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Thyroid Cancer Incidence and Clinicopathological Distribution in Bariatric Surgery Cases

Bariatrik Cerrahi Olgularında Tiroid Kanseri İnsidansı ve Klinikopatolojik Dağılımı

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Abstract

Aim Obesity is strongly associated with increased risk of many cancer types. It is estimated that approximately 20% of all cancers are caused by overweight. It is considered that there is a direct relation between overweight and thyroid cancer. The aim of this study is to evaluate the incidence and clinicopathological distribution of thyroid cancer in bariatric surgery cases.

Material and Method The present study was conducted with a total of 2316 patients who underwent bariatric surgery because of morbid obesity in our metabolic and bariatric surgery clinic between April 2014 and November 2021.

Results It was found that the prevalence of thyroid cancer was 1.2% in morbidly obese cases. A total of 23 patients had papillary thyroid cancer (0.99%), 3 patients had follicular cancer (0.12%), 1 patient had medullary cancer (0.04%), and 1 patient had anaplastic cancer (0.04%).

Conclusion It was found in the present study that the most common cancer type was thyroid papillary cancer, and follicular, medullary, and anaplastic cancer were found to be less frequently. There appears to be a relation between Body Mass Index and the thyroid cancer risk.

Keywords Bariatric surgery, histopathological distribution, obesity, thyroid cancers,

Özet

Amaç *Obezite, birçok kanser türünün artan riski ile güçlü bir şekilde ilişkilidir. Tüm kanserlerin yaklaşık %20'sinin aşırı kilodan kaynaklandığı tahmin edilmektedir. Fazla kilo ile tiroid kanseri arasında doğrudan bir ilişki olduğu düşünülmektedir. Bu çalışmada amaç Bariatrik cerrahi olgularında tiroid kanseri insidansı ve klinikopatolojik dağılımını değerlendirmektir.*

Gereç ve Yöntem *Bu çalışma, Nisan 2014 ile Kasım 2021 tarihleri arasında metabolik ve obezite cerrahisi kliniğimizde morbid obezite nedeniyle obezite cerrahisi uygulanan toplam 2316 hasta ile gerçekleştirildi.*

Bulgular *Morbid obez olgularda tiroid kanseri prevalansının %1,2 olduğu saptandı. Toplam 23 hastada papiller tiroid kanseri (%0,99), 3 hastada foliküler kanser (%0,12), 1 hastada medüller kanser (%0,04) ve 1 hastada anaplastik kanser (%0,04) vardı.*

Sonuç *Bu çalışmada en sık görülen kanser tipinin tiroid papiller kanseri olduğu ve foliküler, medüller ve anaplastik kanserlerin daha az sıklıkta olduğu saptandı. Vücut Kitle İndeksi ile tiroid kanseri riski arasında bir ilişki var gibi görünmektedir.*

Anahtar Kelimeler *Bariatrik cerrahi, histopatolojik dağılım, obezite, tiroid kanserleri*

INTRODUCTION

The association between obesity and increased cancer incidence and cancer-related mortality has been established well in recent years. It is estimated that 14% of cancer deaths in men and 20% in women may be because of obesity.[1] Uncontrolled weight gain frequently causes metabolic disorders, altered steroid hormone production, and chronic subclinical inflammation. These pathophysiological effects have been associated with the development and progression of tumors.[2]

There has been a stable increase in the Thyroid Cancer (TC) incidence worldwide in the last three decades.[3] The incidence was later reported to be 0.02% with available data. The highest increase in incidence was reported in women, and stemmed from papillary thyroid cancer, which is the most common histological type.[4-5]

Previous studies showed that TCs are more aggressive in the obese population, and increase the rates of microscopic extra-thyroidal invasion and advanced stage. It has been recently shown that the prevalence of TC is 0.15% in men and 0.50% in women. TCs were also associated directly with increasing age, higher systolic blood pressure, lighter weight, and shorter stature. However, there are also several other studies which show the relation of TC with excessive BMI.[6-7] Although some studies mention a positive relation with obesity, especially in women, some other studies report that the relation between TC and obesity is a controversial one.[8-9] For this reason, the purpose of the present study was to determine the prevalence and histopathological distribution of TC that were detected in multidisciplinary evaluations in the management of obese patients before bariatric surgery. All of these patients were those who were found to have TC during pre-operative evaluation and scans when they applied to the obesity clinic.

MATERIAL and METHOD

The present study was conducted with a total of 2316 patients who underwent bariatric surgery because of morbid obesity in our metabolic and bariatric surgery clinic between April 2014 and November 2021. The evaluation results of each case were obtained from the files and electronic records. The anthropometric data, physical examination results, laboratory results, and ultrasonographic and pathological data of the cases were analyzed. The study had a cross-sectional descriptive design and was conducted by examining the data and files of the patients retrospectively after the approval of Medicana International Samsun Hospital Clinical Research Ethics Committee in line with ethical rules (decision no 7154, 01.11.2021).

The frequency and histopathological types of the cases with thyroid cancer were used as the data during the evaluations of the study group with a Body Mass Index (BMI) ≥ 40 kg / m2 with a multidisciplinary approach before bariatric surgeries. All cases were evaluated with Thyroid Ultrasonography before bariatric and metabolic surgeries. Biopsy and further examinations were performed from each nodule in the indication, and cancer prevalence was determined with these examinations. Thyroid fine needle aspiration biopsy decision was made based on the EU-TIRADS score. EU-TIRADS 3 nodules >20 mm (very low risk, malignancy risk 2-4%); EU-TIRADS 4 nodules >15 mm (low-intermediate risk, malignancy risk 6-17%); EU-TIRADS 5 TIAB was performed when nodules were >10 mm (moderate-high risk, risk of malignancy 26-87%).10 The cases between the ages of 18-65 were included in the study. Each patient was evaluated individually with the multidisciplinary study group in our hospital.

Statistics

The data were expressed as Mean ± Standard Deviation (SD), and the continuous variables were determined with baseline statistics (mean, standard deviation). Percentages were used for continuous variables, and $p<0.05$ was taken to be statistically significant. The data were analyzed with the SPSS Software (Statistical Package for the Social Sciences, version 22.0, Chicago).

RESULTS

Electronic and file records of 2316 patients were evaluated in the present study; and 1452 of the patients were female, and 864 were male. The mean age of the patients was 47.8 ± 8.4, and Body Mass Index (BMI) was 50.3±5.6 kg/m2. The sociodemographic and clinical characteristics of the study group are shown in Table 1.

Table 1. Clinical characteristics of patients

Parameter	Whole cohort
Age, year± SD	47.8 ± 8.4
Gender, female (%, n)	1452 (62.6%)
Weight, kg	110.3±14.5
BMI, kg/m2	50.3 ± 5.6
Nodule prevalence (with ultrasonography), n (%)	1482 (63.9%)
Fine needle aspiration biopsy, n (%)	1009 (68.0%)
Background thyroid tissue	
Normal	741 (31.9%)
Nodular goiter, n (%)	1482 (63.9%)
Lymphocytic thyroiditis, n (%)	416 (17.9%)
Hashimotos' thyroiditis, n (%)	324 (13.9%)
Lymph node surgery	
Central neck dissection, n (%)	9 (32.1%)
Lateral neck dissection, n (%)	3 (10.7%)
Tumor size, mm	21.4 ± 11.5
Extra thyroidal metastasis, n (%)	8 (28.5%)
Whole Cohort-n (%); SD: Standard Deviation.	

Bariatric surgeries were performed for the treatment of obesity in 65.6% (n=1521), and metabolic surgeries were performed for the treatment of Type 2 Diabetes in 34.3% (n=795) of the patients. The thyroid tissues were evaluated ultrasonographically in all cases. Thyroid parenchyma was found to be normal in 31.9%, thyroid nodule in 63.9%, and thyroiditis in 31.9%. Fine needle aspiration was performed for 43.5% of all cases; and 32.1% underwent central lymph node dissection, and 10.7% lateral lymph node dissection were performed in TC cases. Extra thyroidal metastases were 28.5%. The data are shown in Table 1.

The data on the prevalence and histopathological types of TC in morbidly obese patients are very rare. It was found that the prevalence of TC was 1.20% in morbidly obese cases (n=28). A total of 23 patients had papillary thyroid cancer (0.99%), 3 patients had follicular cancer (0.12%), 1 people had medullary cancer (0.04%), 1 patient had anaplastic cancer (0.04%). The frequency and histopathological distribution of the thyroid cancer in obese patients are shown in Table 2.

Table 1. Clinical characteristics of patients

Morbidities	Prevalence of morbidities n (%)
Papillary Cancer	23 (0.99%)
Classic variant	9 (39.1%)
Follicular variant	11 (47.8%)
Tall cell variant	2 (4.6%)
Hurtle cell variant	1 (4.3%)
Follicular cancer	3 (0.12%)
Medullary Cancer	1 (0.04%)
Anaplastic cancer	1 (0.04%)
Total	28 (1.20%)
Whole Cohort-n (%); SD: Standard Deviation.	

DISCUSSION

In recent years, the prevalence of thyroid cancer has increased dramatically largely because of the identification of subclinical disease. The latest epidemiological data and the recent developments in the recommendations to diagnose and treat thyroid cancer cases with low risk promise that the prevalence may begin to slow.[11-12] In previous studies, the prevalence of TC was reported to be 0.03-0.09%, and as high as 0.15-0.11% in many countries in Europe in recent years.[13] A significantly increased prevalence of TC was detected in obese cases in the present study.

Several previous studies showed that there is a prevalence of thyroid nodules of 2-6% with palpation, 19-35% with ultrasound, and 8-65% in autopsy data.[14] It was also shown that parenchymal hypoechogenicity, general prevalence of thyroid nodules, and the frequency of multiple nodules are higher in severely obese individuals.[15] It was found in the present study that there is an increased general frequency

of parenchymal hypoechogenicity, thyroiditis, and nodules; and the prevalence of nodules was 63.9% in severely obese cases. Fine needle aspiration biopsy was performed for 68.0% of these nodules. The prevalence of TC was 1.2% in morbidly obese cases, and extrathyroidal metastases were 28.5%. In previous studies, it was shown that the presence of lymph node metastasis is 30-50% in thyroid cancers at the time of diagnosis.[16-17]

Obesity is strongly associated with increased risk in many cancer types.[18] Increased prevalence of obesity is a serious health problem increasing the risk of various chronic diseases, including cancer.[19] It is estimated that approximately 20% of all cancer cases are caused by overweight. There are many prospective epidemiological studies which show that there is a direct relation between overweight and cancer.[20] TC was detected to be most common before bariatric surgery in previous studies.[21,22] Greater Body Mass Index was positively correlated with nodular thyroid disease in observational studies.

In the present study, it was found that the most common cancer was thyroid papillary cancer, and follicular, medullary, and anaplastic cancer were detected less frequently. Large case-control studies and meta-analyses showed that there are relations between Body Mass Indices and thyroid cancer risk in men and women.[23,24] There are also studies which show that obesity is associated with more aggressive features in thyroid cancers such as extrathyroidal spread and more advanced tumor stage.[25,26] More aggressive features of thyroid cancers were not detected in the present study.

Obesity and hyperinsulinemia are related closely with each other. Insulin increases hepatic insulin-like growth factor-1 (IGF-1) production. Serum IGF-1 levels are associated with increased cancer risk, including thyroid, prostate, colon, endometrium, and breast, with evidence that serum IGF-1 levels play critical roles in tumor progression and metastasis.[24] Obesity tends to have higher Thyroid Stimulating Hormone (TSH) levels, which may be an independent risk factor for thyroid cancer.[27-30] Again, as a disease strongly associated with obesity, Type 2 Diabetes Mellitus is also defined as a risk factor for increased TSH levels and thyroid cancer.[31-32]

The increased incidence of thyroid cancers stems from the increased diagnosis of differentiated thyroid cancers, particularly papillary thyroid cancers. The incidence rates of follicular, anaplastic, and medullary thyroid cancers have been stable for the last three decades.[33,34] In the present study, thyroid cancers were found to increase more because of increased differentiated thyroid cancers, similar to non-obese cases. The greatest increase was detected in papillary cancer type. Also, the distribution of papillary cancer variants in the present study was the most common follicular variant, and classical variant, tall cell variant, and hurtle cell variant were detected less frequently. Similar to our study, papillary cancer variants or differentiation patterns were reported to be the most common classical variants and follicular variants previous in studies.[33] Here, it was shown that the distribution rates of papillary cancer variants were similar in obese and non-obese cases.

CONCLUSION

The prevalence of obesity and thyroid cancer has increased in recent years in parallel on a global scale. When the present study and available evidence were considered, the increased incidence in differentiated thyroid cancer appears to be pathogenically linked to the spread of obesity. Some of the influencing factors that may explain this association were identified previously. Fighting and preventing obesity can reduce obesity-related cancer prevalence.

Ethical Approval

The ethics committee of this study was obtained from Medicana International Samsun Hospital Clinical Research Ethics Committee (7154 decision no, 01.11.2021).

Peer-review

Externally and internally peer-reviewed.

Author Contributions

Concept: E.A., Z.E., H.E., Ö.K.O., Design: E.A., Z.E., H.E., K.G., F.G., Data Collection or Processing: E.A., Ö.K.O., Analysis or Interpretation: E.A., Z.E., H.E., Ö.K.O., Literature Search: E.A., Z.E., H.E., Ö.K.O., Writing: E.A., Z.E., H.E., Ö.K.O.

Conflict of interest

The authors declare that they have no confict of interest.

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