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Training our Future Endocrine Surgeons: A Look at the Endocrine Surgery Operative Experience of U.S. Surgical Residents

Barbara Zarebczan, MD, Victoria Rajamanickam, MS, Glen Levenson, PhD, Herbert Chen, MD, and Rebecca S Sippel, MD

Section of Endocrine Surgery, Department of Surgery, University of Wisconsin, Madison, WI 53792

Abstract

Background—Over the last 10 years the number of endocrine procedures performed in the US has increased significantly. We sought to determine if this has translated into an increase in operative volume for general surgery and otolaryngology residents.

Method—We evaluated records from the Resident Statistic Summaries of the RRC for US general surgery and otolaryngology residents for the years 2004–2008, specifically examining data on thyroidectomies and parathyroidectomies.

Results—Between 2004 and 2008, the average endocrine case volume of US general surgery and otolaryngology residents increased by approximately 15%, but otolaryngology residents performed over twice as many operations as US general surgery residents. The growth in case volume was mostly due to increases in the number of thyroidectomies performed by US general surgery and otolaryngology residents (17.9 to 21.8, $p=0.007$ and 46.5 to 54.4, $p=0.04$). Overall, otolaryngology residents also performed more parathyroidectomies than their general surgery counterparts (11.6 vs. 8.8, $p=0.007$).

Conclusion—Although there has been an increase in the number of endocrine cases performed by graduating US general surgery residents, this is significantly smaller than that of otolaryngology residents. In order to remain competitive, general surgery residents wishing to practice endocrine surgery may need to pursue additional fellowship training.

Introduction

The number of endocrine procedures being performed in the United States has been steadily increasing over the last few years, with 80,505 cases being done in 2004, an increase of over 16,000 operations in 4 years (1). It is estimated that a minimum of 97,700 cases will be performed in 2020, but it may be as high as 173,509 procedures. The rise in case volume has been attributed to improved imaging techniques, leading to an increase in the diagnosis of endocrine malignancies, as well as the development of new surgical techniques, such as

Correspondence: Rebecca Sippel, MD, University of Wisconsin, H4/750 CSC, 600 Highland Ave., Madison, WI 53792-7375, PH 608-263-1387, FAX: 608-252-0912, SIPPEL@surgery.wisc.edu.

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minimally invasive parathyroidectomy. A large proportion of these procedures are being done by high-volume endocrine surgeons, but many are still being performed by general surgeons who perform only a few thyroidectomies and parathyroidectomies each year (1,2). Over the last few years there has also been an increase in the percentage of thyroid and parathyroid procedures being done by otolaryngologists (3,4,5). Given the projected growth in endocrine procedures, more general surgeons will be needed that are capable of performing these procedures. Previously, Harness and colleagues reported that the operative experience of US general surgery residents in parathyroid and thyroid surgery was marginal at best (6). In this study we wanted to establish whether the increasing numbers of endocrine procedures being performed correlated with an increase in case volume for both US general surgery and otolaryngology residents. We also wished to examine whether a difference existed in the case volume of general surgery residents when compared to otolaryngology residents.

Method

The operative case logs of graduating US general surgery and otolaryngology residents were evaluated for the years 2004 through 2008. The operative data for both groups was obtained from each group's Residency Review Committee of the ACGME. The average number of thyroidectomies and parathyroidectomies performed were evaluated. The data was further divided into cases performed as a surgeon junior, defined by the ACGME to be those cases performed prior to the chief year and as a surgeon chief, those cases performed as a chief resident (7). Statistical analysis was carried out utilizing unpaired t-tests and ANOVA to determine significant differences with a p-value <0.05. All p-values reported were two-sided. Analyses were performed using SPSS, version 17.

Results

In the time period evaluated the number of US general surgery and otolaryngology residency programs did not change significantly (Table 1). Similarly, the number of graduating chief residents in both programs remained stable.

Between the period of 2004-2008 both US general surgery and otolaryngology residents increased their average endocrine case volume. US general surgery residents increased their numbers from a mean of 26.4 to 30.9 cases, while otolaryngology residents saw an increase from 57.1 to 67.3 cases. Overall, otolaryngology residents did over twice as many cases as the general surgery residents ($p<0.001$).

When the operative case volume was broken down by procedure, it was the increase in the number of thyroidectomies being performed which led to the overall boost in case volume. During this time period US general surgery residents saw an improvement in their thyroidectomy numbers from a mean of 17.9 to 21.8 procedures ($p=0.007$). Likewise, otolaryngology residents also saw a significant rise in case volume performing 54.4 thyroidectomies in 2008 compared to 46.5 just four years earlier ($p=0.04$). The cases were then broken down by resident level and both otolaryngology chief residents and surgeon juniors performed significantly more thyroidectomies than their general surgery counterparts (Figure 1). As demonstrated in Figure 1, general surgery junior level residents have slowly begun to close the gap, having completed on average 13.3 thyroidectomies in 2008 compared to 15 done by otolaryngology surgeon juniors. The discrepancy in case volume amongst chief residents continues to increase, with otolaryngologists performing 39.4 cases in 2008 compared to only 8.5 done by their general surgery chief resident colleagues.

During this same time period, the average number of parathyroidectomies being done by both groups also increased, but not to the same extent that the thyroidectomy numbers did (Figure 2). General surgery junior level residents performed more parathyroidectomies than otolaryngology junior residents in each of the four years studied. In 2008, general surgery juniors had increased their numbers from 4.5 to 5.5, while otolaryngology junior residents had an increase from 3.7 to 3.8. As was seen with thyroidectomies, otolaryngology chief residents performed many more parathyroidectomies on average each year than general surgery chief residents. In 2004 otolaryngology chiefs completed 6.9 parathyroid procedures and increased their case volume to an average of 9.1 cases in 2008. During this same time period chief residents in general surgery saw a decrease in their case volume performing 3.6 parathyroidectomies in 2008, compared to 4 cases in 2004.

When evaluating both thyroid and parathyroid case volume by resident level two trends are apparent. In general surgery, between 2004 and 2008, residents have performed more cases as surgeon juniors than surgeon chiefs and the difference in volume is increasing. Conversely, otolaryngology residents perform many more parathyroid and thyroid operations as surgeon chiefs than surgeon juniors.

There not only exists a vast discrepancy in average case volumes amongst residents, but also in the maximum number of operations performed by any one resident in both otolaryngology and general surgery. When evaluating the maximum number of thyroid cases done by a single resident, there are programs where the maximum number of cases performed by an otolaryngology chief resident is consistently much higher than those done by general surgery chief residents (Figure 3). Interestingly, general surgery junior residents have been increasing their maximum numbers of thyroidectomies from 54 performed in 2004 to 68 cases in 2008, while otolaryngology surgeon juniors have seen a drop from 99 thyroid cases in 2004 to 73 operations in 2008. Similarly, the maximum numbers of parathyroid cases are consistently performed by otolaryngology residents (Figure 4). Both otolaryngology surgeon juniors and chief level residents participate in increasingly more parathyroid cases than their general surgery colleagues.

Discussion

With the growing number of thyroid and parathyroid diseases being diagnosed and the advent of new surgical techniques becoming the mainstay of treatment in the United States, there is an increasing need to train surgeons in the field of endocrine surgery. In a 1995 study, Harness found that the average US general surgery resident graduates having performed 5.1 parathyroidectomies and 12.6 thyroidectomies (6). From our study it is apparent that as the number of endocrine procedures being done has increased so have the number of procedures that general surgery and otolaryngology residents have reported participating in. Yet, there is high variability in the number of procedures being performed. As evidenced by our results, there are large variations in operative experience, particularly if one considers that there are residents performing over 100 thyroid and/or parathyroid operations, suggesting that there may be general surgery and otolaryngology residents who may graduate from residency not having performed a single thyroidectomy or parathyroidectomy. Clearly, there are also residency programs in the United States where both general surgery and otolaryngology residents are performing over 50 thyroidectomies and parathyroidectomies before graduating. From a study done by Prinz, it is likely that the residents seeing such high operative volumes are at institutions with at least one endocrine surgeon on staff (8).

In two studies published in the otolaryngology literature, researchers have proposed that since at least 1996, there has been a trend toward parathyroidectomies and thyroidectomies

being done by otolaryngologists and not general surgeons (3,4). Both studies evaluated the increasing number of endocrine procedures done by chief residents in both fields as well as the growing proportion of articles on thyroid and parathyroid surgery being authored by otolaryngologists as proof of this claim. In the thyroid study, graduating otolaryngology residents are shown to have participated in more thyroidectomies on average than general surgery residents since 1995 with a growing gap in the number of cases up to 2004 (3). In our study we found similar results for thyroidectomy case volume, with otolaryngology residents in the role of surgeon junior and surgeon chief performing a significantly larger number of procedures than general surgery residents. We also demonstrate that the gap between otolaryngology and general surgery residents continues to widen, with an average difference in case volume in 2004-2005 of 14.4 cases compared to 17.6 cases in 2007-2008. In the otolaryngology parathyroid study, general surgery residents performed more parathyroidectomies than their otolaryngology colleagues until 2005, when for the first time otolaryngology residents performed more cases (4). In our study we demonstrate that otolaryngology residents continue to perform more parathyroid cases overall, but general surgery junior residents perform more parathyroid operations than otolaryngology juniors. Unfortunately, the difference in parathyroid case numbers is also growing, with an average difference of 3.8 cases in 2007-2008, compared to a difference of 2.1 cases in 2004-2005. As a result of these studies, it appears that on average, otolaryngology residents may graduate with better training in thyroid and parathyroid surgery than general surgery residents.

When comparing the general surgery and otolaryngology resident case volume we saw two trends emerge. While the volume of endocrine cases done by general surgery residents has increased, the majority of general surgery residents perform thyroidectomies and parathyroidectomies earlier in their training as surgeon juniors. Conversely, otolaryngology residents are performing most thyroidectomies and parathyroidectomies as chief residents. Since there are no prior data on this topic we can only speculate on the reason behind this trend. It may be a reflection of the sub-specialization of general surgery and emergence of fellowships. Once a general surgery chief resident has decided to pursue a different area of training they see endocrine surgery as having a lower priority and those cases are then done by a junior level surgeon. Sub-specialization is not as prevalent in the field of otolaryngology, therefore most otolaryngology residents will likely perform endocrine operations as part of their practice and consider the training during their chief years to be pertinent to their future practice. This trend may also be a reflection of the increased training demands of a general surgery residency. General surgery residents need to be trained in both open and laparoscopic approaches to surgery in a shorter time frame with the new 80 hour work week mandates, which could make training in endocrine surgery less relevant to many general surgery chief residents.

These studies and our data question whether general surgery residents who complete their residency are adequately trained to perform endocrine surgery safely in practice. In a study from Hopkins, researchers found that high-volume endocrine surgeons, considered to be those completing greater than 100 thyroid procedures per year, performed more difficult surgeries, were more likely to operate on patients with cancer, and most importantly, had fewer complications than those performing less than 100 procedures per year (9). One of the ways to ensure that general surgeons intending to perform endocrine surgery in practice have high-volume and uniform training is through endocrine surgery fellowships. The American Association of Endocrine Surgeons (AAES) provides a list of clinical fellowships in the United States and abroad (Table 2). In order to provide consistent training, these programs adhere to objectives and curriculum set forth by the AAES. In a study by Roman and colleagues, they demonstrated that endocrine fellows performed more thyroid and parathyroid cases than would be necessary to be competent (11). They also found that at the

conclusion of their training, 90% of fellows felt comfortable performing parathyroidectomies in practice and 97% felt comfortable performing thyroidectomies. There is some variability in the case volume of the various fellowship programs, but most fellows can anticipate performing greater than 250 cases annually and be confident that they will be well trained to perform parathyroidectomies and thyroidectomies in clinical practice.

Another approach to training future endocrine surgeons is to focus case volumes on those residents who plan to do endocrine surgery in their practices. In 2004, the American Surgical Association Blue Ribbon Committee Report on Surgical Education was published and one of the suggestions made by the committee was for the earlier sub-specialization of general surgery (12). They proposed a curriculum where after three years of general surgery a resident would begin their sub-specialty training. Therefore, we could focus our training on those residents that wished to pursue endocrine surgery as a fellowship or as part of their future general surgery practice. This may be one of the best ways for general surgeons to remain actively engaged in the field of endocrine surgery.

One of the limitations of this study is that the resident case logs are self-reported. Currently, the ACGME requires that general surgery residents graduate having performed a minimum of 8 endocrine operations. It may be possible that once residents reach that minimum number they no longer record each case they perform. There may also be over and under-reporting of cases based on what role a resident feels they play in an operation. Therefore there may be residents who participated in a thyroidectomy or parathyroidectomy, but may feel that their role did not warrant being logged as surgeon junior or chief.

Similarly, the operative volumes reported by the fellowship programs may be overestimated because they are self-reported and currently a system does not exist for endocrine fellows to document their case volumes. In a 2008 paper, Le and colleagues reported on the operative volumes of endocrine fellowship programs and they were quite variable with case numbers ranging from 27 to 732 (12). In our study, we looked at only programs approved by the AAES and found that their total reported case numbers were more consistent.

Conclusion

As the field of endocrine surgery continues to expand, the training of future endocrine surgeons needs to adapt. In order to provide the most up-to-date and safest treatment options for patients and to remain competitive with the increasing number of otolaryngologists performing thyroid and parathyroid procedures, general surgery residents wishing to practice thyroid and parathyroid surgery may benefit from additional training in their chief year or dedicated fellowship training.

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Figure 1.

As surgeon juniors (SJ), otolaryngology residents on average performed 14.8 thyroidectomies compared to 11.6 performed by general surgery residents ($p=0.02$). Otolaryngology chief residents (OTO SC) also, on average, performed more thyroidectomies than general surgery surgeon chiefs (GS SC), (34.8 vs. 8.3, $p<0.001$).

Figure 2.

As junior level residents, general surgeons performed more parathyroidectomies than their otolaryngology colleagues (5.1 vs. 3.6, $p=0.001$). Otolaryngology chief residents participate in more parathyroid procedures than general surgery chiefs (8.0 vs. 3.7, $p=0.002$).

Figure 3.

In each year examined, at least one otolaryngology resident performed a larger number of maximum thyroid cases when compared to their general surgery counterparts. When divided by resident level of training both at a surgeon junior and chief level, otolaryngology residents perform a higher maximum number of thyroid cases.

Figure 4.

Otolaryngology residents outperform general surgery residents in the maximum number of parathyroid procedures performed by a single resident in a given year. This trend was also demonstrated when cases were divided by resident level of training with otolaryngology chief resident and surgeon junior residents performing a greater number of maximum cases than their general surgery counterparts.

Table 1

Number of General Surgery (GS) and Otolaryngology (OTO) programs and residents in the United States between 2004-2008.

	Year	#of Programs	#of Residents	# Thyroid & Parathyroid Cases
General Surgery (GS)	2004-2005	250	1022	26926
	2005-2006	250	1008	27895
	2006-2007	248	1004	30154
	2007-2008	246	1020	31562
Otolaryngology (OTO)	2004-2005	101	255	14561
	2005-2006	102	272	15986
	2006-2007	102	259	15950
	2007-2008	100	253	17019

Table 2

Reported case volumes of Endocrine Surgery Fellowship programs participating in 2009 Match. Adapted from the AAES website and websites of various participating fellowship programs (9).

FELLOWSHIP	TOTAL	THYROID	PARATHYROID	ADRENAL	PANCREAS	GI/ENDOCRINE
Brigham & Womens Hospital, Boston, MA	>300	N/R	N/R	N/R	N/R	N/R
University of Calgary, Calgary, Alberta Canada	220-255	120-140	60	15-20	15	10-20
Cleveland Clinic, Cleveland, OH	>635	N/R	N/R	>30	5	N/R
Columbia University, New York, NY	>880	>300	>250	>30	>200	N/R
Johns Hopkins, Baltimore, MD	>550-580	N/R	N/R	30-40	10-20	10-20
Massachusetts General Hospital, Boston, MA	>300	N/R	N/R	N/R	N/R	N/R
Mayo Clinic, Rochester, MN	>455	>130	270	35	20	N/R
Rush University Chicago, IL	435-440	250	150	30	N/R	5-10
Scott & White Clinic Texas A&M, Temple, TX	>500	>300	>150	>20	N/R	N/R
UC San Francisco, San Francisco, CA	N/R	N/R	N/R	N/R	N/R	N/R
University of Miami, Miami, FL	>340	275	115	40	10	N/R
University of Michigan, Ann Arbor, MI	>700-725	N/R	N/R	>75	25-50	N/R
University of Pittsburgh, Pittsburgh, PA	>900	>500	>250	>50	>10	N/R
University of Texas-M.D. Anderson, Houston, TX	N/R	N/R	N/R	N/R	N/R	N/R
Yale University, New Haven, CT	>885	>500	>350	>30	>5	N/R
Alfred Hospital, Melbourne, Australia	>700	550	150	N/R	N/R	N/R
University of Mexico, Mexico City, Mexico	>600	N/R	N/R	N/R	N/R	N/R
University of Sydney, Sydney Australia	>1100	>150	>250	>40	>10	N/R
University of Wisconsin, Madison, WI	>700	>350	>250	>30	>10	>5