**Supplementary table 1.** Hazard ratios of cancer-specific survival according to the WHO 2017 classification and the presence of TERT promoter mutations.

| Staging               | No of patients (n) | No of death (n) | CSS 5-year (%) | CSS 10-year (%) | CSS 15-year (%) | Hazard ratio (95% CI) | P-value |
|-----------------------|--------------------|-----------------|----------------|-----------------|-----------------|------------------------|---------|
| MI-FTC with WT-TERT   | 35                 | 1               | 100            | 94.7            | 94.7            | Reference              |         |
| EA-FTC with WT-TERT   | 19                 | 1               | 100            | 93.3            | 93.3            | 1.21 (0.08-19.34)      | 0.893   |
| WI-FTC with WT-TERT   | 9                  | 3               | 88.9           | 77.8            | 66.7            | 7.13 (0.74-68.59)      | 0.089   |
| MI-FTC with M-TERT    | 4                  | 0               | 100            | 100             | 100             | 0.0                    | 0.990   |
| EA-FTC with M-TERT    | 5                  | 3               | 33.3           | 0.0             | 0.0             | 59.09 (5.72-610.68)    | 0.001   |
| WI-FTC with M-TERT    | 5                  | 3               | 80.0           | 40.0            | 40.0            | 23.26 (2.33-231.78)    | 0.007   |

*WHO* World Health Organization, *MI-FTC* minimally invasive follicular thyroid carcinoma, *EA-FTC* encapsulated angioinvasive follicular thyroid carcinoma, *WI-FTC* widely invasive follicular thyroid carcinoma, *WT* wild-type, *M* mutant, *CSS* cancer-specific survival, *CI* confidential interval.
Supplementary table 2. Hazard ratios of disease-free survival according to the WHO 2017 classification and the presence of TERT promoter mutations.

| Staging                | No of patients (n) | No of recur (n) | DFS 5-year (%) | DFS 10-year (%) | DFS 15-year (%) | Hazard ratio (95% CI)     | P-value |
|------------------------|--------------------|-----------------|-----------------|-----------------|-----------------|---------------------------|---------|
| MI-FTC with WT-TERT    | 35                 | 2               | 100             | 94.4            | 88.5            | Reference                 |         |
| EA-FTC with WT-TERT    | 19                 | 1               | 100             | 93.3            | 93.3            | 0.68 (0.06-7.54)          | 0.753   |
| WI-FTC with WT-TERT    | 9                  | 3               | 66.7            | 66.7            | 66.7            | 5.19 (0.86-31.19)         | 0.072   |
| MI-FTC with M-TERT     | 4                  | 1               | 100.0           | 100.0           | 100.0           | 3.11 (0.28-34.70)         | 0.357   |
| EA-FTC with M-TERT     | 5                  | 2               | 0               | 0               | 0               | 22.32 (2.63-189.81)       | 0.004   |
| WI-FTC with M-TERT     | 5                  | 5               | 0               | 0               | 0               | 57.79 (9.24-361.54)       | <0.001  |

WHO World Health Organization, MI-FTC minimally invasive follicular thyroid carcinoma, EA-FTC encapsulated angioinvasive follicular thyroid carcinoma, WI-FTC widely invasive follicular thyroid carcinoma, WT wild-type, M mutant, DFS disease-free survival, CI confidential interval.
**Supplementary table 3.** Clinicopathological characteristic of 77 patients according to alternative grouping.

|                          | Group 1 (n = 58) | Group 2 (n = 9) | Group 3 (n = 10) | P for trend |
|--------------------------|------------------|----------------|------------------|------------|
| **Sex (n, %)**           |                  |                |                  |            |
| Female                   | 44 (74.6)        | 6 (66.7)       | 9 (90.0)         | 0.499      |
| Male                     | 14 (24.1)        | 3 (33.3)       | 1 (10.0)         |            |
| **Age, year (mean, SD)** | 39.2 (14.1)      | 44.3 (11.4)    | 58.4 (16.4)      | 0.002*     |
| **Size**                 |                  |                |                  |            |
| Mean, cm (mean, SD)      | 3.4 (1.5)        | 4.2 (3.4)      | 5.4 (2.8)        | 0.110*     |
| 4 cm or less             | 40 (69.0)        | 7 (77.8)       | 4 (40.0)         |            |
| More than 4 cm           | 18 (31.0)        | 2 (22.2)       | 6 (60.0)         | 0.152      |
| **Gross ETE**            |                  |                |                  |            |
| Absent                   | 58 (100.0)       | 9 (100.0)      | 7 (70.0)         | <0.001     |
| Present                  | 0 (0.0)          | 0 (0.0)        | 3 (30.0)         |            |
| **Distant metastasis**   |                  |                |                  |            |
| Absent                   | 58 (100.0)       | 7 (77.8)       | 4 (40.0)         | <0.001     |
| Present                  | 0 (0.0)          | 2 (22.2)       | 6 (60.0)         |            |
| **AJCC/TNM 8th stage**   |                  |                |                  |            |
| Stage 1                  | 56 (96.6)        | 7 (77.8)       | 2 (20.0)         | <0.001     |
| Stage 2                  | 2 (3.4)          | 2 (22.2)       | 5 (50.0)         |            |
| Stage 3/4                | 0 (0.0)          | 0 (0.0)        | 3 (30.0)         |            |
| **Surgical extent**      |                  |                |                  |            |
| Total                    | 28 (48.3)        | 8 (17.4)       | 10 (100.0)       | <0.001     |
| Subtotal or lobectomy    | 30 (51.7)        | 1 (11.1)       | 0 (0.0)          |            |
| **Cumulative RAI dose**  |                  |                |                  |            |
| Less than 100 mCi        | 30 (51.7)        | 1 (2.9)        | 3 (30.0)         | 0.060      |
| 100 mCi or more          | 28 (48.3)        | 8 (88.9)       | 7 (70.0)         |            |

SD standard deviation, ETE extrathyroidal extension, AJCC/TNM American Joint Committee/tumor-node-metastasis, RAI radioactive iodine, *P for trend for continuous variables was analyzed using Jonckheere-Terpstra test.