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# FDG-avidity of Thyroid Cancer Does Not Predict Clinical Aggressiveness in PET Incidentaloma

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## INTRODUCTION

- 18F-FDG-avid differentiated thyroid cancers (DTC) have been known to behave more aggressively, especially in metastatic sites (flip-flop phenomenon).
- However, the clinical behavior of DTC detected incidentally by FDG-PET (PET incidentaloma) has been sparsely reported.
- The aim of this study is to determine whether flip-flop phenomenon is applicable in PET-incidentaloma

## METHOD

- Patients who had pre-operative FDG-PET scan (staging or health screening) and underwent thyroid cancer surgery at Chonnam National University Hwasun Hospital during Jan, 2006 ~ Aug, 2013 (n=195).
- 165 patients (42 males, 123 females) were analysized: 15 patients with non-PTC and 15 patients with diffuse FDG uptake pattern were excluded.
- Focal thyroid uptake vs. no uptake on $^{18}$ F-FDG PET scan, pathologic findings, clinical outcome

## RESULT

- 129 DTC patients were FDG-avid and 36 patients non-FDG-avid. FDG avid PTC is more aggressive than FDG non-avid PTC in the clinicopathologic findings (Table 1).

**Table 1.** Baseline characteristics of PTC patients according to FDG avidity on the pre-operative PET-CT scan .

| | FDG avid (n=129) | FDG non-avid (n=36) | P-value |
|---|---|---|---|
| **Age** | 56.37±12.91 | 58.89±11.24 | 0.290 |
| **Sex (male, %)** | 31 (24.0) | 11 (30.6) | 0.427 |
| **Purpose of PET-CT** | | | 0.002 |
| **Screening** | 75 (58.1) | 32 (88.9) | |
| **Health examination** | 20 (15.5) | 6 (16.7) | |
| **Other cancer** | 55 (42.6) | 26 (72.2) | |
| **Staging** | 54 (41.9) | 4 (11.1) | |
| **SUV-max (nodule)** | 9.31±9.65 | - | <0.001 |
| **FDG-avidity of LN (n, %)** | | | |
| **SUV-max (LN)** | 2.90±8.67 | 0.47±1.26 | 0.003 |
| **Pre-operative TSH** | 2.12±1.50 | 2.12±1.51 | 0.986 |
| **Pre-operative free T4** | 1.36±0.33 | 1.39±0.32 | 0.605 |
| **Pre-operative Tg** | 78.11±203.99 | 29.45±47.11 | 0.024 |
| **Histopatholgic findings** | | | |
| **Tumor size (cm)** | 1.48±1.16 | 0.64±0.46 | <0.001 |
| **LN metastasis** | 63 (48.8) | 9 (25.0) | 0.011 |
| **central** | 28 (21.7) | 6 (16.7) | 0.509 |
| **lateral** | 35 (27.1) | 3 (8.3) | 0.018 |
| **Distant metastasis** | 5 (3.9) | 1 (2.8) | 1.000 |
| **Lung** | 4 (3.1) | 0 (0.0) | |
| **Bone** | 0 (0.0) | 1 (2.8) | |
| **Esophagus** | 1 (0.8) | 0 (0.0) | |
| **ETI (n, %)** | 43 (33.3) | 3 (8.3) | 0.003 |
| **Bilaterality (n, %)** | 33 (2.6) | 5 (13.9) | 0.141 |
| **Multiplicity (n, %)** | 38 (29.5) | 10 (27.8) | 0.844 |
| **Thyroiditis (n, %)** | 21 (16.3) | 3 (8.3) | 0.232 |
| **Surgery** | | | 0.001 |
| **Total thyroidectomy** | 119 (92.2) | 25 (69.4) | |
| **Lobectomy** | 10 (7.8) | 11 (30.6) | |
| **RAI therapy** | 79 (61.2) | 12 (33.3) | 0.003 |

- After removal of high risk group (staging PET-CT group), thyroid PET-CT incidentaloma patients (n=107) were compared according to FDG avidity.
- Among 165 PTC patients, the purpose of PET-CT scan is screening in 107 patients (26 patients for health examination and 81 patients for the evaluation for other cancer) and staging in 58 patients (Table 2).

**Table 2.** Baseline characteristics and FDG avidity of thyroid cancer according to the purpose of per-operative PET-CT scan.

| | Screening PET-CT scan (n=107) | Staging PET-CT scan (n=58) | p-value |
|---|---|---|---|
| **Age** | 59.47±8.83 | 52.22±16.60 | 0.003 |
| **Sex (male, %)** | 23 (21.5) | 19 (32.8) | 0.113 |
| **FDG-avidity of nodules (n, %)** | 75 (47.8) | 54 (93.1) | 0.001 |
| **SUV-max (nodule)** | 5.16±6.56 | 11.22±12.21 | 0.001 |
| **FDG-avidity of LN (n, %)** | 13 (12.1) | 36 (62.1) | <0.001 |
| **SUV-max (LN)** | 0.41±1.16 | 5.86±12.12 | 0.001 |
| **Pre-operative TSH** | 2.16±1.48 | 2.05±1.55 | 0.659 |
| **Pre-operative free T4** | 1.32±0.28 | 1.46±0.39 | 0.022 |
| **Pre-operative Tg** | 28.02±47.13 | 138.13±286.80 | 0.010 |
| **Histopatholgic findings** | | | |
| **Tumor size (cm)** | 0.86±0.50 | 2.11±1.43 | <0.001 |
| **LN metastasis** | 30 (28.0) | 42 (72.4) | <0.001 |
| **central** | 21 (19.6) | 13 (22.4) | 0.673 |
| **lateral** | 9 (8.4) | 29 (50.0) | <0.001 |
| **Distant metastasis** | 1 (0.9) | 5 (8.6) | 0.021 |
| **Lung** | 0 (0.0) | 4 (6.9) | |
| **Bone** | 1 (0.9) | 0(0.0) | |
| **Esophagus** | 0 (0.0) | 1 (1.7) | |
| **ETI (n, %)** | 18 (16.8) | 28 (48.3) | <0.001 |
| **Bilaterality (n, %)** | 21 (19.6) | 17 (29.3) | 0.158 |
| **Multiplicity (n, %)** | 29 (27.1) | 19 (32.8) | 0.445 |
| **Thyroiditis (n, %)** | 11 (10.3) | 13 (22.4) | 0.035 |
| **Surgery** | | | 0.008 |
| **Total thyroidectomy** | 88 (82.2) | 56 (96.6) | |
| **Lobectomy** | 19 (17.8) | 2 (3.4) | |
| **RAI therapy** | 79 (73.8) | 12 (20.7) | 0.003 |
| **Clinical outcome** | | | 0.021 |
| **Remission** | 99 (92.5) | 45 (77.6) | |
| **Persistent** | 2 (1.9) | 6 (10.3) | |
| **Recurrence** | 6 (5.6) | 7 (12.1) | |
| **Follow-up period (months)** | 37.96±20.69 | 44.55±22.97 | 0.062 |

- Among thyroid PET-CT incidentaloma patients, FDG avid PTC group (n=75) revealed larger tumor size (0.97±0.52 vs. 0.61±0.35, p=0.001), but extra-thyroidal invasion (ETI), cervical lymph node metastasis, and distant metastasis was not different between FDG avid PTC group and FDG non-avid PTC group.
- A cumulative risk of cervical lymph node metastasis according to primary tumor size of FDG avid PTC group is not different from those of FDG non-avid PTC group (p=0.394) (Fig. 1).

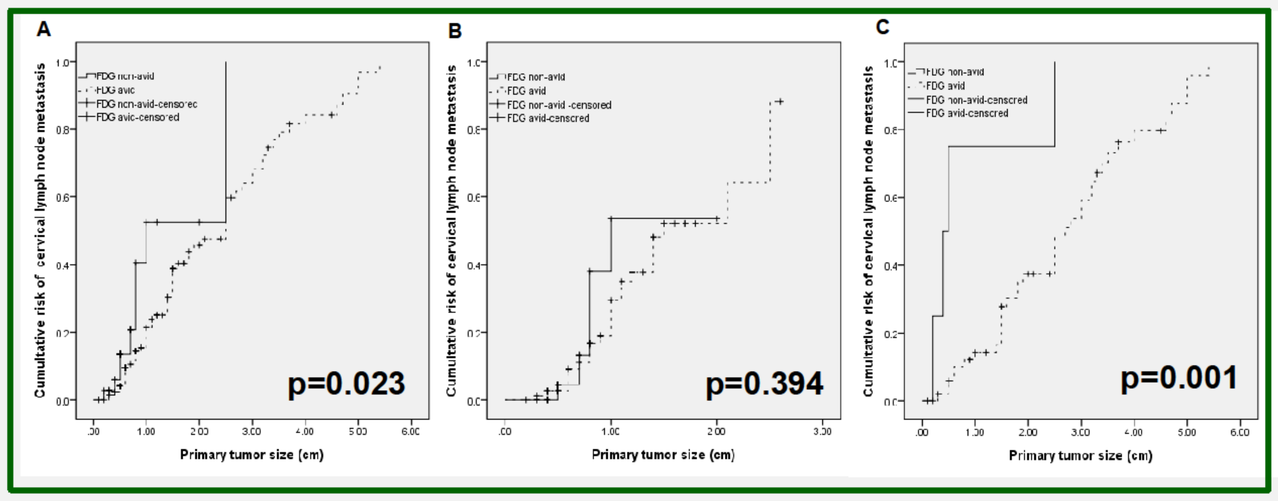


**Fig 1.** Cervical lymph node metastasis according to primary tumor size, (A)Total patients with FDG-PET (B) PTC patients detected by screening PET-CT scan, (C) PTC patients with pre-operative staging PET-CT scan

## CONCLUSION

**DTC detected with FDG-avidity do not seem to behave aggressively, based on initial operative findings. FDG-avidity of DTC does not add to conventional risk factor assessment for initial therapeutic decision.**



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