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Prognostic factors of survival and recurrence pattern in differentiated thyroid cancer: A retrospective study from Western Turkey

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Objectives. The aim of this study was to determine prognostic factors in patients with well-differentiated thyroid cancer (WDTC).

Methods. This retrospective study included 181 well-differentiated thyroid cancer patients who were operated between Decembers 1996-2007. Total of 181 patients [139 (76.8%) women and 42 (23.2%) men with a mean age of 46.3 years] who were subjected to a complete follow-up, were enrolled in the study. The mean follow-up period was 7.1 years (range 3.1 to 14.9 years). Medical records were reviewed regarding to age, gender, extent of surgery, tumor size, multifocality, clinical stage, capsule infiltration, extracapsular invasion, histological type, lymph node metastasis, distant metastasis, radioactive iodine treatment and prognosis.

Results. During follow-up, in 41 (22.6%) patients locoregional recurrences were detected and 5 (2.7%) patients passed away. Determined statistically significant prognostic factors were as follows; tumor size (histopathologically), extent of surgery, histological type, lymph node metastasis, tumor invasion (capsule and extracapsular) and clinical stage.

Conclusions. Well-differentiated thyroid cancer is a disease with good prognosis when detected early and appropriate treatment applied. Despite the prognosis, it is good to apply the right treatment and reduce recurrence and mortality rates, prognostic factors are well known and must be considered in patient management.

Key words: thyroid cancer; prognostic factors; thyroidectomy

Thyroid cancer is the most common endocrine malignancy which accounts for less than 1% of all cancers and slow-growing tumors (Biersack and Grunwald 2005). Its incidence is dramatically rising. Although survival of well-differentiated thyroid cancer (WDTC) is usually good, it is evident that it can become life-threatening. Even though, microcarcinomas have been reported in 5% to 36% of autopsied adults. The clinical increase of the incidence of small diameter cancer depends mostly on the development of preoperative diagnostic and postoperative pathological techniques (Pelizzo et al. 2006). During follow-up, recurrence is a common incidence that is usually not life-threatening. Meanwhile, recurrence is a main stressor, even in small carcinomas. The most important prognostic factor for thyroid cancer (for disease-free survival, recurrence, and metastasis) is the histological type of the cancer (Tatic 2003). Several studies have been published prognostic factors of papillary thyroid carcinoma and these prognostic factors, like advanced age, male gender, large tumor size, extrathyroid extension, lymph node metastasis, and distant metastasis, are well known today (Ito and Miyauchi 2009). With the philosophy that knowledge of risk factors will have a major impact on treat-

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Fig. 1. Windows Mobile 2003 operation system.

ment management, we aimed to demonstrate the risk factors of WDTC predicting recurrence and survival in patients who were followed for up to 15 years, in the current study. Until recently, in order to be able to predict the behavior of the tumor, many classification systems were made up for well differentiated thyroid cancer. In this study, we also aimed to determine the significance of the 3 staging systems (European Organization for Research and Treatment of Cancer [EORTC], De Groot, and tumor-node-metastasis [TNM]) on the prognosis of the well differentiated thyroid cancer. The prognosis of patients with well-differentiated thyroid cancer can be predicted by TNM, De Groot, and EORTC classifications. After an initial preoperative evaluation, these patients should be re-evaluated postoperatively, taking into account the same criteria. To our knowledge, this study is the first study from Turkey reporting prognostic data of thyroid cancer patients.

Materials and Methods

During a period from December 1996 to December 2007, a total of 3245 patients underwent surgical treatment for thyroid disease at the university teaching hospital in Izmir - Turkey. Total of 181 patients with WDTC, 139 (76.8%) women and 42 (23.2%) men with a mean age of 46.3 years, who were subjected to a complete follow-up, were enrolled in the study. Patients whose files lacked of follow-up information were excluded from the study. Operative and hospital records were reviewed for prognostic indices. Of the analyzed WDTC patients, 164 (90.6%) had papillary cancers, 14 (7.7%) follicular cancers, 2 (1.1%) WDTC (not papillary and follicular cancer), and 1 (0.6%) Hurthle cell carcinoma. Patients were divided into two groups according to age at diagnosis: ≤ 45 and > 45 year-old age. A total of 72 patients (39.8%) had an age ≤ 45, while 109 (60.2%) patients were found to be > 45 years (Table 1). At our department, thyroidectomy methods applied for the treatment of thyroid cancer are total thyroidectomy, near-total thyroidectomy, and completion thyroidectomy. It is possible to classify indications for re-operation of thyroid diseases into three categories. These are: 1) symptomatic recurrent multinodular goiter, 2) residual or recurrent cancer, and 3) postoperative diagnosis of cancer as described elsewhere (Makay et al. 2005). Prophylactic or therapeutic simultaneous central (level VI) with or without lateral (levels II-V) selective neck dissection was performed for clinically or histopathologically (with fine needle aspiration biopsy) proven cervical or lateral lymph node metastasis. All treatment decisions were made after discussion at a multidisciplinary endocrine council meeting. Locoregional recurrence was defined as recurrence proven by ultrasonography or scintigraphy

Table 1

General characteristics of patients

Parameter		N (%)
Age	<45	72 (39.8%)
	>45	109 (60.2%)
Gender	Female	139 (76.8%)
	Male	42 (23.2%)
Ultrasonographic nodule size	<1 cm	16 (9.8%)
	1.1-2 cm	70 (43.0%)
	2.1-3 cm	43 (26.4%)
	>3 cm	34 (20.8%)
Histopathological tumor size	<1 cm	68 (37.5%)
	1.1-2 cm	60 (33.2%)
	2.1-3 cm	26 (14.4%)
	3.1-4 cm	10 (5.5%)
	>4 cm	17 (9.4%)
Surgical technique	Total throidectomy	-
	Yes/No	114 (63%)/67 (37%)
Histopathology	Papillary	108 (60.7%)
	Papillary microcarcinoma	56 (31.4%)
	Follicular	14 (7.9%)
Number of metastatic lymph	1	8 (4.4%)
	2	8 (4.4%)
	>3	19 (10.5%)
Tumor invasion	Capsul	15 (8.3%)
	Surrounding soft tissue	8 (4.4%)
	Vascular	6 (3.3%)
Postoperative treatment	Radioiodine ablation	130 (71.8%)
	<150 mCi	89 (68.4%)
	>150 mCi	41 (31.6%)
Locoregional recurrence		41 (22.6%)
	Radioiodine ablation (>150 mCi)	21 (51.2%)
	Radioiodine ablation (<150 mCi)	16 (39.0%)
Mortality		5 (2.7%)

with detected pathological lymph nodes or tissue, or increase in thyroglobulin (TG) levels.

The mean follow-up period was 7.1 years range (3.1 to 14.9 years). During the last follow-up, 139 patients were living without evidence of recurrence (including detecTable thyroglobulin levels) and 41 (22.6%) patients were suffering from recurrent disease. Five (2.7%) patients from the current study deceased due to advanced disease.

Medical records were reviewed regarding to age, gender, extent of surgery, tumor size, multifocality, clinical stage, capsule infiltration, extracapsular invasion, histological type, lymph node metastasis, distant metastasis, radioactive iodine treatment, and prognosis. Assessment of risk for death was based on the DeGroot (DeGroot et al. 1995), EORTC (Byar et al. 1979) and TNM scales (Edge et al. 2010). A computer application was developed, which is a PDA (personal digital assistant) application, running on a porTable computer with at least Windows Mobile 2003 operation system (Fig. 1). The clinician used this application to perform thyroid cancer staging and predicting cancer stage, using three predictive staging systems such as DeGroot, EORTC, and TNM.

Endpoints for statistical analysis were taken as recurrence of disease and mortality. In case of recurrence, time from initial operation to the date when recurrence was first identified was calculated. All analyses were performed using SPSS Statistical Analysis software (release 15.0, Chicago, IL, USA). All quantitative data were presented as mean values ± SEM. Disease-free survival rates and survival data were analyzed by using

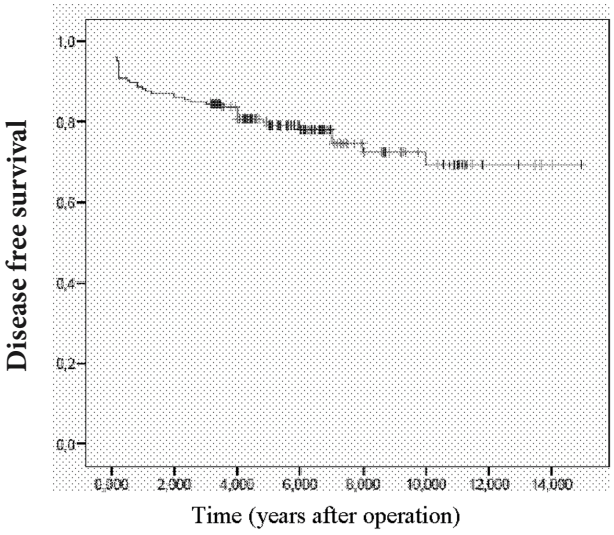

Fig. 2. Disease free survival.

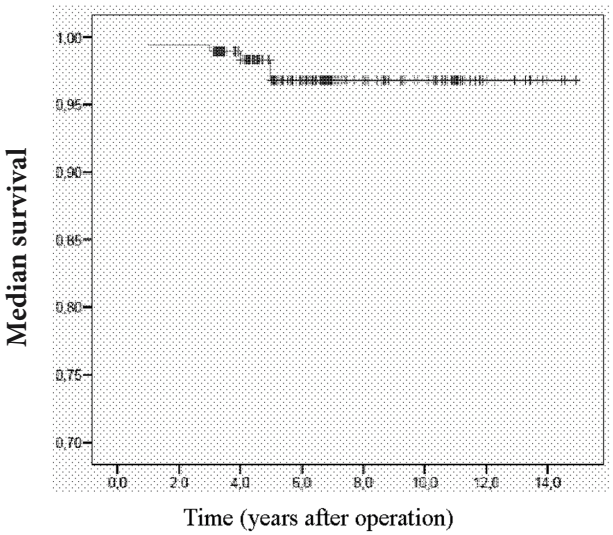

Fig. 3. Median survival.

the Kaplan-Meier method and were compared by the log-rank test. Logistic regression analysis was performed for multivariate analysis to determine significant factors associated with recurrence. A p-value < 0.05 was considered significant.

Results

From 181 patients, 41 (22.6%) locoregional recurrences were detected and 5 (2.7%) patients passed away during follow-up (Fig. 2, Fig. 3). Determined statistically significant prognostic factors were as follows: histopathologic tumor size, extent of surgery, histological type, lymph node metastasis, tumor invasion (capsule and extracapsular), and clinical stage.

Patients were divided into four groups according to the ultrasonographic nodule size which were 1) <1 cm 2) 1.1-2 cm 3) 2.1-3 cm 4) >3 cm (Table 2). Eighteen patients (9.9%) were excluded from the analysis because information regarding the ultrasonographic nodule size could not be reached. No statistically significant results could be obtained in all groups (p>0.05).

Patients were divided into five groups according to the histopathological tumor size which were 1) < 1 cm 2) 1.1-2 cm 3) 2.1-3 cm 4) 3.1-4 cm 5) > 4 cm (Table 3). Of these five groups, in the 1st and 2nd groups, disease-free survival rates were found to be statistically significant (79.9% in Group 1 and 66.7% in Group 2) (p<0.05).

Patients were divided into three groups according to the type of surgical technique as 1) total thyroidectomy 2) near-total thyroidectomy 3) completion thyroidectomy (Table 4). In these three groups, in the 1st and 3rd groups, disease-free survival rates were found to be statistically significant (70.7% in Group 1, 52.8% in Group 3) (p<0.05).

Patients were divided into five groups according to the histopathologic type of tumor as 1) papillary cancer, 2) follicular cancer, 3) papillary microcarcinoma 4) well-differentiated thyroid cancer (non-papillary, non-follicular) 5) Hurthle cell carcinoma (Table 5). Three patients (1.6%) in Groups 4 and 5 were excluded from the analysis because they were statistically insignificant. Of these three groups, in the 1st and 2nd groups, disease-free survival rates were detected to be statistically significant (69.2% in Group 1, 42.9% in Group 2) (p<0.05) and in the 2nd and 3rd groups, disease-free survival rates were detected to be statistically significant (42.9% in Group 2, 72.6% in Group 3) (p<0.05). Although the difference was insignificant, the worst disease-free survival rate was determined in Group 2 (42.9%).

Patients were divided into four groups according to the number of metastatic lymph nodes identified histopathologically as 1) non-metastatic lymph nodes 2) 1 metastatic node 3) 2 metastatic nodes 4) >3 metastatic nodes (Table 6). In the 1st and 2nd groups, disease-free survival rates were found to be statistically significant (81.1% in Group 1 vs. 62.5% in Group 2) (p<0.05), in the 1st and 3rd groups, disease-free survival rates were found to be statistically significant (81.1% in Group 1 vs. 30% in Group 3) (p<0.05) and in the 1st and 4th groups, disease-free survival rates were found to be statistically significant (81.1% in Group 1 vs. 31.6% in Group 4) (p<0.05).

Table 2
Patients' data according to the ultrasonographic nodule size

Groups	Number of patients	Locoregional recurrence	Group specific recurrence (%)	Disease free survival (%)	Overall survival (%)
<1 cm	16 (9.8%)	4 (2.5%)	25.0%	75.0%	100%
1.1-2 cm	70 (43.0%)	14 (8.6%)	20.0%	80.0%*	97.1%
2.1-3 cm	43 (26.4%)	9 (5.4%)	20.9%	79.1%	97.6%
>3 cm	34 (20.8%)	7 (4.3%)	20.6%	79.4%*	97.0%
Total	163 (100%)	34 (20.8%)			

*p<0.05

Table 3
Patients' data according to the histopathological tumor size

Groups	Number of patients	Locoregional recurrence	Group specific recurrence (%)	Disease free survival (%)	Overall survival (%)
< 1 cm	68 (37.5%)	10 (5.5%)	14.7%	85.3%	98.5%
1.1-2 cm	60 (33.2%)	19 (10.5%)	31.6%	68.4%	98.3%
2.1-3 cm	26 (14.4%)	6 (3.3%)	23.1%	76.9%	96.1%
3.1-4 cm	10 (5.5%)	2 (1.1%)	20.0%	80.0%*	90.0%
> 4 cm	17 (9.4%)	4 (2.2%)	23.5%	76.5%*	94.1%
Total	181 (100%)	41 (22.6%)			

*p<0.05

Table 4
Patients' data according to the type of surgical technique

Groups	Number of patients	Locoregional recurrence	Group specific recurrence (%)	Disease free survival (%)	Overall survival (%)
Total thyroidectomy	114 (63.0%)	17 (9.4%)	14.9%	85.1%*	94.7%
Near-total thyroidectomy	27 (14.9%)	6 (3.3%)	22.2%	77.8%*	100%
Completion thyroidectomy	40 (22.1%)	18 (9.9%)	45.0%	55.0%	97.5%
Total	181 (100%)	41 (22.6%)			

*p<0.05

Table 5
Patients' data according to the histopathologic type of tumor

Groups	Number of patients	Locoregional recurrence	Group specific recurrence (%)	Disease free survival (%)	Overall survival (%)
Papillary cancer	108 (60.7%)	24 (13.4%)	22.2%	77.8%*	99.1%
Follicular cancer	14 (7.9%)	8 (4.5%)	57.1%	42.9% (a, b)	78.5%
Papillary microcarcinoma	56 (31.4%)	8 (4.5%)	14.3%	85.7%*	98.2%
Total	178 (100%)	40 (22.4%)			

a - (Papillary cancer) × (Follicular cancer) p=0.005
b - (Follicular cancer) × (Papillary microcarcinoma) p=0.002

Table 6
Patients' data according to the number of metastatic lymph nodes identified histopathologically

Groups	Number of patients	Locoregional recurrence	Group specific recurrence (%)	Disease free survival (%)	Overall survival (%)
No lymph node dissection	146 (80.6%)	22 (12.1%)	15.1%	84.9%	97.2%
1 metastatic lymph node	8 (4.4%)	3 (1.6%)	37.5%	62.5%*	100%
2 metastatic lymph nodes	8 (4.4%)	5 (2.8%)	62.5%	37.5%*	87.5%
>3 metastatic lymph nodes	19 (10.5%)	11 (6.1%)	57.9%	42.1%	100%
Total	181 (100%)	41 (22.6%)			

*p<0.05

Table 7
Patients' data according to the tumor invasion histopathologically

Groups	Number of patients	Locoregional recurrence	Group specific recurrence (%)	Disease free survival (%)	Overall survival (%)
No invasion	152 (84%)	30 (16.6%)	19.7%	80.3%	98.7%
Surrounding soft tissue invasion	8 (4.4%)	4 (2.2%)	50%	50%	100%*
Vascular invasion	6 (3.3%)	3 (1.6%)	50%	50%	66.6%*
Capsule invasion	15 (8.3%)	4 (2.2%)	26.6%	73.4%	93.3%
Total	181 (100%)	41 (22.6%)			

*p<0.05

Patients were divided into four groups according to histopathologically tumor invasion as 1) no invasion 2) surrounding soft tissue invasion 3) vascular invasion 4) capsule invasion (Table 7). In these four groups; overall survival rates of Group 1 and 3 were found to be statistically significant (99% in Group 2 vs. 75% in Group 3) (p<0.05).

According to DeGroot staging system, Stage 1 and Stage 2 patients' results were compatible, and Stage 3 and 4 patients results were determined to be different (Stage 3; 87% vs. 66.6%, Stage 4; 35% vs. 100%, p=0.04). Compared to EORTC staging system, Stage 3 and Stage 4 patients' results were detected to be different (Stage 3; 51% vs. 100%, Stage 4; 33% vs. 50%, p=0.02). The most consistent results in terms of prognosis was determined to be consistent with the TNM staging system (Stage 1; 100% vs. 97.8%, Stage 4; 45.3% vs. 50%) (Table 8).

Table 8
Patients' data according to the TNM staging system

TNM	Edge et al. 2010 (%)	Current study (%)
Stage 1	100	97.8
Stage 2	100	100
Stage 3	95.8	100
Stage 4c	45.3	50.0

Discussion

Well-differentiated thyroid cancer has a good prognosis when detected early and treated correctly. Determinations of risk factors which are effective for tumor recurrence and mortality and determine the method of the treatment are important for follow-up and treatment for thyroid cancer. In many studies (most retrospective), the effects of different prognostic factors on recurrence and mortality for thyroid cancer have been demonstrated. Many prognostic scoring systems have been developed to determine patient risk factors on the basis of these prognostic factors. Some parameters (like whole body scan and the presence of macroscopic invasion) were developed for the determination of the recurrence risk in American Thyroid Association (ATA et al. 2009) guidelines, but in this study; patients' risk probabilities could not be calculated according to this system because we were not able to reach these parameters.

Although in most of the prognostic systems (like EORTC and Metastasis-Age-Completeness of resection-Invasion-Size [MACIS]), age is accepted as an effective parameter on prognosis of WDTC, in our study, we detected 23.6% locoregional recurrence rate in <45 years-old group and 22% in >45 years-old group, which was found to be statistically insignificant. Nevertheless, recurrence rate of WDTC was detected to be 19.4% in female and 33.3% in male patients in our study. Of 5 mortalities, 4 (2.8%) deaths were determined in females.

When patients were evaluated according to the ultrasonographic nodule size, '1.1-2 cm' groups disease-free survival rates were better than '>3 cm' group, as expected (74.5%, 67% respectively) ($p<0.05$). Meanwhile, the worst disease-free survival rate was determined in '>3 cm' group and the best results were determined in '2.1-3 cm' group. At the same time, the worst rate was in '>3 cm' group (97%). Although a direct relation between ultrasonographic tumor size and prognosis has not been defined so far, in this study, we found out that overall survival decreased with increasing ultrasonographic tumor size. Besides, thyroid cancer diagnosis cannot be determined through ultrasonographic size of tumor alone. Especially, when tumor size is less than 4 cm, it is necessary to be careful while assessing the malignancy suspicion nodule ultrasonographically. Ultrasonographical features related to the malignancy are solid, hypoechoic nodules, halo irregularity, absence of halo and microcalcification, rather than the size of the nodule. Although results were found to be statistically insignificant due to low sample size, in the first group, disease-free survival rates were worse than in the other groups. Therefore, there is a question, whether preoperative diagnosis was delayed in patients with small tumor size or no adequate surgical or medical treatments were implemented (lymph node dissection, radioiodine ablation).

Looking at the effect of the pathologic tumor size on prognosis, '3.1-4 cm' groups' disease-free survival rates were detected better than that of '>4 cm' group (80% and 47.1% respectively). The worst disease-free survival rate was determined in '>4 cm' group (47.1%) and the worst overall survival rate was found in '1.1-2 cm' group (92.9%). In the report of Konturek et al. (2012), patients with tumors above 40 mm died markedly sooner and mortality rates were higher (4.8% for <2 cm and 52.5% for >4 cm). In this respect, the stage of the disease and treatment modalities differ when pathologic tumor size increase. In the report of Loh et al. (1997) with regard to the primary tumor size, none of the patients with an intrathyroidal tumor of 1 cm or less died of cancer. Conversely, patients with extrathyroidal invasion (T4) had more than 3-fold risk of recurrence and death, respectively, compared to those with large intrathyroidal (T3) tumors. In the report of Ito et al. (2012), node metastasis 3 cm or larger and/or extranodal tumor extension very strongly affected prognosis of patients, regardless of the tumor size.

Looking at the point in terms of the type of surgical technique, it was seen that in the total thyroidectomy groups, disease-free survival rates were detected worse than in the near-total thyroidectomy group (70.7% and 77.4%, respectively) (statistically insignificant). The worst disease-free survival rate was determined in completion thyroidectomy. In the report of Chow et al. (2002), 842 thyroid cancer patients were evaluated and locoregional recurrence rate was determined as 15.4 (14.9% and 22.2% in our study) in patients with total or near-total thyroidectomy, 47.5% recurrence rate in patients with lobectomy and total thyroidectomy was emphasized as the recommended surgical method. In our clinic, in the treatment of WDTC, total thyroidectomy is performed due to high rate of multicentricity (24%) (Erol et al. 2010). Traditionally, most departments in Western countries have performed total thyroidectomy regardless of the size and location of the primary lesion. This is recommended with few exceptions by previous guidelines. The benefits of total thyroidectomy are 1) the serum thyroglobulin level can be used as a marker of carcinoma recurrence; 2) radioiodine ablation therapy or whole body scan can be performed immediately when carcinoma recurrence is suspected; 3) there is no risk of recurrence to the remnant thyroid (Erol et al. 2010).

The histopathologic type of tumor is a powerful determinant factor of disease-free survival. Patients were evaluated according to the histopathologic type of tumor; in papillary cancer and papillary microcarcinoma groups, disease-free survival rates were found to be statistically significant (69.2% in Group 1, 72.6% in Group 3) ($p>0.05$). The worst disease-free survival rate was determined in follicular cancer group (42.9%) and the best results were determined in papillary microcarcinoma group. The worst overall survival was determined in papillary microcarcinoma group (97.5%). Disease-free survival rate in patients with well-differentiated papillary and follicular carcinoma is longer than poorly differentiated thyroid cancer. Follicular cancer is a typically solitary capsulated tumor and clinically more aggressive than papillary cancer. In contrast to papillary cancer, it has a tendency to

metastasis hematogenously (especially in the lungs and bone). The most important marker in the diagnosis of follicular cancer is the infiltration of the capsule and blood vessels (Li Volsi 1990). In a report by Hundahl et al. (1998), follicular thyroid cancer 10-year survival rate was found to be 85%. The presence of blood vessel invasion is an indicator of poor prognosis. Older age at diagnosis, advanced stage of tumors and larger tumor diameter worsens the prognosis. In a study reported in Japan, microscopic lymph node metastasis was found in 84% of all patients. If tumor size increases, the rate of lymph node metastasis increases as well. All of these are poor prognostic criteria (Noguchi et al. 1997).

Metastasis to lymph nodes is believed to affect prognosis negatively (Ito and Miyauchi 2009). Our results suggest a significant difference in disease-free survival rates when we compared patients with only one metastatic node vs. two metastatic nodes. Disease-free survival was better in the latter group (30% vs. 62.5%) ($p>0.05$). Looking at these results, disease-free survival rate of Group 4 was better than Group 3. As expected, surgery may be more aggressive in patients with known lymphatic metastasis. This may explain the better disease-free survival rates in Group 4 compared to Group 3. All guidelines recommend neck dissection if for identified lymph node metastasis. Lateral and central neck dissections are to be the preferred methods instead of berry picking dissection. As seen in the present study, the risk of recurrence increases with the increase in the number of metastatic lymph nodes. According to ATA guidelines, prophylactic central neck dissection is recommended, particularly in the patients with T3-T4 tumors (ATA et al. 2009). BTA (British Thyroid Association) guidelines emphasizes that hypoparathyroidism and recurrent laryngeal nerve damage that may occur during neck dissection is seen in very low proportions if performed by experienced surgeons and stated that the central neck dissection can be applied to all cancer patients (Tuttle et al. 2007). Hughes and coworkers (1996) found that nodal disease carried an increased risk of recurrence and a tendency toward lower 20-year survival in patients 45 year or older. Most investigators currently agree that regional nodal metastases indicate more extensive disease, and that affected patients have a tendency toward regional nodal recurrence (Clark 1996; Hughes et al. 1996).

The presence of tumor invasion is a prognostic factor for increased morbidity and mortality rates. In this study, in no invasion and vascular invasion groups, disease-free survival rates were found statistically significant (74.5% in Group 1, 50% in Group 3) ($p<0.05$). The worst overall survival rate was found in the 'vascular invasion' group (75%). Approximately one-third of patients with invasive cancer die within a decade because of cancer (Dean and Hay 2000). As Chow et al. (2002) reported, 14 (2.9%) mortalities were observed in 484 patients with noninvasive cancer and invasive cancer group 42 of 332 patients (12.6%) died from cancer and locoregional recurrence rates were determined 13.8-24.4%, respectively. In this study, mortality rates were detected as 1.3% in noninvasive cancer group and 6.9% in invasive group and locoregional recurrence rates were 19.7-37.9%, respectively.

Until recently, in order to predict the behavior of the tumor, many classification systems have been designed for WDTC. While determining cancer treatment strategies to identify the prognosis of patients, identifying locoregional risk scoring correctly and accurately are very important clinically. For this reason, patients' risk groups should be interpreted as low or high risk groups by using classification systems. In this study, we concluded that TNM staging system can determine the prognosis in a manner consistent with the clinical findings in the determination of the prognosis of WDTC (Stage 1; 100% vs. 97.8%, Stage 4; 45.3% vs. 50%).

During a mean follow-up time of 7.1 years we have detected 41 (22.6%) locoregional recurrences. In a report by Mazzaferri and Kloos (2001), locoregional recurrence rate of 143 patients who underwent no radiation or adjunctive therapy was reported as 35%, while in the thyroid hormone suppression group, this rate decreased to 23%. The best recurrence rates were in thyroid hormone plus [I^{131}] group, which was reported as 13%. They emphasized that two thirds of recurrences occurred within the first decade after initial therapy. In the current study, there was no statistically significant difference between the patients whether they received radioactive iodine treatment or not.

As a result, although WDTC has a good prognosis, to prevent recurrence and to prolong disease-free survival, it is a compulsory that patients are assessed carefully preoperatively. A more detailed identification of prognostic factors is essential. Considering the results of our study, which was carried out in patients living in an endemic goiter area, because of high locoregional recurrence rates in patients undergoing a surgical strategy else than a total thyroidectomy, total thyroidectomy should be the preferred method of surgical treatment for WDTC.

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