Long-Term Quality of Life and Pregnancy Outcomes of Differentiated Thyroid Cancer Survivors Treated by Total Thyroidectomy and I 131 during Adolescence and Young Adulthood

Melanie Metallo, Lelia Groza, Laurent Brunaud, Marc Klein, Georges Weryha, Eva Feigerlova

To cite this version:


HAL Id: hal-01663658
https://hal.univ-lorraine.fr/hal-01663658
Submitted on 14 Dec 2017

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution| 4.0 International License
Research Article

Long-Term Quality of Life and Pregnancy Outcomes of Differentiated Thyroid Cancer Survivors Treated by Total Thyroidectomy and I\(^{131}\) during Adolescence and Young Adulthood

Melanie Metallo,\(^1\) Lelia Groza,\(^1\) Laurent Brunaud,\(^2\) Marc Klein,\(^1\) Georges Weryha,\(^1\) and Eva Feigerlova\(^{1,3}\)

\(^1\)Department of Endocrinology, University Hospital Center of Nancy, 54000 Nancy, France
\(^2\)Department of General and Endocrine Surgery, University Hospital Center of Nancy, 54000 Nancy, France
\(^3\)Department of Endocrinology, University Hospital Center of Poitiers, 86000 Poitiers, France

Correspondence should be addressed to Eva Feigerlova; eva.feigerlova@fulbrightmail.org

Received 15 November 2015; Accepted 19 January 2016

Academic Editor: Carlo Cappelli

Copyright © 2016 Melanie Metallo et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction. Differentiated thyroid cancer (DTC) is rare and confers good prognosis. Long-term health related quality of life (HRQoL) and pregnancy outcomes are not well known in subjects treated during adolescence and young adulthood.


Results. Forty-five of 61 patients (74%) responded to the survey. Cumulative I\(^{131}\) activity was \(\leq\) 3.85 GBq in 18 subjects and \(>\) 3.85 GBq in 27 subjects. Mean time from diagnosis was 7.6 ± 5.2 years for the group \(\leq\) 3.85 GBq versus 16.9 ± 11.6 years for the group \(>\) 3.85 GBq (\(P < 0.05\)). No significant alteration in long-term HRQoL and global self-esteem was observed. Thirty pregnancies after I\(^{131}\) were noted in patients from the group \(>\) 3.85 GBq and 10 in patients from the group \(\leq\) 3.85 GBq. Frequency of miscarriages was of 17% (group \(>\) 3.85 GBq) and 10% (group \(\leq\) 3.85 GBq) with 9 and 24 live births, respectively. No congenital malformations or first year mortality was noted.

Conclusion. Long-term HRQoL, global self-esteem, and pregnancy outcomes are not affected in young female survivors of DTC.

1. Introduction

Differentiated thyroid cancer (DTC) is rare and its incidence in Europe in 2012 has been estimated as 6.3 per 100 000 with a mortality rate of 0.4 per 100 000 [1]. In spite of its relatively good prognosis, relapsing disease is frequent especially in young patients and long-term follow-up is warranted [2–4]. This may produce emotional, psychosocial, or physical limitations and implies the necessity for measurement of health related quality of life (HRQoL) in order to identify patients in need [5, 6]. One of the generic instruments largely used in this context is the generic SF-36 health questionnaire evaluating HRQoL in eight domains [7] which has previously been used in patients with thyroid cancer [8–11].

Up till now, existing studies report short-term HRQoL of patients with DTC [8, 10, 12]. However, data on a long-term HRQoL are rare [10]. The Swedish SF-36 survey has shown no alteration of mental and physical quality of life in 77 patients who underwent total thyroidectomy and RAI for DTC [10]. Recently, a national wide Swedish study has evaluated long-term HRQoL in 279 DTC survivors registered in the national population-based Swedish Cancer Registry [11]. Results of this survey demonstrate that half of the study participants were concerned, 15 years after initial diagnosis, of experiencing a disease recurrence and had a significantly lower HRQoL compared to subjects without concerns [11]. To our knowledge, a long-term HRQoL of survivors of DTC diagnosed and treated during adolescence and young adult age has not been reported.
One of the treatment options of DTC is radioactive iodine ablation (RAI), which can produce long-term consequences, especially on fertility and pregnancy outcomes [3, 4, 13]. This may represent an additional burden for patients in reproductive age. Although limited by small sample sizes and select population sampling, the literature data suggest that there is no significant impact of RAI on pregnancy outcomes [14–16]. Balenović et al. [17] reported outcomes of 49 pregnancies in the population of 76 women treated by therapeutic dose of RAI in adulthood with a median activity of $^{131}$I prior to pregnancy of 3.7 GBq, with range of 2.96–28.86 GBq. Thirty-five children (72%), 5 (10%) miscarriages, and 9 (18%) induced abortions were noted. There were no congenital malformation and first year mortality. A higher therapeutic dose (>3.7 GBq) did not have a significant impact on pregnancy outcomes. Similarly, in the largest French study [15], which included 206 pregnancies, no significant impact on pregnancy outcomes has been demonstrated. However, no such question has been addressed specifically to young patients.

Altogether, literature data indicate insufficient information concerning long-term HRQoL and pregnancy outcomes in patients with DTC diagnosed and treated at young age. We therefore conducted a cross-sectional study aiming at evaluating a long-term quality of life and global self-esteem of female survivors of DTC diagnosed and treated by total thyroidectomy and $^{131}$I during adolescence and young adulthood. We also assessed pregnancy outcomes after total thyroidectomy and treatment by $^{131}$I.

2. Methods

2.1. Participants. The University Hospital in Nancy is a tertiary referral centre in the region of Lorraine (France) for treatment of thyroid cancer and keeps a register of patients, available from 2004, based on a diagnostic code. Females who were followed in the Department of Endocrinology of the University Hospital in Nancy between 1 January 2004 and 31 December 2013 for histologically proven differentiated thyroid cancer (DTC) and who were below 25 years of age at the time when they were first treated for DTC were eligible to participate in this retrospective study.

Based on medical records, a telephone call was made to patients who fulfilled appropriate inclusion and exclusion criteria to introduce the study and to solicit participation. Letters were subsequently sent to those patients who were willing to participate with information about the research project along with a consent form. Inclusion criteria were as follows: age ≤ 25 years at the time of the first treatment for DTC. Patients aged above 25 years at diagnosis of DTC and those presenting with undifferentiated thyroid cancer or medullary thyroid cancer were excluded from the study.

A total of 90 patients eligible to participate were retrieved from the database. Twenty-eight subjects could not be contacted because of the missing data (incomplete address) in the medical records and 1 patient refused to participate. The questionnaires were sent via mail to 61 potential participants. Written informed consent was obtained from all patients prior to inclusion.

All patients underwent total thyroidectomy followed by radioactive iodine (RAI) ablation by $^{131}$I after thyroid hormone withdrawal or after rhTSH stimulation at dose ranging from 1.48 to 3.7 GBq (40–100 mCi) as initial treatment. All patients were subsequently under TSH-suppressive treatment and were advised to avoid pregnancy after each $^{131}$I administration for 6 months. Due to modifications of practice guidelines over the study period between 1974 and 2013 the follow-up was not standardized. All patients diagnosed with a disease recurrence defined as increase in serum thyroglobulin and detection of iodine avidity on whole body diagnostic $^{131}$I scan (0.11–0.15 GBq, 3–4 mCi), or positive finding on neck ultrasonography, computed tomography, or fusion 2-deoxy-2-[18F]fluoro-D-glucose whole body positron emission tomography/computed tomography (18F FDG-PET/CT), received 3.7 GBq (100 mCi) of $^{131}$I. TNM staging was performed according to the criteria of the American Joint Committee on Cancer 2009.

2.2. Health Related Quality of Life Assessment. Health related quality of life was evaluated using the self-administered Short Form–36 version 2 (SF-36 v2) [7, 19]. The questionnaire covers 8 health domains (functioning, physical and social domain, physical and emotional domain, mental health, pain index, vitality, general health perceptions, and health transitions) [7] and has previously been used in patients with thyroid cancer [8, 9]. To assess dimensions of global self-esteem, a shortened version of Physical Self-Inventory [18] consisting of 6 single domains (global self-esteem, physical self-worth, sport competence, physical condition, attractive body, and physical strength) was used. The results of SF-36 and ISP-25 were compared with healthy subjects from the French reference population [18, 19].

2.3. Reproductive and Fertility Outcome Assessment. To evaluate fertility and reproductive outcomes a four-part self-administered instrument was developed by investigators after consideration of the relevant data available in the literature. The questionnaire was sent to participants by mail and took approximately 30 to 45 minutes to complete. All responses were kept confidential. The survey addressed the following domains. The first domain provided information on the self and familial medical history, treatment, tobacco and alcohol consumption of responders, weight, and size (11 items). The second domain concerned demographic data (5 items). The third domain of the questionnaire focused on gynaecological history (12 items). The fourth domain recorded data concerning reproductive and fertility outcomes (miscarriage, abortion, prematurity, low birth weight, birth defects, and assisted reproductive treatment, 8 items). Subjects were invited to add free comments at the end of the questionnaire.

3. Results

3.1. Characteristics of Study Participants. Of 90 subjects who were eligible to participate, 61 received questionnaire between December 2014 and June 2015. Twenty-eight subjects could
not be contacted because of the missing data (incomplete address) in the medical records and 1 patient refused to participate. Four females presented a history of another malignancy preceding diagnosis of thyroid cancer (acute lymphoblastic leukemia, \( n = 3 \), and Ewing sarcoma, \( n = 1 \)) and were excluded from the study. Finally, out of 61 subjects who received the questionnaire, 45 returned the questionnaire, for a survey response rate of 74%. Flow chart of study participants is detailed in Figure 1.

The patients were divided into two groups according to the cumulative dose of \( ^{131}I \): first, lower dose (\( \leq 3.85 \text{ GBq} \)) and second, higher dose (\( > 3.85 \text{ GBq} \)). The mean age at diagnosis of DTC was similar for both groups. Compared to the patients from the lower dose group, the patients from the higher dose group had a significantly longer mean follow-up period, 7.6 \( \pm \) 5.2 versus 16.9 \( \pm \) 11.6 years, respectively (\( P < 0.05 \)). Four patients presented with pulmonary metastases and 1 patient presented with bone metastases at diagnosis. Mean cumulative dose of \( ^{131}I \) was 3.5 versus 8.3 GBq for the first and second group, respectively. Total dose was unknown for 6 females from the second group, but it was superior to 3.85 GBq. Characteristics of the participants are detailed in Table 1.

### Table 1: Clinical and demographic characteristics of patients diagnosed and treated with differentiated thyroid cancer before age of 25 years.

<table>
<thead>
<tr>
<th>Cumulative dose of ( ^{131}I )</th>
<th>( \leq 3.85 \text{ GBq} )</th>
<th>( &gt; 3.85 \text{ GBq} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>18</td>
<td>27</td>
</tr>
<tr>
<td>Diagnosis before age of 18 years (yes)</td>
<td>5 (28%)</td>
<td>12 (44%)</td>
</tr>
<tr>
<td>Age at diagnosis (years)</td>
<td>19.9 ( \pm ) 3</td>
<td>19.3 ( \pm ) 3.9</td>
</tr>
<tr>
<td>Actual age (years)</td>
<td>27.7 ( \pm ) 6.7(*)</td>
<td>36.1 ( \pm ) 11.1(*)</td>
</tr>
<tr>
<td>Time since diagnosis (years)</td>
<td>7.6 ( \pm ) 5.2(*)</td>
<td>16.9 ( \pm ) 11.6(*)</td>
</tr>
<tr>
<td>Histology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Papillary</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>Follicular</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TNM stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T?</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>T1</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>T2</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>T3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>T4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>N0</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>N1</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>M0</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>M1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Administration of ( ^{131}I )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at first treatment</td>
<td>19.9 ( \pm ) 3</td>
<td>19.3 ( \pm ) 3.9</td>
</tr>
<tr>
<td>Cumulative dose</td>
<td>3.54 ( \pm ) 0.47(**)</td>
<td>8.25 ( \pm ) 1.64(**)</td>
</tr>
<tr>
<td>Number of administration times</td>
<td>0.96 ( \pm ) 0.2(**)</td>
<td>2.7 ( \pm ) 1.7(**)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Engaged</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Married</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Divorced</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without diploma</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Professional diploma</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>“Bac-level” diploma</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>University studies</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Profession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Professional activity (yes)</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Active</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Stopped</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>IMC (kg/m(^2))</td>
<td>25.9 ( \pm ) 4</td>
<td>23.7 ( \pm ) 5</td>
</tr>
</tbody>
</table>

Data are presented as mean (\( \pm \)SD) or number (percentage).\(* P < 0.05; ** P < 0.001.

3.2. Quality of Life and Global Self-Esteem. The components of the SF-36 and ISP-25 questionnaires are detailed in Table 2. A total of 42/45 subjects (93%) responded to the SF-36 and 40/45 (89%) to the ISP-25 questionnaires. The SF-36 and ISP-25 results were compared with the corresponding data from a French reference population [18, 19]. No significant difference between the cancer group and the healthy French population was observed. There was a nonsignificant decrease in physical condition parameter in both cancer groups compared to the French healthy population [18, 19]. No differences between the different parameters in the higher dose cancer group and the lower dose cancer group were observed (Figure 2).

3.3. Pregnancy Outcomes. Mean cumulative dose of \( ^{131}I \) administered prior to pregnancy was 3.74 GBq for the first group and 7.88 GBq for the second group (Table 3). Patients’ ages at the time of pregnancy were in mean 26.3 and 27.3 years for the lower and the higher dose groups, respectively. The mean interval between the last administration of \( ^{131}I \) and

---

**Figure 1: Flow chart of study participants.**
Table 2: Long-term quality of life and global self-esteem of patients diagnosed with differentiated thyroid cancer before age of 25 years.

<table>
<thead>
<tr>
<th></th>
<th>Cumulative dose of $^{131}I$</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\leq3.85$ GBq</td>
<td>$&gt;3.85$ GBq</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n/N$</td>
<td>Mean</td>
<td>SD</td>
<td>$n/N$</td>
<td>Mean</td>
<td>SD</td>
<td>$n/N$</td>
<td>Mean</td>
</tr>
<tr>
<td>SF-36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical functioning</td>
<td>16/18</td>
<td>89.6</td>
<td>10.7</td>
<td>26/27</td>
<td>88.7</td>
<td>11.6</td>
<td>0.841</td>
<td></td>
</tr>
<tr>
<td>Physical role</td>
<td>16/18</td>
<td>73.2</td>
<td>37.2</td>
<td>26/27</td>
<td>69.2</td>
<td>37.3</td>
<td>0.967</td>
<td></td>
</tr>
<tr>
<td>Emotional role</td>
<td>16/18</td>
<td>80.0</td>
<td>32.9</td>
<td>26/27</td>
<td>71.7</td>
<td>33.6</td>
<td>0.714</td>
<td></td>
</tr>
<tr>
<td>Vitality</td>
<td>16/18</td>
<td>45.6</td>
<td>18.2</td>
<td>26/27</td>
<td>49.8</td>
<td>21.4</td>
<td>0.654</td>
<td></td>
</tr>
<tr>
<td>Mental health</td>
<td>16/18</td>
<td>64.3</td>
<td>13.6</td>
<td>26/27</td>
<td>61.5</td>
<td>15.0</td>
<td>0.608</td>
<td></td>
</tr>
<tr>
<td>Social functioning</td>
<td>16/18</td>
<td>72.6</td>
<td>26.3</td>
<td>26/27</td>
<td>73.1</td>
<td>21.7</td>
<td>0.550</td>
<td></td>
</tr>
<tr>
<td>Bodily pain</td>
<td>16/18</td>
<td>72.6</td>
<td>36.3</td>
<td>26/27</td>
<td>73.4</td>
<td>27.5</td>
<td>0.143</td>
<td></td>
</tr>
<tr>
<td>General health</td>
<td>16/18</td>
<td>59.5</td>
<td>22.4</td>
<td>26/27</td>
<td>53.1</td>
<td>24.5</td>
<td>0.148</td>
<td></td>
</tr>
<tr>
<td>ISP-25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global self-esteem</td>
<td>14/18</td>
<td>3.8</td>
<td>1.3</td>
<td>24/27</td>
<td>4.3</td>
<td>1.1</td>
<td>0.419</td>
<td></td>
</tr>
<tr>
<td>Physical self-worth</td>
<td>14/18</td>
<td>3.2</td>
<td>1.1</td>
<td>26/27</td>
<td>3.5</td>
<td>1.3</td>
<td>0.129</td>
<td></td>
</tr>
<tr>
<td>Physical condition</td>
<td>14/18</td>
<td>2.6</td>
<td>1.3</td>
<td>26/27</td>
<td>2.4</td>
<td>1.1</td>
<td>0.461</td>
<td></td>
</tr>
<tr>
<td>Sport competence</td>
<td>14/18</td>
<td>2.2</td>
<td>1.2</td>
<td>26/27</td>
<td>2.6</td>
<td>1.2</td>
<td>0.228</td>
<td></td>
</tr>
<tr>
<td>Attractive body</td>
<td>14/18</td>
<td>3.5</td>
<td>1.3</td>
<td>26/27</td>
<td>3.9</td>
<td>1</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td>Physical strength</td>
<td>14/18</td>
<td>2.4</td>
<td>1.3</td>
<td>26/27</td>
<td>2.3</td>
<td>1.1</td>
<td>0.866</td>
<td></td>
</tr>
</tbody>
</table>

$N$: number of respondents; $n$: number of observations.

Figure 2: Results of SF-36 (a) and ISP-25 (b) for the two groups of patients (cumulative $^{131}I$ activity $\leq3.85$ GBq versus cumulative $^{131}I$ activity $>3.85$ GBq) and the French reference population [18, 19]. Scores for each questionnaire component are represented as means ($\pm$SD).

Pregnancy was comparable for both study groups and was 69.7 months for the patients who received cumulative $^{131}I$ dose $\leq3.85$ GBq and 75.3 for the patients with cumulative $^{131}I$ dose $>3.85$ GBq. Forty pregnancies after administration of $^{131}I$ were observed: 30 in patients who received cumulative dose of $^{131}I$ $>3.85$ GBq and 10 in patients who received a dose of $\leq3.85$ GBq. Frequency of miscarriages was of 17% in females from the group $>3.85$ GBq and 10% in patients with cumulative $^{131}I$ dose $\leq3.85$ GBq. In total, 9 and 24 live births were noted for the first and the second groups, respectively.
4. Discussion

Herein, we evaluated a long-term health related quality of life and pregnancy outcomes in young female thyroid cancer survivors from the region of Lorraine in France. Our study highlights that long-term quality of life and global self-esteem are not affected. Up till now, little has been published on a long-term HRQoL in patients with DTC. The Swedish SF-36 survey has shown no alteration of mental and physical quality of life in 77 patients of all ages who underwent total thyroidectomy and RAI for DTC [10]. Recently, a national wide Swedish study including 279 DTC survivors (218 females of mean age of 51 years) demonstrated a significantly poorer HRQoL in patients diagnosed and treated by total thyroidectomy and I\textsuperscript{131} in adolescence and young age. The high response rate (74%) to our survey reflects interest of subjects and ongoing health concern despite having completed the cancer therapy. Interestingly, information-seeking behavior in cancer survivors and desire to receive additional health related information has been observed [20]. Thus, implementation of management strategies to better meet the patients’ needs after completion of cancer therapy has recently been suggested [20–22]. Moreover, in spite of excellent prognosis of DTC, HRQoL of DTC survivors may be affected by life long thyroid hormone supplementation and in some cases by disorders of calcium homeostasis [23].

In terms of pregnancy outcomes, to our knowledge, the here presented study is the first to be addressed specifically to the population of long-term DTC survivors diagnosed and treated during adolescence or young adult age. Forty pregnancies after administration of I\textsuperscript{131} were observed: 30 in patients who received cumulative dose of I\textsuperscript{131}>3.85 GBq and 10 in patients who received ≤3.85 GBq. Frequency of miscarriages was of 17% in females from the group >3.85 GBq and 10% in patients with cumulative I\textsuperscript{131} dose ≤3.85 GBq. Our observations are consistent with the data for the French general population [24] and with the data reported for the French population with DTC diagnosed and treated in adulthood (18% miscarriages out of 152 pregnancies and cumulative I\textsuperscript{131} activity <0.37 GBq and 21% miscarriages out of 178 pregnancies and cumulative I\textsuperscript{131} activity ≥3.70 GBq) [25]. Based on the statement of the French National Authority for Health (http://www.has-sante.fr/portail/upload/docs/application/pdf/2010-07/ald30_gm_cancer_thyroide_web.pdf) avoiding pregnancy for 6 months after I\textsuperscript{131} treatment is suggested. The effects of other factors such as thyroid hormone status on the pregnancy outcomes were not investigated and this topic is out of the scope of this paper.

The conclusions of this study should be applied with caution since its sample population is not truly a reflection of the total French population of female patients diagnosed with DTC at adolescent age and young adulthood. However, the high response rate to this study represents less serious
potential for a nonresponse bias. Furthermore, majority of
the study participants were still in their reproductive age and
report their real-life experience.

Altogether our results suggest that quality of life of young
female thyroid cancer survivors is not affected. The results
allowed us to evaluate the quality of life over a longer
time period and incite new questions regarding information
strategies for patients who underwent active thyroid cancer
treatment especially at young age.

Abbreviations

DTC: differentiated thyroid cancer
HRQoL: health related quality of life
RAI: radioiodine ablation.

Conflict of Interests

The authors declare that there is no conflict of interests
regarding the publication of this paper.

Acknowledgment

The authors would like to thank Annick Lelièvre for technical
assistance.

References

incidence and mortality patterns in Europe: estimates for 40
countries in 2012,” European Journal of Cancer, vol. 49, no. 6,

in children and adolescents—systematic review of the literature,”
Journal of Thyroid Research, vol. 2011, Article ID 845362, 7 pages,
2011.

and M. Phillip, “Differentiated thyroid carcinoma in pediatric
patients: comparison of presentation and course between pre-

guidelines for children with thyroid nodules and differentiated

transform healthcare,” British Medical Journal, vol. 346, article
f167, 2013.

meaningful cut-scores for fatigue in a cohort of breast cancer
survivors: a Health, Eating, Activity, and Lifestyle (HEAL)
Study,” Quality of Life Research, vol. 22, no. 9, pp. 2279–2292,
2013.

form health survey (SF-36). I. Conceptual framework and item

ablation of thyroid remnants after preparation with recombi-
nant human thyrotropin in differentiated thyroid carcinoma:
results of an international, randomized, controlled study,” Journal

[9] I. Boret, J. Bonastre, B. Catargi et al., “Quality of life and cost-
effectiveness assessment of radioiodine ablation strategies in
patients with thyroid cancer: results from the randomized phase
III ESTIMABL trial,” Journal of Clinical Oncology, vol. 33, no. 26,

Nilehn, and J. Jhrult, “Differentiated thyroid cancer in a Swedish
county long—term results and quality of life,” Acta Oncologica,

ants of long-term quality of life in patients with differentiated
thyroid carcinoma—a population-based cohort study in Swe-

quality of life impairments in differentiated thyroid cancer
patients: results from a monitoring programme,” European Journal of Nuclear Medicine and Molecular Imaging, vol. 42, no. 8,

ment of female fertility and carcinogenesis after iodine-131
therapy for differentiated thyroid carcinoma,” Journal of Nuclear

come of pregnancy after radioactive iodine treatment for well

to radioactive iodine-131 for scintigraphy or therapy does not

Astorga, “Conception after iodine-131 therapy for differentiated

“Pregnancy outcome after treatment with radioiodine for dif-
ferentiated thyroid carcinoma,” Collegium Antropologicum, vol.

shortened assessment of physical self in adults,” Perceptual and

French SF-36 Health Survey: translation, cultural adaptation
and preliminary psychometric evaluation,” Journal of Clinical

information seeking behaviors: a comparison of survivors who

[21] L. Squiers, L. J. Finney Rutten, K. Treiman, M. A. Bright, and
B. Hesse, “Cancer patients’ information needs across the cancer

[22] M. A. Shea-Budgell, X. Kostaras, K. P. Myhill, and N. A. Hagen,
“Information needs and sources of information for patients
during cancer follow-up,” Current Oncology, vol. 21, no. 4, pp.

