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Can imaging studies be omitted in patients with sporadic primary hyperparathyroidism?



Alex Dombrowsky, BS,^a Deena Weiss, BS,^b Norah Bushman, BS,^b
Herbert Chen, MD,^a and Courtney J. Balentine, MD, MPH^{a,c,d,*}

^aDepartment of Surgery, University of Alabama at Birmingham, Birmingham, Alabama

^bDepartment of Surgery, University of Wisconsin, Madison, Wisconsin

^cInstitute for Cancer Outcomes and Survivorship, University of Alabama at Birmingham, Birmingham, Alabama

^dBirmingham & Tuscaloosa Veteran's Affairs Hospital, Tuscaloosa, Alabama

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ABSTRACT

Background: The cost-effectiveness of routine preoperative imaging for patients undergoing parathyroidectomy is controversial. The purpose of this study is to evaluate whether omission of routine preoperative imaging would affect efficiency or safety of parathyroidectomy.

Methods: We implemented a no-imaging protocol for patients with primary hyperparathyroidism and no prior neck surgery. If the patient did not have preoperative parathyroid imaging before evaluation by a surgeon, no radiologic studies were ordered, and the patient was scheduled for parathyroidectomy. We used propensity matching to address differences between the imaging and no-imaging groups.

Results: From 2000 to 2015, 83 patients underwent parathyroidectomy without imaging compared to 1245 patients with preoperative imaging. We successfully matched 64 patients with no preoperative imaging to equivalent patients who had imaging prior to surgery. Median age was 60 y, and 84% were women. There was no significant difference in operative time between patients with and without preoperative imaging (84 min for both groups, $P < 0.32$). Intraoperative parathyroid hormone levels dropped by at least 50% in all patients without preoperative imaging and in 98% of patients with imaging ($P < 0.24$). Neither group had recurrences 6 mo after surgery. Overall complication rates in the no-imaging (5%) and the imaging group (11%) were also similar ($P < 0.18$).

Conclusions: Parathyroid surgery without preoperative imaging is safe, effective, and offers equivalent outcomes compared to an approach based on routine preoperative imaging. Experienced surgeons can consider omitting preoperative imaging in patients without a history of neck surgery as this may reduce overall treatment costs.

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* Corresponding author. Department of Surgery, University of Alabama at Birmingham, 1600 7th Avenue South Lowder Building, Suite 500, Birmingham, AL 35233. Tel.: +1 205 638 2152; fax: +1 205 638 2120.

E-mail address: c.balentine@icloud.com (C.J. Balentine).

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Introduction

Preoperative imaging changed how parathyroid surgery is performed by facilitating a unilateral or minimally invasive approach rather than a bilateral neck exploration.¹⁻³ Before the advent of modern imaging technology, the only way for surgeons to treat hyperparathyroidism was to examine all four parathyroid glands to determine which were normal and which were abnormal. Unilateral parathyroidectomy utilizes preoperative imaging to localize abnormal glands and intraoperative parathyroid hormone (PTH) assay to predict the success of the operation without necessarily having to visualize all four parathyroids.^{1,3} Commonly used imaging modalities include sestamibi scintigraphy, ultrasound, and dynamic contrast-enhanced computed tomography.^{3,4}

Imaging studies add significantly to the cost of treatment for hyperparathyroidism, but costs may be balanced by decreasing operative time and reducing postoperative complications by avoiding unnecessary bilateral neck explorations. In the absence of randomized controlled trials addressing this topic, surgeons have relied on modeling studies to evaluate the cost-effectiveness of preoperative imaging.⁵⁻⁷ These studies have assumed that a unilateral neck exploration with intraoperative PTH is faster than bilateral neck exploration and that a bilateral neck exploration requires an inpatient admission while a unilateral approach is done as an outpatient procedure.⁵⁻⁷ These assumptions are not representative of common practice at many institutions and may lead to inaccurate conclusions regarding the benefits of routine preoperative parathyroid imaging.⁸

The purpose of this study is to evaluate whether the omission of routine preoperative imaging would affect the efficiency (operative time) or morbidity of parathyroidectomy. We hypothesized that an experienced endocrine surgeon can safely and efficiently perform parathyroidectomy without routine preoperative imaging.

Methods

No-imaging practice

IRB approval was obtained for data collection and analysis at the University of Wisconsin and subsequently at the University of Alabama at Birmingham after the senior authors moved to that institution. At the University of Wisconsin, the endocrine surgery division implemented a change of practice with respect to imaging before parathyroid surgery. Previously, we routinely ordered ultrasound or sestamibi imaging to localize parathyroid adenomas prior to surgery. For patients with localized parathyroid adenomas, we performed unilateral parathyroid surgery, and we used intraoperative PTH monitoring to decide whether it was necessary to explore the contralateral side. Under the new no-imaging policy, the use of preoperative imaging was largely left to the discretion of the referring physician (primary care or endocrinology). If the referring physician ordered imaging before consulting endocrine surgery, then that information was used for operative planning. However, if the patient saw endocrine surgery

without any imaging tests then that patient was scheduled for surgery without ordering imaging studies.

Patient population and setting

The University of Wisconsin at Madison is a tertiary referral center with four fellowship trained endocrine surgeons. The most experienced surgeon in the group performed 1328 operations for patients with primary hyperparathyroidism between 2000 and 2015 and that comprised our study cohort.

Surgical technique and postoperative care

All patients were placed supine in the beach chair position with an infusion bag for the shoulder roll. A transverse skin incision was made slightly more than one finger width below the cricoid. We did not raise any flaps but proceeded to divide the strap muscles in the midline after the skin incision. The surgeon then mobilized the thyroid so it could be rolled medially to identify the parathyroids. For a unilateral exploration, we typically identified both glands before deciding whether to proceed to the contralateral side. If one gland was normal appearing and the other was abnormal, we would send a PTH level and wait for a 50% drop to determine cure. If levels did not drop, then we would explore the contralateral side. Alternatively, if both glands appeared normal (or abnormal) on the first side, we would proceed to the contralateral side. If all four glands were identified, then we did not wait for intraoperative PTH levels to return before closing the incision and leaving the operating room.

After surgery, our practice was to send all patients home following an observation period of 1-4 h, regardless of whether they had a unilateral or bilateral exploration. When transportation home immediately after surgery was not feasible, for either medical or social reasons, patients would be admitted for observation without full-hospital admission status. All patients had calcium and PTH checked at the 1-2 wk postoperative visit and at 6 mo after surgery. Patients were considered cured at 6 mo if their serum calcium was high preoperatively and was within the range of normal at 6 mo. For patients with normal calcium but inappropriately high PTH preoperatively, they were considered cured if both calcium and PTH were normal at 6 mo. We did not routinely perform endoscopy or refer for voice evaluation after surgery unless patients complained of dysphonia or dysphagia or unless the surgeon was concerned for recurrent laryngeal nerve injury.

Additional outcomes and definitions

We defined a gland as ectopic if it was found outside of the usual locations (in the carotid sheath for upper glands, outside the lower pole/thyroid/thymic ligament/thymus for lower glands, intrathyroidal for either). Outpatient surgery is defined as the patient going home the same day as the procedure. This was considered distinct from discharge within 23 h, where the patient was admitted for observation after surgery but spent <23 total hours in the hospital. Postoperative complications were defined as follows: (1) hoarseness was coded as transient

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