OBSERVATION

Consideration of Submandibular (Undescended) Ectopic Parathyroid Glands in Surgery and Localization Studies

Anatomy of the parathyroid glands varies. During embryogenesis, precursor glands descend from the third and fourth pharyngeal pouches into the neck, but up to 20% end up in “ectopic” locations.1 Adenomas that develop from undescended glands in the submandibular region are difficult to identify on standard imaging and account for 7% of cases of persistent hyperparathyroidism following parathyroidectomy.2 Undescended adenomas are well described in endocrine surgery literature but nearly absent from otolaryngology literature. With approval from Eastern Virginia Medical School’s institutional review board to use patient cases in a deidentified format, we identified the senior authors’ (J.T.W. and D.W.K.) patients with undescended parathyroid adenomas.

Report of Cases | Case 1. An asymptomatic man in his 40s with primary hyperparathyroidism presented for evaluation. His family history included several first-degree relatives who had undergone parathyroidectomy and a brother with a “stomach acid” tumor. His preoperative serum calcium level was 12.3 mg/dL, parathyroid hormone (PTH) level was 421 pg/mL, and technetium Tc 99m sestamibi single photon emission computed tomographic (SPECT) imaging was nonlocalizing. (To convert serum calcium to millimoles per liter, multiply by 0.25.) Genetic testing revealed heterozygosity for a variant of MEN1 (exon 8, codon 376 CTG>CCG).

At the initial surgery, the right superior, right inferior, and left superior parathyroid glands appeared normal, but left neck and superior mediastinal exploration failed to reveal the left inferior gland. The left thyroid lobe and left superior parathyroid were removed, and the PTH level remained elevated at 236 pg/mL. The left level 6 contents and superior mediastinum were excised along with the right superior parathyroid, leaving the right inferior parathyroid in situ. The final PTH level was 253 pg/mL. The patient was readmitted on postoperative day 3 for acute pancreatitis and hypercalcemia.

Repeated sestamibi imaging (Figure 1) revealed asymmetric uptake of the left submandibular gland, and computed tomography (CT) confirmed a mass in that location (Figure 2). Retrospective review of the initial sestamibi images also suggested asymmetry in this area. At reoperation on postoperative day 6 a parathyroid adenoma at the level of the mandible was identified and removed. The remaining parathyroid glands appeared normal and were left in situ. The final PTH level was 62 pg/mL.

Case 2. A hemodialysis-dependent man in his 50s with secondary hyperparathyroidism was referred for parathyroidectomy. In the 6 months preceding surgery, his serum calcium level ranged from 9.82 to 11.0 mg/dL, and his PTH level ranged from 955 to 1552 pg/mL.

Preoperative imaging was deferred, and the patient underwent 4-gland exploration in February 2002. Intraoperatively, the left superior and inferior parathyroid glands were removed. The final PTH level was 420 pg/mL. Subsequently, sestamibi imaging was obtained, revealing uptake in the right superior thyroid lobe. At reoperation on postoperative day 8, the right superior parathyroid and right thyroid lobe were removed. Bilateral medial neck and mediastinal dissection failed to identify the remaining gland, and the PTH level decreased from 1019 to 562 pg/mL.

In April 2004, the patient presented for completion parathyroidectomy with a PTH level of 1541 pg/mL. A repeated sestamibi scan was read as nonlocalizing, but the surgeon interpreted asymmetric uptake in right level 2. Intraoperatively, a 2 × 2-cm adenoma was identified and excised from that location; the patient’s PTH level decreased from 562 to 125 pg/mL.

Case 3. A woman in her 50s presented with primary hyperparathyroidism; her serum calcium level was 12.6 mg/dL, and her PTH level was 1302 pg/mL. A sestamibi scan from 2005 showed uptake near the submandibular gland, and a repeated study revealed asymmetric uptake in the right thyroid bed and superior to the left thyroid lobe.

Intraoperatively, a left inferior undescended parathyroid adenoma at the level of the mandible was identified and removed. The remaining parathyroid glands appeared normal and were left in situ. The final PTH level was 62 pg/mL.

Figure 1. Case 1: Sestamibi Single Photon Emission Computed Tomographic (SPECT) (Second Study)

An image from the second sestamibi SPECT series obtained after the patient’s initial surgery demonstrating asymmetric tracer uptake in the left submandibular gland.
Figure 2. Case 1: Computed Tomographic (CT) Scan

An axial cut from a CT study obtained after the patient’s initial surgery and second sestamibi single photon emission computed tomographic (SPECT) series confirmed a mass in the left submandibular gland (arrow).

Discussion | As illustrated by these cases, undescended parathyroid adenomas are challenging to identify with sestamibi studies. When sestamibi studies do not demonstrate uptake in the thyroid bed or mediastinum, careful scrutiny for asymmetry of the submandibular regions is warranted to rule out these lesions. Alternatively, 4-dimensional CT imaging is a useful adjunct for localizing undescended adenomas.

Suhyla Alam, MD
Peter G. Volsky, MD
J. Trad Wadsworth, MD
Daniel W. Karakla, MD

Author Affiliations: Department of Otolaryngology–Head and Neck Surgery, Virginia, Commonwealth University, Richmond (Alam); Pittsburgh Ear Associates, Pittsburgh, Pennsylvania (Volsky); Department of Otolaryngology–Head and Neck Surgery, Emory University School of Medicine, Atlanta, Georgia (Wadsworth); Department of Otolaryngology–Head and Neck Surgery, Eastern Virginia Medical School, Norfolk (Karakla).

Corresponding Author: Suhyla Alam, MD, Department of Otolaryngology–Head and Neck Surgery, Virginia Commonwealth University, 202 N 20th St, Apt 407, Richmond, VA 23223 (syla.alam@gmail.com).

Published Online: October 1, 2015. doi:10.1001/jamaoto.2015.2069.

Conflict of Interest Disclosures: None reported.

Previous Presentations: This study was presented at the American Academy of Otolaryngology-Head and Neck Surgery Annual Meeting; September 29–October 2, 2013; Vancouver, British Columbia, Canada; and the Virginia Society of Otolaryngology Annual Meeting; April 22, 2013; Virginia Beach, Virginia.


RESEARCH LETTER

Association of Hearing Impairment and Mortality in the National Health and Nutrition Examination Survey

Hearing impairment (HI) is common in older adults. Its prevalence doubles with every decade of life, affecting two-thirds of adults older than 70 years.1 Hearing impairment has been shown to be associated with various negative health outcomes. The association of HI and mortality has been studied in select populations.2,3 We investigated the association of HI and all-cause mortality in a nationally representative sample of adults in the United States.

Methods | Using combined data from the January 1, 2005, to December 31, 2006, and January 1, 2009, to December 31, 2010, cycles of the National Health and Nutrition Examination Survey (NHANES), we studied 1666 adults 70 years or older who had undergone audiometric testing. The NHANES is an ongoing epidemiologic study designed to assess the health of the US population using representative samples.4 The NHANES protocol was reviewed and approved by the National Center for Health Statistic’s Institutional Review Board and informed written consent was obtained from all participants. Analysis was conducted from March 1 to May 1, 2015.

Severity of HI was defined per the World Health Organization criteria, based on the pure-tone average of hearing thresholds (in decibels) at speech frequencies (0.5-4 kHz) in the ear with better hearing (no HI, <25 dB; mild HI, ≥25 dB but <40 dB; moderate or more severe HI, ≥40 dB).5 Mortality was determined by probabilistic matching between NHANES data and death certificates from the National Death Index through December 31, 2011.6

Baseline characteristics of participants were compared using the χ2 test. The association between HI and mortality was analyzed using Cox proportional hazards regression models sequentially adjusted for demographic characteristics and cardiovascular risk factors known to be epidemiologically associated with HI. All analyses were weighted and conducted using the Stata statistical software program, version 12 (StataCorp LP).

Results | Compared with individuals without HI (n = 527), individuals with HI (n = 1139) were more likely to be older, male, white, former smokers, less educated, and have a history of cardiovascular disease and stroke (Table 1). In the age-adjusted model, moderate or more severe HI was associated with a 54% increased risk of mortality (hazard ratio [HR], 1.54; 95% CI, 1.08–2.18) and mild HI with a 27% increased risk of mortality (HR, 1.27;