nodules; at 50 yr of age, nodules detectable by palpation in ≈5%, but prevalence of nodules 40% to 50% when population evaluated with US; speaker estimates that US would detect nodules in 5% to 10% of healthy children; causes — multinodular goiter (eg, single large nodule caused by chronic lymphocytic thyroiditis); colloid goiter; solitary nodules may represent simple cyst or neoplasm (follicular adenoma most common benign thyroid neoplasm; papillary carcinoma most common cancerous thyroid neoplasm); approximately 25% of excised nodules malignant, but overall risk for cancer low

Risk factors for cancer: irradiation of head and/or neck — monitoring for nodules and development of cancer necessary for remainder of life; exposure to radioactive fallout — incidence of cancer in children living in Chernobyl area increased ≥10-fold in 5 to 10 yr after accident; Fukushima data not yet available; family history of thyroid cancer — only ≈5% of papillary carcinoma familial; however, medullary thyroid cancer usually associated with multiple endocrine neoplasia (MEN) syndrome, which has autosomal-dominant inheritance (children often referred for genetic screening when parent diagnosed MEN syndrome); clinical features — rapid growth of nodule; firm, fixed nodule; hoarseness or vocal cord paralysis; pathologic cervical lymph node

Diagnostic test algorithm for nodules: start with TTFs and US; TSH suppressed and solitary nodule on US — perform RAIU and scan to confirm hyperfunctioning or toxic adenoma; solitary cystic nodule and normal TTFs — universally benign; manage with aspiration (often curative) and follow up with US; normal TTFs with multinodular goiter and positive TgAb and TPOAb — indicative of Hashimoto thyroiditis; decide whether treatment with thyroid hormone appropriate based on thyroid function; follow up with examination of neck and periodic US; indications for FNA — normal TTFs, US showing solitary solid or mixed solid cystic nodule, with any dimension of ≥1 cm, or, with all dimensions <1 cm but showing features associated with increased risk for cancer (ie, hyperechoicity, microcalcifications, irregular margins, increased central vascularity, pathologic cervical lymph nodes [usually, with loss of fatty hilum], or documented enlargement of nodule on serial US)

Management of thyroid cancer: in cases of papillary thyroid cancer, stage preoperatively (obtain computed tomography of chest to rule out metastasis to lungs); if treatment with radioactive iodine under consideration, avoid using iodine-containing contrast because thyroid unable to take up until iodine load from contrast excreted (3-4 mo wait required); surgical recommendations — refer to “high-volume” thyroid surgeon; preferred procedure total thyroidectomy, with some dissection of central and lateral neck for sampling of lymph nodes; prognosis — at presentation, approximately two-thirds of children have spread to cervical lymph nodes or to lungs; prognosis better in children than in adults; registry data show 5-yr survival of 98%, 97% at 15 yr, and 91% at 30 yr

Tonsillectomy and Adenoidectomy: Indications and Postoperative Management

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American Academy of Otolaryngology guidelines: list indications for tonsillectomy and adenoidectomy; not applicable to tonsillitis, intracapsular surgery, or partial removal techniques; based on studies of healthy children (not necessarily applicable to those with diabetes, cardiopulmonary diseases, craniofacial disorders, congenital anomalies, sickle cell disease, immune deficiencies, or coagulopathies)

Age and indication for tonsillectomy: predominance of obstruction vs infection varies with age; 0 to 3 yr of age — obstruction almost 100% of cases; infection rare (<5%); 4 to 10 yr of age — obstruction 90%; infection 10%; 11 to 18 yr of age — proportions of obstructive and infectious indications nearly equal

Level of obstruction: at zero, tonsils not visible; 1+ represents <25% obstruction; 2+, 25% to 50%; 3+, >75% of usually described as “no residual airway”; obstruction mutually exclusive of infections

Sleep-disordered breathing (SDB): manifestations — difficulty breathing at night, snoring, mouth breathing, pauses or obstructive apnea, and (sometimes) enuresis; associated daytime symptoms include growth delay (ie, growth hormone secreted in deep REM sleep; caloric intake not optimally contributing to growth), behavioral problems (due to hyperactivity or constant fatigue), with resulting problems in school, and dysphagia

Management of SDB: tonsillectomy improves quality of life; polysomnography (PSG) — gold standard for diagnosis, but often unnecessary with good clinical history and PE; “poor man’s sleep study” (ie, tape of breathing during sleep) may serve as substitute; ask parents about sleep positions (neck often hyperextended); PSG recommended in children with complicated medical conditions and thus at increased risk for anesthetic complications; healthy children need PSG only if diagnosis questionable or no improvement seen postoperatively

Factors affecting resolution: obesity; craniofacial disorders; Down syndrome; hypertrophic tonsils contribute to SDB, but etiology often multifactorial; tonsillectomy effective in 60% to 70% of children overall, but only in 10% to 25% of those with obesity

Tonsillitis: tonsils appear enlarged and glossy (inflamed), with some exudate; Paradise or Pittsburgh criteria — study showed that children with 7 infections in 1 yr, 5/yr for 2 consecutive years, or 3/yr for 3 consecutive years, tended to have significant rate of infection; infection indicated by ≥1 factors including fever (>38.3°C), tonsillar exudate, positive test for group A streptococcal infection, or cervical adenopathy; children who did not meet these criteria tended to improve without surgery; modifiers of criteria — surgery recommended for child with fewer episodes if infections extremely severe (causing prolonged absences from school), or child has multiple allergies or intolerances to antibiotics, history of complication such as peritonsillar abscess or Lemierre syndrome, periodic fevers with aphthous stomatitis, pharyngitis, and adenitis (PFAPA), pediatric autoimmune neuropsychiatric disorder associated with Streptococcus (PANDAS) syndrome, or “ping pong” spread of infection in household

Pathogens of infection: 50% of cases viral (eg, Epstein-Barr, adenovirus, parainfluenza, influenza A or B); 20% bacterial (most commonly, streptococcal); patients who develop nonsuppurative complications of streptococcal infection (eg, glomerulonephritis, rheumatic fever) usually considered candidates for tonsillectomy

Peritonsillar abscess: rate of recurrence 10% to 17%, but increases to 20% to 30% with history of recurrence of tonsillitis (strengthens indication for surgery); quinsy tonsillectomy — involves removal of tonsils when abscess present; usually performed in children who need anesthesia for draining of abscess; eliminates possibility of recurrence

Chronic tonsillitis: ≥3 mo of sore throat, with recurrent acute episodes; meets criteria for considering intervention
Adenoidectomy alone: indications — ≥4 episodes of recurrent purulent rhinorrhea in 1 yr; persistent symptoms of adenoiditis despite 2 courses of antibiotics; sleep disturbance with airway obstruction; hyponasal speech; otitis media for >3 mo, associated with need for >1 set of pressure equalizer tubes; dental malocclusion with orofacial growth disturbance (adenoid facies); obstructive sleep apnea (OSA; consider size of adenoids); exclude allergies as cause

Postoperative management: outpatient adenotonsillectomy safe, except in populations at increased risk for complications (eg, children <3 yr of age; those with cardiac disease, Down syndrome, neuromuscular disorder, obesity, failure to thrive, craniofacial anomalies, apnea-hypopnea index of >10/hr), who require overnight admission; pain management — pain significant for ≤2 wk; no postoperative pain medication ideal; no evidence supports benefit of perioperative local anesthetic at time of surgery; dehydration contributes to increased pain; morning pain most severe because of increased edema due to position, poor sleep, and relative dehydration

Oral analgesics: codeine — not recommended; genetic variations in metabolism associated with lack of efficacy or risk for overdose; tramadol — safe and effective; potency intermediate between codeine and morphine; rarely causes respiratory depression; not compounded by outside pharmacies; hydrocodone and acetaminophen — safe, but taste may not be tolerated; narcotics have negative side effects (eg, nausea, dizziness, constipation, sedation); nonsteroidal anti-inflammatory drugs — do not alter risk for postoperative bleeding; alternation with narcotics associated with good outcomes; time-dependent dosing more effective than “as needed” during first few days; speaker recommends alternating between tramadol plus acetaminophen and ibuprofen every 3 hr; on day 4, medications given on as-needed basis; intraoperative steroids — decrease nausea, vomiting, and throat pain, and improve oral intake

Acknowledgements

Dr. LaFranchi and Dr. Malone spoke at the 23rd Annual Practical Pediatrics for the Primary Care Physician, held September 26-27, 2013, in St. Paul, MN, and sponsored by Children’s Hospitals and Clinics of Minnesota. To attend the 24th Annual Practical Pediatrics for the Primary Care Physician, please visit www.childrensmn.org. The Audio Digest Foundation thanks Dr. LaFranchi, Dr. Malone, and Children’s Hospitals and Clinics of Minnesota for their cooperation in the production of this program.

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Review Educational Objectives on page 1
Take pretest
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Take posttest
1. For which of the following cases is radioactive iodine uptake and scan indicated? 
   (A) Patient with normal thyrotropin (TSH) levels and multinodular goiter 
   (B) Patient with suppressed TSH levels ** 
   (C) Patient with normal TSH levels and single solid nodule >1 cm 
   (D) All the above 

2. The most common cause of childhood goiter is: 
   (A) Hashimoto thyroiditis ** (C) Subacute thyroiditis 
   (B) Graves disease (D) Colloid goiter 

3. In a patient who has received medication for goiter, which of the following is the recommended follow-up routine? 
   (A) Check thyroid function tests (TFTs) after 3 mo and monitor goiter with serial ultrasonography (US) 
   (B) Check TFTs after 3 mo and monitor goiter with physical examination (PE) 
   (C) Check TFTs after 6 to 8 wk and monitor goiter with serial US 
   (D) Check TFTs after 6 to 8 wk and monitor goiter with PE ** 

4. Patients who have undergone radiation therapy to the head and neck require monitoring for the development of thyroid cancer for the: 
   (A) First 5 yr after treatment (C) First 15 yr after treatment 
   (B) First 10 yr after treatment (D) Remainder of their lives ** 

5. What is the recommended management of a patient with normal TFT levels and a solitary cystic nodule? 
   (A) Observation 
   (B) Aspiration of nodule and follow-up with US ** 
   (C) Surgical removal of the nodule and follow-up with PE 
   (D) Treatment with radioactive iodine followed by surgical removal of nodule 

6. Which of the following are strongly associated with increased risk for a thyroid malignancy? 
   1. Nodule with any dimension >1 cm 
   2. Family history of papillary cancer 
   3. US showing thyroid with “moth-eaten” appearance 
   4. Presence of microcalcifications in a thyroid nodule 
   (A) 2,4 (B) 1,2,3 (C) 1,4 ** (D) 1,3,4 

7. Adolescents 11 to 18 yr of age are referred for tonsillectomy: 
   (A) Primarily due to obstruction 
   (B) Primarily due to infections 
   (C) In approximately equal proportions for obstruction and infections 
   (D) Due to high risk for lymphoma of the tonsil ** 

8. According to the Paradise criteria, a tonsillectomy is indicated for: 
   (A) Patient with 5 infections in 1 yr 
   (B) Patient with 3 infections per year for 3 consecutive years ** 
   (C) Patient with 4 infections per year for 2 consecutive years 
   (D) A or B 

9. An adenotonsillectomy should be performed on an inpatient basis in which of the following? 
   1. All children <5 yr of age 
   2. 8-yr-old patient with Down syndrome 
   3. 6-yr-old patient with apnea-hypopnea index score of 11/hr 
   4. 7-yr-old patient with obesity 
   (A) 1,2,4 (B) 2,3 (C) 1,2,3,4 (D) 2,3,4 

10. Which of the following medications is not recommended for treatment of postoperative pain in children who have undergone tonsillectomy? 
   (A) Codeine ** (C) Nonsteroidal anti-inflammatory drug 
   (B) Tramadol (D) Hydrocodone 

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