Role of Initial Iodine-131 Whole-Body Scan and Serum Thyroglobulin in Differentiated Thyroid Carcinoma Metastases

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We evaluated the role of first ^{131}I-whole-body scan and of first serum thyroglobulin (Tg) measurement after surgery in the early diagnosis of metastases from differentiated thyroid carcinoma (DTC). **Methods:** In 269 patients with metastases from DTC, we retrospectively evaluated the results of first whole-body scan (performed 40 days after surgery with diagnostic or therapeutic ^{131}I dose) and in 69 of them we also evaluated the result of first Tg measurement (performed the day before the first whole-body scan) in relation to the presence, localization and type of metastases. **Results:** In all patients, the first whole-body scan was positive for the thyroid remnant, and in 54.3% of patients it was also positive for metastases. In the remaining 45.7% of patients, metastases were detected during the follow-up. First Tg levels were >60 ng/ml in 66.7% of patients with metastases. First whole-body scan detected metastases in 47.8% of patients with Tg values <60 ng/ml, while Tg values were >60 ng/ml in 61.3% of patients with first whole-body scan negative for metastases. The combined results of both first whole-body scan and first Tg measurement allowed the early detection of metastases in 82.6% of patients. Whole-body scan detected distant metastases more frequently than local lymph node metastases ($p < 0.01$). **Conclusion:** In more than 80% of patients, metastases were suspected or diagnosed as early as 40 days after surgery in the presence of residual thyroid tissue by combined evaluation of results of first whole-body scan and Tg measurement.

Key Words: differentiated thyroid carcinoma; thyroglobulin; iodine-131 whole-body scan

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For many years, whole-body scan with ^{131}I has been considered one of the most important diagnostic tools in the follow-up of differentiated thyroid carcinoma (DTC). However, its utility in detecting metastases has been questioned because the metabolic activity of residual thyroid tissue after total thyroidectomy can be such that it masks possible secondary tissue. In particular, large residual tissue can preferably take up the administered radioiodine, thus preventing the detection of the metastatic sites (*1–6*).

Since the early 1980s, thyroglobulin (Tg) measurement also has been used to diagnose the presence of metastases but not during the first phase of follow-up, because Tg production by residual thyroid tissue and by metastases is indistinguishable (*7–9*). The aim of our study was to evaluate the sensitivity of first whole-body scan and Tg measurement for the early detection of metastases.

PATIENTS AND METHODS

From our statistics of 1489 patients with DTC, we retrospectively studied 269 patients with metastases, monitored from 1958 to 1993 (Table 1). In all patients, a total thyroidectomy was performed and 40 days later, in the absence of L-thyroxine therapy, a first whole-body scan with a diagnostic dose of ^{131}I [3–5 mCi (111–185 MBq)] was performed (first d-whole-body scan) to determine the presence of residual thyroid tissue for ablative ^{131}I therapy and/or to detect the presence of metastases. About 5 days after ablative therapy [40–80 mCi (1480–2960 MBq) ^{131}I], we performed the first post-therapy whole-body scan (first t-whole-body scan). At the time of the first Tg measurement, all patients had thyroid-stimulating hormone (TSH) levels above 30 μIU/ml. Four to eight months after ablative ^{131}I therapy, we performed a second diagnostic whole-body scan (second d-whole-body scan) and, if a therapeutic dose of ^{131}I was given, a second post-therapy whole-body scan (second t-whole-body scan).

TABLE 1
Summary of Patient Characteristics

Characteristic	Number
Sex	
Male	77
Female	192
Male-to-female ratio	1:2.5
Age (yr)	
Mean	44.6
Range	10–74
Histology	
Papillary	184
Follicular	85
Follow-up (yr)	3–32
Site of metastases	
Lymph nodes	95
Lungs	85
Bone	33
Other sites	20
Multiple	36

Tg measurements were taken by radioimmunoassay (Sorin Biomedica, Saluggia, Italy; normal values <60 ng/ml according to manufacturer's instructions). Patients with anti-Tg antibodies were not included in this study. A linear, double-head scanner was used (Biniscanner; Italelettronica, Rome, Italy) for whole-body scanning.

We considered the results of first whole-body scan (either first d-whole-body scan or t-whole-body scan) in 200 patients diagnosed between 1958 and 1984, and we considered both first d/t-whole-body scan and first Tg measurement in 69 patients diagnosed between 1985 and 1993.

For the results of first Tg measurement, we defined an upper cutoff of 60 ng/ml (as the highest normal value with residual thyroid tissue present) and a lower cutoff of 5 ng/ml (as in the absence of thyroid tissue).

On the basis of the results of first whole-body scan, patients were divided into two groups: positive and negative for metastases. We also considered metastases without ^{131}I uptake, those metastases in which whole-body scan was always negative and were diagnosed

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TABLE 2
Metastases Detected by Diagnostic or Therapeutic Iodine-131 Dose Whole-Body Scan Between 1958 and 1984

Site of metastases	First d/t WBS	Second d/t WBS	Not detected by WBS (no ^{131}I uptake)	Total
Lymph node	31	32	6	69
Distant	77	22*	32†	131
Lungs	49	5	10	64
Bone	15	8	3	26
Other sites	1	3	8	12
Multiple	12	6	11	29
Total	108 (54%)	54 (27%)	38 (19%)	200 (100%)

*$p < 0.0001$ at χ^2 vs. patients with lymph node metastases
†$p = 0.01$ at χ^2 vs. patients with lymph node metastases
d/t WBS = whole-body scan with either diagnostic (d) or therapeutic (t) ^{131}I dose.

mainly by radiography, for cases until 1975, and also by MRI, CT, ultrasonography, fine-needle biopsy and methylene diphosphonate bone scan, later. In all patients, metastases were identified within 15–18 mo after surgery.

RESULTS

In all patients some residual thyroid tissue was detected by scintigraphy, with ^{131}I uptake on the thyroid bed generally between 2% and 5%.

Tables 2 and 3 show the results of first whole-body scan (either d-whole-body scan or t-whole-body scan) for metastasis detection by site in 200 patients diagnosed between 1958 and 1984 and in 69 patients diagnosed between 1985 and 1993, respectively. The results of second whole-body scan (either d-whole-body scan or t-whole-body scan), performed 4–8 mo after radioisotopic remnant ablation, are shown for comparison.

Considering all whole-body scan results, first d/t-whole-body scan detected early metastases in more than half of the patients (54.3%).

Out of all distant metastases (174 cases), 60.3% were detected by first whole-body scan; in contrast, only 43.1% of all lymph node metastases (95 cases) were detected by first whole-body scan (χ^2, $p = 0.01$). Nevertheless, in lymph node metastases the percentage of non-^{131}I uptake was lower than in distant metastases (9.5% and 25.3%, respectively; χ^2, $p = 0.003$).

Because no significant differences were found between patients diagnosed between 1958 and 1984 and patients diagnosed between 1985 and 1993, as far as whole-body scan results are concerned, we therefore considered only 69 patients with both Tg and whole-body scans for further statistical analysis. No correlation was found between TSH and first Tg levels.

As shown in Table 4, in 66.7% of patients Tg values were above 60 ng/ml and in 27.5% of patients levels were between 5 and 60 ng/ml, whereas there were only 5.8% false-negative cases with Tg levels lower than 5 ng/ml.

Tg levels were consistently higher in distant metastases than in lymph node metastases. Thus, Tg values greater than 60 ng/ml were found in 76.7% of patients (33/43) with distant metastases and in only 50% of patients (13/26) with lymph node metastases (χ^2, $p = 0.04$). In patients with lymph node metastases, 42.3% (11/26) had Tg values between 5 and 60 ng/ml compared with 18.6% of patients (8/43) with distant metastases (χ^2, $p = 0.063$).

Combined evaluation of first whole-body scan and first Tg results is shown in Table 5. Out of the 23 patients whose first Tg levels were <60 ng/ml, the whole-body scan was positive in 11 (47.8%). Thirty-one patients had a negative first whole-body scan, but Tg values were >60 ng/ml in 19 (61.3%). In 73.3% of patients (11/15) with metastases without ^{131}I uptake and 50% (8/16) of patients with a negative first whole-body scan, we observed Tg values >60 ng/ml.

These data demonstrate that first whole-body scan and Tg results reciprocally revealed unsuspected metastases.

Twelve patients (including 4 with non-^{131}I uptake metastases) had negative whole-body scan and Tg levels <60 ng/ml. Out of these, 8 patients (all with values between 5 and 60 ng/ml) had positive second whole-body scans, and in the 4 remaining patients (2 with Tg <5 ng/ml and 2 with Tg between 5 and 60 ng/ml) metastases were later detected by other diagnostic techniques.

The results of whole-body scan and Tg were concordant in 39.1% of patients, but the combined use of whole-body scan

TABLE 3
Metastases Detected by Diagnostic or Therapeutic Iodine-131 Dose Whole-Body Scan Between 1985 and 1993

Site of metastases	First d/t WBS	Second d/t WBS	Not detected by WBS (no ^{131}I uptake)	Total
Lymph node	10	13	3	26
Distant	28	3*	12	43
Lungs	17	1	3	21
Bone	4	0	3	7
Other sites	2	1	5	8
Multiple	5	1	1	7
Total	38 (55.1%)	16 (23.2%)	15 (21.7%)	69 (100%)

*$p < 0.0001$ at χ^2 vs. patients with lymph node metastases
d/t WBS = whole-body scan with either diagnostic (d) or therapeutic (t) ^{131}I dose.

TABLE 4
Results of First Thyroglobulin (Tg) Measurement Between 1985 and 1993

Site of metastases	Tg ≥60 ng/ml	Tg ≥5 and <60 ng/ml	Tg <5 ng/ml	Total
Lymph node	13	11	2	26
Distant	33*	8	2	43
Lungs	15	6	0	21
Bone	7	0	0	7
Other sites	5	2	1	8
Multiple	6	0	1	7
Total	46 (66.7%)	19 (27.5%)	4 (5.8%)	69 (100%)

*$p = 0.04$ at χ^2 vs. patients with lymph node metastases.

and Tg allowed us to detect or suspect the presence of metastases in 82.6% of patients.

Further indications can be obtained by grouping patients by age, histology and site of metastases (Table 6). We observed a higher prevalence of metastases without ^{131}I uptake in patients ≥40 yr of age (χ^2, $p = 0.04$). In 50% of patients with papillary carcinoma, metastases were detected on first whole-body scan, 28% were detected after whole-body scan (after ablation of residual thyroid tissue) and in 22% of patients metastases were not detected by whole-body scan but by other diagnostic techniques (radiography, CT, bone scan, etc.). By contrast, in follicular carcinoma these figures were 68.4%, 10.5% and 21.1%, respectively. Finally, we observed a higher prevalence of "uncertain" Tg values (between 5 and 60 ng/ml) in younger patients (40.8%) than in older patients (19%) (χ^2, $p < 0.05$), probably due to the frequency of lymph node metastases in patients over 40 yr old.

DISCUSSION

The presence of the postsurgical remnant has always been considered an obstacle to the correct interpretation of first whole-body scan and Tg results. However, some investigators have hypothesized that, even in the presence of the whole thyroid, high levels of Tg justify the suspicion of thyroid carcinoma (*10–12*). According to our experience, in some patients it is also possible to detect distant metastases by whole-body scan even before the thyroidectomy.

In this article, we evaluate the sensitivity of first whole-body scan and first Tg measurement in detecting metastases in patients thyroidectomized for differentiated carcinoma before the ablation of residual thyroid tissue. We showed that the combined result of first whole-body scan and first Tg measurement allows the detection or suspicion of metastases in 82.6% of patients with metastases.

Identifying lymph node metastases is more difficult than identifying distant metastases due to the relatively lower Tg levels and equivocal whole-body scan results. Interpretation is hampered by the possible presence of nearby residual tissue, often dysmorphic and with dimensions similar to that of possible lymph nodes, or by radioiodine uptake by some of the salivary glands. Therefore, a careful clinical preliminary examination, with accurate palpation of the neck and ultrasonography or fine-needle biopsy, is often enough to detect lymph node metastases, particularly if a lymphectomy had been performed.

Thus, first whole-body scan and Tg measurement are not as useful in detecting lymph node metastases as for distant metastases. However, clinical or echographic examination for lymph node metastases can be performed subsequently and, if metastases are found, can generally be surgically removed. Moreover, we observed a good response to ^{131}I therapy and the prognosis is generally more favorable for lymph node metastases than for distant metastases. However, their presence must not be ignored because it can be a sign of later systemic dissemination (*13*). Poor whole-body scan detection of lymph node metastases occurred when the postsurgical remnant was very large. Thus, a careful and complete total thyroidectomy is imperative for subsequent detection of positive lymph nodes.

Patients with distant metastases had better scintigraphic detection and higher Tg production during the follow-up period compared with patients with lymph node metastases. However, the prognosis in patients with distant metastases was worse (*14*).

We observed a higher prevalence of metastases without ^{131}I uptake in patients with >40 yr of age at time of diagnosis (χ^2, $p < 0.05$). Older patients had higher Tg levels, probably because of a higher prevalence of distant metastases. Higher Tg levels were also seen in follicular tumors than in papillary tumors. Furthermore, metastases were detected by whole-body scan more in follicular tumors than in papillary tumors and in distant metastases than in lymph node metastases.

The role of whole-body scan in the follow-up of DTC is unquestionable (*9,15*), but, in our opinion, the significance of the first whole-body scan has often been underestimated. If well executed, its low sensitivity (54.3% in this series) is well compensated for by its high specificity (*16*).

We considered first whole-body scan either after a diagnostic or therapeutic ^{131}I dose, because both were performed in the

TABLE 5
Combined Results of First Diagnostic or Therapeutic Iodine-131 Dose Whole-Body Scan and Thyroglobulin Measurement

	Tg ≥60 ng/ml	Tg ≥5 and <60 ng/ml	Tg <5 ng/ml	Total
First WBS positive	27	9	2	38 (55.1%)
First WBS negative	8	8	0	16 (23.2%)
Not detected by WBS*	11	2	2	15 (21.7%)
Total	46 (66.7%)	19 (27.5%)	4 (5.8%)	69 (100%)

*Metastases with no ^{131}I uptake.
Tg = thyroglobulin; WBS = whole-body scan.

TABLE 6
Results of First Thyroglobulin Measurement and d/t Whole-Body Scan in 69 Patients for Whom Both Data Are Available

	Age (yr) (%)		Histology (%)		Site of metastases (%)	
Result (%)	<40 (27)	≥40 (42)	Follicular (19)	Papillary (50)	Lymph nodes (26)	Distant (43)
Tg >60 ng/ml (46)	14 (51.8)	32 (76.2)	16 (84.2)	30 (60.0)	13 (50.0)	33 (76.7)*
Tg ≥5 and <60 ng/ml (19)	11 (40.8)	8 (19.0)	2 (10.5)	17 (34.0)	11 (42.3)	8 (18.6)
Tg <5 ng/ml (4)	2 (7.4)	2 (4.8)	1 (5.3)	3 (6.0)	2 (7.7)	2 (4.7)
First d/t WBS positive (38)	16 (59.3)	22 (52.4)	13 (68.4)	25 (50.0)	10 (38.5)	28 (65.1)
First d/t WBS negative (16)†	9 (33.3)	7 (16.7)	2 (10.5)	14 (28.0)	13 (50.0)	3 (7.0)‡
Not detected by WBS (15)§	2 (7.4)	13 (30.9)¶	4 (21.1)	11 (22.0)	3 (11.5)	12 (27.9)

*$p = 0.04$ with χ^2 vs. patients with lymph node metastases.
†Patients with first negative d/t WBS then positive second d/t WBS.
‡$p < 0.0001$ with χ^2 vs. patients with lymph node metastases.
§Metastases with no ^{131}I uptake.
¶$p = 0.04$ with χ^2 vs. patients <40 yr of age.
d/t WBS = whole-body scan with either diagnostic (d) or therapeutic (t) ^{131}I dose; Tg = thyroglobulin.

first phase of follow-up. We routinely used both techniques to increase the whole-body scan sensitivity for metastasis detection (*17*).

The choice of a Tg cutoff of 60 ng/ml can be considered arbitrary but, without established parameters and taking into account the presence of a postsurgical remnant, we chose the normal range of the commercial kit used. In the later phases of follow-up, we considered a cutoff of 5 ng/ml as indicative of absence of metastases.

The range of "uncertainty" of Tg values (between 5 and 60 ng/ml) emphasizes the importance of the whole-body scan, which in this study detected 9 of 19 cases of metastases with Tg values within this range (47.4%) and also 2 of 4 cases with Tg <5 ng/ml (50%).

Some investigators recently indicated the ratio between first Tg level and ^{131}I uptake on the thyroid bed as a prognostic marker (*18*). In our experience, there was no correlation between Tg levels and iodine uptake and, even if both are TSH dependent (*19*), positivity on whole-body scan is more related to TSH level than is Tg value. Also, if many factors other than the presence of a surgical remnant can influence Tg levels, such as recent hyperthyroidism or thyroiditis, endemic goiter or previous surgical shock (*20–22*) or false-negative results (4 patients in this series), our data demonstrate that high Tg levels, even in the presence of thyroid remnant, justify the suspicion of metastases.

In our experience, in patients without metastases, Tg levels can be and remain moderately high for some months after surgery and remnant ablation. This is probably because of a sudden and then prolonged Tg release from thyrocytes after surgery and ^{131}I therapy. These results can be interpretated as false-positive, but in these patients Tg values always decreased to 5 ng/ml or less within 6–12 mo.

The complementary use of first whole-body scan and first Tg measurement offers a good indicator of the presence of metastases, but the importance of radioisotopic remnant ablation must not be underestimated because whole-body scan and Tg results can be fully evaluated only after ablation (*23–25*). High Tg levels can indicate the presence of metastases but not their location, which only whole-body scan can identify, providing information for ^{131}I therapy.

CONCLUSION

After total thyroidectomy both whole-body scan and Tg measurement must always be performed. In the presence of residual tissue, combined analysis of results can provide a reliable and early indication of the presence of metastases.

Thyroidectomy must be as complete as possible and followed by radioisotopic remnant ablation to accurately assess whole-body scan and Tg results.

Finally, for early evaluation of disease in clinical practice, we suggest the following outline:

1. If the first whole-body scan is positive, regardless of Tg results, the presence of metastases is certain.
2. If the first whole-body scan is negative:
   a. metastases are rare with Tg values <5 ng/ml;
   b. metastases are possible (predominantly lymph node) with Tg values between 5 and 60 ng/ml;
   c. metastases are probable (predominantly distant, age >40 yr and non-^{131}I uptaking) with Tg values >60 ng/ml.

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REFERENCES

1. Schlumberger M, Fragu P, Parmentier C, Tubiana M. Thyroglobulin assay in the follow-up of patients with differentiated thyroid carcinomas: comparison of its value in patients with or without normal residual tissue. *Acta Endocrinol* 1981;98:215–221.
2. Blahd WH, Drickman MV, Porter CW, Hill VA, Baumgartner WA. Serum thyroglobulin, a monitor of differentiated thyroid carcinoma in patients receiving thyroid suppression therapy: concise communication. *J Nucl Med* 1984;25:673–676.
3. Lindegaard MW, Paus E, Hore J, Kullman G, Stenwig AE. Thyroglobulin radioimmunoassay and ^{131}I scintigraphy in patients with differentiated thyroid carcinoma. *Acta Chir Scand* 1988;154:141–145.
4. Schlumberger M, Travagli JP, Fragu P, Gardet P, Lumbroso J, Parmentier C. Follow-up of patients with differentiated thyroid carcinoma. Experience at Institut Gustave Roussy, Villejuif. *Eur J Cancer Clin Oncol* 1988;2:345–350.
5. Allanic H. Cancer differencié de la thiroide. Ethiopathogenie, anatomopathologie, diagnostic, traitement. *Rev Prat (Paris)* 1992;42:263–266.
6. Lubin E, Mechlis-Frish S, Zatz S, et al. Serum thyroglobulin and iodine-131 whole-body scan in the diagnosis and assessment of treatment for metastatic differentiated thyroid carcinoma. *J Nucl Med* 1994;35:257–262.
7. Spies WG, Wojtowicz CW, Spies SM, Shah AY, Zimmer AM. Value of post-therapy whole body ^{131}I imaging in the evaluation of patients with thyroid carcinoma having undergone high-dose ^{131}I therapy. *Clin Nucl Med* 1989;14:793–800.
8. Attie JN, Bock G, Moskowitz GW, Margouleff D, Dubner S. Postoperative radioactive iodine evaluation of total thyroidectomy for thyroid carcinoma: reappraisal and therapeutic implications. *Head Neck* 1992;14:297–302.

9. Sherman SI, Tielens ET, Sostre S, Wharam MD Jr, Ladenson PW. Clinical utility of post-treatment radioiodine scans in the management of patients with thyroid carcinoma. *J Clin Endocrinol Metab* 1994;78:629–634.
10. Thoresen SO, Myking O, Glattre E, Rootwelt K, Andersen A, Foss OP. Serum thyroglobulin as preclinical tumour marker in subgroups of thyroid cancer. *Br J Cancer* 1988;57:105–108.
11. Panza N, Lombardi G, De Rosa M, Pacilio G, Lapenta L, Salvatore M. High serum thyroglobulin levels—diagnostic indicators in patients with metastases from unknown primary sites. *Cancer* 1987;60:2233–2236.
12. De Vathaire F, Blanchon S, Schlumberger M. Thyroglobulin level helps to predict recurrence after lobo-isthmusectomy in patients with differentiated thyroid carcinoma. *Lancet* 1988;2:52–53.
13. McHenry CR, Rosen IB, Walfish PG. Prospective management of nodal metastases in differentiated thyroid cancer. *Am J Surg* 1991;162:353–356.
14. Mazzaferri EL. Treating differentiated thyroid carcinoma: where do we draw the line? [Editorial]. *Mayo Clin Proc* 1991;66:105–111.
15. Tenenbaum F, Corone C, Schlumberger M, Parmentier C. Thyroglobulin measurement and postablative iodine-131 total body scan after total thyroidectomy for differentiated thyroid carcinoma in patients with no evidence of disease [Letter]. *Eur J Cancer* 1996;32A:1262.
16. Ronga G, Fiorentino A, Paserio E, et al. Can iodine-131 whole-body scan be replaced by thyroglobulin measurement in the postsurgical follow-up of differentiated thyroid carcinoma? *J Nucl Med* 1990;31:1766–1771.
17. Pacini F, Lippi F, Formica N, et al. Therapeutic doses of iodine-131 reveal undiagnosed metastases in thyroid cancer patients with detectable serum thyroglobulin levels. *J Nucl Med* 1987;28:1888–1891.
18. Grunwald F, Menzel C, Fimmers R, Zamora PO, Biersack HJ. Prognostic value of thyroglobulin after thyroidectomy before ablative radioiodine therapy in thyroid cancer. *J Nucl Med* 1996;37:1962–1964.
19. Edmonds CJ, Kermode JC. Thyrotropin receptors, tumour radioiodine concentration and thyroglobulin secretion in differentiated thyroid cancer. *Cancer* 1985;52:537–541.
20. Ericcson UB, Tegler L, Lennquist S, Borup Christensen S, Stahl E, Thorell JI. Serum thyroglobulin in differentiated thyroid carcinoma. *Acta Chir Scand* 1984;150:367–375.
21. Ryff de Lèche A, Staub JJ, Kolmer-Faden R, Muller-Brand J, Heitz PU. Thyroglobulin production by malignant thyroid tumors. An immunocytochemical and radioimmunoassay study. *Cancer* 1986;57:1145–1153.
22. Aiello DP, Manni A. Thyroglobulin measurement vs. iodine-131 total body scan for follow-up of well-differentiated thyroid cancer. *Arch Intern Med* 1990;150:437–439.
23. Ruiz Garcia J, Ruiz de Almodovar JM, Olea N, Pedraza V. Thyroglobulin level as a predictive factor of tumoral recurrence in differentiated thyroid cancer. *J Nucl Med* 1991;32:395–398.
24. Ronga G, Fiorentino A, Fragasso G, Fringuelli FM, Todino V. Complementary role of whole body scan and serum thyroglobulin determination in the follow-up of differentiated thyroid carcinoma. *Ital J Surg Sci* 1986;16:11–15.
25. Blahd WH. Management of thyroid cancer. *Compr Ther* 1993;19:197–202.

Influence of Scanning Doses of Iodine-131 on Subsequent First Ablative Treatment Outcome in Patients Operated on for Differentiated Thyroid Carcinoma

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The therapeutic outcome after ^{131}I first ablative treatment in patients operated on for nonmedullary differentiated thyroid carcinoma was compared after both the currently used scanning dose of 111 MBq ^{131}I and a scanning dose of 37 MBq ^{131}I. **Methods:** Two-hundred twenty-nine consecutive patients with no known metastases were retrospectively studied. They were divided in two populations according to the scanning dose (127 patients with 111 MBq and 102 patients with 37 MBq). All patients received 111 or 37 MBq ^{131}I for diagnostic purposes and 3.7 GBq ^{131}I for ablative therapy 9 days later. To assess the efficacy of the treatment, all patients were studied with ^{131}I and with thyroglobulin plasma assays 6–17 mo later. **Results:** Successful outcome was significantly more frequent after a scanning dose of 37 MBq ^{131}I than after a scanning dose of 111 MBq (76% versus 50%, $p < 0.001$). The treatment efficacy was particularly enhanced after 37 MBq in patients with associated lymphocytic thyroiditis. **Conclusion:** In patients with no known metastases, our data suggest that the impairment of the treatment efficacy observed after a scanning dose of 111 MBq ^{131}I is related to a stunning effect on the thyroid remnants. The threshold amount above which this effect begins to occur in thyroid remnants could be between 37 and 111 MBq ^{131}I. Consequently, a scanning dose of only 37 MBq ^{131}I could be recommended before first ablative treatment. The absence of metastatic patients in our study prevents any conclusion about the possible stunning of the neoplastic tissue. Nevertheless, we must suspect such an effect and try to avoid it, especially during follow-up after first radioiodine therapy. For instance, one may consider postponing radioiodine treatment several weeks or even months after scanning dose administration or using only thyroglobulin measurement for patients who are likely to receive a subsequent radioiodine treatment.

Key Words: iodine-131 treatment; thyroid cancer; scanning dose; stunning effect

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Despite some controversies, radioiodine treatment is frequently performed after total or subtotal thyroidectomy for nonmedullary differentiated thyroid cancer even if radioiodine accumulation is limited to the thyroid bed and is not specific for tumor (*1–7*). The success of the ^{131}I ablative treatment depends on different factors (such as size of the remnants, thyroid-stimulating hormone (TSH) stimulation, iodine diet, etc.), and currently accepted guidelines have recently been published on this issue (*8–10*). One of these guidelines concerns the scanning dose to use before possible ^{131}I treatment. A dose of no more than 74–185 MBq is advocated because higher doses have been shown to impair the ability of the remnant tissue to take up the subsequent therapeutic dose of ^{131}I (*11,12*). The purpose of this study is to know if this impairment, the so-called stunning effect, could appear with the currently used scanning dose of 111 MBq ^{131}I and could reduce the efficacy of subsequent radioiodine treatment. This is a retrospective study on two consecutive populations, the first treated after a scanning dose of 111 MBq ^{131}I, the second after a scanning dose of 37 MBq ^{131}I.

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