Bilateral Neck Exploration for Sporadic Primary Hyperparathyroidism: Use Patterns in 5,597 Patients Undergoing Parathyroidectomy in the Collaborative Endocrine Surgery Quality Improvement Program

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BACKGROUND: For many surgeons, focused parathyroidectomy has become the preferred approach for management of sporadic primary hyperparathyroidism (HPT). This study describes use patterns of bilateral neck exploration (BE) by endocrine surgeons participating in the Collaborative Endocrine Surgery Quality Improvement Program (CESQIP).

STUDY DESIGN: Using the CESQIP parathyroid dataset (2014 to 2017), use trends, demographic and clinical characteristics of patients undergoing BE vs focused vs focused converted to BE parathyroidectomy were compared. Preoperative, intraoperative, and postoperative variables were also analyzed.

RESULTS: Among 5,597 patients who underwent initial parathyroidectomy for HPT, BE was used in 2,253 (40%), 613 (11%) of which were converted procedures. Patients with BE were older and more likely female. Ultrasound (87%), sestamibi (66%), and CT scans (20%) were commonly used. Glands were highly localized. Intraoperative-parathyroid hormone (ioPTH) was used in >90%. Operative time >2 hours was more likely in BE (16%) and converted (30%) vs focused (3%) procedures. Two or more glands were removed in 57% of BE cases. Outpatient procedures were more common in focused cases; emergency room visits, readmissions, and complications were more likely in BE and converted cases. Concern for failure and lack of ioPTH decrease was significantly more common in BE and converted cases.

CONCLUSIONS: This is the first analysis of parathyroidectomy use trends by high-volume endocrine surgeons in CESQIP. Bilateral neck exploration is a commonly used approach (40%), and conversion from focused to BE was observed in 11% of cases, despite highly localized glands. Bilateral neck exploration remains a complex and frequently used procedure, and surgeons intending to perform parathyroid surgery should be adequately trained and adept at BE. (J Am Coll Surg 2019;228:652–661. © 2019 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

Bilateral neck exploration (BE) is considered the gold standard operation for sporadic primary hyperparathyroidism (HPT).[1] However, with improvement in preoperative imaging and use of intraoperative parathyroid hormone (ioPTH) monitoring, focused parathyroidectomy is now increasingly performed, with excellent outcomes and cure rates equivalent to those with BE.[1-5] Using a survey questionnaire of general and endocrine

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Abbreviations and Acronyms

BE = bilateral neck exploration
CESQIP = Collaborative Endocrine Surgery Quality Improvement Program
ED = emergency department
HPT = hyperparathyroidism
ioPTH = intraoperative parathyroid hormone
LOS = length of stay
RLN = recurrent laryngeal nerve

surgeons, Greene and colleagues[2] reported a major switch in parathyroidectomy practice in the United States between 1998 and 2003, when the majority of parathyroid surgeons adopted focused parathyroidectomy as the preferred initial surgical approach to HPT.[2] Moreover, in training the next generation of endocrine surgeons, we predominantly teach the use of ultrasound and other imaging studies followed by a focused approach, guided by ioPTH level, and that BE is used only when multiglandular disease is suspected or encountered.[5]

Multiple studies have shown equivalent short-term success rates of focused parathyroidectomy guided by ioPTH when compared with BE, although a few studies have shown that BE may be a more durable approach with longer postoperative follow-up.[1,3,4] However, if both operative approaches can be shown to have equivalent success rates, as defined by long-term normal serum calcium levels, then the primary reported reasons why surgeons currently prefer the focused approach are: its relative ease of completion, lesser dissection (therefore minimizing the risk of recurrent laryngeal nerve injury or devascularization of normal parathyroid glands), potential for smaller incisions, shorter operative times, potential avoidance of overnight stay, and cost containment.[6-8]

Recent studies have suggested that in an era when preoperative radiologic localization studies are pervasive, regardless of whether a focused or BE approach is planned, a major driver of cost in parathyroidectomy is the performance of BE.[9,10] These studies submit that the use of multiple preoperative localization studies is more cost-effective, due to avoidance of the overnight hospital stay associated with BE and to potentially shorter operating times, and assume that focused patients are frequently ambulatory, while BE patients are always admitted overnight for observation. Yet, there are surgeons who perform ambulatory parathyroidectomy routinely, regardless of the operative approach used, and it is unclear to what extent ambulatory parathyroidectomy is practiced by endocrine surgeons.

The Collaborative Endocrine Surgery Quality Improvement Program (CESQIP) is a database of endocrine surgery-specific data created in 2012. It captures endocrine-specific indications for surgery, patient comorbidities, and outcomes for thyroid, parathyroid, adrenal, and neuroendocrine pancreas procedures. The CESQIP uses concepts of continuous quality improvement to improve patient outcomes and optimize costs. This is accomplished through patient-centered data collection, ongoing performance feedback to clinicians, and improvement based on analysis of collected data and collaborative learning. Patient-centered data collection and entry are performed at the provider level using an ArborMetrix computer-based data entry platform. Data are available to CESQIP participants after approval of a data use proposal by the CESQIP Committee.

Presumably, a proportion of CESQIP surgeons perform routine BE on all patients, and others perform BE when they expect multiglandular disease or when ioPTH fails to decrease during an intended focused procedure. Few studies have compared the outcomes of intended BE vs intended focused parathyroidectomy vs focused converted to BE in patients with preoperative imaging studies performed for localization. Furthermore, there is a paucity of data regarding the safety of same-day discharge in patients with BE.[11-13] This study examines the use patterns of BE by CESQIP surgeons and evaluates the perioperative outcomes of intended BE vs focused or focused converted to BE parathyroidectomy in patients who have had preoperative imaging studies in CESQIP.

METHODS

Definition of the cohort

After obtaining Institutional Review Board approval, patients who underwent parathyroidectomy for HPT between January 2014 and June 2017 were identified for this study. At the time of this investigation, the CESQIP parathyroid database included 7,347 unique records of patients who underwent parathyroidectomy.

Patients were divided into 3 cohorts based on the operative approach: focused parathyroidectomy, BE, and focused converted to BE. Only patients older than age 18 were included. Patients with secondary, tertiary, familial, or lithium-induced hyperparathyroidism or those with parathyroid cancer were excluded. Patients with a history of previous parathyroid or thyroid surgery and those undergoing concomitant thyroid procedures were also excluded.

Patient demographics, preoperative, operative and postoperative variable definitions

Patient age at diagnosis, sex, race, and BMI were obtained. Based on CESQIP data definitions, race was grouped into

white, black, Hispanic, Asian, and unknown/other. The BMI was grouped into BMI $\leq$40 kg/m^2 and >40 kg/m^2. Preoperative variables included use of preoperative imaging and positive gland localization. The type and number of imaging studies obtained were documented. The type of preoperative imaging studies included ultrasound, sestamibi, and CT. Imaging studies were considered localized (positive) if 1 of any of the above studies performed were documented to be positive, localized single gland with high confidence, localized single gland with low confidence, or multiglandular localization. Imaging studies were considered nonlocalizing (negative) if all studies performed were documented as either negative or nonlocalizing.

Operative variables included use of ioPTH monitoring, use of recurrent laryngeal nerve (RLN) monitoring, operative time, number of glands removed, and if there was a >50% drop of ioPTH levels at the end of the procedure. Operative time was a categorical variable grouped by <1 hour, 1 to 2 hours, >2 but <3 hours, or >3 hours. The variable for number of glands removed was dichotomized into $\leq$1 gland removed or $\geq$2 glands removed.

Postoperative variables included length of hospital stay (LOS), emergency department (ED) visits, readmission within 30 days of the index operation, and complications. Complications captured in the database included skin and soft tissue infections, pulmonary embolus, stroke, deep vein thrombosis, sepsis, septic shock, myocardial infarction, cardiac arrest, urinary tract infection, renal insufficiency, renal failure, pneumonia, coma, need for postoperative transfusion in the first 72 hours postoperatively, and 30-day mortality. Endocrine-specific complications captured include RLN transection and hematoma. Length of stay was a categorical variable defined as outpatient, 1 day, or $\geq$2 days. The indication for ED visit and/or readmission within 30 days was documented. Surgeon concern for operative failure was defined as concern for persistent hyperparathyroidism.

The CESQIP dataset includes deidentified surgeon identification number and therefore, a subgroup analysis was performed using the CESQIP data to describe the effect of surgeon volume on operative practice trends for parathyroidectomy. The data were divided into 2 cohorts based on the operating surgeon volume; $\geq$50 parathyroidectomies/year defined a high-volume surgeon.[14] Routine BE surgeons were defined as those who performed >50% of their procedures using the BE approach. Outcomes were compared between routine high-volume BE surgeons and routine high-volume focused surgeons.

Statistical analysis

Summary statistics were used to compare the demographics, perioperative variables, and outcomes of parathyroidectomies. Chi-square, Student's *t*-test and ANOVA were used to compare categorical and continuous variables. Statistical significance was defined as $p < 0.05$. Missing data were excluded from the analysis.

RESULTS

A total of 5,597 patients underwent initial parathyroidectomy for HPT. Patient demographics and preoperative variables by operative approach are shown in Table 1. Patients who underwent BE were more likely to be older and white when compared with the focused group. There was no difference in the BMI distribution between groups. Overall, BE was performed in 2,253 (40%) procedures. Focused parathyroidectomy was intended in 3,957 cases, and 613 (15.5%) of those were converted to BE at the discretion of the surgeon.

Overall, preoperative imaging was used in nearly all patients (n = 5,417, 96%). The most common studies performed were ultrasound (86%), sestamibi (66%), and CT scans (20%), and the majority of patients had 2 or more imaging studies performed (71%). Patients who underwent focused parathyroidectomy were more likely to have preoperative imaging performed than patients who underwent BE (97% vs 94%, $p < 0.001$) and were more likely to have positive imaging localization of the parathyroid gland(s) when compared with BE (97% vs 72%, $p < 0.001$).

The intraoperative variables are shown in Table 2. Overall, ioPTH monitoring was used in >90% of cases, including 91% of BE. Recurrent laryngeal nerve monitoring was used in 33%. There were 4 (0.07%) RLN transections reported, with all transections occurring during focused procedures (p = NS). Operative time >2 hours was more likely in BE (16%) and converted (30%) vs focused (3%) procedures. Two or more glands were removed in 57% of BE cases and in 66% of converted cases. The BE and converted procedures had a lower proportion of ioPTH drop > 50% at the end of the case, 95% and 93%, respectively, compared with 99% of patients having an ioPTH drop of >50% in the focused group.

Postoperative outcomes variables are shown in Table 3. The majority of procedures (66%) were performed in an outpatient setting with (no overnight stay). Outpatient procedures were more common in focused cases (75%) when compared with BE and focused converted to BE cases (51% and 54%, respectively). Emergency department visits, readmissions, and complications were all more likely in BE and converted cases when compared with focused cases. Additionally, surgeon concern for failure was higher in BE cases. The proportion of ED visits for hypocalcemia was the same (16%) across the groups.

Table 1. Demographics and Preoperative Variables of Patients Undergoing Parathyroidectomy for Primary Sporadic Hyperparathyroidism in the Collaborative Endocrine Surgery Quality Improvement Program

Variable	Focused (n = 3,344)	Bilateral neck exploration (n = 1,640)	Focused to converted (n = 613)	p Value
Age, y, median (IQR)	61 (53,69)	63 (54,69)	63 (56,70)	0.001
Female sex, n (%)	2,548 (76)	1,269 (77)	439 (80)	0.067
Race, n (%)				<0.001
White	2,448 (73)	1,390 (85)	483 (79)	
Black	327 (10)	69 (4)	48 (8)	
Hispanic	261 (8)	80 (5)	21 (3)	
Asian	51 (2)	14 (1)	<10 (1)	
Unknown	250 (7)	86 (5)	54 (9)	
BMI, n (%)				0.655
≥40 kg/m^2	3,014 (91)	1,488 (91)	549 (90)	
>40 kg/m^2	316 (9)	1,486 (9)	62 (10)	
Imaging obtained, n (%)	3,230 (97)	1,545 (94)	610 (99)	<0.001
Number of imaging studies performed				<0.001
0–1	1,065 (32)	403 (25)	179 (31)	
>2	2,275 (68)	1,236 (75)	434 (71)	
Type of imaging, n (%)				
Ultrasound	2,843 (85)	1,442 (88)	557 (91)	<0.001
Sestamibi	2,082 (62)	1,207 (74)	400 (65)	<0.001
CT	760 (23)	212 (13)	121 (20)	<0.001
Localized gland, n (%)	3,136 (97)	1,112 (72)	573 (94)	<0.001

IQR, interquartile range.

Observed complications included reintubation, tracheostomy, hematoma, skin and soft tissue infection, pulmonary embolus, stroke, deep vein thrombosis, sepsis, cardiac arrest, urinary tract infection, acute renal insufficiency, pneumonia, and nerve injury. There were no significant differences in the rates of reported individual complications between groups.

A total of 87 surgeons contributed data to the CESQIP parathyroid database. Of those surgeons, 23 (26%) were considered high-volume surgeons and 65 (74%) were low-volume surgeons. However, the majority of parathyroidectomies included in the CESQIP dataset were performed by high-volume surgeons (n = 4,059, 73%) using a focused approach (n = 3,334, 60%). The number of parathyroid procedures by surgeon volume per operative approach is depicted in Figure 1. A greater proportion of intended BE (77%) and focused converted to BE (76%) procedures were performed by high-volume

Table 2. Intraoperative Adjunct Use Patterns and Operative Events in Patients Undergoing Parathyroidectomy for Primary Sporadic Hyperparathyroidism in the Collaborative Endocrine Surgery Quality Improvement Program

Variable	Focused (n = 3,344)	Bilateral neck exploration (n = 1,640)	Focused to converted (n = 613)	p Value
ioPTH used, n (%)	3,137 (94)	1,494 (91)	582 (95)	0.001
Nerve monitoring used, n (%)	1,151 (34)	472 (29)	244 (40)	<0.001
Recurrent laryngeal nerve transection, n (%)	<10 (0.12)	0 (0)	0 (0)	0.260
Operative time, n (%)				<0.001
<1 h	2,041 (61)	524 (32)	73 (12)	
1–2 h	1,211 (36)	848 (52)	357 (58)	
2–3 h	71 (2)	229 (14)	153 (25)	
>3 h	21 (1)	39 (2)	30 (5)	
≥ 2 glands removed, n (%)	178 (5)	933 (57)	402 (66)	<0.001
>50% drop ioPTH at end of case*, n (%)	2,990 (99)	1,400 (95)	533 (93)	<0.001

*Not all surgeons reported ioPTH drop.
ioPTH, intraoperative parathyroid hormone.

Table 3. Postoperative Outcomes in 5,597 Patients Undergoing First Time Parathyroidectomy for Primary Sporadic Hyperparathyroidism in the Collaborative Endocrine Surgery Quality Improvement Program

Variable	Focused (n = 3,344)	Bilateral neck exploration (n = 1,640)	Focused to converted (n = 613)	p Value
Length of stay				<0.001
Outpatient	2,287 (75)	768 (51)	305 (54)	
1 d	691 (23)	695 (46)	241 (43)	
≥2 d	64 (2)	46 (3)	16 (3)	
ED visit (n = 5,113), n (%)	94 (3)	43 (3)	31 (6)	<0.007
Readmission (n = 5,113), n (%)	24 (0.8)	22 (1.5)	12 (2)	0.008
Complication (n = 5,583), n (%)	29 (0.9)	43 (2.9)	12 (2.3)	<0.001
Concern for failure (n = 3,187), n (%)	22 (1)	33 (4)	14 (5)	<0.001

ED, emergency department.

surgeons when compared with the focused approach (67%). Nine surgeons (10%) performed BE >50% of the time in their practices (range 54.5% to 100%) and 2 performed BE >90% of the time. When these 2 surgeons were excluded, BE was used in 35% of cases, and their exclusion did not change the previously reported outcomes. Table 4 depicts the number and proportion of cases performed by providers who use BE in >50% of their cases. Table 5 compares the outcomes of high-volume surgeons who routinely perform BE compared with the outcomes of high-volume surgeons who routinely perform focused surgery.

DISCUSSION

This study examined the use patterns of BE for parathyroidectomy by CESQIP surgeons. The majority of parathyroidectomies were performed with preoperative imaging and with a focused approach using ioPTH guidance. Despite the nearly universal use of imaging and high rate of preoperatively localized glands, 40% of parathyroidectomies were performed using the BE technique. Importantly, and in spite of a mean of 2 preoperative imaging studies per patient, 613 (15.5%) of the 3,957 cases that were planned as focused parathyroidectomies were converted to BE. This rate of conversion is higher than the historical 3% to 10% expected incidence of multiglandular disease reported during focused operations.[15-18] A possible explanation is the increasing number of patients undergoing parathyroidectomy with "mild," "asymptomatic," and "non-localized" HPT, who may have a higher incidence of multigland disease. Furthermore, high-volume parathyroid surgeons may use a lower threshold to perform BE given subtle intraoperative findings. Lastly, ioPTH was highly used regardless of operative approach, and some surgeons may be using stricter ioPTH cure criteria requiring PTH to fall into normal range or below 40 pg/mL, which may lead to more BE.[19,20]

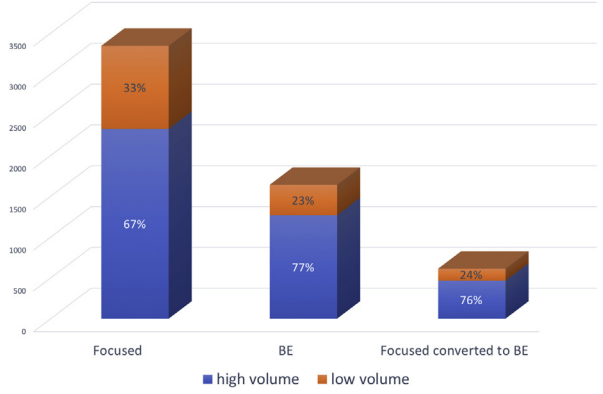

Figure 1. Number of parathyroidectomies performed by surgeon volume per operative approach. BE, bilateral neck exploration.

This study also evaluated the perioperative outcomes of intended BE vs focused vs focused converted to BE parathyroidectomy in CESQIP. When the surgeon intended to perform a focused parathyroidectomy and the operation was completed using such an approach, patients were discharged on the same day 75% of the time. With an intended BE or converted operation, patients had ambulatory surgery only 51% to 54% of the time, respectively. Yet if we evaluate the data by intention to treat, 67% (2,592) of the 3,957 intended focused explorations were ambulatory. These data demonstrate that the majority of CESQIP surgeons discharge patients from the hospital the same day of the procedure (60%, 3,360 of 5,597), irrespective of the operative approach, and suggests that ambulatory parathyroidectomy is safe for the majority of patients.[11,13,15] A recent report on trends, frequency, and quality of parathyroid surgery among >17,000 patients treated in California showed that there is a shift to more ambulatory parathyroidectomy and fewer overall complications.[21] Such trends were more pronounced among centers that performed a high volume of parathyroidectomy cases. The CESQIP does not track the reason for inpatient observation in parathyroidectomy, but one can surmise that reasons to

Table 4. Collaborative Endocrine Surgery Quality Improvement Program Surgeons Performing Bilateral Neck Exploration on >50% of Their Cases

Surgeon	Parathyroid procedure, n	Months of data entry	High vs low volume	Focused parathyroidectomy, n (%)	Bilateral neck exploration, n (%)
A	50	15	Low	14 (28)	36 (72)
B	258	42	High	<10 (3)	250 (97)
C	36	12	Low	15 (42)	21 (58)
D	21	35	Low	<10 (38)	13 (62)
E	90	21	High	35 (39)	55 (61)
F	201	39	High	<10 (1)	199 (99)
G	11	16	Low	<10 (45)	<10 (55)
H	33	10	Low	15 (45)	18 (55)
I	182	21	High	82 (45)	100 (55)

keep patients overnight may include concern for severe hypocalcemia, hematoma, medical comorbidities, and either patient or surgeon preference, among others.

This study also evaluated postoperative complications for patients who had parathyroidectomies performed by CESQIP surgeons. Overall, RLN injury was very rare (0.07%) and was reported only in patients undergoing focused operations (0.12%). The incidence of permanent RLN injury during parathyroid surgery is thought to be very low (0.18 to 0.4%).[22,23] Intraoperative RLN monitoring was used by a minority of surgeons. The utility of intraoperative nerve monitoring in preventing RLN injury during thyroid and parathyroid surgery is largely unproven and remains controversial, and the findings of this study appear to support the unproven benefit.[22] Neck hematomas were uncommon (0.25%) in this dataset; in the literature they are thought to occur in 0.1% to 0.3% of parathyroid operations.[24,25] Emergency room visits were similar between focused and intended BE, and the proportion of ED visits for hypocalcemic complaints were not significantly different among groups. On the other hand, the incidence of readmission and overall complications for intended BE and converted cases was double that for the focused approach, but it remained low overall. A recent review of the American College of Surgeons (ACS) NISQIP program (2006 to 2014) analyzed 14,500 patients with primary HPT undergoing parathyroidectomy and found an overall morbidity and mortality rate of 4.9% including a 0.1% mortality rate, 1.2% readmission rate, and 1.3% reoperation rate. They also reported that 0.3% of patients were readmitted for hypocalcemia, 0.3% underwent reoperation for hematoma, and the most common complication was wound infection (although the ACS-NISQIP dataset lacks granularity regarding the operative approached used).[25]

Regarding failure and cure after parathyroidectomy, the only observation that can be made from this dataset is that BE and converted operations were more commonly associated with a lesser likelihood of ioPTH decrease at the end of the operation and a higher concern for failure by the surgeon. Unfortunately, the current follow-up information in the dataset is incomplete and does not allow for meaningful conclusions regarding long-term cure. The literature reports that patients who have nonlocalized

Table 5. Outcomes of Routine Focused High-Volume Surgeon Compared with Routine High-Volume Bilateral Neck Exploration Surgeon

Variable	High-volume focused surgeon case (n = 3,328)	High-volume bilateral neck exploration surgeon case (n = 731)	p Value
Length of stay, n (%)			0.004
Outpatient	2,029 (67)	469 (64)	
1 d	940 (31)	256 (35)	
≥2 d	55 (2)	<10 (1)	
ED visit (n = 3,752), n (%)	103 (3)	<10 (1)	<0.001
Readmission (n = 3,752), n (%)	35 (1)	<10 (1)	0.267
Complication (n = 3,752), n (%)	32 (1)	18 (2.5)	0.003
Concern for failure (n = 2,062), n (%)	31 (2)	16 (3.5)	0.047

Nineteen high-volume focused surgeons (in >50% of cases, the surgeon used a focused approach and the surgeon performed >50 cases/year of data entry); 4 high-volume bilateral neck exploration surgeons (in >50% of cases the surgeon used a bilateral exploration approach and the surgeon performed >50 cases/year of data entry).

glands are more likely to have a complicated or failed parathyroidectomy,[26,27] and it is not surprising that converted operations may also have a higher failure rate because they represent those patients with missed multiglandular disease, false positive imaging, and possibly, more difficult anatomy.

Among the 87 surgeons contributing to the parathyroid CESQIP dataset, 26% were categorized as high-volume surgeons and performed 73% of the cases. This study illustrates that the majority of surgeons contributing to CESQIP prefer the focused approach. Interestingly some of the highest volume surgeons performed the majority of parathyroid procedures using the BE approach despite having a similar proportion of patients with positive localization studies. The etiology of this finding is unknown. It may be that these high-volume surgeons encounter higher multiglandular disease in their practice such that they prefer to perform an intended BE, or they are surgeons who have always performed a BE approach, or they are surgeons who began using a focused approach and then transitioned to BE as their practice evolved.

Data are entered in CESQIP by practicing endocrine surgeons. This is a voluntary self-reporting program and as such, has several limitations. Complete data entry is not required for case submission; this results in loss of data granularity and may lead to under-reporting of outcomes data such as complications and/or failure. Additionally, surgeons may be selectively or inconsistently entering data and therefore, these data may not reflect the true practices or outcomes of the surgeons and centers contributing. Due to overlapping data variables and sometimes incomplete descriptions in the data dictionary, there are certain variables that are prone to data entry error and internal inconsistency within a given record. Further refinement and continued improvement are goals of the CESQIP program.

CONCLUSIONS

In conclusion, this is the first analysis of parathyroidectomy use trends by endocrine surgeons in CESQIP. Bilateral exploration is a commonly used approach (40%), and conversion from focused to BE was observed in 15.5% of cases despite highly localized glands. Bilateral exploration remains a complex, frequently used, and necessary procedure. Surgeons intending to perform parathyroid surgery should be adequately trained and adept at BE.

Author Contributions

Study conception and design: Kiernan, Wang, Solórzano
Acquisition of data: Kiernan, Solórzano
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Discussion

DR MARTHA A ZEIGER (Charlottesville, VA): Several years ago Drs Barry Inabnet, Nancy Perrier, Julie Ann Sosa, and others translated the idea of a comprehensive database of endocrine surgery case logs with the potential for a multitude of studies into a national computer program, a company, and got approval from the American Association of Endocrine Surgeons and most recently, the Centers for Medicare and Medicaid Services; thus the origin of the Collaborative Endocrine Surgery Quality Improvement Program (CESQIP), a feat of passion, hard work, self-funding, a true determination. It has now become a robust platform on which many of us today study our surgical outcomes. The following comments also relate to the limitations of the data provided in CESQIP that your study highlights.

When you report a positive localization study, one needs to know if the identified adenoma correlates to the positive image, ie one needs more precise localization data in order to interpret a true specificity. The exact number of parathyroid glands removed and specifically correlated weights should be also reported; was it a double adenoma or 4-gland hyperplasia?

Do we need to know the precise reason for conversion from a focused approach to a bilateral exploration? The CESQIP reports on whether the patient had a 50% reduction only in parathyroid hormone (PTH) at the end of the case. As we know, this is not the true Miami criteria (it should be within 10 minutes and the metric based on half-life of PTH). We should consider recording more specificity in the database. I strongly recommend we, as endocrine surgeons, advocate for these additional fields. How will your group advocate for addressing these limitations in CESQIP?

The authors report that a greater proportion of intended bilateral neck exploration (BE) and focused-converted BE than focused approach were performed by high volume surgeons. However, among surgeons performing BE, more than 50% of the time, just 2 surgeons account for 52% of patients treated and the same 2 surgeons account for 66% of the BE procedures. It might be interesting to ask if the results would have differed if the patients treated by these 2 surgeons, who performed BE on 97% to 99% of their patients, respectively, were excluded.

Furthermore, was the observed phenomenon of more BE performed among high-volume surgeons because fewer had a positive imaging result? In other words, were more complicated patients sent to them, and therefore a referral bias to explain this phenomenon? It would be more valuable to examine what percent of cases done by high-volume surgeons were planned BE because of simply practice patterns, or because of the complexity of the cases referred.

Lastly, how was the cutoff derived? We need to be careful about timelines and definitions. I just moved to Charlottesville after a 20-year busy endocrine surgery practice in Baltimore, but would not consider myself a low-volume surgeon. However, having just joined CESQIP at the University of Virginia, I would be categorized as such. This study represents a tipping point for endocrine surgeons using a national database to study the surgical outcomes of our endocrine patients.

DR HERBERT CHEN (Birmingham, AL): Dr Solórzano presented data from the CESQIP. They concluded that bilateral exploration remains a complex and frequently used procedure, and surgeons intending to perform parathyroid operations should be adequately trained and adept at this procedure, and I totally agree. In full disclosure, and for my conflict of interest, I was a participant in CESQIP when I was a faculty member at Wisconsin, so my data are in this study. But when I moved down south to the University of Alabama-Birmingham, I declined to participate in the program, although I am on the board of directors for CESQIP. As Dr Solórzano pointed out, the CESQIP is very different than NSQIP. The CESQIP has the advantage because it is supposed to include all patients that the surgeon operated on, but it is self-reported. As you know, NSQIP is only a sampling, but that sampling is entered by a nurse and really validated by a third party. Therefore, CESQIP is very prone to surgeon bias and either the surgeon's