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Techniques of parathyroid exploration at North American endocrine surgery fellowship programs: what the next generation is being taught

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Abstract

BACKGROUND: Minimally invasive techniques are now often used to treat primary hyperparathyroidism but with uncertain conformity and some controversy. Endocrine surgery fellowships (ESFPs) have recently proliferated.

METHODS: The directors of the 19 ESFPs recognized by the American Association of Endocrine Surgeons were polled to identify the approaches currently taught to trainees.

RESULTS: With 100% participation, all ESFPs obtain ≥1 imaging study, and 95% use ultrasound to assess for concurrent thyroid nodules that require care. For an apparent single adenoma, all ESFPs minimize dissection, use intraoperative parathyroid hormone monitoring, and, if multiglandular disease is identified, perform 4-gland exploration. Outpatient surgery (89%) and postoperative oral calcium use (68%) are common. All programs define cure as durable normocalcemia (median, 6 months).

CONCLUSIONS: American Association of Endocrine Surgeons fellowship programs teach congruent management strategies that include focused dissection, intraoperative parathyroid hormone use, and intent to cure. These consistencies define a future standard for assessment of parathyroidectomy outcomes.

The first successful parathyroidectomy for primary hyperparathyroidism (PH) was performed in 1925. Ever since, surgeons have been challenged to achieve operative cure given the fact that only about 85% of patients with sporadic PH have single parathyroid adenomas, while the rest have multiglandular disease that is often occult on imaging. Thus, the gold standard in the surgical management of PH has long been bilateral cervical exploration, with visual identification of all parathyroid glands, comparison of relative gland sizes and weights, and resection of only enlarged glands. Over the past 2 decades, however, with improvements in preoperative imaging techniques and the development of immunoassays that allow rapid, intraoperative measurement of parathyroid hormone (PTH) levels, the surgical approach to patients with PH has undergone a fundamental and rapid shift.[1–5] At most but not all US medical centers, routine bilateral cervical exploration has largely been supplanted by minimally invasive approaches that allow a direct, focused dissection of the

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culprit parathyroid glands and that rely on functional assessment with intraoperative PTH (IOPTH) monitoring to determine if all abnormal glands have been removed; IOPTH monitoring can also help with intraoperative localization. When combined with IOPTH monitoring, several minimally invasive approaches have now been shown to have equivalent long-term success rates compared with traditional routine bilateral parathyroid exploration.[6–10]

In a recent survey of parathyroid surgeons, Greene et al[5] found that a limited approach was performed by 68% of survey respondents, compared with only 11% 10 years previously; similarly, routine bilateral exploration was performed by 10% of respondents, compared with 74% only 10 years previously. Yet despite widespread acceptance of the concept of a focused approach as the preferred method, there is considerable variability in knowledge and practice patterns related to technique and to use of adjuncts, a disparity highlighted by recent debate in the surgical literature regarding the best surgical approach.[11,12]

In 1980, the American Association of Endocrine Surgeons (AAES) was founded as a society devoted to "surgical expertise in diseases of the thyroid, parathyroid, adrenal glands as well as neuroendocrine tumors of the pancreas and GI tract." Accompanying the rapid growth both in AAES membership and in high-volume endocrine surgery centers nationwide has been the proliferation of new endocrine surgery fellowships; as of 2011, there were 19 clinical fellowships recognized by the AAES in the United States and Canada. The increasing number of trained endocrine surgery fellows likely means wider dissemination of learned techniques for parathyroidectomy. The purpose of this study was to identify the methods of parathyroidectomy for PH that are now being taught to the next generation of endocrine surgeons in these programs.

Methods

A brief clinical survey was constructed by the senior author concerning the routine conduct of parathyroid exploration for sporadic PH. The survey consisted of questions on management ranging from use of preoperative imaging, use of intraoperative adjuncts, and postoperative management of patients with PH. The program directors of the 19 AAES-recognized clinical fellowships in North America at the time of the 2011 annual meeting of the AAES were asked to participate, with the specific assumption that their responses would reflect the philosophy and approach of all faculty endocrine surgeons at their program. All surveys were conducted by a single person (S.E.C.). The study received approval of the institutional review board at the University of Pittsburgh (PRO11050171).

Results

All AAES program directors participated in this survey, for a response rate of 100%. The geographic distribution of the programs is depicted in Fig. 1.

Preoperative vitamin D testing was reported by 84% of programs. All programs obtain ≥ 1 type of imaging study for localization preoperatively, and all plan to minimize dissection with a focused approach if an apparent solitary adenoma is identified on imaging. Most programs (89%) obtain >1 imaging study for localization, with the most common combination being ultrasound and sestamibi (Fig. 2). Cervical ultrasound is obtained by 18 programs (95%); 7 programs (39%) reported performing their own ultrasound, and 11 programs (61%) reported using radiology-performed ultrasound ($P = .10$). Sestamibi imaging, with or without single-photon emission computed tomography, is routinely obtained by 15 programs (79%), including 2 programs that obtain combined single-photon emission computed tomographic and computed tomographic scans, and is the sole imaging modality obtained at 1 program (5%). Five programs (26%) reported routinely obtaining 4-dimensional computed tomographic scans for preoperative imaging. Of the 18 programs that routinely obtain ultrasound, all use the information obtained to identify potential thyroid pathology, and if identified, all obtain fine-needle aspiration biopsy as clinically indicated to determine the need for concomitant thyroid surgery at the time of parathyroidectomy.

IOPTH monitoring is used at all 19 training institutions during exploration for PH. Interestingly, respondents reported considerable variation in the assay type and in the institutional turnaround time for results, as well as in the number, sites, and timing of IOPTH samples (Table 1). To define an adequate IOPTH drop after parathyroidectomy, 7 programs (37%) use the sole criterion of a decrease of $>50\%$ from the highest preexcision value, while 12 programs (63%) use the dual intraoperative criteria of a decrease of $>50\%$ from the highest preexcision value plus a decrease into the normal range for the assay used ($P = .10$). Several respondents also indicated that a downward-sloping trend in postresection IOPTH levels was a predictor of success. If intraoperative criteria are not met, all programs consider this to signify the presence of additional abnormal parathyroid tissue, and guided by IOPTH results, all continue the operation with intent to find and manage the additional tissue for cure. During exploration, most programs (84%) obtain the weight of the resected abnormal parathyroid glands, but only 2 programs (11%) routinely dissect and identify the ipsilateral normal parathyroid gland ($P < .0002$), and no program reported routine biopsy of an ipsilateral normal gland at every operation.

In addition to IOPTH criteria, situations named by some respondents to routinely prompt a bilateral exploration included the intraoperative discovery of >1 ipsilateral enlarged gland (42%), an inability to find a culprit gland on the first side (32%), bilaterally positive imaging results (32%), lithium history (11%), an initial low IOPTH level (5%), and very young patient age, which is associated with undiagnosed multiple endocrine neoplasia type 1.[13] Without considering a bilateral exploration to be obligatory, 8 programs (42%) reported heightened concern for multiglandular disease if the first encountered abnormal parathyroid