

Research Article

Management of Hyperthyroidism in Senegal with Radioactive Iodine (Radioiodine Therapy): A Study of 142 Cases

Thiaw Gora^{1, 2, *} , **Ki Thierry Romuald³** , **Boye Adji Thioro^{1, 2}**,
Djigo Mamoudou Salif^{1, 2}, **Gueye Kalidou¹**, **Diop Ousseynou^{2, 4}**,
Bathily El Hadji Amadou Lamine^{1, 2}, **Ndong Boucar^{2, 4}**

¹Nuclear Medicine Department, Idrissa Pouye General Hospital, Dakar, Senegal

²Faculty of Medicine, Pharmacy and Odontology, Cheikh Anta Diop University, Dakar, Senegal

³Fundamental and Mixed Sciences Department, Institute of Health Sciences, Nazi Boni University, Bobo-Dioulasso, Burkina Faso

⁴Nuclear Medicine Department, Dalal Jamm Hospital, Dakar, Senegal

Abstract

Introduction: Hyperthyroidism encompasses all the clinical and biological manifestation associated with overactivity of the thyroid gland. In Senegal, epidemiological data enabling an estimate of the overall prevalence of hyperthyroidism remain limited. However, studies conducted in our own centers point to a high prevalence of hyperthyroidism relative to other thyroid disorders, with a clear female predominance. In our country, it is generally offered as a second-line treatment, following the use of ATDs. Our main objective was to assess the place of this treatment in managing hyperthyroidism in adults in our setting. **Patients and Methods:** We conducted a retrospective, descriptive study from January 2016 to December 2022, involving 142 patients with hyperthyroidism treated with radioiodine therapy at the Department of Nuclear Medicine, Idrissa POUYE General Hospital, Dakar. Radioiodine therapy was administered according to established indications and after exclusion of contraindications and obtaining informed consent. Treatment was performed on an outpatient basis, with radiation protection instructions provided to all patients. An ablative dose was preferred to optimise therapeutic efficacy. Clinical and laboratory assessment was performed at 6 and 12 months. **Results:** The mean age was 42.7 years $\pm$ 13.05 years, with ages ranging from 16 to 72 years. There was a clear predominance of female, corresponding to a sex ratio of 0.23. The 31- 45 age group was the most represented, accounting for 43.5% of patients. Graves' disease was the most common etiology, found in 128 patients. Seven patients had TMG ; 2 had TA ; one had a pre-toxic left lobar nodule ; and 4 had hyperthyroidism of undetermined etiology. Radioiodine therapy was prescribed as second-line treatment in 98% of cases. The mean interval between discontinuation of ATDs and radioiodine administration was 12.5 days, ranging from 2 to 90 days. The average activity of iodine-131 administered using an empirical approach was 16.53 mCi. At 6 months, 23.07% of patients were euthyroid, 50.77% were hypothyroid, 13.84% remained hyperthyroid, and 12.30% showed clinico-biological discordance. Therapeutic efficacy at 6 months was 73.84%. Following a second dose in 9 patients and continued monitoring of the remainder, the overall success rate reached 85.38% at 12 months. **Conclusion:** Radioiodine therapy is an effective and well-tolerated treatment option for the management of hyperthyroidism. In our series, its efficacy was 85.38% at 12 months. These results confirm its value in the Senegalese context, particularly in Graves' disease, and support the wider adoption of this treatment.

*Correspondence: Thiaw Gora (mohametgora0@gmail.com)

Received: 21 September 2026; **Accepted:** 4 October 2026; **Published:** 23 October 2026



Copyright: © The Author(s), 2026. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

Keywords

Radioiodine Therapy, Management, Hyperthyroidism

1. Introduction

Hyperthyroidism encompasses the clinical and biological manifestations associated with excessive production of thyroid hormones. Its epidemiology remains poorly documented. Its prevalence is estimated to be between 0.1 and 4 per cent in the United States and Europe, with a higher incidence among women. In sub-Saharan Africa, particularly in Senegal, overall epidemiological data remain limited, although some studies report a high prevalence of hyperthyroidism amongst thyroid disorders [1, 2].

Graves' disease is the main cause, followed in particular by toxic multinodular goiter, toxic adenomas and thyroiditis. Management relies primarily on antithyroid drugs (ATDs), surgery and radioiodine therapy, the role of which varies according to context and clinical practice [3].

Radioiodine therapy is an effective, safe and simple treatment option for hyperthyroidism. Its use is increasing in Africa, particularly in Morocco and Senegal [4, 5]. In Senegal, it is mainly offered as a second-line treatment following antithyroid drugs. However, access to it remains limited by constraints relating in particular to cost and availability.

Since 2016, radioiodine therapy has taken on an increasingly prominent role in Senegalese treatment algorithms for hyperthyroidism.

The main objective of our study was to assess the role of radioiodine therapy in the management of hyperthyroidism in Senegal.

2. Patients and Methods

This was a retrospective, descriptive study conducted over a 7-year period, from January 2016 to December 2022, based on the records of patients with hyperthyroidism treated with radioiodine therapy at the Nuclear Medicine Department of Idrissa Pouye General Hospital.

For each patient, the following data were collected:

- 1) age, sex, and etiological diagnosis of hyperthyroidism
- 2) whether radioiodine therapy was prescribed as first-, second-, or third-line treatment
- 3) thyroid ultrasound findings
- 4) thyroid scintigraphy findings prior to radioiodine administration
- 5) the interval between discontinuation of medical treatment and radioiodine administration
- 6) the administered iodine-131 activity, in millicuries (mCi)
- 7) therapeutic response at 3, 6, and 12 months, based on

clinical and biological monitoring (ultrasensitive TSH and FT4)

Data were entered and analyzed using SPSS (Statistical Package for the Social Sciences), and graphs were produced with Microsoft Excel 2013.

For all patients, therapeutic doses of radioiodine were administered under the following conditions:

- 1) After discontinuation of antithyroid drugs (in previously treated patients), a washout period of 5 to 7 days was targeted.
- 2) Iodine intake was to be avoided during the month preceding treatment (seafood, iodine-containing medications, contrast-enhanced CT scans).
- 3) Thyroid hormone levels were checked immediately before radioiodine administration.
- 4) An empirical dose averaging around 15 mCi was targeted, adjusted according to the patient's age, thyroid volume, severity of hyperthyroidism, and socioeconomic circumstances. Higher doses were generally reserved for patients living far from the center and those of lower socioeconomic status, with the aim of promptly achieving hypothyroidism a state more easily managed with hormone replacement therapy.
- 5) Treatment was administered as a single oral capsule, taken on an empty stomach in the "hot" room; the patient then returned home. No hospitalization was required.
- 6) Radiation-safety measures were explained to the patient both before and after radioiodine administration.
- 7) After treatment, each patient received a treatment report, follow-up test results, and written guidance on the radiation-safety precautions to be observed.

Follow-up was carried out jointly by the referring physician and the nuclear medicine physician, with measurement of ultrasensitive TSH and FT4 at 3 and 6 months after Iodine-131 administration, and beyond (up to 12 months) when needed. Thus, treatment was considered effective when the patient's condition progressed towards euthyroidism or hypothyroidism. The persistence of hyperthyroidism, on the other hand, was regarded as a treatment failure.

3. Results

A total of 142 patients treated with radioactive iodine for hyperthyroidism were included over the study period.

3.1. Age

The mean age of patients was 42.7 years $\pm$ 13.05 years, ranging from 16 to 72 years. The 31- 45 age group was the most

represented, accounting for 43.5% of patients (Figure 1).

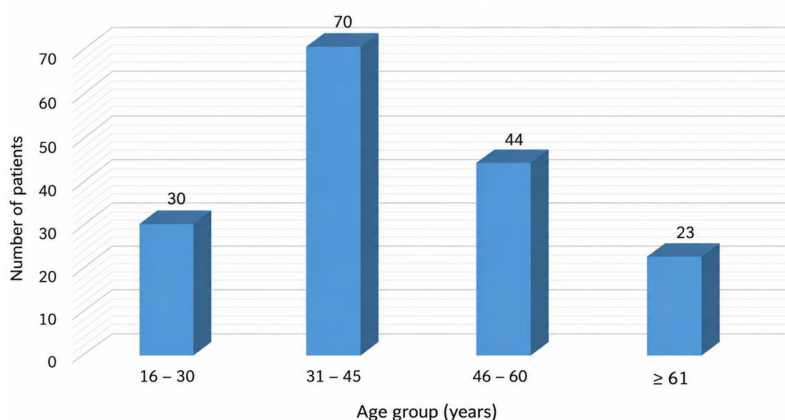


Figure 1. Distribution of patients by age group.

3.2. Sex

Our series showed a clear female predominance: 115 women (81%), corresponding to a male-to-female ratio of 0.23.

3.3. Pre-treatment Imaging

Seventy patients underwent thyroid ultrasound. Among them, 28.7% had a hypervascular goiter; the remaining patients showed a range of other ultrasound findings, in varying proportions, as shown below (Figure 2). Thyroid gland volume on ultrasound ranged from 10 to 67.77 cm³ with a mean of 29.7 cm³.

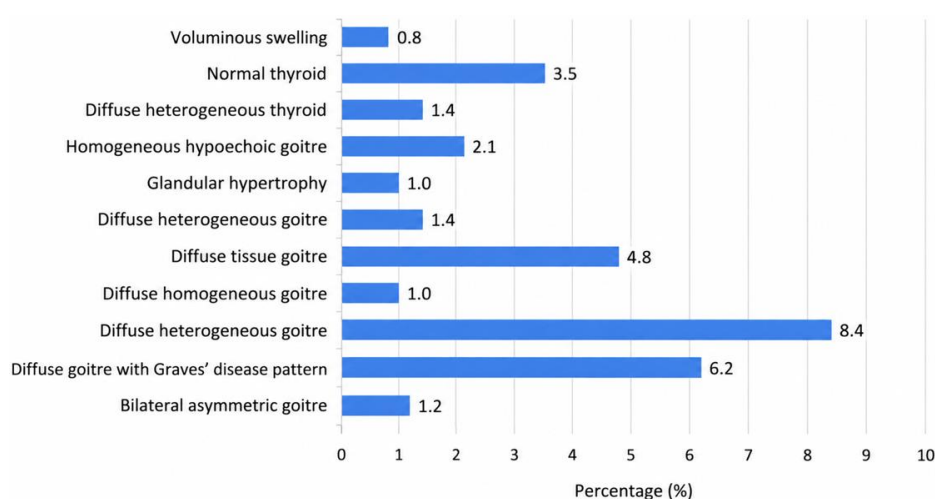


Figure 2. Cervical ultrasound findings by patient.

A thyroid scintigraphy had been performed in 99 patients (69.7%). It revealed homogeneous and diffuse uptake, consistent with Graves' disease, in 66.22% of cases. The thyroid weight estimated by scintigraphy ranged from 15.3 to 88 g,

with a mean of 38.02 g. Diagnostic concordance between the findings of the thyroid scintigraphy and those of the cervical ultrasound was found in 23.2% of cases.

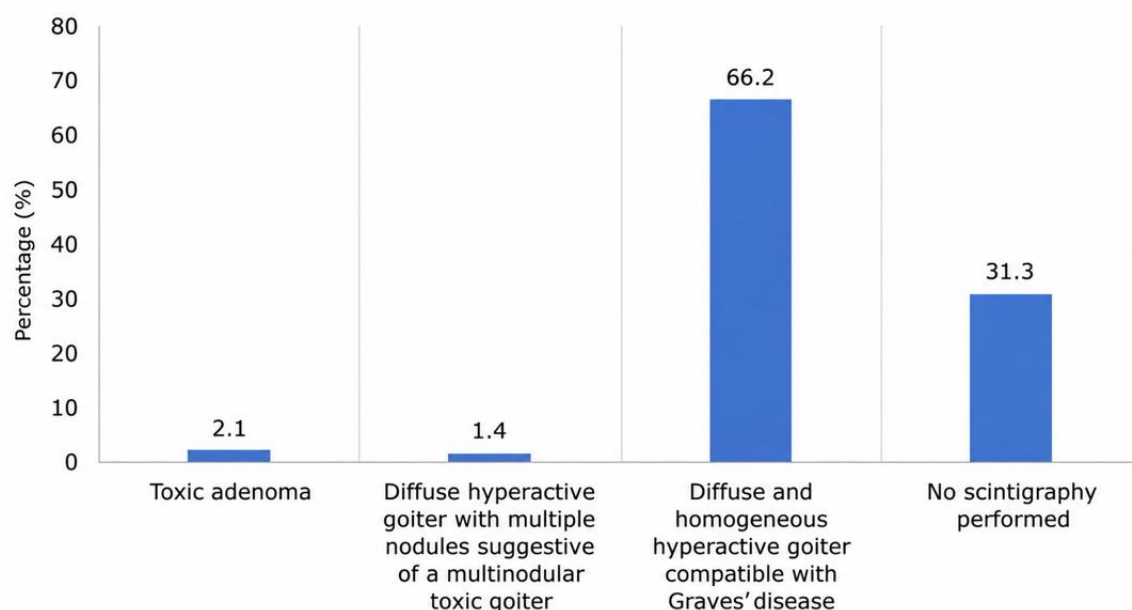


Figure 3. Proportion of patients by thyroid scintigraphy finding.

3.4. Etiological Diagnosis of Hyperthyroidism

Graves' disease was the most common etiology, accounting

for 128 patients (90%), followed by toxic multinodular goiter (4.92%), toxic adenoma (1.40%), and pre-toxic nodule (one case). No etiology was identified in 4 cases of hyperthyroidism.

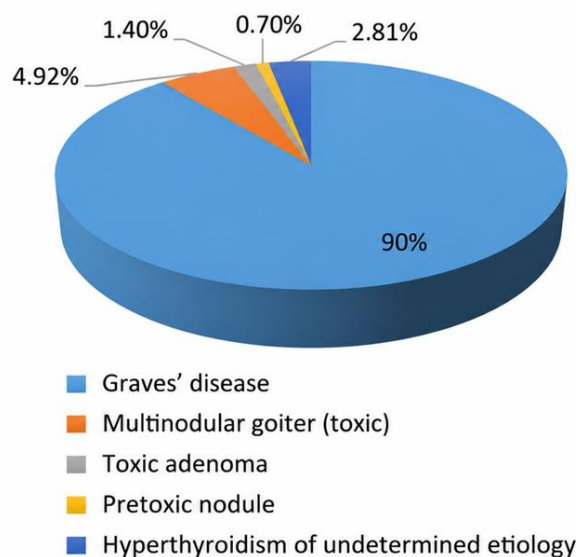


Figure 4. Distribution of patients by etiology of hyperthyroidism.

3.5. Indications for Radioiodine Therapy

Radioiodine therapy was prescribed as second-line treatment in 98% of cases. Eighteen patients (12.6%) had achieved only incomplete remission after treatment with antithyroid drugs, 11 patients had relapsed while on antithyroid drugs, one

patient was intolerant to antithyroid drugs, and one patient was resistant to antithyroid drugs. In 2% of cases, radioiodine was indicated as third-line treatment for persistent hyperthyroidism after partial thyroidectomy. The figure below shows the distribution of patients by indication, as recorded on referral forms.

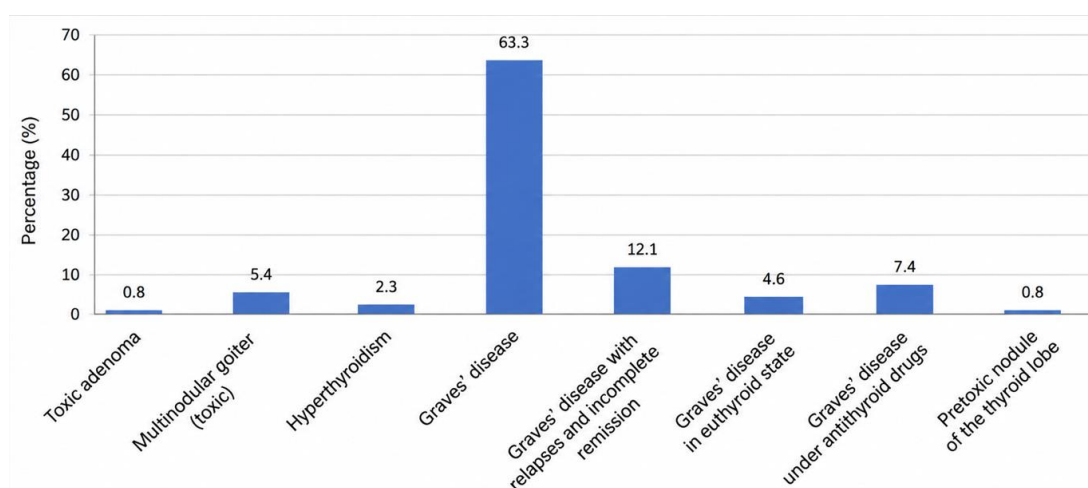


Figure 5. Distribution of patients by indication, as recorded by the referring physician.

3.6. Interval Between Discontinuation of Antithyroid Drugs and Radioiodine Administration

The mean interval between discontinuation of antithyroid drug treatment and radioiodine administration was 12.5 days, ranging from 2 to 90 days. Most patients had been treated with Thyrozol (45.3%), followed by Carbimazole (“Carbigen”) (21.1%) and Neo-Mercazole (22%). The study population was divided into six subgroups according to the length of this interval.

The table below shows the distribution of patients according to the interval between discontinuation of antithyroid drugs and radioiodine administration.

Table 1. Distribution by interval since antithyroid drug discontinuation.

Interval	Number of patients	Percentage (%)
2 to 6 days	25	17.5
7 to 14 days	60	42
15 to 21 days	5	3.5
1 month	10	7
2 months	2	1.4
3 months	2	1.4

Interval	Number of patients	Percentage (%)
Total	104	72.8
Not specified	38	26.6

3.7. Radioiodine Dose

Mean administered iodine-131 activity was 16.53 mCi, ranging from 9.63 to 22.02 mCi.

3.8. Therapeutic Evaluation at 6 Months

Overall, follow-up results at 6 months (n = 130; 12 patients lost to follow-up) showed:

- 1) 23.07% of patients euthyroid (n = 30);
- 2) 50.77% of patients hypothyroid (n = 66);

The therapeutic efficacy assessed six months after radioiodine therapy was 73.84%.

3.84% of patients remained hyperthyroid (n = 18), and 12.30% showed clinico-biological discordance (n = 16).

Clinical-biological discordance: persistence or improvement in the clinical manifestations of hyperthyroidism whilst laboratory parameters (serum TSH and/or FT4) do not correspond to the clinical condition, or vice versa.

The figure below shows the distribution of patients by clinical and biological status after 6 months of post-treatment follow-up.

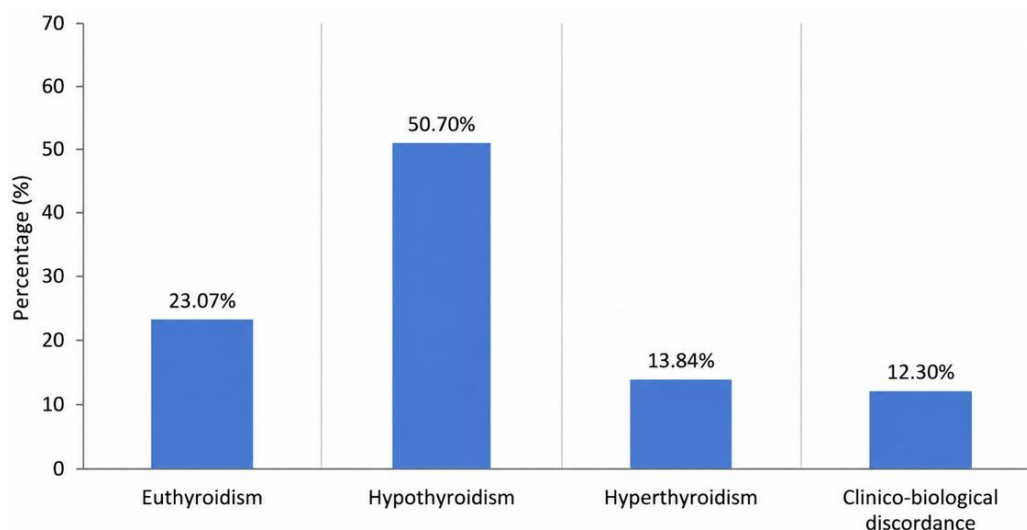


Figure 6. Therapeutic evaluation at 6 months.

A second course of radioiodine therapy was indicated for nine patients who continued to suffer from hyperthyroidism following their first course of radioiodine therapy. All achieved hypothyroidism within 3 months of the second dose, for a 100% success rate in this subgroup. Six patients (4 with discordance, 2 with persistence) became hypothyroid after follow-up was extended to 12 months.

Overall success rate at 1 year: 85,38% ($n=30+66+9+6=111$ patients).

4. Discussion

In our series, 142 patients underwent radioiodine therapy. This sample size appears relatively small given the likely higher number of patients with hyperthyroidism in our setting [6].

In Senegal, epidemiological data on the overall prevalence of hyperthyroidism and its clinical management remain limited, making it difficult to assess the true role of radioiodine therapy at a national level.

4.1. Age

In our series, the mean age of patients was 42.7 ± 13.05 years, ranging from 16 to 72 years. These results were comparable to those reported in other African studies, which found similar mean ages [4, 7, 8]. In the study by S. El Issami et al. [9], which focused on the treatment of hyperthyroidism with iodine-131, the mean age was 49.5 years, with the 40–49 age group being the most common. In our series, the most common age group was 31–45 years.

4.2. Sex

The higher prevalence of hyperthyroidism in women is widely reported in the literature. Our findings are consistent

with those of several studies carried out in Senegal and internationally, which have found a higher prevalence in women, with sex ratios varying according to the populations studied and the sample sizes [4, 7–10]. However, N. El Ghissassi et al. [11] reported a male predominance, accounting for 54% of patients, in their study conducted at the endocrinology department of the Mohamed V Military Hospital in Rabat.

4.3. Pre-treatment Imaging

Modern diagnostic methods for hyperthyroidism rely in particular on thyroid imaging, specifically ultrasound and thyroid scintigraphy. The latter can be performed using iodine-123 (^{123}I) or technetium-99m ($^{99\text{m}}\text{Tc}$) [12].

In our series, thyroid scintigraphy was performed using $^{99\text{m}}\text{Tc}$, which enabled, in particular, the assessment of thyroid uptake in patients. According to several guidelines, scintigraphy is an important investigation in the etiological work-up of hyperthyroidism and may be recommended as a first-line investigation in certain clinical situations [13]. Cappelli et al., in their study on the role of imaging in Graves' disease, suggest that cervical ultrasound should be used first-line, consistent with our own practice [14]. Seventy of our patients underwent cervical ultrasound, yielding a mean thyroid volume of 29.7 cm^3 ; while 99 patients underwent thyroid scintigraphy, with a mean weight of 38.02 g. Diagnostic concordance between cervical ultrasound and thyroid scintigraphy was found in 23.2% of cases.

Wesche et al. [15] compared ultrasound and thyroid isotopic scan measurement of thyroid volume in patients referred for iodine-131 treatment and reported findings like ours.

Thyroid isotopic scan evaluation of the thyroid gland also allows assessment of iodine-131 uptake and distribution and remains the most accurate method for diagnosing hyperthyroidism.

4.4. Etiological Diagnosis of Hyperthyroidism

The main causes of hyperthyroidism are Graves' disease, toxic multinodular goiter and toxic adenoma. Their prevalence varies depending on the populations studied and the characteristics of the case series.

In our study, Graves' disease was by far the most common, accounting for 90% (128 patients) of cases, followed by toxic multinodular goiter (4.92%) and toxic adenoma (1.40%). One case of a pre-toxic nodule in the left lobe was also identified.

These results differed from those reported by S. El Issami et al. [9], who found a more diverse distribution of etiologies: Graves' disease (60%), toxic adenoma (20%), toxic multinodular goiter (13%), pre-toxic adenoma (4%) and Graves'-like nodular goiter (3%). This study thus reported a higher proportion of toxic adenomas than of toxic multinodular goiters, in contrast to our series.

This ranking of etiologies was also reported by Nwatsock et al. in their study on the indications and 6-month efficacy of fixed-activity ablative radioiodine therapy for hyperthyroidism in Yaoundé [16]. Beslic et al. [17] studied the prevalence of hypothyroidism after radioiodine therapy according to the etiology of hyperthyroidism and the therapeutic dose; their study reported a high proportion of toxic adenoma (56%), followed by Graves' disease (19%) and toxic multinodular goiter (7%), with unknown etiologies notably frequent (14%) and a small proportion of post-surgical relapse (4%).

Graves' disease remains the leading etiology in our region; however, other causes of hyperthyroidism are far from negligible, underscoring the need for a thorough diagnostic work-up to identify the underlying etiology and optimize treatment response.

4.5. Indications for Radioiodine Therapy

The treatment of hyperthyroidism with radioiodine therapy is one of the oldest therapeutic applications of nuclear medicine. According to the literature, radioiodine therapy is mainly used as a second-line treatment in Europe and Africa, whilst it is regarded as the standard treatment option in the United States [18]. Several studies report a preference for using radioiodine therapy as a second-line treatment in the management of hyperthyroidism, particularly in Graves' disease. This trend was observed in the work of I. El Bez et al. [19], El Issami et al. [9], Seck [7] and Bathily et al. [20]. Conversely, Aschawa H et al. [21] reported the use of radioiodine therapy as first-line treatment in only 3% of patients with Graves' disease, notably in one patient with Behçet's disease who refused surgery. Furthermore, Wong K. K et al., in a study conducted at the University of Michigan on the efficacy of a calculated single dose of iodine-131 in Graves' disease, reported that iodine therapy was the first-line treatment in 56.6 per cent of patients [22]. These data illustrate the differences in therapeutic practices across countries, recommendations and the characteristics of the populations studied.

Sellem et al. [5] found that 9.3% of patients received radioiodine as first-line treatment, versus 90.7% as second-line.

In our study, radioiodine was used as second-line treatment in 98% of cases, following incomplete remission in 21 patients, resistance to antithyroid drugs in 13 patients, and intolerance to antithyroid drugs in the remainder.

Similar findings were reported by Aschawa et al. [21] in Morocco, where 43% of cases followed failure of medical treatment and 13% followed intolerance to medical treatment.

4.6. Interval Between Discontinuation of Antithyroid Drugs and Radioactive Iodine Administration

Discontinuing antithyroid drug treatment before radioiodine therapy is a key step in the treatment process. In our study, the mean interval was 12.5 days, ranging from 2 to 90 days.

There is no consensus on the optimal interval between discontinuing ATDs and administering radioiodine. Recommendations therefore vary between countries and professional bodies. The American Thyroid Association (ATA) and the European Thyroid Association recommend a minimum interval of 7 days [17]. The French Society of Nuclear Medicine and Molecular Imaging (SFMN), for its part, recommends a period of between 4 and 10 days prior to radioiodine therapy [23]. In South Korea, the study by Park H et al. [12] reports a recommended interval of 3 to 5 days. Furthermore, a meta-analysis of 14 randomised studies involving 1,306 patients, conducted by Walter M. A et al. [13] in 2007, concluded that the optimal interval is 3 to 7 days between discontinuing ATDs and radioiodine therapy. If this is not possible, an increase in the iodine-131 dose may be considered. Continuing ATDs treatment during the week preceding or following iodine therapy could indeed increase the risk of treatment failure and reduce the rate of post-treatment hypothyroidism [13]. Kartamihardja et al. [24] divided their cohort into three groups based on antithyroid drug management: an interval greater than 3 days, an interval of 3 days or less, and no antithyroid pretreatment at all. Their results were better than ours, with therapeutic success rates of 79%, 57%, and 90% in the three groups, respectively. This variation reflects the influence of antithyroid drugs on radioiodine efficacy and may explain why some countries favor radioiodine as first-line treatment.

4.7. Radioiodine Dose

Determining the activity of iodine-131 to be administered remains a long-standing topic of debate. Two main approaches are described in the literature: the administration of a fixed or empirical activity, and the use of an activity calculated on the basis of parameters such as the weight or volume of the thyroid gland, its iodine uptake rate and the physical half-life of the radionuclide.

In our study, an empirical dose of iodine-131 was administered, with a mean of 16.56 mCi and a range of 9.63 to 22.02

mCi. The choice of dose took into account, in particular, the patient's age, thyroid volume and the degree of hyperthyroidism. This average activity was comparable to that reported in several Tunisian studies [5, 25, 26]. At six months, a single course of radioiodine therapy resulted in remission in 61.5% of cases. This result is comparable to those reported in other studies, in which a single course of treatment resulted in remission in the majority of patients [26, 27].

4.8. Therapeutic Efficacy at 6 Months

Six months into treatment, 23.07% of patients were euthyroid, 50.70% were hypothyroid, whilst 13.84% continued to present with hyperthyroidism and 12.30% showed a clinical-biological discordance. The treatment success rate at six months was 73.84%. These results were slightly lower than those reported by Rezgani et al. [26], who found a therapeutic efficacy of 79.5% at six months following radioiodine therapy. Other studies [4, 5, 28, 29] also reported higher success rates

at six months, with a low proportion of persistent hyperthyroidism. These different results are compared in Table 2. Beyond six months, several authors, notably Choukry et al. [25] and Oueslati et al. [30], reported therapeutic efficacy at one year, with a predominance of hypothyroidism. Boelaert et al. [31], in their study on predicting cure and the risk of hypothyroidism in patients treated with radioiodine for hyperthyroidism, reported a high success rate with high fixed doses, at the cost of an increased rate of hypothyroidism (with 600 MBq, an 84% success rate was achieved, alongside 60% hypothyroidism at one year). That same study identified male sex, severe hyperthyroidism, and large goiters as risk factors for treatment failure, requiring higher doses to achieve cure.

In our study, the success rate at 12 months was 85.38%, like that reported by Boelaert et al., whose study likewise addressed radioiodine therapy for hyperthyroidism in general. These findings support close post-treatment monitoring, particularly in patients with clinico-biological discordance, to avoid unnecessary repeat dosing.

Table 2. Summary of selected studies on the long-term efficacy of radioiodine therapy in hyperthyroidism.

Authors	Sample size	Follow-up	Therapeutic efficacy
Our study	130	6 months	73.84%
El Issami S et al. [9], 2011	N=280	6 months	92% GD; 98% TA; 97% TMG
Lounissi N et al. [9], 2017	N=21	6 months	86% TMG
Fieffe S et al. [32], 2009	N=40	6 months	94% Hyperthyroidism
Feleh EE et al. [33], 2017	N=70	7 months	84% GD
Boelaert K et al. [31], 2009	N=1278	12 months	84% Hyperthyroidism
Sellem A et al. [5], 2020	N=54	12 months	88.88% GD
Our study	N=130	12 months	85.38% Hyperthyroidism

(TA = toxic adenoma; TMG = toxic multinodular goiter; GD = Graves' disease)

5. Conclusion

Radioiodine therapy is an effective, safe and well-tolerated treatment option for the management of hyperthyroidism. In our Senegalese series of 142 patients, it was mainly used as a second-line treatment, with Graves' disease being the predominant condition. These results confirm the value of radioiodine therapy in our setting and highlight the importance of long-term clinical and laboratory follow-up, particularly given the gradual progression towards hypothyroidism and the possibility of persistent hyperthyroidism requiring a second course of treatment. In Senegal, the development of radioiodine therapy therefore appears relevant for improving the management of hyperthyroidism, particularly Graves' disease. Its accessibility

and its role in the therapeutic strategy could be strengthened, taking into account the indications, the clinical characteristics of patients and the available resources.

Abbreviations

ATA	American Thyroid Association
ATDs	Antithyroid Drugs
FT4	Free Thyroxine
GD	Graves's Disease
¹²³ I	Iodine-123
mCi	Millicurie
MBq	Megabecquerel
TA	Toxic Adenoma
^{99m} Tc	Technetium-99m
TMG	Toxic Multinodular Goiter

Author Contributions

Thiaw Gora: Conceptualization, Resources

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Prevalence of thyroid disorders at the Medical Biochemistry Laboratory of Aristide Le Dantec Hospital [Internet]. Available at: <http://bibnum.ucad.sn/viewer.php?c=mmoires&d=memm%5f2018%5f0217>
- [2] Therapeutic management of hyperthyroidism in Dakar [Internet]. [cited 29 Jan 2023]. Available at: <http://bibnum.ucad.sn/viewer.php?c=thm&d=thm%5f2021%5f0154>
- [3] Bardet S. 131I Radioiodine therapy in Graves' disease: Us et coutumes, controverses and guidelines. *M édecine Nucl éaire*. 1 Oct 2020; 44(4): 267-71. <https://doi.org/10.1016/j.mednuc.2020.06.001>
- [4] Mbodj M, Guerrouj H, Amjad I, Ben Ra ï NA. Contribution of iodine-131 in the treatment of Graves' disease at the Nuclear Medicine Department of Ibn Sina Hospital, Rabat. *M édecine Nucl éaire*. 1 Oct 2009; 33(10): 592-8. <https://doi.org/10.1016/j.mednuc.2009.07.019>
- [5] Sellem A, Elajmi W, Mhamed RB, Oueslati N, Ouertani H, Hammami H. Radioiodine therapy in Graves' disease: role and efficacy. *The Pan African Medical Journal* [Internet]. 25 Aug 2020 [cited 9 Mar 2023]; 36(341). Available at: <https://doi.org/10.11604/pamj.2020.36.341.21623>
- [6] Diagne N, Faye A, Ndao AC, Djiba B, Kane BS, Ndongo S, et al. [Epidemiological, clinical, therapeutic and evolutive aspects of Basedow-Graves disease in the Department of Internal Medicine at CHU Aristide Le Dantec, Dakar (Senegal)]. *Pan Afr Med J*. 2016; 25: 6. <https://doi.org/10.11604/pamj.2016.25.6.7868>
- [7] Seck EHK. Iodine-131 treatment in Graves' disease: preliminary study at the Nuclear Medicine Department of Grand Yoff General Hospital (HOGGY), Dakar [Internet]. [Dakar]: Cheikh Anta Diop University of Dakar; [cited 28 Apr 2023]. Available at: <http://bibnum.ucad.sn/viewer.php?c=thm&d=thm%5f2018%5f0282>
- [8] Marin ò M, Latrofa F, Menconi F, Chiovato L, Vitti P. Role of genetic and non-genetic factors in the etiology of Graves' disease. *J Endocrinol Invest*. 1 Mar 2015; 38(3): 283-94. <https://doi.org/10.1007/s40618-014-0214-2>
- [9] El Issami S, Sarroukh F, Elrhoul M, Guerrouj H, Ghfir I, Ben Rais Aouad N. Treatment of hyperthyroidism with iodine-131: a study of 280 cases. *M édecine Nucl éaire*. 1 Oct 2011; 35(10): 528-32. <https://doi.org/10.1016/j.mednuc.2011.08.001>
- [10] Koffi DP, Fagnidi F, Lokrou A, Danho J, Abodo J, Hue A, et al. Hyperthyroidism in Abidjan: Clinical, Biological, Therapeutic and Evolutive Aspects in 399 Cases. *Health Sci Dis* [Internet]. 14 Oct 2019 [cited 29 Apr 2023]; 20(6). Available at: <http://www.hsdfmsb.org/index.php/hsd/article/view/1623>
- [11] El Ghissassi N, Daoudi A, Belmajdoub G, Kabbaj F, El Wadeh I, Sbaiter N. Therapeutic aspects of Graves' disease. *Annales d'Endocrinologie*. 1 Sep 2012; 73(4): 307.
- [12] Park H, Kim HI, Park J, Park SY, Kim TH, Chung JH, et al. The success rate of radioactive iodine therapy for Graves' disease in iodine-replete area and affecting factors: a single-center study [Internet]. Wolters Kluwer; 2020 [cited 10 May 2023]. Available at: <https://doi.org/10.1097/MNM.0000000000001138>
- [13] Walter MA, Briel M, Christ-Crain M, Bonnema SJ, Connell J, Cooper DS, et al. Effects of antithyroid drugs on radioiodine treatment: systematic review and meta-analysis of randomised controlled trials. *BMJ*. 8 Mar 2007; 334(7592): 514. <https://doi.org/10.1136/bmj.39114.670150.BE>
- [14] Cappelli C, Pirola I, De Martino E, Agosti B, Delbarba A, Castellano M, et al. The role of imaging in Graves' disease: a cost-effectiveness analysis. *Eur J Radiol*. Jan 2008; 65(1): 99-103. <https://doi.org/10.1016/j.ejrad.2007.03.015>
- [15] Wesche MF, Tiel-van Buul MM, Smits NJ, Wiersinga WM. Ultrasonographic versus scintigraphic measurement of thyroid volume in patients referred for 131I therapy. *Nucl Med Commun*. Apr 1998; 19(4): 341-6. <https://doi.org/10.1097/00006231-199804000-00008>
- [16] Nwatoock JF, Mbeng AV, Dong-À-Zok F. Indications and 6-Month Efficacy of Fixed Ablative Activity Radioiodine Therapy in Hyperthyroidism in Yaound é *Health Sci Dis* [Internet]. 14 Oct 2019 [cited 1 May 2023]; 20(6). Available at: <https://doi.org/10.5281/hsd.v20i6.1644>
- [17] Beslic N, Licina S, Sadija A, Milardovic R. Incidence of Hypothyroidism after Radioactive Iodine-I131 Treatment in Dependence of Hyperthyroidism Etiology and Therapy Dose. *Med Arch*. Aug 2017; 71(4): 270-3. <https://doi.org/10.5455/medarh.2017.71.270-273>
- [18] Reid JR, Wheeler SF. Hyperthyroidism: diagnosis and treatment. *Am Fam Physician*. 15 Aug 2005; 72(4): 623-30.
- [19] El Bez I, Tulbah R, Alghmlas F, Alharbi M. Role of radioactive iodine in the treatment of Graves' disease in children and adolescents. *Annales d'Endocrinologie*. 1 Sep 2020; 81(4): 224.
- [20] Bathily EHAL, Diop O, Ndong B, Djigo MS, Thiaw G, Gu èye K, et al. Treatment of hyperthyroidism with iodine-131: preliminary activity report from the Nuclear Medicine Department of Grand Yoff General Hospital, Dakar. *M édecine Nucl éaire*. 1 Mar 2020; 44(2): 130-1. <https://doi.org/10.1016/j.mednuc.2020.01.075>
- [21] Aschawa H, Touil S, Shimi Y, Bendaoud H, Meftah S. Hyperthyroidism: short-term efficacy of radioactive iodine treatment. *Revue Marocaine de Santé Publique* [Internet]. 16 Jun 2017 [cited 4 Apr 2023]; 4(6). Available at: <https://doi.org/10.34874/IMIST.PRSM/RMSP/6328>

- [22] Wong KK, Shulkin BL, Gross MD, Avram AM. Efficacy of radioactive iodine treatment of Graves' hyperthyroidism using a single calculated ¹³¹I dose. *Clin Diabetes Endocrinol*. 2018; 4: 20. <https://doi.org/10.1186/s40842-018-0071-6>
- [23] Schwartz C. Guide for drafting treatment protocols for hyperthyroidism with iodine-131 [Internet]. 2006. Available at: www.sfbmn.org
- [24] Kartamihardja AHS, Massora S. The influence of antithyroid drug discontinuation on the therapeutic efficacy of ¹³¹I in hyperthyroidism. *World J Nucl Med*. Apr 2016; 15(2): 81-4. <https://doi.org/10.4103/1450-1147.167584>
- [25] Choukry S, Benouhoud J, Choukry K, Aschawa H, Guensi A. Outcomes of Graves' disease after radioiodine therapy (a study of 78 cases). *Médecine Nucléaire*. 1 May 2018; 42(3): 164. <https://doi.org/10.1016/j.mednuc.2018.03.083>
- [26] Rezgani I, Meddeb I, Yeddeas I, Slim I, Mhiri A, Ben Slimène MF. Comparative study of radioiodine therapy efficacy in Graves' disease and toxic thyroid nodules. *Annales d'Endocrinologie*. 1 Sep 2017; 78(4): 337. <https://doi.org/10.1016/j.ando.2017.07.390>
- [27] Velayoudom FL, Marchandise X, Nocaudie M, d'Herbomez M, Docao C, Bauters C, et al. Iodine-131 as treatment for benign goiters. *La Presse Médicale*. 1 Jan 2005; 34(2, Part 1): 94-100. [https://doi.org/10.1016/S0755-4982\(05\)88235-1](https://doi.org/10.1016/S0755-4982(05)88235-1)
- [28] Hebaili N, El Bez I, Ben Sellem D, Slim I, Eltaief B, Mhiri A, et al. Evolution of Graves' ophthalmopathy after radioiodine therapy: impact of corticosteroid therapy. *Annales d'Endocrinologie*. 1 Sep 2013; 74(4): 349. <https://doi.org/10.1016/j.ando.2013.07.373>
- [29] Charfi N, Ben Mrad N, Trabelsi L, Chtourou K, Smaoui M, Guermazi F, et al. P231 Results of radioactive iodine treatment of Graves' disease (a study of 137 cases). *Annales d'Endocrinologie*. 1 Oct 2005; 66(5): 493. [https://doi.org/10.1016/S0003-4266\(05\)82072-4](https://doi.org/10.1016/S0003-4266(05)82072-4)
- [30] Oueslati I, Khessairi N, Kilani MO, Melki A, Mchirgui N, Khiari K, et al. Autoimmune conditions associated with Graves' disease. *Annales d'Endocrinologie*. 1 Oct 2014; 75(5): 320. <https://doi.org/10.1016/j.ando.2014.07.172>
- [31] Boelaert K, Syed AA, Manji N, Sheppard MC, Holder RL, Gough SC, Franklyn JA. Prediction of cure and risk of hypothyroidism in patients receiving ¹³¹I for hyperthyroidism. *Clinical Endocrinology* 70(1), 129-138, 2009. <https://doi.org/10.1111/j.1365-2265.2008.03291.x>
- [32] Fieffe S, Cuif-Job A, Testard A, Fortun I, Pochart JM, Papathanassiou D, Schwartz C. Treatment of hyperthyroidism with iodine-131: calculated dose versus fixed dose. *Médecine Nucléaire* 33 (2009) 313. <https://doi.org/10.1016/j.mednuc.2009.02.008>
- [33] Feleh EE, Mahjoubi S, Bchir N, Jaidane A, Sellem A, Ouertani H. Role of radioiodine therapy in the treatment of Graves' disease. *Annales d'Endocrinologie*. 1 Sep 2017; 78(4): 326. <https://doi.org/10.1016/j.ando.2017.07.352>