Prognosis of papillary thyroid carcinoma in elderly patients after thyroid resection

A retrospective cohort analysis

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Abstract

The size of the elderly population and the incidence of papillary thyroid carcinoma (PTC) in this group appear to be rapidly increasing, although published information based on more detailed older age groupings are lacking.

This study aimed to determine the clinical features and outcomes of elderly patients in PTC.

All consecutive patients who received surgery for PTC in our Department from 1978 to 2014 were included. We compared 3 patient groups: young (<65 years), older (65–75 years), and very old patients (>75 years). Total thyroidectomy was performed with lymph node (LN) dissection in most cases, and radioiodine therapy was administered as needed.

A total of 3835 patients (3257 young patients, 450 older patients, and 128 very old patients) were identified. Very old patients were more likely to have advanced (III/IV) tumor, nodes, metastases (TNM) stage, greater tumor size, number of tumors, and extracapsular invasion compared with young and older patients. For the 2289 patients with LN dissection (60%), metastatic LNs were more frequent in the very old group (44%) than in the other groups (34% young and 33% older patients) (P<0.01). Very old patients had more frequent distant metastases (5%) than the older (2%) and young groups (1%) (P<0.001). The overall postoperative morbidity was not significantly different between the 3 age groups. Recurrence was documented in 202 (6.2%) young, 29 (6.4%) older, and 15 (11.7%) very old PTC patients (P=0.04). The 5-year disease-free survival was 81.3% for very old, 92.9% for older, and 94.7% for young group (P<0.001).

Very old patients should be considered high-risk PTC patients and their therapeutic strategy may benefit from aggressive treatment.

Abbreviations: BMI = body mass index, DFS = disease-free survival, LN = lymph node, LND = lymph node dissection, PTC = papillary thyroid carcinoma, TSH = thyroid-stimulating hormone.

Keywords: aged, elderly, local, lymph node metastasis, neoplasm recurrence, papillary, thyroid cancer, thyroidectomy
patients who underwent the same surgical treatment in a high-volume referral center.

2. Patients

2.1. Methods

This study is a retrospective cohort analysis of all consecutive patients who underwent primary surgery for PTC in our surgical department from January 1978 to December 2014. All data were entered into a prospective database of our department. Informed consent was obtained before each operation that represented standard practice of care in accordance with the practice guidelines of the French Society of Surgery.

The charts of all patients were reviewed and analyzed retrospectively. The patients were divided into 3 age groups: <65 years (young), between 65 and 75 years inclusively (older), and older than 75 years (very old). We retrospectively analyzed clinical and pathological characteristics in the 3 groups and the outcomes of the patients. In each group of patients, we studied factors involved in the recurrence of disease and death-specific mortality. The following clinical and pathologic variables were studied: gender, diabetes, arterial hypertension, dyslipidemia, use of vitamin-K antagonists or antiplatelet drugs, body mass index (BMI), tumor size, tumor multifocality and bilaterality, tumor invasion (extracapsular extension and vascular invasion), tumor staging in accordance with the 7th edition of the AJCC pTNM staging system, number of resected LNs, number of LN metastases, extranodal extension of positive LNs, and distant metastasis. The therapeutic factors that were studied included the extent of thyroid resection (total thyroidectomy and others) and LN dissection (LND) and the use of postoperative radioiodine therapy.

2.2. Surgery

We typically performed total thyroidectomy and LND in 1 step for the PTC patients diagnosed with preoperative ultrasound (US)-guided fine-needle aspiration cytology or with a positive frozen section during surgery. However, if the PTC diagnosis was made after lobectomy or isthmectomy, LND was performed during a completion thyroidectomy, with the exception of the pT1a (tumor size ≤10mm) patients who did not undergo reoperation. A therapeutic LND was performed in patients with clinically evident positive LNs according to the physical examination, neck US, or cytology. In other patients, a prophylactic LND was performed. As previously described and although the impact of microscopic LN metastases on recurrence remains unclear, we performed a systematic central LND (level VI) on the side of the largest primary thyroid tumor (limited to the anterior paratracheal nodes on the opposite side) and lateral LND levels III and IV (and level II if the cancer was located in the upper third of the thyroid lobe) because these tumors have a notably high incidence of nodal metastases. Patients who had a postoperative diagnosis of PTC on the thyroid specimen and who did not need a reoperation to complete thyroidectomy had no LND (Nx).

2.3. Radioactive iodine therapy

Radioiodine ablation was administered in all N1 patients, in cases with tumors >10 mm in diameter, and/or when there was evidence of tumor extracapsular extension. This treatment was administered after withdrawing thyroid hormones for 1 month or with the use of in the lower-risk patient group. The radioactive 131I dose was 3.7 GBq until August 2012. From September 2012, we started 1.1 GBq under recombinant human thyrotropin for PTC patients with a low or intermediate risk of recurrence (T1b, T2, micro-pT3 ≤10 mm, and N0 or Nx, excluding aggressive subgroups of PTC: tall-cells, solid, columnar, or oncocytic variants, diffuse sclerosing variant).

2.4. Follow-up and recurrence

Follow-up information was obtained from a database containing patient medical records. A standardized procedure was used for patient follow-up visits, including check-ups under thyroid-stimulating hormone (TSH) stimulation 6 months, 12 months, and annually thereafter. After 7 years of follow-up, periodic correspondence with patients or their referring physicians was set up to occur every 3 years. Physical examinations, neck US, and serum thyroglobulin measurements after stimulation or under suppressive treatment were routinely performed during the follow-ups.

Locoregional recurrence was assessed by fine-needle aspiration biopsy and/or 131I evaluation and/or by isolated and repeatedly elevated serum thyroglobulin levels (>10 ng/mL after L-thyroxin withdrawal in the absence of interfering antibodies). Distant metastases were assessed by cytological or histological analyses or by iodine uptake after diagnostic or therapeutic 131I dosing.

2.5. Statistical analysis

Quantitative data were expressed as the mean ± SD or the median (range). Qualitative data were represented as a percentage or frequency. Clinicopathological differences between the 3 groups were compared using Student’s tests for quantitative data and Chi-square tests for qualitative data. A univariate logistic regression was used to estimate the relationship between recurrence and the following variables: the patient’s sex, (main) tumor size, number of tumors (multifocality, bilaterality), sum of the largest sizes of all foci, tumor invasion (extracapsular extension, vascular invasion), number of resected LNs, number of LN metastases, extranodal extension of positive LNs, and distant metastasis. The DFS was estimated using the Kaplan–Meier estimator. The follow-up time was censored on the basis of the date of the last event, which was recurrence, death, or the last visit. The prognosis factors were tested using Cox proportional-hazards regression. In addition, the DFS and disease-specific mortality was compared between the 3 groups using Cox proportional-hazards regression. All tests were 2-sided at the 5% level of significance. Statistical analyses were performed using SAS computer software (SAS Institute Inc., Cary, NC).

3. Results

3.1. Characteristics of the study cohort

During the study period, 3835 PTC consecutive patients underwent surgery in our Department and were included in the study, including 3257 patients under 65 years (young, 85%), 450 patients from 65 to 75 years (older, 12%), and 128 patients older than 75 years (very old, 3%). Male sex, diabetes, arterial hypertension, dyslipidemia, and vitamin-K antagonist therapy were more frequent in the older and very older groups than in young patients. Only BMI distribution was comparable between the 3 groups (Table 1).
The diagnosis of PTC was confirmed by fine-needle aspiration cytology or operative frozen section in 2289 patients (60% of the 3835 PTC patients). Other patients with a PTC were diagnosed only on final pathology [n=1546 patients, 40%] (52% (n=67) of very old patients, 53% (n=238) of older patients, and 38% (n=1241) of young patients (P<0.001)]. The rate of a total thyroidectomy was significantly lower in very old patients than the rate in the other groups (P=0.001) (Table 2). LND was performed in 2289 patients (60% of the 3835 PTC patients), including 444 therapeutic (19%) and 1845 prophylactic LND. LND was significantly more frequent in the younger group than in the older and very old groups (P=0.001).

Table 2 summarizes the pathological findings. Greater tumor size, number of tumors, and extracapsular invasion occurred more frequently in the very old group (P<0.001, P=0.05, and P=0.06, respectively). Very old patients were more likely to have advanced (II/IV) TNM stage at presentation (41%) than young patients (27%; P=0.0003) and older patients (30%, P=0.01). For the 2289 patients with LND, metastatic LNs were more frequent in the very old group (44%, 27/61 patients) than in the other groups: 34% (679/2016) young patients and 33% (71/212) older patients (P=0.01). Extracapsular extension occurred more frequently in the very old patients (52%, 14/27) than in the other patient groups: 28% (190/679) in young patients and 31% (22/71) in older patients (P=0.0001). The very old patients had more frequent distant metastases (n=7, 5%) than the older (n=11, 2%) and young groups (n=26, 1%) (P<0.001).

The overall complication rates were not significantly different between the 3 age groups. Permanent hypocalcaemia and recurrent laryngeal nerve palsy occurred in 3.7% (n=121) and 1.7% (n=54) of young patients, 2% (n=47) and 1.1% (n=15) of older patients, and 2.3% (n=13) and 0.8% (n=2) of very old patients, respectively. Very old patients had a significantly higher rate of permanent hypocalcaemia (7%, 8/115) than young patients (2%, 11/553) (P<0.001).

### Table 1
Demographics and clinical characteristics of the studied PTC patients (n=3835).

| Variable                  | Young <65 y (n=3257) | Older 65–75 y (n=450) | Very old >75 y (n=128) | P       |
|---------------------------|----------------------|-----------------------|------------------------|---------|
| Sex                       |                      |                       |                        |         |
| Female                    | 2624 (81)            | 338 (75)              | 98 (77)                | 0.02    |
| Age, y                    | 47 (12–65)           | 68.5 (65–75)          | 77.5 (75–90)           |         |
| BMI, kg/m²                 | 24.2 (16–61)         | 25.4 (18–45)          | 24.9 (17–37)           | 0.9     |
| Comorbidities             |                      |                       |                        |         |
| Diabetes                  | 130 (5)              | 55 (15)               | 13 (12)                | <0.001  |
| Arterial hypertension     | 387 (16)             | 176 (47)              | 57 (52)                | <0.001  |
| Dyslipidemia              | 259 (11)             | 96 (26)               | 39 (36)                | <0.001  |
| Vitamin-K antagonist therapy | 18 (1)            | 8 (2)                 | 12 (9)                 | <0.001  |
| Sleep apnea               | 35 (1)               | 5 (1)                 | 2 (2)                  | 0.9     |
| History of cancer         | 151 (6)              | 56 (15)               | 18 (14)                | <0.001  |

Data are presented as n (%) or as the median (range).

BMI = body mass index, N/A = not available.

### Table 2
Pathology results for the studied PTC patients (n=3835).

| Variable                  | Young <65 y (n=3257) | Older 65–75 y (n=450) | Very old >75 y (n=128) | P       |
|---------------------------|----------------------|-----------------------|------------------------|---------|
| Primary tumor             |                      |                       |                        |         |
| Size, mm                  | 10 (1–150)           | 8 (1–110)             | 12 (1–100)             | <0.001  |
| Multifocality             | 1282 (39)            | 165 (37)              | 55 (43)                | 0.4     |
| Bilaterality              | 768 (24)             | 105 (23)              | 31 (24)                | 0.9     |
| Number of tumors          | 1 (1–108)            | 1 (1–15)              | 1 (1–50)               | 0.05    |
| Sum of the largest size of all foci, mm | 15 (1–200) | 10 (1–110) | 16.5 (10–107) | 0.001  |
| Vascular invasion         | 197 (60)             | 26 (6)                | 12 (9)                 | 0.3     |
| Extracapsular invasion    | 791 (24)             | 120 (27)              | 45 (35)                | 0.01    |
| T status (TNM classification) |                    |                       |                        | 0.01    |
| T1-T2                     | 2380 (73)            | 317 (70)              | 75 (59)                |         |
| T3-T4                     | 877 (27)             | 133 (30)              | 53 (41)                |         |
| Thyroid surgery           |                      |                       |                        |         |
| Total thyroidectomy       | 3027 (93)            | 423 (94)              | 113 (88)               | 0.03    |
| LND                       | 2016 (62)            | 212 (47)              | 61 (48)                | 0.001   |
| Prophylactic              | 1627 (81)            | 170 (80)              | 48 (79)                | 0.9     |
| Therapeutic               | 389 (19)             | 42 (20)               | 13 (21)                |         |
| Excised LN                | 18 (1–115)           | 14 (1–65)             | 15 (1–69)              | 0.004   |
| LN metastasis             | 679 (34)             | 71 (33)               | 27 (44)                | 0.01    |
| Central compartment       | 562                  | 46                    | 21                     | 0.001   |
| Lateral compartment       | 410                  | 35                    | 17                     | 0.2     |
| Involved LN               | 3 (1–52)             | 2 (1–30)              | 2 (1–17)               | 0.3     |
| Extracapsular extension   | 190 (28)             | 22 (31)               | 14 (52)                | 0.0001  |
| Distant metastases        | 26 (1)               | 11 (2)                | 7 (6)                  | <0.001  |

Data are presented as n (%) or as the median (range).

LN = lymph nodes, LND = lymph node dissection, TNM = tumor, nodes, metastases.
patients, respectively. The older and very old patients were more likely to experience neck hematoma than the younger patients (1.7% vs 0.6%, \( P = 0.003 \)). Other postoperative medical complications were observed in 0.6% (\( n = 19 \)) of the young group, 2.7% (\( n = 12 \)) of the older group, and 2.3% (\( n = 3 \)) of very old group (\( P < 0.001 \)).

Fifty-two percent of the very old patients (\( n = 67 \)) received radioiodine therapy. This rate was equivalent in older patients (53%, \( n = 240 \)), and lower than the rate in young patients (68%, \( n = 2212 \), \( P = 0.0002 \)). The mean dose of radioactive iodine delivered to the patients was lower in the older and very old patients (1.92 ± 1.87 and 2 ± 1.92 GBq, respectively) than in the young patients (2.5 ± 1.67 GBq) (\( P < 0.001 \)).

### 3.2. Follow-up and oncologic outcomes

The median follow-up period was 7.7 years (range, 0.9–36.4 years). Postoperative events occurred in 202 (6.2%) young patients, 29 (6.4%) older patients, and 15 (11.7%) very old PTC patients (\( P = 0.04 \)). The median time from initial surgery to recurrence was 1.1 years (range, 0.1–28 years), including 1.1 years (range, 0.1–28 years) for young, 0.8 years (range, 0.1–8.3 years) for older, and 0.9 years (range, 0.2–4.6 years) for very old patients (\( P = 0.4 \)). Recurrences were locoregional in 157 young patients (48.8%), 19 older patients (42.2%), and 10 very old patients (7.8%) (\( P = 0.1 \)), including 7 (70%), 18 (95%), and 146 (93%) respectively, who underwent reoperative surgery. An exclusive second radioactive therapy was delivered in the remaining patients with advanced locoregional extent or with no neck target on imaging procedures in patients with elevated thyroglobulin level.

In the subgroup of N0-x patients, the recurrence rate was significantly higher among very old patients than young and older patients (5.9% vs 2.4% and 2.3%, respectively, \( P < 0.001 \)). Among patients with LN metastases (N1), older and very old patients experienced a higher risk of recurrence than young patients (33% and 28% vs 21%, respectively, \( P = 0.04 \)).

Inside the groups of older and very old patients, univariate analysis showed that tumor size, sum of the largest size of all foci, number of tumors, extracapsular extension, LN involvement, and extranodal extension were significant risk factors for recurrence (Table 3). Vascular invasion and distant metastases were also significantly associated with recurrence among older patients. In multivariate analysis, all analyzed variables were found to contribute to the risk of recurrence in older and very old patients (Table 3) and the most significant explanatory values were LN involvement [odds ratio (OR) = 6.8 (2.9–16.2) and OR = 6.4 (2.9–14.2), respectively] and extranodal extension [OR = 12.4 (2.9–42) and OR = 10.2 (4.7–31.5), respectively].

A total of 57 patients (1.5%) died during the follow-up (0.7%, \( n = 24 \) young patients; 4.7% \( n = 21 \) older patients; 9.4%, \( n = 12 \) very old patients) including 28 patients who died from PTC (disease-specific mortality): 9 patients (0.3%) in the young group, 10 (2.0%) in the older group, and 9 (7%) in the very old group (\( P < 0.001 \)). The 5-year DFS rates in the very old group were lower than in the older and young groups (81.3%, 92.9%, and 94.7%, respectively) (\( P < 0.001 \), Fig. 1).

### 4. Discussion

In the present study, we demonstrated that advanced age is a significant prognostic factor in the risk of recurrence and DFS for PTC. One of the most important aspects of this analysis is the impact of an age cutoff of 75 years for elderly patients; this age subdivision resulted in a clear step-up in risk of recurrence: these patients had a 2-fold increased risk of recurrence compared with the other patients. Our findings extend the results of previous reports [12–14] that studied associations between elderly patients and PTC clinicopathological features [15–17]. The effect of age on PTC aggressiveness could soon represent an increasing public health challenge worldwide because of the increasing number of elderly people; in our series, PTC patients who were older than 65 years represented 16% of the entire cohort, including 4% who were over 75 years.

### Table 3

**Univariate and multivariate analysis to identify risk factors for recurrence in elderly patients related to clinicopathological characteristics.**

| Variable                                           | Old patients (65–75 y) | Very old patients (75 y) |
|----------------------------------------------------|------------------------|--------------------------|
|                                                   | No event | Event | Univariate analysis | Multivariate analysis | No event | Event | Univariate analysis | Multivariate analysis |
|                                                   | \( n = 421 \) | \( n = 29 \) | \( P \) | OR (95% CI) | \( n = 113 \) | \( n = 15 \) | \( P \) | OR (95% CI) |
| Sex                                                |                       |                   |               |                |                       |                   |               |                |
| Male                                               | 105 (25)             | 7 (24)            | 0.9           | 26 (23)        | 4 (27)               | 0.8            |
| Female                                             | 316 (75)             | 22 (76)           |               | 87 (77)        | 11 (73)              |               |
| BMI, kg/m²                                          | 26.2 ± 3.4           | 25.5 ± 3.7        | 0.3           | 25.4 ± 3.4     | 24.7 ± 3.8           | 0.6            |
| Tumor size, mm                                      | 10.7 ± 8.8           | 37 ± 17.8         | <0.0001       | 4.5 (2–14)     | 17.6 ± 15.4          | 0.01           | 2.4 (1.5–3.8) |
| Multicentricity                                    | 152 (38)             | 12 (41)           | 0.6           | 49 (43)        | 6 (40)               | 0.8            |
| Bilaterality                                        | 95 (23)              | 10 (34)           | 0.1           | 25 (22)        | 6 (40)               | 0.1            |
| Number of tumors                                    | 1.7 ± 0.9            | 2.8 ± 2.3         | <0.0001       | 2.2 (1.6–4.2)  | 2.6 ± 2              | 0.03           | 2 (1.4–4.2)  |
| Sum of the largest size of all foci, mm            | 12.9 ± 10.6          | 42.4 ± 18.3       | <0.0001       | 4.1 (1.3–18.6) | 21.6 ± 18.3          | 0.03           | 2.8 (1.9–4.7) |
| Extracapsular extension                            | 97 (23)              | 23 (79)           | <0.0001       | 3.2 (1.5–6.9)  | 35 (31)              | 0.007          | 3.2 (1.2–5.5) |
| Vascular invasion                                   | 16 (4)               | 10 (34)           | <0.0001       | 10.5 (2.6–29)  | 10 (8.8)             | 0.6            |
| Lymph node involvement                             | 51 (12)              | 20 (69)           | <0.0001       | 6.8 (2.9–16.2) | 18 (16)              | <0.0001        | 6.4 (2.9–14.2) |
| Extranodal extension                                | 8 (1.9)              | 14 (48)           | <0.0001       | 12.4 (2.9–42)  | 8 (7)                | 0.0001         | 10.2 (4.7–31.5) |
| Distant metastases                                  | 3 (1)                | 8 (28)            | <0.0001       | 15.2 (5.3–47.1) | 5 (4)                | 0.2            |

Data are presented as \( n \) (%) or as the mean ± standard deviation. BMI = body mass index, CI = confidence interval, OR = odds ratio. * \( P < 0.05 \).
We showed that very old patients had more aggressive clinicopathological characteristics than other groups, including tumor size, extracapsular extension, T status, LN metastasis, and extranodal extension. Various factors could explain the advanced disease in elderly patients. One such factor is the high frequency of late diagnosis in these patients. However, this explanation appears to be insufficient, as some authors found that older patients are likely to die from their disease regardless of the stage of their PTC. Another possible explanation is a less aggressive treatment of PTC in older patients despite the fact that their tumors have unfavorable clinicopathological features. In our series, we found that the therapeutic approach was less extensive, with a lower total thyroidectomy rate (88% vs 94% in younger patients), and a lower LND rate (48% vs 62%). We also reported that elderly patients were less likely than younger adults to receive radioiodine therapy.

In previous studies, the difference of DFS between young and elderly patients (75–98%) is debatable. We found that the 5-year DFS was lower in very old patients than in the older and young groups (81.3%, 92.9%, and 94.7%, respectively) (P < 0.001). Like other groups, we found that the risk of disease-specific mortality progressively increases with age category: 9 patients (0.3%) in the young group, 10 (2.0%) in the older group, and 9 (7%) in the very old group; Lang et al showed that compared with patients aged 45 to 60 years, the risks were higher in those aged 61 to 70 years [hazard ratio (HR) 2.340; 95% confidence interval (95% CI) 1.268–5.855] and older than 70 years (HR 3.908; 95% CI 1.624–9.205). Yang et al also reported a 5-year incidence of death from thyroid cancer for patients >75 and older of 12.2% versus 6.8% for patients aged 65 to 75 years and <2% for younger patients (P < 0.001). However, these series reported quite heterogeneous thyroid carcinoma including follicular, medullary and anaplastic cancers, and differences in DFS and disease-specific mortality rate between the present study and these previous reports could be explained by the fact that we limited our cohort to PTC patients, excluding other forms of thyroid carcinoma.

The impact of LN metastasis and extranodal extension on recurrence is significantly greater in elderly patients, supported by several recent studies. When analyzed in a multivariate model, we found that nodal status was the most powerful independent predictor of recurrence. The presence of LN metastases and extranodal extension conferred a risk of recurrence, respectively, more than 6 times [OR = 6.8 (CI = 2.9–16.2) for older and OR = 6.4 (CI = 2.9–14.2) for very old patients] and 10 times higher than N0/Nx [OR = 12.4 (CI = 2.9–42) for older and OR = 10.2 (CI = 4.7–31.5) for very old patients]. These findings emphasize the utility of performing an adequate LND among elderly patients.

The postoperative course was similar in very old patients and other patients in terms of permanent recurrent laryngeal nerve injury and hypoparathyroidism. The only difference was an increasing risk of neck hematoma in the older patients. This result could be explained by a significantly higher rate of vitamin-K antagonist therapy and arterial hypertension in the older patients. These patients were also more likely to have medical postoperative complications, but there were no intraoperative or in-hospital postoperative deaths for the elderly patients in our studies.

We believe that surgery for PTC in very old patients is safe, has an acceptable postoperative complication rate, and could be adapted to the aggressiveness of the patient’s PTC. Previous studies focusing on elderly patients showed significantly longer overall survival for patients who underwent surgery than for those who did not. Prompt consideration of an extensive initial surgical approach, including systematic LND, appears to be justified to limit the risk of disease recurrence. Surgery should not be denied on the basis of chronological age, particularly because inadequate treatment might result in recurrent or metastatic disease during the follow-up period, with a higher risk of reoperations and more radioiodine therapy administration.

Other issues are the role and the impact of postoperative radioiodine therapy in elderly patients with PTC. Our present study demonstrates that despite a more aggressive disease in these patients, radioiodine therapy was less performed when compared with younger patients. In view of the reported higher risk of complications of postoperative radioiodine therapy among elderly patients, including arrhythmias, osteoporosis, insomnia, and anxiety, many authors suggest lower doses of radioiodine I-131 therapy in this population.

However, a specific treatment strategy for elderly patients with PTC is still debated. Our paper supports the fact that surgical treatment with thyroidectomy and LND is acceptable and safe for old and very old PTC patients, especially if radioiodine therapy is supposed to be more problematic in this population.

Limitations of our study include its retrospective nature of patients surgically treated for PTC over a long period. Changes in surgical management or radioiodine therapy might have a confounding effect on the outcomes analysis. In addition, because the number of very old patients was moderate, although higher than in any previous study, no significant findings in the analysis (such as multifocality, bilaterality, or vascular invasion) might be due to inadequate study power.

Our results suggest that very old patients (>75 years) are exposed to higher recurrence rates and lower disease-free survival. Elderly patients undergo thyroid surgery with similar risks to younger patients. Therefore, surgical treatment with total thyroidectomy and LND should be seriously considered in very old PTC patients. Our data contribute to improving informed decision-making and suggest that we need an improved therapeutic strategy for elderly patients.

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