Surgical treatment of differentiated thyroid carcinoma: a retrospective study

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1. ABSTRACT

A retrospective study was carried out to assessed reliability of the prognostic factors (histology, age, sex, and stage), and standard procedures for the surgical treatment of differentiated thyroid cancers (DTC). From the 144 DTC cases reviewed with follow-up ranging from 1 to 25 years (m=6.33 years), total mortality for cancer was found to be 55% (8 patients), with a predictive positive value for recurrence of 95.4% and 91.8% at 12 and 24 months, respectively. Median survival was 8.8 years (range 1 to 25 years). The multivariate analysis showed that factors such as age > 45 years, histology of intermediate malignancy, size up to 1.5 cm, and presence of metastases, significantly worsened the prognosis, regardless of the intervention that was carried out. We suggest total thyroidectomy for the treatment of benign pathologies and confirmed or suspected cases of cancer. We reserve lobotihmectomy for the treatment of benign pathologies confined to one lobe or those with FNAB suggesting a follicular neoplasm.

2. INTRODUCTION

The term differentiated thyroid cancers (DTC) refers to the most frequent and differentiated forms of thyroid cancers originating from the follicular epithelium. By a retrospective analysis of DTCs encountered in our experience, we intended to assess the easily known and reliable prognostic factors (histology, age, sex, and stage) and to identify, where possible, standard procedures for the appropriate surgical treatment.

In differentiated thyroid cancers there are several prognostic factors that gave rise to the various score staging systems (Ages, Ames, Macis etc.) (1, 2, 3). Although they are all prognostically reliable, nonetheless appropriate treatment cannot be selected solely on these systems. Some parameters for the score are valuable only after surgery (histology, T stage). Thus there is ample reason to prefer total thyroidectomy, mainly based on the possibility of a more effective and efficient follow-up (4).
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Table 1. Surgical Cases: Differentiated Thyroid Carcinoma (1978 – 2003)

<table>
<thead>
<tr>
<th>Patients</th>
<th>144</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up</td>
<td>1 – 25 years (average 7.3 years)</td>
</tr>
<tr>
<td>Drop out – N° and % of patients lost to follow-up</td>
<td>20 cases (13.8%)</td>
</tr>
<tr>
<td>Overall Mortality</td>
<td>8 cases¹ / 124 (6.45%)</td>
</tr>
<tr>
<td>Overall Survival</td>
<td>114 cases/124 (91.93%)</td>
</tr>
<tr>
<td>Overall Survival free from disease</td>
<td>110 cases/124 (88.70%)</td>
</tr>
</tbody>
</table>

¹ One patient died of cardiovascular disease and one died of acute leukemia

Table 2. Cases divided by surgical procedure

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>Number of cases</th>
<th>Lymphectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Thyroidectomy</td>
<td>117</td>
<td>18</td>
</tr>
<tr>
<td>Initial total</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>Second step total thyroidectomy</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Total thyroidectomy in patients already treated elsewhere</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Subtotal Thyroidectomy</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Lobo-Histhmectomy</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

In spite of an increased accuracy of pre-operative diagnostic tools (ultrasound-guided FNAB, color and power Doppler, nuclear medicine with sesta-MIBI indicator) (5, 6, 7), only less than half of cancers are diagnosed pre-operatively; 10-15% have doubtful cytological diagnosis, and about 40% are given a generic diagnosis of multinodular goiter. Still two main issues are of concern. Surely, there are cases in which conservative surgery (loboisthmectomy or subtotal thyroidectomy) followed by opotherapy is able to ensure the same therapeutic result of total thyroidectomy. This is a matter of knowing if and what are the prognostic parameters of success that can direct the indications. The second issue, strictly related to the first, is to consider as resolutive only two main interventions: total thyroidectomy or loboisthmectomy. To answer our first question, we chose to evaluate our own experience on the basis of variables of greater prognostic weight, trying to identify acquirable preoperative data able to influence the surgical choice. The second question finds an answer in the improvement of preoperative diagnostics, able to provide a more refined study of the thyroid ultrastructure.

3. PATIENTS AND METHODS

Our personal experience relies on 144 cases of DTC (39M, 105F), operated during more than 25 years (1978-2003) (table 1); we carried out 95 total thyroidectomies, 11 of them associated with laterocervical lymphadenectomy and two associated with laterocervical and upperclavicular lymphadenectomy; seven totalizations in patients who underwent previous surgery elsewhere, four of them associated with lymphadenectomy, 20 subtotal thyroidectomies, two of them followed by lymphadenectomy and 22 loboisthmectomies; among these patients, 12 of them accepted totalization, three were totalized with respective laterocervical lymphadenectomy, three refused the operation, and in four of them loboisthmectomy was considered radical surgical treatment (table 2).

All the data of the prognostic variables examined make it clear that:

3.1. Age

It is known that DTC found over 40 years of age shows a worse prognosis than in younger patients (8, 9, 10) with adverse effects increasing decade by decade. We accepted the age of 45 as staging preliminary discriminant.

3.2. Gender

The variable of gender seems to have a prognostic role lower than that of age. Although the statistical analysis assign to males a reliable predictive meaning, its weight is still doubtful.

3.3. Histotype and grading

The definition itself of follicular and papillary neoplasm traditionally has a prognostic meaning that gives papillary forms a better prognosis (80-90% survival after 10 years) than follicular ones (65-75% survival after 10 years). However these differences disappear when groups of patients of the same age and stage are compared (8 – 16). Therefore the main difference is that, as a rule, follicular cancers are discovered in advanced age and stages.

We adopted the classification proposed by the pathologists Carcangiu and Rosai that tests and classifies the histological form according to morphological methods of prognostic valence. This classification divides all cancer arising from the follicular epithelium into three fundamental groups (17).

1. Low malignancy (78% of cases), including all the typical forms of papillary carcinoma, the follicular variations of papillary carcinoma, the forms of sclerosing carcinoma, the differentiated Hurtle’s cell cancer.

2. Intermediate malignancy (15.2% of cases), including all the forms of solid cancer, trabecular cancer, the widespread sclerosing forms, the forms with high columnar cells, the insular forms, the less differentiated cancer Hurtle’s cells cancer, and the differentiated forms with undifferentiation areas.
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Table 3. Relapse of disease and mortality of DTC correlated to the stage at primary treatment and at the surgical stage

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Stage</th>
<th>Histology</th>
<th>1st surgery</th>
<th>Recurrence</th>
<th>2nd surgery</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>34</td>
<td>T1N0M0</td>
<td>Papillary ca.</td>
<td>Lobobioth.</td>
<td>N+ after 9 years</td>
<td>Tot Thyroidectomy</td>
<td>D.F. after 10 years</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
<td>T2N0M0</td>
<td>Follicular ca. with atypical features</td>
<td>Subtotal Thyroidectomy</td>
<td>N+ after 6 years</td>
<td>Totalization + Lymphad.</td>
<td>Alive and D.F. after 2 years</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
<td>T2N0M0</td>
<td>Papillary ca.</td>
<td>Tot. Thyroid+loboiothm.</td>
<td>N+ at 1 y</td>
<td>Lymphad</td>
<td>Alive and D.F. after 2 years</td>
</tr>
<tr>
<td>M</td>
<td>60</td>
<td>T4N1M0</td>
<td>Papillary ca with atypical features</td>
<td>Tot. Thyroid-lymphad</td>
<td>M+ after 8 years</td>
<td>Radioiodine</td>
<td>Alive m+</td>
</tr>
<tr>
<td>M</td>
<td>49</td>
<td>T3N0M0</td>
<td>Papillary ca.</td>
<td>Tot Thyroidectomy</td>
<td>M+ after 5 years</td>
<td>Radioiodine</td>
<td>Dead after 10 years</td>
</tr>
<tr>
<td>M</td>
<td>52</td>
<td>T3N1M0</td>
<td>Follicular ca.</td>
<td>Tot Thyroidectomy + Lymphad</td>
<td>M+ after 2 years</td>
<td>Dead after 2 years</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>53</td>
<td>T2N0M1</td>
<td>Follicular ca. with atypical features</td>
<td>Tot. Thyroidectomy</td>
<td>N+ after 1 years</td>
<td>Dead after 1 year</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>60</td>
<td>T4N0M1</td>
<td>Follicular ca. with atypical features</td>
<td>Tot Thyroidectomy</td>
<td>Radioiodine</td>
<td>Dead after 4 years</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>76</td>
<td>T4N1M0</td>
<td>Infiltrating papillary ca.</td>
<td>S.T. + Tracheotomy + Lymphad</td>
<td>N+ at 1 year</td>
<td>M+ after 4 years</td>
<td>Dead at 4 years (tracheal involvement)</td>
</tr>
<tr>
<td>F</td>
<td>58</td>
<td>T4N1M0</td>
<td>Papillary ca. with atypical features</td>
<td>Tot Thyroidectomy + Lymphad</td>
<td>Dead after 10 years (tracheal involvement)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>76</td>
<td>T3N1M1</td>
<td>Infiltrating follicular ca.</td>
<td>Tot Thyroidectomy + Lymphad</td>
<td>Radioiodine</td>
<td>Dead after 1 year m+</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>63</td>
<td>T3N0M0</td>
<td>Follicular ca with atypical features</td>
<td>Tot Thyroidectomy</td>
<td>M+ after 3.5 years</td>
<td>Radioiodine</td>
<td>Dead after 4.5 years m+</td>
</tr>
</tbody>
</table>


3. HIGH MALIGNANCY (6.8% OF CASES), INCLUDING ALL FORMS OF ANAPLASTIC CARCINOMA

A perspective study might suggest verifying whether or not being included in the first or second group really has a prognostic value, which is different for age and staging. Large perspective and retrospective studies have fixed the maximum of 1.5 cm as the critical diameter, with worse prognoses for larger sizes. However the exact cut-off size able to influence the prognosis and thus the therapeutic choice, is extremely variable. According to some AA., the limit would be 5 cm (12), according to others 4 cm (16 – 18), and fewer studies would identify as 2 cm or 1 cm the prognostic limit (19 – 22).

3.4. Nodules

It is unquestionable that the involvement of latero-cervical lymph nodes worsens the stage (23), but the appearance of N+ in younger patients (<30 years old) does not change the prognosis, substantially favorable, both in terms of metastases, and of survival (24, 25). There are still authors who state that nodal involvement would negatively affect the prognosis (26), although they suppose that it’s significant only for unfavorable histology (17).

3.5. Metastasis

There is a sure correlation between the effect on the prognostic staging of metastases M, which is, in fact, the cause of the decrease of survival rate from 53% after 5 years to 38% after 10 years, and to 30% after 15 years (18 – 22). The localization of metastases would have a prognostic value also, but always negative in comparison with any variable; similarly, extra-thyroid invasion has a particularly unfavorable prognostic mean (28, 29).

Statistical analysis used the Kaplan-Meyer method for the disease-free survival rate and the overall survival evaluations and the Mann – Withney’s test for the comparison of different clinico-pathological characteristics.

4. RESULTS

Statistical analysis brought to light that in 144 cases examined with a follow-up from 1 to 25 years (m= 7.3 years) and with a drop out of 20 cases (13.8%), total mortality for cancer has been of 8 cases (5.5%) besides one death for cardiovascular pathology and one death six months after surgery because of acute lymphoblastic leukemia, with a median disease-free survival of 4.2 years (range 10 months to 25 years) and with negative predictive value of 95.4% and 91.8 % at 12 and 24 months respectively. The median survival was found to be 8.8 years (range 1 to 25 years) and with an estimation of overall survival rate at 24 and 48 months of 97.6% and the 94.4% respectively (table 3).

In table 3 mortality seems to be strictly correlated to the presence of distant metastases at the time of surgery (three cases), with their appearance during the follow-up (four cases), and with the local aggressiveness of the tumor (acute respiratory distress from massive tracheal invasion) in two cases with unfavorable histology (wide undifferentiated areas), while the evidence of lymph-node metastasis does not seem to affect the prognosis (1st, 2nd, 3rd cases).

In the 1st case of table 3, the long survival time seems to be independent from the primary treatment (loboithectomy) and not conditioned by the evidence after nine years of loco-regional nodal metastases. In any case, the importance of a secondary treatment must be considered with totalization and lymphadenectomy to ensure an easier follow-up. Also in the 2nd case, only histology (intermediate malignancy) suggests some careful consideration.
The 3rd case is quite peculiar: the primary treatment seemed adequate, but required a latero-cervical lymphadenectomy on the opposite side one year after surgery, thus confirming that indeed there is no set standard lymphadenectomy in the treatment of DTC.

As for mortality, it must be considered that the 7th, 8th, and 11th cases belong to the histopathologic group of intermediate malignancy (Carcangiu-Rosai) and that one of them (the 7th) already presented brain metastases at primary treatment; the aggressiveness is confirmed by the low grading, the high T and the type of metastasis that ensure a rapid and unfavorable prognostic evolution. It is not casual that the most unfavorable cases are males aged over 45 years.

4.1. Age

In our experience, the age variable shows a correlation with the sex and T variables, thus rendering doubtful the suggested link between survival and disease recurrence. With regard to age, mortality for cancer is predominant in patients over age 45 and in patients over 30 with disease recurrence. Out of 124 patients screened, we found disease recurrence in only three (all lymphnodal, 5%) , among 60 patients <45 years old; two had received a partial primary treatment, so had to be completed by totalization and lymphoadenectomy after six and nine years, while the only patient who had already received total thyroidectomy underwent locoregional lymphadenectomy after one year. All of them are alive and free from disease (follow-up range 2-20 years). Among the 64 patients >45 years old there were nine recurrences (14%): three were nodal , associated with extranodal spread (trachea) and five were associated with distant metastases; unfortunately among these nine, only one is still alive (M+ after 8 years, treated by radioiodine therapy) (tables 4, 5).

4.2. Gender

Little statistical difference was found in gender, although the statistical interpretation of the phenomenon is doubtful. Males appear to show poorer prognostics with regard to other variables (histology, stage, and age). Out of the 89 female patients there were only six recoveries (6.7%) with three deceased and three still alive, and with disease-free-survival comprised between 2 and 17 years. In the group of 35 male patients there were six cases of disease relapse (17.1%), five of whom died (tables 4, 5).

4.3. Histology and grading

Another significant datum seems to be the histology and the grading that is found to be statistically independent from the variables of age, sex, and family history even when correlated with T; in fact the group of cancers with intermediate malignancy presents more deaths and recoveries. In the low malignancy group (81 cases), we found four recoveries (4.95%): three patients currently alive; who had a disease-free survival ranging from a minimum of four to a maximum of 17 years and one death after 10 years. In the intermediate malignancy group (43 cases) instead, we recorded eight recoveries (18.6%), with six dead patients, two still alive and with a disease-free survival comprised between five months and six years.

4.4. Tumor

In our experience related to the size of the cancer we found that with cancers smaller than 1.5 cm (43 cases), we had one recovery (2.32%); the patient is alive 18 years after the primary treatment. With cancers between 1.6 cm and 2.5 cm of size (34 cases) we had three recoveries (8.8%); two patients died after one year and one is alive after 10 years. With cancers larger than 2.5 cm (45 cases) we had eight recoveries (17.7%), seven deceased, and one alive after nine years follow-up. A multivared analysis has shown a remarkable level of correlation with the other variables (sex, age, family, and histology).

4.5. Nodules

A doubtful datum arises from the distribution of the survival rate correlated with loco-regional lymph-node metastases: only four patients relapsed N+ (12) died, while eight of them are still alive.

4.6. Metastasis

With regard to the relapse with distal metastases, the datum reveals a reasonable prognostic role; in fact among M+ patients there are seven deceased patients and only one still alive. These data are in correlation with the variables of T and grading.

5. DISCUSSION

The prognostic role of surgical treatment is a tricky problem, because of surgical preference and difference in the extension of the operation; in second place, even in series that include standard behaviors for every cancer, at every stage, the result is sometimes of over- or under-treatment. In more eclectic records of cases, usually a paradox-effect is seen and those forms with worst prognosis may have received larger treatments. There must be then a naturally conceptual objection: that the operation should adapt itself to the cancer prognosis and not the contrary. If there is a chance to gain prognostic certainties, many studies should try and acquire them. The analysis of our work leads to a combination of characteristics that represent the portrait of the patient with more unfavorable prognosis: male gender, age >45 years, with cancer larger than 1.5 cm in size, and histological forms of intermediate malignancy. In our records this group includes 19 cases, six of them with relapse (31.5%) five deceased, one still alive, but with recurrence within one year. Which therapeutic choices do these considerations suggest? In the treatment of the most aggressive cancers even a hard-line surgical strategy is unable to control the tumoral dissemination and it needs to be improved by a preventive strategy and the knowledge of more and deeper biological and genetic mechanisms.

On the other hand, there is the group with the more favorable combination: female gender, age <45 years old, cancers smaller than 1.5 cm, histological forms of low malignancy. In our record of cases this group includes 41 cases with only one case of recurrence of disease, still surviving.
The identification of a family form of microcarcinoma (5.9% of carcinomas) has an unfavorable prognostic meaning in spite of the low level of T (33). The proposal relevant to other factors such as those caused by the tissue environment in which the cancer develops, have been disappointing (lectine, laminine, collagenesis, K1 anti-tripsine). The presence of peritumoral lymph cell infiltrates has dubious meaning: it is irrelevant in European studies, while protective in the United States and Japanese analyses. More interesting perspectives come from the integration of the biomolecular research with the gene typification RET/PTC in un-and differentiated thyroid neoplasia (34, 35) and from that of the oncogenes RET/PTC1 (36) and RET/PTC3 (37). Their phenotypic expression does not affect the prognosis. Other interesting perspectives come from immunohistochemical research on malignant neoplasia markers such as CD44v6 and galectina-3 by FNAB. The application by FNAB of more advanced methods of genic determination would permit us to reach an optimal level of pre-operative information, allowing the most effective surgical strategy. Recent studies have brought to light the possibility of biomolecular determination by FNAB, using not a semi-quantitative-PCR but a real-time quantitative reverse transcription-PCR for mRNA of oncotel-fibrocntine like marker of thyroid neoplastic undifferentiation. Today, the choice of the surgeon can be guided by additional information concerning the nature and ultrastructure of cancer, thus rendering the surgical behavior linked with tumor biology. The modern aspirating needle cytology, the selection of diagnostic immunohistochemical prognostic markers, and the methodologies of intraoperative echo and radio-control allow the surgeon to "see and palpate" the glandular ultrastructure preoperatively.

6. REFERENCES


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Key Words: Differentiated Thyroid Carcinoma, Prognostic Factors In Thyroid Carcinoma, Total Thyroidectomy, Cancer, Tumor, Neoplasia, Treatment

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