

Ultrasound in Ti-Rads Classification of Thyroid Nodules at the Marie Curie Medical Clinic

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How to cite this paper: Ousmane, T., Siaka, D., Mansa, S.D., Mamadou, N., Aissata, D., Lansanou, B.O., Nagnoumague, C., Modibo, C., Issa, C., Mamadou, D., Traore, S.A. and Diaman, K.A. (2024) Ultrasound in Ti-Rads Classification of Thyroid Nodules at the Marie Curie Medical Clinic. *Open Journal of Medical Imaging*, 14, 114-122.

<https://doi.org/10.4236/ojmi.2024.143012>

Received: July 17, 2024

Accepted: August 31, 2024

Published: September 3, 2024

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Abstract

Introduction: A thyroid nodule is a localized hypertrophy within the thyroid parenchyma. The aim of our study was to study the benefit of ultrasound in the Ti-rads classification of thyroid nodules. **Methodology:** This was a prospective study with a descriptive aim, with prospective collection, which took place over a period of 17 months at the “Marie Curie” medical clinic. The ultrasound machine used was a Voluson E8 from 2011 and the examinations were carried out by two radiologists and two experienced sonographers. The parameters studied were sociodemographic data; clinical data and ultrasound aspects of the Ti-rads classification in the management of nodules. **Results:** We collected 235 patients out of 738 patients referred to the service for a cervical ultrasound, *i.e.* a frequency of 31.84% of cases. There was a female predominance with 95.7% of cases and a sex ratio of 0.04. The average age of our patients was 50 years. We found on cervical ultrasound: Isthmo-lobar glandular hyperplasia in 99 patients, *i.e.* a frequency of 42.1%. The Ti-rads 3 classification was the most represented in 69.4% of cases. The benignity criterion represented 85.6% of cases in our patients and the malignancy criterion represented 14.4% of cases. **Conclusion:** The precise description of a thyroid nodule provided by ultrasound (Ti-rads) is essential in the management of nodules.

Keywords

Ultrasound, Thyroid, Nodules, Ti-Rads, “Marie Curie” Medical Clinic

1. Introduction

A thyroid nodule is a localized hypertrophy within the thyroid parenchyma. This is a common condition in ENT and Head and Neck Surgery practice [1]. The detection of a thyroid nodule is common in the general population. The prevalence of nodules discovered on palpation of the neck varies, depending on sex and age. In 84% of cases, thyroid nodules are asymptomatic and detected incidentally on requested imaging. Of all thyroid nodules discovered, approximately 90% are benign nodules [2]. The ultrasound prevalence is approximately 10 times higher than the clinical prevalence, estimated in France between 11% and 55%. This prevalence is, however, probably underestimated, because most nodules do not cause any clinical manifestation and only approximately 11% - 13% regress spontaneously [3]. Age after 40 years, the presence of nodules is multiplied by five in half of the population over 60 years, sex (four women for one man), iodine deficiency, medical history, genetic factors) [4]. In the United States, the observed prevalences are on average 10% to 50%. In Africa, thyroid pathologies are dominated by goiters and thyroid nodules, followed by hypothyroidism [5] [6]. Ultrasound has become the reference imaging in the detection of thyroid nodules and for positive diagnosis in the search for signs of malignancy and monitoring. In Mali, several studies have focused on pathologies of the thyroid gland in the general population; but few studies have focused on the characteristics of the nodules, hence the initiation of our work, the aim of which was to study the benefit of ultrasound in the Ti-rads classification of thyroid nodules.

2. Methodology

Our study took place in the health structure (Medical Clinic) “Marie-Curie” of commune V in Quartier-Mali of the BAMAKO district in Mali. It was a descriptive study, with prospective collection, which took place over a period of 17 months from June 2022 to November 2023. Our study involved patients of all ages and genders referred to the imaging department for thyroid ultrasound in which the ultrasound results were pathological presenting thyroid nodules. These examinations were performed by a Voluson E8 ultrasound scanner with 3 probes (endovaginal, convex and bar). The 4 - 12 MHz multi-frequency strip probe was used for the examinations. Ultrasound examinations without thyroid nodules were not included in our study. Two experienced radiologists and two sonographers performed the examinations. The data were collected on a pre-established individual survey form based on the examination requests. They were analyzed by SPSS version 25 and Excel 2016 software. The parameters studied were sociodemographic data and clinical and ultrasound data from the Ti-rads classification.

3. Results

In our study, we collected 235 pathological patients out of 738 patients referred to the service for a cervical ultrasound, *i.e.* an overall frequency of 31.84% (Figure 1).

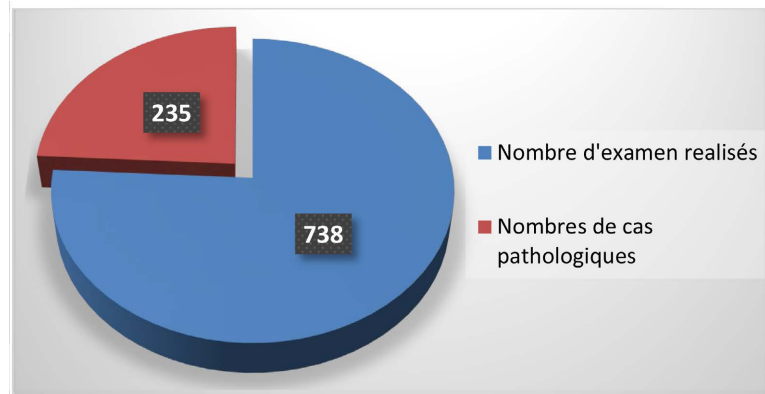


Figure 1. Distribution of patients according to the pathological examinations found.

Sociodemographic aspects: The female gender represented 95.7% of cases with a sex ratio (M/F) of 0.04. The average age was 50 years with extremes of 10 and 80 years. The 41 - 50 year old age group represented 20.9% of our patients followed by the 71 - 80 year old age group in our series (**Table 1**).

Table 1. Distribution of patients according to age.

Age	Effective (s)	Percentage (%)
10 - 20	9	3.8
21 - 30	38	16.2
31 - 40	23	9.8
41 - 50	49	20.9
51 - 60	42	17.9
61 - 70	28	11.9
71 - 80	46	19.6
Total	235	100.0

Hypertension was the most common medical history, accounting for 28.1% of cases, followed by diabetes (10.6% of cases) and gastroduodenal ulcer (6.4% of cases). The housekeeping profession was the most represented with 56.6% of cases, followed by traders (14.5% of cases); students (6% of cases); artists (5.5% of cases); journalists and instructors (2.6% of cases); lawyers (2.1% of cases) and breeders (1.3% of cases). The Malinké ethnic group represented 25.5% of cases in our study. Married couples were the most affected with a frequency of 63.8% of cases.

Clinical aspects: The majority of patients (*i.e.* 89.8% of cases) did not have a family history of goiter and 10.2% of patients had familial ATCD in our series. The goiter assessment was the most frequent clinical information with 76.6% of cases followed by dysthyroidia assessment and health assessment with respectively 16.5% and 2.1% of cases.

Ultrasound aspects: The majority of our patients had multiple nodules in 76.6% of cases and single nodules seen on ultrasound were 23.4% of cases. Bilat-

eral isthmo-lobar nodules were more represented in 37.9% of cases followed by bilateral lobar localization in 24.3% of cases. The right lobe was more affected than the left lobe with 20% and 11.1% of cases respectively.

The left isthmo-lobar region represented 3.4% of cases and of the right with 2.1% of cases. In our study, the morphology of the thyroid gland most described was hyperplasia with a nodule in the bilateral isthmo-lobar region in 42.1% of cases and the normal gland with a nodule in 19.1% of cases. The size of nodules of 1 to 2 cm was the most represented with 46.4% of cases and masses of 3cm and more were 26.8% of cases. Nodules with regular contours were the majority with 93.2% of cases and nodules with irregular contours were the minority with 6.8% of cases. The echogenicity of the nodules was much more heterogeneous echogenic in 61.2% of cases followed by iso-echoic nodules in 13.1% of cases; Anechoic nodules with 11.5% of cases and hypo-echoic nodules in 10.6% of cases.

The echostructure of the nodules was mixed in most cases in 40.4% of cases followed by solid (tissue) nodules in 26.4% of cases then cystic nodules in 11.5% of cases and spongiform nodules in 9.4% of cases. The mixed vascularization (central and peripheral) of the nodules was more represented in 43.5% of cases followed by peripheral vascularization with 26.4% of cases and central vascularization with 3.8% of cases. Macro-calcifications were the most frequent with 17% of cases and micro-calcifications represented 7.7% of cases. There were only 16.6% of cases of cervical lymphadenopathy in our study. The Ti-rads 03 classification represented 63% in our study (**Table 2**) and (**Figures 2-5**).

Table 2. Distribution of patents according to the Ti-rads classification.

TI-RADS	Effective (s)	Percentage (%)
TI-rads 1	0	0
TI-rads 2	38	16.2
TI-rads 3	148	63
TI-rads 4	33	14.0
TI-rads 5	16	6.80
Total	235	100.0



Figure 2. Cross-sectional thyroid ultrasound showing a left upper lobar spongiform nodule with peripheral vascularization on color Doppler (Ti-rads 2 classified examination).

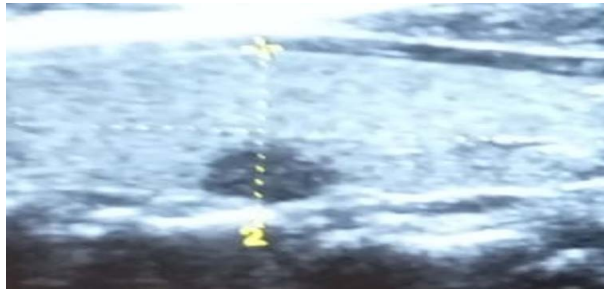


Figure 3. Ultrasound in longitudinal section showing a hypo-echoic lower lobar nodule with a long axis parallel to the well-defined skin plane (Ti-rads 3 examination).

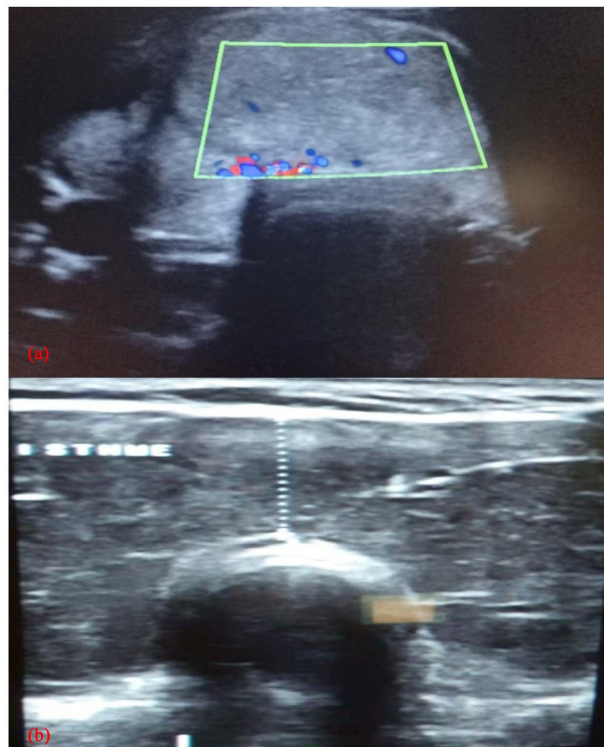


Figure 4. Cross-sectional cervical ultrasound showing a heterogeneous, partially cystic isthmus nodule with poorly defined contours and micro calcifications (a) and a moderately hypo-echoic upper lobar nodule that is fairly well limited with peripheral vascularization on Doppler (b) (examination classified Ti-rads 4).

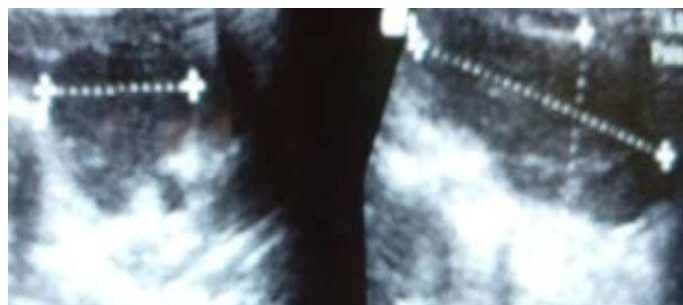


Figure 5. Cervical ultrasound in longitudinal section showing a 19 mm hypo-echoic supero-lobar nodule with limited contours higher than wide with multiple micro calcifications (Examination classified Ti-rads 5).

4. Discussion

In our study, we were faced with some limitations and difficulties which are the following: the lack of information or incomplete data regarding the clinical situation of the patients (such as personal and family history, dietary risk factors as well as biological data).

Nevertheless, the methodological rigor made it possible in this work to appreciate the main ultrasound characteristics of the nodules in the Ti-rads classification at the Marie Curie medical clinic.

Epidemiological data: The overall frequency in our study was 31.84% of cases. Colonna in France found an incidence of 9.1/100,000 women and 2.7/100,000 men [7]. The prevalence of nodules on ultrasound reaches 11 to 55% of cases according to J. Tramalloni *et al.* [8]. Our result was higher or equal to that of the literature, which could be explained by the fact that Mali is an endemic area of goiter according to the studies of Bayo *et al.* [9].

Sociodemographic data: The female gender was predominant in our study with 95.7% of cases, *i.e.* a sex ratio of 0.04. This predominance had been reported in other studies both in Europe and in Africa and in particular in Mali [10]-[13]. Doumbia M at the CHU Hôpital du Mali reported 82% female sex [10]. Indeed, female gender and pregnancy constitute risk factors for the occurrence of thyropathies in general. The theory of the influence of hormones had been mentioned according to M. Mbede *et al.* in 2021 [5]. The age group of 41 to 50 years was represented in 49% of cases. The average age of our patients was 50 years. Our results were similar and or close to those found in African and Western literature. [13]-[15]. The earlier occurrence of thyropathies in our context would have a dual origin: the excessive pregnancy rate in Africa and the predominant iodine deficiency in our regions, especially in West Africa. The majority of our patients were housewives, *i.e.* 56.6% of cases. This result was superimposable with that of Camara S in 2021 which reported 58.5% of cases [16]. Housewives were the most vulnerable socio-professional category, due to their low financial income which is a barrier to accessing quality health services, because according to data from EDSM VI [17], almost half (47% of cases) of women in Mali report that they have financial difficulties in accessing health care.

Clinical data: In our study, 10.2% of patients had a family history of thyroid disease. These results differed from those of Mariko *et al.* [18] who reported 24.3% of patients with a family history of thyroid disease.

The impact of heredity is clearly demonstrated in thyroid pathology. Some authors had reported familial goiter in subjects with thyroid nodules [19]. In our study, 76.6% of patients were referred of goiter evaluation. 16.5% of cases were referred for dysthyroidism and 03% for dysphagia. Given these reasons, the ultrasound scans were carried out with the aim of evaluating the ultrasound contribution of the nodules in order to contribute to their management.

Ultrasound data: The Ti-rads classification was established to define a standardized and reliable course of action for any thyroid nodule in order to eliminate

the risk of thyroid cancer. [20]-[22]. The analysis of the different items of the Ti-rads classification allowed us to note the following observations: Our nodules were multiple in more than half of the cases, *i.e.* 76.6%, This result was consistent with that of Kouamé K *et al.* who reported 75.8% of cases of multiple nodules [22]. The echostructure was mixed in 40.4% of cases. Coulibaly A *et al.* observed 16.8% cystic nodules [23]. Solid nodules represented 26.4% of cases. Concerning their echogenicity, these were heterogeneous nodules in 61.2% of cases and hypoechoic in 10.6% of cases. This result differed from those of Coulibaly A *et al.* and Achy OB *et al.* who had found 55.88% respectively 55.88% and 64.44% of cases of hypoechoic nodules [23] [12]. Hypoechoic nodules were the most highly suspicious of malignancy according to the literature at around 42%. [24] [25]. In our study, the vascularization of the nodules was anarchic (mixed) in 43.4% of cases. Kouamé K *et al.* reported 8.8% of cases of nodules with abnormal vascularization [22]. The other major criteria for nodules were highlighted in small proportions with respectively 7.7% of cases of microcalcifications; 6.8% of cases of nodules with irregular contours. These results differed from those of Coulibaly A *et al.* which found 5.26% of cases of microcalcifications, 4.8% of cases of nodules with irregular contours [23]. The semiological ultrasound analysis of the thyroid nodules in our series allowed us to suggest benign nature (Ti-rads 2) in 16.2% of cases; (Ti-rads 3) in 63% of cases and the highly suspicious nature of malignancy (Ti-rads 4 and 5) in 20.8% of cases. These diagnosed hypotheses were based essentially on the analysis of the contours of the nodules, their echostructure, the presence or absence of microcalcifications and associated lesions, in particular the presence of suspicious-looking cervical lymphadenopathy. In the literature, these items have a significantly positive relationship with the malignancy of nodules, but the definitive diagnosis remains the pathological examination [10].

5. Conclusion

Ti-rads classification of thyroid nodules constitutes an important step of thyroid nodules. Thyroid ultrasound made it possible to classify the nodules in our series according to the benignity criteria (T-IRADS 2 and 3) which represented 79.2% of cases. And the malignancy criteria (Ti-rads 4 and 5) in 20.8% of cases. A complementary cytopathological study is recommended in order to establish a decision tree taking into account clinical, ultrasound and cytopathological elements. Which would be more useful for possible surgeries and therapeutic follow-ups.

Ethical Aspect

Informed consent was obtained from patients and anonymity was maintained during the study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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