Use of Radioiodine after Thyroid Lobectomy in Patients with Differentiated Thyroid Cancer: Does It Change Outcomes?

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BACKGROUND: Radioiodine (RAI) lobe ablation in lieu of completion thyroidectomy is not recommended. This study describes RAI use patterns and outcomes in patients with well-differentiated thyroid cancer (DTC) after thyroid lobectomy (TL).

STUDY DESIGN: A total of 170,330 patients diagnosed with DTC between 1998 and 2011 were identified using the National Cancer Database. Demographic, tumor, and treatment variables were analyzed using both univariate and multivariate regression.

RESULTS: A total of 32,119 patients (20%) underwent TL as the definitive procedure. Mean age at diagnosis was 48 years, median tumor size was 1 cm, 4% had extrathyroidal extension, 4% had positive lymph nodes, and <1% distant metastases. Radioiodine was administered to 24% of patients in the TL cohort and represented 10% of the overall RAI use. In multivariate analysis, RAI use was associated with age younger than 45 years (odds ratio [OR] = 1.51), community facilities (OR = 1.26), ≥1 cm tumors (OR = 5.67), stage II (OR = 1.54) or III (OR = 2.05), positive lymph nodes (OR = 1.78), and extrathyroidal extension (OR = 1.36). On both univariate and multivariate analysis, RAI after TL was associated with improved survival at both 5 and 10 years follow-up (97% vs 95% and 91% vs 89%, respectively; hazard ratio = 0.53; 95% CI, 0.38−0.72; $p < 0.001$)

CONCLUSIONS: Nearly one quarter of TL patients received RAI. The strongest predictors of RAI use were larger cancers and advanced stage. Use of RAI in these patients was associated with improved overall survival. Future studies and guidelines will need to more clearly address this practice and educate providers about the appropriate use of RAI in TL patients. (J Am Coll Surg 2015;220:617−625. © 2015 by the American College of Surgeons)

Radioiodine (RAI) has been used in the postsurgical treatment of well-differentiated thyroid cancer (DTC) for more than 50 years.[1] Although the indications and recommendations for its use have changed over time, current American Thyroid Association and National Comprehensive Cancer Network guidelines recommend RAI ablation in select patients after total thyroidectomy.[2,3] The role of RAI ablation after thyroid lobectomy (TL), however, is unclear. The 2009 American Thyroid Association's guidelines for the management of DTC state: "Ablation of the remaining lobe has been used as an alternative to completion thyroidectomy. It is unknown whether this approach results in similar long-term outcomes. Consequently, routine RAI ablation in lieu of completion thyroidectomy is not recommended."[2]

Several small retrospective studies have described the use of RAI lobe ablation after TL as a safe and effective alternative to completion thyroidectomy in DTC.[4-7] Santra and colleagues[7] studied the long-term outcomes of RAI lobe ablation in a cohort of 364 TL patients with DTC and compared them with a group of 372 patients

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Abbreviations and Acronyms

DTC = differentiated thyroid cancer
HR = hazard ratio
NCDB = National Cancer Database
OR = odds ratio
PTC = papillary thyroid cancer
RAI = radioiodine
TL = thyroid lobectomy

who underwent completion thyroidectomy and RAI remnant ablation. After a median follow-up of 5 years, recurrence-free, disease-free survival and cause-specific mortality were similar between the groups. The authors concluded that RAI lobar ablation is a safe, simple, effective, and less expensive alternative to completion thyroidectomy in patients with DTC. To our knowledge, there are no randomized studies or large retrospective studies that compare the outcomes of patients who undergo TL with or without postoperative RAI.

Using the National Cancer Database (NCDB), this study describes RAI use rates and factors associated with its use after TL in DTC. It also compares the overall survival of patients who underwent TL alone with that of patients who underwent TL followed by RAI.

METHODS

Data source and patient acquisition

After obtaining IRB approval, patients 18 years of age and older diagnosed with DTC between 1998 and 2011 were identified in the NCDB using the ICD-O-3 as the reference for histology coding (papillary thyroid cancer [PTC], codes 8050, 8340−8344, and 8350; follicular thyroid cancer, codes 8330−8332, 8335, and 8337; Hürthle cell thyroid cancer, code 8290). The NCDB is a joint program of the American College of Surgeons and the Commission on Cancer that captures newly diagnosed malignancies from Commission on Cancer approved hospitals, which account for >75% of all cancers and close to 85% of all thyroid cancers in the United States.[8,9] Data are abstracted, coded, and reported according to nationally established protocols coordinated by the National American Association of Central Cancer Registries by Commission on Cancer trained and certified cancer registrars.

Demographic, clinical characteristics, and definitions

Patient age at diagnosis, sex, race, urban or rural residence, insurance status, facility type and location, and survival status were obtained. Age at diagnosis was classified into two groups (18 to 44 years, 45 years and older). Race was grouped into white, white Hispanic, black, and other. A residence was defined as urban if it was located in a metropolitan area or the population was >2,500 and was designated rural if it was not located in a metropolitan area and the population was <2,500. Insurance status was divided into private insurance, Medicaid, Medicare, military, or uninsured. Facility type included academic/research facilities and community-based health centers. Facility location was grouped by region: East, South, Midwest, and Mountain/Pacific.

Clinical variables of interest included number of primary cancers per patient, Charlson/Deyo comorbidity score,[10] extent of thyroid surgery, use of RAI, and overall survival. Only patients with one primary cancer who underwent lobectomy were included. Thyroid lobectomy was defined as removal of a lobe with or without isthmusectomy and also included removal of a lobe with partial removal of contralateral lobe (surgery of primary site codes 20−23, 30). Radioiodine was documented if patients received RAI or combination external beam radiation therapy and RAI. Overall survival was analyzed at 5 and 10 years.

Pathologic characteristics included histology, stage, tumor size, regional lymph node status, extrathyroidal extension, and distant metastases. Histologic type included PTC, follicular thyroid cancer, and Hürthle cell carcinoma based on ICD-O-3 codes. Tumor stage was coded according to the NCDB analytic stage group, which is assigned the value of the reported pathologic stage group but uses clinical stage group if pathologic stage is not available. Tumor size was classified as <1 cm or ≥1 cm. Lymph nodes status was grouped into negative or positive and was only documented in patients who had lymph nodes examined. Extrathyroidal extension was defined as extension of tumor beyond the pericapsular soft tissue/connective tissue.

Statistical analysis

Summary statistics were used to compare the demographic, clinical, and pathologic characteristics of patients who received RAI with those who did not. Chi-square, Student's *t*-test, and ANOVA were used to compare categorical and continuous variables. Logistic regression was used to identify independent factors associated with use of RAI.

Kaplan-Meier analysis was used to determine overall survival and to perform univariate analysis of the impact of RAI on overall survival; the log-rank test was used to calculate statistical significance of the comparison. For multivariate analysis, Cox proportional hazards regression modeling was performed to identify a priori chosen factors that were independently associated with overall survival. Hazard ratios and 95% CIs were calculated to