A Tale of Two Cancers: Traveling to Treat Pancreatic and Thyroid Cancer

Michael G White, MD, Megan K Applewhite, MD, Edwin L Kaplan, MD, FACS, Peter Angelos, MD, PhD, FACS, Dezheng Huo, MD, PhD, Raymon H Grogan, MD, FACS

BACKGROUND: Patients diagnosed with a malignancy must decide whether to travel for care at an academic center or receive treatment at a nearby hospital. Here we examine differences in demographics, treatment, and outcomes of those traveling to academic centers for their care vs those not traveling, as well as compare travel for an aggressive vs indolent malignancy.

STUDY DESIGN: All patients with papillary thyroid carcinoma (PTC) or pancreatic ductal adenocarcinoma (PDAC) undergoing surgical resection and in the National Cancer Database were examined. Travel for care was abstracted from "crowfly" distance between patients' ZIP codes and treatment facility, region, county size, urban/metro/rural status, and facility type.

RESULTS: In total, 105,677 patients with PTC and 22,983 patients with PDAC were analyzed. There were no survival differences by travel in the PTC group. Survival was improved for patients with PDAC traveling from urban/rural settings (hazard ratio = 0.89; 95% CI 0.82 to 0.96; $p = 0.002$). Patients traveling with PDAC were more likely to have a complete resection and lymph node dissection. Those traveling were less likely to receive chemotherapy or radiotherapy (all $p < 0.001$). Those traveling with PTC were older, more likely to be male, have Medicare insurance, and had a higher stage of disease (all $p < 0.001$). Rates of radioactive iodine were lower, American Thyroid Association guidelines were more likely followed, and lymph node dissection was more common for those traveling for care of their PTC (all $p < 0.001$).

CONCLUSIONS: There are improvements in both quality and survival for those traveling to academic centers for their cancer care. In the case of PTC, this difference in quality did not affect overall survival. In PDAC, however, differences in quality translated to a survival advantage. (J Am Coll Surg 2017;225:125−137. © 2017 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

Surgical resection of a malignancy is the cornerstone of treatment for most solid cancers. For papillary thyroid cancer (PTC) and pancreatic ductal adenocarcinoma (PDAC), the relationship between surgeon volume and perioperative outcomes has been well established.[1,2] Yet, most thyroidectomies in the US are done by surgeons who perform fewer than 7 thyroidectomies per year.[3] This is significantly less than the 25 to 30 thyroidectomies per year commonly accepted as a minimum threshold to be considered a "high-volume" surgeon, whose outcomes have been shown to be better than lower-volume surgeons.[1,4,5] In the case of pancreatic cancer, studies showing that improved survival is associated with surgeon volume have begun to drive a greater centralization in care.[6,7]

It remains unclear how many patients with PTC or PDAC are aware of the volume to outcomes relationship. Many of those who live outside metropolitan centers face barriers in accessing the relatively few high-volume surgeons in the US. For patients who live in rural areas, these barriers are even more formidable because most high-volume surgeons practice in metropolitan settings or at academic referral centers. Despite its importance to patients and referring physicians, little is known about

Disclosure Information: Nothing to disclose.

Support: This work was supported by grants from the National Institutes of Health (K12CA139160 to Raymon H Grogan).

Presented at the Western Surgical Association 124th Scientific Session, Coronado, CA, November 2016.

Received December 9, 2016; Revised February 18, 2017; Accepted February 20, 2017.

From the Department of Surgery, Endocrine Surgery Research Group (White, Kaplan, Angelos, Grogan), Department of Public Health Sciences, University of Chicago (Huo), Chicago, IL, and Department of Surgery, Albany Medical College, Albany, NY (Applewhite).

Correspondence address: Raymon H Grogan, MD, FACS, Department of Surgery, Endocrine Surgery Research Group, 5841 S Maryland Ave, MC 4052, Chicago, IL 60637. email: rgrogan@surgery.bsd.uchicago.edu

http://dx.doi.org/10.1016/j.jamcollsurg.2017.02.017
ISSN 1072-7515/17

Abbreviations and Acronyms

ATA = American Thyroid Association
CoC = Commission on Cancer
HR = hazard ratio
NCCN = National Comprehensive Cancer Network
NCDB = National Cancer Database
OR = odds ratio
PDAC = pancreatic ductal adenocarcinoma
PTC = papillary thyroid cancer

whether traveling to receive surgical oncologic care results in differences in perioperative outcomes and overall survival. Similarly, the role that a patient's or referring physician's perception of the aggressiveness of malignancy plays in the rate of travel and demographics of those patients traveling for care is unknown.

To address this gap in knowledge, we used the National Cancer Database (NCDB) to examine demographic and treatment differences, as well as overall survival for patients with either PTC or PDAC who traveled for care at academic centers and patients who received care closer to home or at community centers. We hypothesized that pancreatic cancer patients are more likely to travel for care than PTC patients. We further hypothesized that traveling for care at an academic center can improve survival probability for pancreatic cancer patients, but not for thyroid cancer patients. Given the indolent nature of PTC, improvements in care associated with high-volume centers might not result in improved survival.

MATERIALS AND METHODS

This study analyzed patients within the NCDB treated for a malignancy with histology codes consistent with PTC (8260, 8343, 8341, 8050, 8340, 8342, 8343, 8344, or 8504) or PDAC (8140) that underwent operative intervention. We used a novel method of defining travel using data available in the NCDB as well and US census data, including mean county size for the urban/rural status code in each of 9 national regions. Patients were categorized based on their ZIP code as residing in a metropolitan, urban, or rural county. Urban and rural patients were subcategorized as being either metropolitan adjacent or not adjacent. National census and US Department of Agriculture data were then used to calculate the mean county size (square miles) for each metropolitan, urban, or rural category in each of the 9 national regions.[8] Patients residing in metropolitan counties or metropolitan-adjacent counties were considered to have traveled for their care if the reported distance from their ZIP code to treatment center was greater than the square root of the mean county size for their region and metropolitan, urban, or rural category. Those patients residing in counties that were not metropolitan adjacent were considered to have traveled for their care if they traveled more than twice the square root of the mean county size for their region and metropolitan/urban/rural category (Fig. 1). The mean county size and distance needed to travel for each category are summarized in eTable 1. Patients in the Pacific or Mountain regions were excluded from analysis, given the variability in county size and discordance between travel lengths compared with other US regions. Patients who received care at an academic center and who traveled greater than the prescribed distance based on their county will be referred to as the "travel" group and all other patients will be referred to as the "no-travel" group. The need to sub-stratify patients as metropolitan vs urban/rural is noteworthy, as simply abstracting travel status does not differentiate those traveling from urban or rural areas with a presumably limited selection of surgeons from those traveling from metropolitan areas where a wealth of surgeons are often available within a county area.

Differences in patient demographics, stage of disease, and treatment were analyzed using analysis of variance or chi-square tests where appropriate. Given the propensity for small differences to be statistically significant and the great number of patients included, statistical significance will be defined as $p = 0.05$, and clinical significance will be defined as a percent difference $\geq 2\%$. The primary end point analyzed was overall survival (disease-specific survival is not abstracted within the NCDB), which was modeled using univariable and multivariate Cox proportional hazards models. Secondary outcomes, including unplanned readmission, resection to clear margins, 30-day mortality, and 90-day mortality, were modeled using univariable and multivariable logistic regression. Quality measures and treatment trends studied included the performance of a lymph node dissection (defined as more than 3 lymph nodes removed for PTC and more than 12 lymph nodes removed for PDAC), extent of resection in PTC, adjuvant radioactive iodine use in PTC, adjuvant chemotherapy for PDAC, adjuvant radiotherapy for PDAC, and adherence to either American Thyroid Association (ATA) (2006 or 2009 edition based on year of diagnosis), or National Comprehensive Cancer Network (NCCN) guidelines in the treatment of PTC.[9-11] The lymph node dissection cutoff was defined by Kantor and colleagues[12] in the case of PDAC, and a cutoff of 3 was defined based on >70th percentile number of lymph nodes examined in the case of PTC. Adherence to guidelines was abstracted from available reported data within the NCDB as described by Adam and colleagues.[13] The