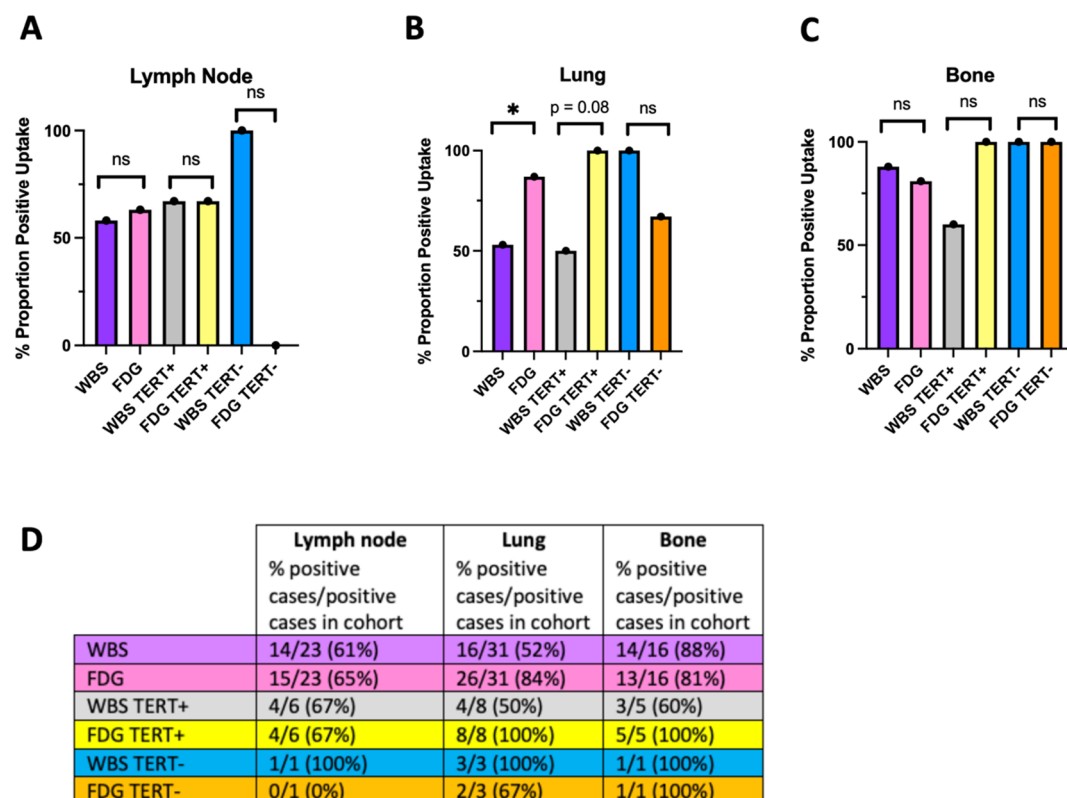


**Supplementary Table S1:** Per patient histology, classification, tumor genetics, and consensus uptake.  
Of note, 4 patients, Patient ID 22, 24, 25, and 26, featured metastases at sites other than lung, lymph, and bone.

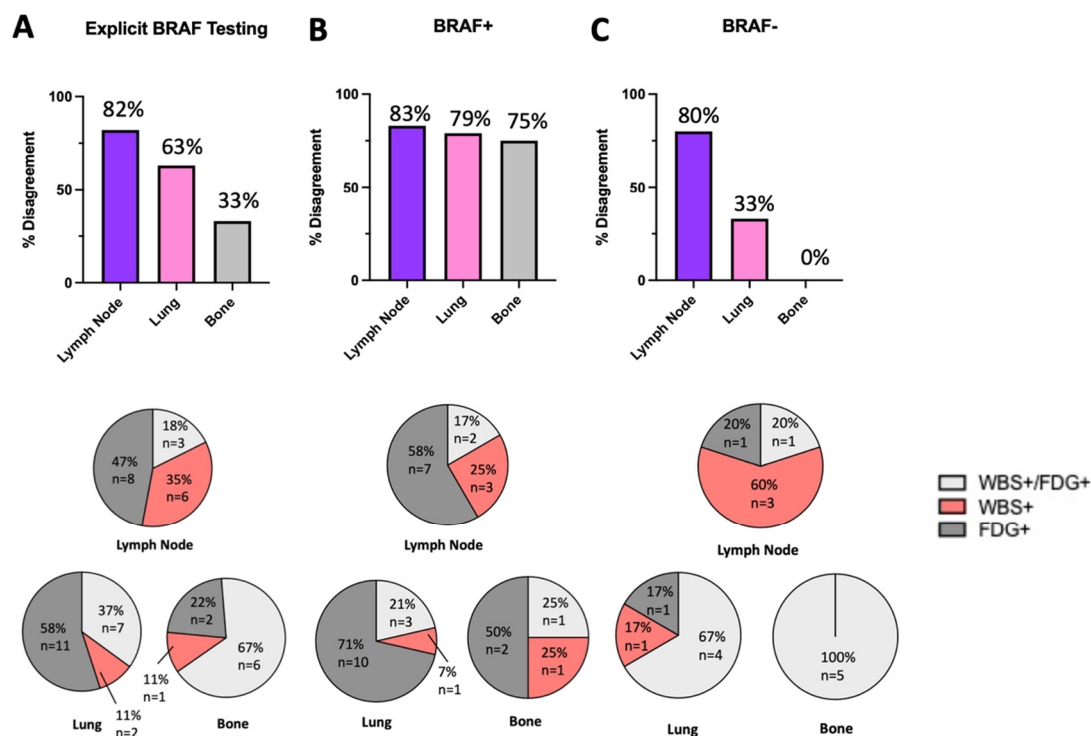
| Patient ID | Histology (DTC subtype) | Classification (Pattern) | BRAF V600E | RAS | TERT | Panel Testing | Additional Gene Mutations (if known) | Lung RAI | Lung FDG | Lymph RAI | Lymph FDG | Bone RAI | Bone FDG |
|------------|-------------------------|--------------------------|------------|-----|------|---------------|--------------------------------------|----------|----------|-----------|-----------|----------|----------|
| 1          | P (Follicular)          | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | 0         | 1         | 1        | 0        |
| 2          | P (Tall)                | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | 0         | 1         | NI       | NI       |
| 3          | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | 0         | 1         | NI       | NI       |
| 4          | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | NI        | NI        | NI       | NI       |
| 5          | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | 1         | 1         | NI       | NI       |
| 6          | P (Classical)           | PP                       | Y          | N   | Y    | Y             | None                                 | 1        | 1        | 0         | 1         | NI       | NI       |
| 7          | P (Classical)           | PP                       | NA         | NA  | NA   | NP            |                                      | NI       | NI       | 1         | 0         | NI       | NI       |
| 8          | P (Classical)           | PP                       | NA         | NA  | NA   | NP            |                                      | NI       | NI       | 0         | 1         | NI       | NI       |
| 9          | P (Mixed)               | FP                       | NA         | NA  | NA   | NP            |                                      | 0        | 1        | NI        | NI        | NI       | NI       |
| 10         | P (NA)                  | PP                       | NA         | NA  | NA   | NP            |                                      | 1        | 0        | 1         | 0         | NI       | NI       |
| 11         | P (Mixed)               | FP                       | NA         | NA  | NA   | NP            |                                      | 1        | 0        | 1         | 0         | NI       | NI       |
| 12         | P (NA)                  | PP                       | N          | N   | N    | Y             | CCDC6-RET fusion                     | 1        | 1        | 1         | 0         | NI       | NI       |
| 13         | P (Classical)           | PP                       | Y          | N   | Y    | NP            |                                      | 0        | 1        | NI        | NI        | NI       | NI       |
| 14         | P (Classical)           | PP                       | NA         | NA  | NA   | NP            |                                      | 0        | 1        | NI        | NI        | NI       | NI       |
| 15         | P (NA)                  | PP                       | NA         | NA  | NA   | NP            |                                      | 0        | 1        | NI        | NI        | NI       | NI       |
| 16         | P (Sclerosing)          | PP                       | Y          | NA  | NA   | NP            |                                      | 1        | 1        | 0         | 1         | NI       | NI       |
| 17         | P (Tall)                | PP                       | Y          | NA  | Y    | NP            |                                      | 0        | 1        | 1         | 0         | 0        | 1        |
| 18         | P (NA)                  | PP                       | Y          | N   | Y    | Y             | None                                 | 1        | 1        | 1         | 1         | 0        | 1        |
| 19         | P (NA)                  | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | 0         | 1         | 1        | 1        |
| 20         | P (Tall)                | PP                       | Y          | NA  | NA   | NP            |                                      | NI       | NI       | 1         | 0         | NI       | NI       |
| 21         | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | 1        | 0        | NI        | NI        | NI       | NI       |
| 22         | P (Follicular)          | PP                       | Y          | NA  | NA   | NP            |                                      | NI       | NI       | NI        | NI        | NI       | NI       |
| 23         | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | 0        | 1        | 0         | 1         | NI       | NI       |
| 24         | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | NI       | NI       | NI        | NI        | NI       | NI       |
| 25         | P (Classical)           | PP                       | Y          | NA  | NA   | NP            |                                      | NI       | NI       | NI        | NI        | NI       | NI       |
| 26         | P (Mixed)               | PP                       | Y          | N   | Y    | Y             | None                                 | NI       | NI       | NI        | NI        | NI       | NI       |
| 27         | P (NA)                  | PP                       | Y          | N   | Y    | NP            |                                      | 0        | 1        | NI        | NI        | NI       | NI       |
| 28         | P (Tall)                | PP                       | Y          | NA  | NA   | NP            |                                      | NI       | NI       | 1         | 0         | NI       | NI       |
| 29         | F                       | FP                       | NA         | NA  | NA   | NP            |                                      | NI       | NI       | NI        | NI        | 1        | 1        |
| 30         | F                       | FP                       | NA         | NA  | NA   | NP            |                                      | NI       | NI       | NI        | NI        | 1        | 1        |
| 31         | F                       | FP                       | NA         | NA  | NA   | NP            |                                      | 0        | 1        | NI        | NI        | 1        | 0        |
| 32         | F                       | FP                       | NA         | NA  | NA   | NP            |                                      | NI       | NI       | NI        | NI        | 1        | 1        |
| 33         | F                       | FP                       | NA         | Y   | NA   | NP            |                                      | NI       | NI       | NI        | NI        | 1        | 1        |
| 34         | F                       | FP                       | N          | Y   | Y    | Y             | BCORL1, MT-ND5 fusion, TP53 mutation | NI       | NI       | NI        | NI        | 1        | 1        |
| 35         | P (Follicular)          | FP                       | NA         | NA  | NA   | NP            |                                      | 1        | 1        | 1         | 1         | NI       | NI       |
| 36         | P (Follicular)          | FP                       | NA         | NA  | NA   | NP            |                                      | 1        | 1        | 0         | 1         | NI       | NI       |
| 37         | P (Follicular)          | FP                       | N          | NA  | NA   | NP            |                                      | NI       | NI       | 1         | 0         | 1        | 1        |
| 38         | F                       | FP                       | N          | N   | Y    | Y             | BRAFV601K, NF2                       | 0        | 1        | 0         | 1         | NI       | NI       |
| 39         | F                       | FP                       | N          | N   | Y    | Y             | FGFR2-SHTN1 fusion, MT-ND5 fusion    | 1        | 1        | 1         | 1         | 1        | 1        |
| 40         | F                       | FP                       | N          | Y   | Y    | Y             | None                                 | 1        | 1        | 1         | 0         | 1        | 1        |
| 41         | P (Follicular)          | FP                       | N          | Y   | N    | Y             | None                                 | NI       | NI       | NI        | NI        | 1        | 1        |
| 42         | P (Follicular)          | FP                       | N          | Y   | N    | Y             |                                      | 1        | 0        | NI        | NI        | NI       | NI       |
| 43         | P (Follicular)          | FP                       | NA         | NA  | NA   | NP            |                                      | 1        | 1        | NI        | NI        | 1        | 1        |
| 44         | P (Follicular)          | FP                       | NA         | NA  | NA   | NP            |                                      | 1        | 0        | NI        | NI        | 1        | 0        |
| 45         | F                       | FP                       | NA         | NA  | NA   | NP            |                                      | 1        | 1        | 1         | 1         | NI       | NI       |
| 46         | P (Classical)           | PP                       | N          | N   | N    | Y             | MET, PAX8, FOSB                      | 1        | 1        | NI        | NI        | NI       | NI       |

**Supplemental Figure S1: WBS and FDG Uptake Stratified by *TERT* Promoter Mutation Status**  
WBS: radioactive iodine whole body scan, FDG: <sup>18</sup>Fluorodeoxyglucose-PET. **(A)** No significant differences were observed in lymphatic tissue metastatic radiotracer uptake in any cohort. **(B)** Significantly increased FDG over iodine uptake was observed in the entire cohort in lung tissue and, to a lesser extent, in the *TERT*<sup>+</sup> sub-cohort ( $p = 0.08$ ), but not in the *TERT*<sup>-</sup> sub-cohort. **(C)** No significant differences in radiotracer uptake were observed in bone in any cohort. **(D)** Table summary with proportions of patients which have metastases at any given site and proportions of patients that had FDG or WBS positivity. Asterisk (\*) indicates  $p < .05$ , ns = not significant.



**Supplemental Figure S2: Agreement between imaging modalities by *BRAF* status.**

WBS: radioactive iodine whole body scan, FDG:  $^{18}\text{F}$ Fluorodeoxyglucose-PET. Agreement is measured by percent discordance between WBS and FDG in patients who had positive uptake by at least one imaging modality. Discordance is inversely proportional to agreement. Below each bar chart, pie charts express the classification of each case into WBS + /FDG + , WBS+ only, and FDG+ only. (A) In the cohort of patients with *BRAF* testing, percent discordant rates for lymph nodes (82%), lung (63%), and bone (33%). (B) In patients with *BRAF*<sup>+</sup> thyroid cancer, lymph node (83%), lung (79%), and bone (75%). (C) In patients with *BRAF*<sup>-</sup> thyroid cancer, lymph node (80%), lung (33%), and bone (0%).



# Supplemental Figure S3: Agreement between imaging modalities by histology.

WBS: radioactive iodine whole body scan, FDG:  $^{18}\text{F}$ Fluorodeoxyglucose-PET. Agreement is measured by percent discordance between WBS and FDG in patients who had positive uptake by at least one imaging modality. Discordance is inversely proportional to agreement. Below each bar chart, pie charts express the classification of each case into WBS + /FDG + , WBS+ only, and FDG+ only at each metastatic site. Discordance is the calculated sum of WBS+ only and FDG+ only. **(A)** In the entire cohort, percent discordant rates for lymph nodes (79%), lung (65%), and bone (31%). **(B)** In patients with papillary histology, lymph node (87%), lung (72%), and bone (67%). **(C)** In patients with follicular histology, lymph node (67%), lung (54%), and bone (23%).

