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Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Original Article

COVID-19 Outcomes of Patients With Differentiated Thyroid Cancer: A Multicenter Los Angeles Cohort Study

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ABSTRACT

Objective: Cancer may be a risk factor for worse outcomes in severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) infections. However, there is a significant variability across cancer types in the extent of disease burden and modalities of cancer treatment that may impact morbidity and mortality from coronavirus disease-19 (COVID-19). Therefore, we evaluated COVID-19 outcomes in patients with a differentiated thyroid cancer (DTC) history.

Methods: This is a retrospective cohort study of patients with a history of DTC and SARS-CoV2 infection from 2 academic Los Angeles healthcare systems. Demographic, thyroid cancer, and treatment data were analyzed for associations with COVID-19 outcomes.

Results: Of 21 patients with DTC and COVID-19, 8 (38.1%) were hospitalized and 2 (9.5%) died from COVID-19. Thyroid cancer initial disease burden and extent, treatment, or current response to therapy (eg, excellent vs incomplete) were not associated with COVID-19 severity in DTC patients. However, older age and the presence of a comorbidity other than DTC were significantly associated with COVID-19 hospitalization ($P = .047$ and $P = .024$, respectively). COVID-19–attributed hospitalization and mortality in DTC patients was lower than that previously reported in cancer patients, although similar to patients with nonthyroid malignancies in these centers.

Conclusion: These data suggest that among patients with DTC, advanced age and comorbid conditions are significant contributors to the risk of hospitalization from SARS-CoV2 infection, rather than factors associated with thyroid cancer diagnosis, treatment, or disease burden. This multicenter report of clinical outcomes provides additional data to providers to inform DTC patients regarding their risk of COVID-19.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) is a novel coronavirus that produces a syndrome of respiratory symptoms, fever, and multiorgan dysfunction called coronavirus disease-19 (COVID-19)[1]. The presentation of COVID-19 can range from an asymptomatic infection to a life-threatening, multiorgan dysfunction requiring ICU-level care, mechanical ventilation, renal replacement therapy, and death. Beginning in late 2019, SARS-CoV2 infection has become the source of a global pandemic with more than 96 million

Abbreviations: ATA, American Thyroid Association; BMI, body mass index; COVID-19, coronavirus disease-19; DM, diabetes mellitus; DRS, dynamic risk stratification; DTC, differentiated thyroid cancer; EMR, electronic medical record; LAC+USC, Los Angeles County-University of Southern California Medical Center; RAI, radioactive iodine; SARS-CoV2, severe acute respiratory syndrome coronavirus 2; UCLA, University of California, Los Angeles.

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infected and more than 2.1 million COVID-19–attributed deaths[1]. Significant prior studies have identified the risk factors for worse outcomes from COVID-19, including older age, cardiovascular and cerebrovascular diseases, pulmonary disease, and diabetes mellitus (DM)[2]. Studies evaluating the potential impact of a history of cancer on COVID-19 severity and outcomes have shown mixed results, with some showing an increased mortality in patients with malignancy and others showing no differences in mortality between those with and without malignancy[3–8]. Furthermore, studies to assess the interplay between COVID-19 and specific malignancies are lacking.

Thyroid cancer is the most common endocrine malignancy, with over 50 000 new cases per year and over 800 000 affected individuals in 2017 in the United States alone[9]. A recent survey of patients with a thyroid cancer history showed high concerns over the COVID-19 pandemic and its impact on their lives[10]. In contrast to several other solid malignancies, differentiated thyroid cancer (DTC) is primarily treated with surgery, thyroid hormone suppression, and occasionally radioactive iodine ablation. Patients are rarely treated with conventional chemotherapy or myelosuppressive agents that are more likely to cause immunosuppression. Additionally, disease-specific survival in DTC is generally excellent[11]. However, thyroid cancer can compromise the airways due to the close proximity of the thyroid gland to the trachea, may metastasize to the lungs, and may alter immune responses through tumor-mediated immunosuppression[12–14]. Despite the significant concern among patients with thyroid cancer, few studies have been published examining the outcomes of patients with a history of thyroid cancer who contract SARS-CoV2.

In the present study, we report the outcomes of SARS-CoV2 infection in patients with a history of DTC who received care at 2 academic Los Angeles healthcare systems. Furthermore, we evaluate thyroid cancer-related and independent patient factors associated with hospitalization and mortality from COVID-19 in this population. These data can provide DTC-specific guidance to providers and DTC patients on the risks of severe COVID-19.

Methods

Study Design and Participants

Participants were identified by a review of the electronic medical record (EMR) from the 2 large academic healthcare systems in California: University of California, Los Angeles (UCLA) Health System and Los Angeles County-University of Southern California Medical Center (LAC+USC) Health System. Centralized COVID-19 databases at each health system identified all patients with a positive COVID-19 antigen or antibody test from January 1 to September 30, 2020. Eligible patients were those with a diagnosis of DTC and positive test for SARS-CoV2 infection. This study involving human subjects was approved by the Institutional Review Boards at both institutions (IRB #20-000650 and IRB #HS-20-00401).

Data Collection

We performed a manual chart review through physician documentation for all identified patients to extract demographic data (age, sex), comorbidities (preexisting DM, lung disease, cardiovascular disease, liver disease, kidney disease, and the use of chronic steroids), body mass index (BMI), and smoking status. Lung disease was defined as a diagnosis of chronic lung pathology, such as asthma, chronic obstructive pulmonary disease (including emphysema), interstitial lung disease, previously diagnosed pulmonary embolism currently on therapeutic anticoagulation (not prophylaxis or therapeutic doses as part of COVID-19 treatment), or pulmonary aspergillosis. Cardiovascular disease was defined as a history of myocardial infarction, arrhythmia, coronary artery disease, peripheral vascular disease, heart failure, or cerebrovascular accident. Liver disease was defined as cirrhosis, alcoholic liver disease, chronic hepatitis, and nonalcoholic fatty liver disease. Chronic kidney disease was defined as having an estimated glomerular filtration rate <60 mL/min/1.73 m^2. The use of chronic steroids was considered taking any dose of oral steroids daily or every other day, excluding steroids taken intermittently, such as for flares of a condition.

For thyroid cancer history, data collection included the date of diagnosis, primary tumor size and histology, lymph node involvement, extrathyroidal spread (none, minimal, or gross), and treatment (surgery type, radioactive iodine [RAI] treatment dose, systemic therapies [eg. tyrosine kinase inhibitors], if received). Available clinical notes, operative and pathology reports, and laboratory and imaging results were abstracted. The risk of disease recurrence was characterized according to the 2015 American Thyroid Association (ATA) guidelines[15] as low, intermediate, or high. Disease response to therapy was determined within 6 months preceding the COVID-19 diagnosis by a review of serum thyroid-stimulating hormone, thyroglobulin concentrations, and imaging results. Response was classified by the 2015 ATA dynamic risk stratification (DRS) as an excellent response, biochemical incomplete response, structural incomplete response, or indeterminate response[15]. Most patients had an American Joint Committee on Cancer (AJCC) seventh (16 patients) or eighth (5 patients) edition stage I or II disease, although this was not evaluated as a predictor of COVID-19 outcomes due to recent changes in patient stage classification (2016 revision to AJCC 8th ed.) and overall low disease-specific mortality in DTC[11].

We identified the following COVID-19 related outcomes for each patient through the EMR review: hospitalization, supplemental oxygen administration (including nasal cannula, high-flow nasal cannula, bilevel positive airway pressure, or mechanical ventilation), mechanical ventilation, vasopressor therapy, the use of renal replacement therapy, and death. When a clear designation of COVID-19 as a contributor or reason for hospitalization or death was not present in the medical record, the presence of acute febrile illness with hypoxemia, acute respiratory distress syndrome, and other established COVID-19 manifestations as well as the absence of other identified immediate causes, were used to classify patients. Data was primarily abstracted by 2 reviewers for each case (Nikhita Kathuria-Prakash, Tina Mosaferi, Mindy Xie, and Lauren Antrim). Cases with unclear classification for thyroid cancer parameters or outcomes were adjudicated by 3 additional reviewers (Trevor E. Angell, Gino K. In, and Melissa G. Lechner).

Statistical Analysis

Descriptive statistics were used to evaluate demographic metrics, thyroid cancer metrics, and COVID-19 outcomes in our cohort of DTC patients. Our prespecified primary clinical outcome was the frequency of hospitalization from COVID-19. The association of COVID-19 hospitalization with age, sex, BMI, thyroid cancer risk of recurrence, cumulative RAI dose, and DTC response to therapy was assessed by Mann-Whitney *U* test (continuous variables, nonparametric) or Fisher Exact test (categorical variables), as indicated, with alpha at 0.05. Statistical consultation was provided by the UCLA Clinical and Translational Science Institute Statistics Core, and statistical analysis was conducted using Prism (GraphPad, v8.0).

Results

Study Population

Of 4267 patients with positive SARS-CoV2 test results, 257 (6.0%) had a diagnosis of cancer (excluding nonmelanoma skin

cancer), including 21 patients with DTC (0.5% of all SARS-CoV2 positive patients and 8.1% of cancer patients). The 257 patients was comprised of 207 cancer patients, including 16 with DTC, from the UCLA (of 3104 patients with positive SARS-CoV2 test results) and 50 cancer patients, including 5 with DTC, from the LAC+USC (of 1163 patients with positive SARS-CoV2 test results). The median age of DTC patients was 56 (interquartile range [IQR], 37-73) years, and 17 (80%) were women (Table 1). Overall, 12/21 (57.1%) of patients had 1 or more comorbidity other than DTC (Table 1). Comorbidities present included type 2 DM (7/21, 33%), lung disease (4/21, 19%), cardiovascular disease (2/21, 9.5%), and chronic steroid therapy (2/21, 9.5%). None had a history of chronic liver or kidney disease and one was a prior smoker (Table 1). Using BMI measurement, 6/21 (28.6%) of the patients were normal weight, 8/21 (38.1%) were overweight (BMI, 25.0-29.9), and 7/21 (33.3%) were obese (BMI, >30.0) (Table 1).

All patients had papillary thyroid cancer (Table 2). The primary tumor size was <1 cm in 6 patients (28%), 1 to 2 cm in 6 patients (28.6%), and >2 cm in 5 patients (23.8%); unknown in 4 (19%) patients. Histologic subtypes were classical (13/21, 61.9%), follicular (5/21, 23.8%), and tall cell, cribriform, and unknown (1/21, 4.8% each). Tumors were intrathyroidal in 15 of 21 patients (71.4%), and lymph node metastasis was present at diagnosis in 10 of 21 patients (47.6%). All patients underwent total thyroidectomy. Sixty two percent of patients received RAI treatment. The ATA risk of recurrence at diagnosis was classified as low, intermediate, and high in 10 (47.6%), 5 (23.8%) and 1 (4.8%) patient, respectively. Initial recurrent risk was not determined from the EMR in 5 patients. The 2015 ATA DRS[15] for all patients within the preceding 6 months was assessed as an indicator of thyroid cancer disease activity. Fifteen of 21 patients (71.4%) had excellent disease responses, and 2 patients (9.5%) had indeterminate, biochemically incomplete, or structurally incomplete responses (Table 2).

Clinical Outcomes in Thyroid Cancer Patients with COVID-19

The clinical outcomes evaluated for COVID-19 were hospitalization, the use of supplemental oxygen, mechanical ventilation, vasopressors, renal replacement therapy, and death (Table 3). Our cohort included patients who had COVID-19 from January 1 to September 30, 2020, with 6 (28.5%), 14 (66.7%), and 1 (4.8%) patient having symptoms from January to March, April to June, and July to September, respectively, similar to the trends in the Los Angeles region. Eight patients (38.1%) were hospitalized for COVID-19, 5 (23.8%) used supplemental oxygen, 3 (14.3%) required mechanical ventilation and vasopressor therapy, and 1 (4.8%) received renal replacement therapy. Two patients died from COVID-19 complications, with a case fatality rate of 9.5% (Table 3).

Table 1
Demographic Characteristics of DTC Patients With COVID-19

Characteristic	Total (N = 21)	Hospitalized (n = 8)	Not Hospitalized (n = 13)
Age (years)			
18-30 years old	3 (14.3%)	1 (33.3%)	2 (66.7%)
30-45 years old	4 (19.0%)	0 (0%)	4 (100%)
45-60 years old	4 (19.0%)	1 (25.0%)	3 (75.0%)
>60 years old	10 (47.6%)	6 (60.0%)	4 (40.0%)
Sex			
Men	4 (19.0%)	2 (50.0%)	2 (50.0%)
Women	17 (81.0%)	6 (35.3%)	11 (64.7%)
BMI			
<25.0	6 (28.6%)	2 (33.3%)	4 (66.7%)
25.0-29.9	8 (38.1%)	2 (25.0%)	6 (75.0%)
>30.0	7 (33.3%)	4 (57.1%)	3 (42.9%)
Comorbidities			
DM	7 (33.3%)	5 (71.4%)	2 (28.6%)
Lung disease	4 (19.0%)	3 (75.0%)	1 (25.0%)
Heart disease	2 (9.5%)	2 (100.0%)	0 (0.0%)
Prescribed chronic steroids	2 (9.5%)	1 (50.0%)	1 (50.0%)
Smoker	1 (4.8%)	0 (0.0%)	1 (100%)
Number of comorbidities			
0	9 (42.9%)	1 (11.1%)	8 (88.9%)
1	8 (38.1%)	3 (37.5%)	5 (62.5%)
2	3 (14.3%)	3 (100.0%)	0 (0%)
3	0 (0.0%)	0 (0%)	0 (0%)
4	1 (4.8%)	1 (100.0%)	0 (0%)

Abbreviations: BMI = body mass index; DM = diabetes mellitus; DTC = differentiated thyroid cancer.

Table 2
Thyroid Cancer Characteristics in DTC Patients With COVID-19

Characteristic	Total (N = 21)	Hospitalized (n = 8)	Not hospitalized (n = 13)
Histology			
Classic	13 (61.9%)	4 (30.8%)	9 (69.2%)
Follicular variant	5 (23.8%)	2 (40.0%)	3 (60.0%)
Tall cell	1 (4.8%)	1 (100%)	0 (0%)
Cribriform	1 (4.8%)	1 (100%)	0 (0%)
Unknown	1 (4.8%)	0 (0%)	1 (100%)
Tumor size (cm)			
<1	6 (28.6%)	2 (33.3%)	4 (66.7%)
1-2	6 (28.6%)	1 (16.7%)	5 (83.3%)
2-4	4 (19.0%)	2 (50.0%)	2 (50.0%)
>4	1 (4.8%)	1 (100%)	0 (0%)
Unknown	4 (19.0%)	2 (50.0%)	2 (50.0%)
Extrathyroidal			
None	15 (71.4%)	6 (40.0%)	9 (60.0%)
Extension			
Minimal	1 (4.8%)	0 (0%)	1 (100%)
Gross	1 (4.8%)	0 (0%)	1 (100%)
Unknown	4 (19.0%)	2 (50.0%)	2 (50.0%)
Lymph node metastasis			
Present	7 (33.3%)	1 (14.3%)	6 (85.7%)
Absent	11 (52.4%)	6 (54.5%)	5 (45.5%)
Unknown	3 (14.3%)	1 (33.3%)	2 (66.7%)
Surgery			
Total thyroidectomy	21 (100%)	8 (31.1%)	13 (61.9%)
Lobectomy	0 (0%)		
ATA risk of structural recurrence			
Low	10 (47.6%)	4 (40.0%)	6 (60.0%)
Intermediate	5 (23.8%)	2 (40.0%)	3 (60.0%)
High	1 (4.8%)	0 (0%)	1 (100%)
Unknown	5 (23.8%)	2 (40.0%)	3 (60.0%)
RAI			
Yes	13 (61.9%)	5 (38.5%)	8 (61.5%)
No	7 (33.3%)	2 (28.6%)	5 (71.4%)
Unknown	1 (4.8%)	1 (100%)	0 (0%)
Cumulative RAI dose (mCi)			
None	7 (33.3%)	2 (28.6%)	5 (71.4%)
<100	3 (14.3%)	0 (0%)	3 (100%)
100-150	4 (19.0%)	3 (75.0%)	1 (25.0%)
>150	5 (23.8%)	2 (40.0%)	3 (60.0%)
Unknown	2 (9.5%)	1 (50.0%)	1 (50%)
Dynamic risk stratification			
Excellent Response	15 (71.4%)	6 (40.0%)	9 (60.0%)
Indeterminate	2 (9.5%)	1 (50.0%)	1 (50.0%)
Biochemically Incomplete	2 (9.5%)	0 (0%)	2 (100%)
Structurally Incomplete	2 (9.5%)	1 (50.0%)	1 (50.0%)

Abbreviations: ATA = American Thyroid Association; DTC = differentiated thyroid cancer; RAI = radioactive iodine.

Thyroid Cancer Characteristics and COVID-19 Outcomes

We evaluated clinical COVID-19 outcomes in relation to thyroid cancer characteristics, including tumor burden and extent, treatment, and the status of disease response to treatment. Most patients who required hospitalization had classic papillary thyroid

Table 3
COVID-19–Related Clinical Outcomes

COVID-19 outcomes	Number (%)
Hospitalization	8 (38.1%)
Supplemental oxygen	5 (23.8%)
Mechanical ventilation	3 (14.3%)
Need for renal replacement therapy	1 (4.8%)
Need for vasopressor therapy	3 (14.3%)
Death	2 (9.5%)

Abbreviation: COVID-19 = coronavirus disease-19.

cancer (4/8, 50%), including both patients with COVID-19–attributed mortality (Table 2). The primary tumor size was neither associated with COVID-19 clinical outcomes nor were features of more aggressive DTC disease (ie, gross extrathyroidal disease extension, lymph node metastasis) (Table 2 and Supplemental Table 1). Across the ATA disease risk of recurrence categories (ie, low, intermediate, high), no associations were observed between the severity of COVID-19 and recurrence risk. The patients included had a median of 10.8 years between the diagnosis of thyroid cancer and the diagnosis of COVID-19, ranging from 3 months (0.33 years) to 36 years between diagnoses. Five of 21 patients were within the 5 years of initial thyroid cancer diagnosis, including 1 of 8 patients who were hospitalized for COVID-19. Interestingly, patients who received a cumulative RAI dose of ≥100 mCi had a higher rate of hospitalization for COVID-19 than those who received no RAI or lower RAI doses (Table 2), although this association was not statistically significant in our cohort. With respect to the DTC disease status and response to therapy near the time of COVID-19 diagnosis, we found no association between hospitalization and ATA DRS category. Six patients with excellent DRS were hospitalized (40%), compared with 1 patient with an indeterminate response (50%) and 1 patient with a structurally incomplete response (50%) (Table 2). Of the 2 patients with COVID-19–attributed deaths, one had an excellent response to treatment and one had a structurally incomplete response (Supplemental Table 1).

Association of Patient Age and Comorbidities with COVID-19 Outcomes

We then evaluated non-DTC clinical parameters previously associated with an increased risk of poor outcomes in COVID-19, including older age, male sex, and medical comorbidities. Older age was significantly associated with hospitalization from COVID-19 ($P = .047$). Patients who were over 60 years of age more often required hospitalization (60% vs 18%), supplemental oxygen (40% vs 18%), mechanical ventilation (20% vs 9%) and vasopressor support (20% vs 9%) than younger patients (Supplemental Table 2). Furthermore, COVID-19–attributed mortality was greater in patients over 60 years of age (20% vs no deaths in patients 60 years old and younger). Men in our cohort were more likely to be hospitalized for COVID-19 (50% vs 35.3%) and die from COVID-19 (25% vs 6%) than women in our cohort, although these did not reach a statistical significance. Additionally, over half (4/7, 57.1%) of patients with a BMI >30 required hospitalization compared with only 28.6% (4/14) with a lower BMI. In patients with DTC, those with type 2 DM, lung disease, or cardiovascular disease were more likely to be hospitalized for COVID-19 (Table 1). Of DTC patients hospitalized for COVID-19, 7 of 8 (87.5%) had 1 or more medical comorbidities compared with 5 of 13 (38.4%) patients who did not require hospitalization. The presence of any medical comorbidity other than DTC (eg, DM or cardiopulmonary disease) was significantly associated with hospitalization for COVID-19 ($P = .024$).

Discussion

The syndrome of COVID-19 resulting from SARS-CoV2 infection is currently the cause of unprecedented hospitalizations, acute respiratory distress syndrome requiring intensive care, and mortality worldwide[1]. A history of cancer has been suggested as a risk factor for poor clinical outcomes from SARS-CoV2 infection, including an increased risk of hospitalization and mortality[3,5,16]. We report the clinical outcomes of SARS-CoV2 infection in patients with DTC from 2 large academic medical centers in the United States, with the largest cohort of this population to date.

The rate of hospitalization for COVID-19 in DTC patients was 38.1%, and 2 of 21 patients (9.5%) had COVID-19–attributed death. We found no association between worse outcomes and thyroid cancer disease extent, treatment, or response to therapy. On the other hand, older age and preexisting DM or cardiopulmonary disease were significantly associated with an increased rate of COVID-19 hospitalization. These findings are consistent with previous studies in more general populations suggesting that advanced age, DM, and pulmonary and cardiovascular diseases are risk factors for poor clinical outcomes from SARS-CoV2 infection[17–19]. Data from the Centers for Disease Control suggested that individuals over 65 years of age were 5 times more likely to be hospitalized and 90 times more likely to die from COVID-19 than individuals 18 to 29 years of age in the United States[20]. Additionally, DM has been associated with a three-fold higher risk of hospitalization from COVID-19, potentially due to immune dysregulation[17,18]. The presence of multiple comorbidities (including DM, chronic kidney disease, obesity, coronary artery disease, stroke, and asthma or chronic obstructive pulmonary disease) further increased the risk of hospitalization from COVID-19 (4.5-fold with 2 and 5-fold with ≥3 comorbidities)[17].

While this study aimed to evaluate the predictors of poor COVID-19 outcomes in DTC patients, the rates of hospitalization and death seen in these patients can be related to the larger population of SARS-CoV2 infected patients in Los Angeles during the study period. Compared with the rate of COVID-19 hospitalization in DTC patients (38.1%), the rate of hospitalization in patients with nonthyroid malignancies across the UCLA and LAC+USC health systems was 37.7% (89/236; P = ns) and in a recently reported cohort from Los Angeles (12.2%)[23]. Furthermore, DTC patients had a rate of COVID-19–attributed death comparable to that of patients with nonthyroid malignancy at these sites (2/21, 9.5% vs 18/236, 7.6%, P = ns). Matched data to directly compare hospitalization and mortality rates in noncancer patients with SARS-CoV2 at these sites were not available. However, the rate of hospitalization for a general population over 60 years of age within the UCLA health system in Los Angeles was 387 of 1343 (28.8%). The overall population of Los Angeles (2.4%) had a lower COVID-19 mortality than our cohort of DTC patients, although similar for the subset of patients ≥60 to 65 years of age (13%-15.6%)[21,22]. Perhaps most importantly, the hospitalization and mortality rates seen in our cohort of DTC patients was much less than the previously reported hospitalization and mortality rates for cancer patients. Petrilli et al reported that 295 of 403 patients with cancer (73%) versus 2446 of 4876 without cancer (50.1%) were hospitalized among a cohort testing positive for SARS-CoV2 at ambulatory and emergency room departments in New York and found an increased risk of COVID-19–associated death among cancer patients (HR, 1.31, 1.05-1.62, $P = .02$)[16]. Another study from New York found a lower case fatality rate among cancer patients with COVID-19; however, this was still significantly higher than age-adjusted mortality for noncancer patients in New York at the same time. Finally, in a meta-analysis by Saini et al, including 52 studies and 18 650 patients with COVID-19, the mortality rate among cancer patients with SARS-CoV2 infection was 25.6% (95% confidence interval, 22.0%-29.5%)[3,5]. The lower rates

of hospitalization and death seen in our cohort of DTC patients is likely multifactorial and may include improved overall outcomes of SARS-CoV2 infection through the summer of 2020, a cancer population comprised of more patients not on active treatment or cytotoxic therapy, and regional differences in the availability of testing. Most patients in this cohort had COVID-19 between April and June, 2020, corresponding to the first 2 peaks of the disease in the Los Angeles region.

There are several limitations that must be considered in the interpretation of these data. While this is the largest cohort of DTC patients with SARS-CoV2 infection reported to date, the relatively small sample size limits our statistical power. Potential significant risk factors, such as RAI exposure, may warrant analysis in larger studies. Interestingly, our data showed worse COVID-19 outcomes in DTC patients that had received cumulative RAI doses >100 mCi, though this difference did not reach statistical significance. Radioactive iodine therapy, which is widely used for the adjuvant treatment of DTC patients, has known side effects, including the risk of secondary malignancies, sialoadenitis, and pulmonary fibrosis that occur with an increased frequency at higher cumulative doses[24,25]. This cohort of DTC patients did not contain patients treated with lobectomy or receiving systemic therapies (eg. chemotherapy, kinase inhibitors, and immunotherapy) for metastatic disease, and therefore may not be generalizable to all patients. In addition, no thyroid cancer patients had lung metastases, which may be expected to worsen the outcomes from COVID-19 due to a decreased baseline pulmonary function. Given the retrospective nature of our study, a complete thyroid cancer staging and risk assessment information was missing for some patients. Furthermore, charts were manually abstracted for clinical outcomes, including hospitalization and death due to COVID-19. When a clear designation of COVID-19 as the cause of clinical outcomes was not present in the medical record, the established manifestations of COVID-19 were used to classify patients, and this is a potential source of bias that may have led to the overestimation of hospitalization and mortality.

Conclusion

These data suggest that a history of DTC, in and of itself, is likely not a significant contributor to the risk of hospitalization from SARS-CoV2 infection, whereas the established risk factors of increased age, underlying cardiopulmonary disease, and DM are likely more significant in determining patient outcomes. Given the significant concern reported by thyroid cancer patients regarding COVID-19, this multicenter report of clinical outcomes can provide guidance to treating providers and DTC patients on the impact of thyroid cancer on SARS-CoV2 infection[10].

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Disclosure

The authors have no multiplicity of interest to disclose.

All studies of human subjects were approved by the Institutional Review Boards at UCLA (IRB #20-000650) and LAC+USC (IRB #HS-20-00401).

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