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Cold nodules of thyroid in children

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Abstract
A cold thyroid nodule is a hypofunctional lesion that does not fix the radioisotope to scintigraphy. The risk of its malignancy is estimated at 30%.
This is a retrospective study of 5 cases operated at the visceral pediatric surgery department "A" of the Children's Hospital of Rabat from 2004 to September 2017. Our main objective is to discuss the difficulties of diagnosis of certainty in front of the child's cold thyroid nodule and to evaluate the modalities of its surgical management while comparing the results of our study with those of the literature. The average age of our patients was 11 years, with a sex ratio F/M of 0,6. Most of our patients consulted for a thyroid nodule, associated in 20% of cases with cervical lymphadenopathy, and in 20% to signs of compression.
Thyroid scintigraphy favored a cold nodule in 100% of cases. Thyroidectomy was indicated in 80% of cases, followed by lymph node dissection in 40% of cases. The diagnosis of certainty of a cold thyroid nodule was based on the anatomopathological examination of the operative specimen, which showed papillary carcinoma in 60% of cases, atypical follicular carcinoma in 20% and a cyst of thyreogloss tract in 20%. Radioactive iodine 131 treatment was performed in 60% of cases. Subsequently 60% of our patients were put on thyroid hormone therapy. The medium-term evolution was favorable in 80% of the cases. Local recurrence was detected in 20% of cases. A well-conducted surgical procedure, followed by an iratherapy, optimizes the therapeutic effectiveness which can be close to 100% even in case of metastases.

Keywords: cold nodules, thyroid, child

Introduction
A thyroid nodule is clinically defined by localized hypertrophy of the thyroid gland.
It is cold if it does not fix the radioisotope (Iodine 121, Iodine 123 or Technetium 99) to the scintigraphy.
A cold nodule may be benign or malignant depending on its histological nature.
In fact, 30% of cold thyroid nodules in children are cancers.
Currently, the improvement of the interpretation of cytological and radiological parameters allow to some extent the selection of cold benign and malignant nodules. But it remains as in all tumoral pathologies performance limits of these para-clinical examinations.
The surgeon therefore finds himself in the danger of medicalization or excessive surgery of benign nodules, which in reality will never have unfortunate consequences and the risk of missing the diagnosis of a thyroid cancer at a nodular stage of small size without metastases where healing is achieved in more than 98%.
The treatment of cold thyroid nodules remains consensual, nevertheless certain borderline situations between the benign and the malignant always pose problem.
If the morbidity of thyroid surgery is low, the consequences of definitive lesions of bilateral recurrent paralysis or hypoparathyroidism are dramatic. This finding makes it necessary on the one hand a better knowledge of the thyroid surgery and on the other hand a better practice of the recommendations of the management of the cold thyroid nodules in order to adapt in each case the best therapeutic indication.
The purpose of this work is to discuss the difficulties of diagnosis of certainty in front of a cold nodule of the thyroid in the child and to evaluate the modalities of its surgical management while comparing the results of our study with those of the literature.

Materiels & Methods
Through a retrospective study, we report 5 cases of children with cold nodules, treated in pediatric visceral surgery "A" at the children's hospital of RABAT in Morocco, during a period from 2004 to January 2018.
During this period, 20 patients were followed in the department for a thyroid pathology, of which 5 were carriers and operated for cold nodules, that is 31% of all the thyroid operative procedures performed in the department.

Results
The age in our series ranged from 6 to 14 years with an average age of 11 years.
The distribution of patients by age group was as follows:
- A patient was 6 years old.
- Three patients were 12 years old.
- A patient was 14 years old.

Our study revealed a predominance of the male sex that is 60% of the cases.

The distribution of sex by age group was as follows

- 6 years: 1 case of male is 20%.
- 12 years: 2 male cases or 40% and one female case is 20%.
- 14 years old: 1 female case is 20%.

The delay between onset of symptomatology and consultation ranged from 3 months to 5 years with an average of 6 years.
Only one patient had a history of kyphoscoliosis followed since the age of one year under reduction and orthopedic corset.
No patient had a history of previous thyroid surgery and cervical irradiation.
No family history of thyroid pathology has been noted.
The appearance of anteriorly increasing cervical swelling was the most prominent revealing sign in all our patients, ie 100% of cases.
Cervical lymphadenopathy was found in only one patient, ie 20% of cases.
A notion of recurrent dyspnea and dysphagia was found in one patient, or 20% of cases.
Among patients in our series, only one patient reported in the interview the concept of general impairment (AEG) of asthenia and weight loss, accounting for 20% of all our cases. series.
No cases were revealed by signs of dysthyroidism.

Preoperative thyroid clearance was requested for all patients, ie 100% of cases

- He returned normal to 4 patients, 80% of cases.
- In 1 patient, he revealed hypothyroidism, or 20% of cases.

Cervical and thyroid ultrasound was first-line in all our patients, 100% of the time.

1. The seat of the thyroid nodule:
2. The thyroid nodules in our series were of left lobe seat in 4 cases, ie 80% of the cases and right lobar seat in one case is 20% of the cases.
   Echogenicity of the thyroid nodule:

- Hyperechoic nodule: No patient.
- Isoechoic nodule: 1 patient is 20% of cases (in the left lobe: Figure 1).
- Hypoechoic nodule: 4 patients, ie 80% of cases.
- Ultrasound revealed cervical lymphadenopathy in 2 patients, ie 40% of our patients:
- Pretracheal ADP under thyroid and left laterocervical in one case is 20% of all our patients.
  Carotid ADP in one case, ie 20% of cases.

All thyroid scintigraphy with Tecneumium 99 returned to favor a cold nodule, ie 100% of the cases in our study series. (Figure 2)
Chest X-ray was performed routinely in all patients in our series; she returned normal to 5 patients, ie 100% of cases.
Cervical CT was requested in only one patient, ie 20% of cases. She was in favor of a malignant tumor lesion of the left thyroid lobe with jugulo-carotid and left spinal adenopathies (observation 2).
All patients received surgical treatment. Thus, the different types of interventions performed were multiple

- A left Isthmo-lobectomy was performed for a single patient.
- A left Isthmo-lobectomy with secondary totalization was performed in a single patient.
- Subtotal thyroidectomy was performed in one patient.
- One-stage thyroidectomy was performed in one patient.
- An isolated resection of a nodule was performed in a single patient.
- Lymph node dissection was performed in 2 patients.

Fig 1: Ultrasound image showing an isoechoic nodule of the left lobe of the thyroid.

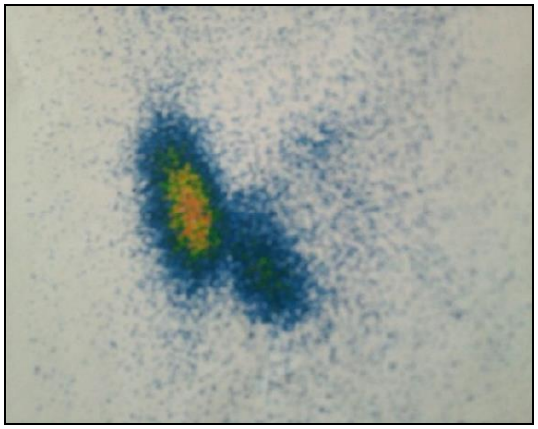

Fig 2: Technetium 99 scintigraphic image of the 2nd case showing a large cold lobar nodular formation.

The anatomopathological analysis of the resection part

- For 1 case, it was inconclusive and she mentioned two diagnoses:
- Atypical hyper-cellular adenoma or minimally invasive follicular carcinoma.
- For 3 other cases, she came back in favor of papillary carcinoma.
- For 1 case, she came back in favor of a cyst of the thyrèoglosse tract (KTTG).

Hormone therapy has been prescribed for replacement, for life after total thyroidectomy, in 2 cases of our series or 40% of cases. It was based on Levothyrox.

It has been prescribed for a single patient, ie 20% of cases.

The patients who received an iratherapy are three, or 60% of patients

- One case underwent subtotal thyroidectomy.
- The other two underwent a total thyroidectomy, immediately for one and In 3 times for the other.

External radiotherapy was not prescribed in any patient of our series.
The immediate operative follow-up was simple in all patients, ie 100% of cases.

Late post-operative follow-ups revealed

- Case of transient recurrent paralysis with persistence of jugulocardiosteal adenopathies and cervical swelling requiring a totalization of the surgical procedure (Isthmolobectomy with secondary totalization), that is 20% of all patients in our series.
- No case of definitive or transient hypocalcemia.

Local recurrence was observed in only 1 case; having benefited from a body scan with iodine131 showing 2 large thyroid residues that were resected and the patient was referred for irathérapie. (Observation n ° 2) that is 20% of the cases of our series (Figure 3).
No patient in our series has metastasized, especially pulmonary or distant.
No deaths were reported.

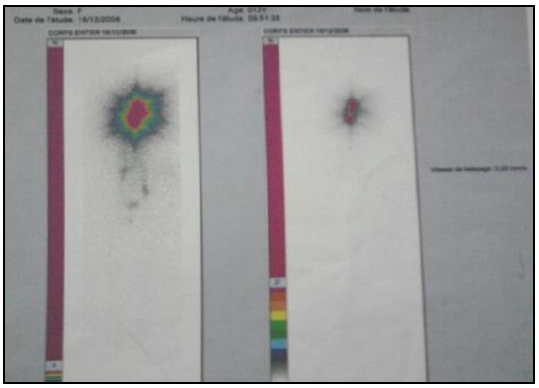

Fig 3: Iodine 131 scanning image showing two large thyroid residues.

Discussion

The thyroid nodule evokes a carcinoma until proven otherwise, the papillary and follicular forms being the most common. The risk of cancer is high with a prevalence of carcinoma of 21 to 25% [1, 2]. Generally, the patient is euthyroid both clinically and biologically subject to the secreting nodule (Plummer's syndrome), which is exceptional in children. The presence of signs of hyperthyroidism or hypothyroidism decreases the risk of cancer, but does not exclude it. In children, thyroid carcinoma represents 1-1. 5% of malignant tumors and 5.7% of tumors of the neck [3]. Proportionally, the risk of thyroid cancer is much higher than in adults [4]. This difference is also confirmed in the prevalence of thyroid carcinoma during nodular goitre. In addition to highlighting the importance of ultrasound in the diagnostic process, the prevalence of thyroid nodules in the general population increases from about 3% on palpation to 30% on ultrasound. Although the mortality rate of thyroid carcinoma is significantly lower in pediatric age, the diagnostic procedure must be rapid. Again, the initial assessment includes the determination of TSH and free T4 in order to rule out a secreting nodule. The presence of anti-TPO and antithyroglobulin antibodies may suggest thyroiditis but also attest to the autoimmune response to the presence of cancer cells. The determination of calcitonin makes it possible to rule out the very rare medullary carcinoma of the thyroid [5]. Ultrasound can tell if it is a solid or cystic lesion, while the scan indicates whether the nodule is "cold". In adults, the following diagnostic procedure consists in performing a fine needle biopsy under ultrasound control [6, 7]. This technique is starting to be used in adolescents [8]. the experience required of the operator and the cytologist as well as the rate of false negatives mean that some pediatric teams still prefer the surgical approach with extemporaneous biopsy, especially when the surgeon uses new laparoscopic techniques [9, 10].
As in adults, the most common form of thyroid cancer is papillary carcinoma [11]. 16 In children, the incidence of cervical lymphadenopathy and / or lung metastases is increased at the time of diagnosis [10, 11]. However, long-term mortality is not greater than that of young adults [10]. When the lesion is benign, the approach is to excise the tumor or lobe. Any malignant lesion requires thyroidectomy. In case of residual thyroid tissue, radioiodine therapy should be considered. Replacement therapy with thyroxine should be initiated with the aim of effectively curbing TSH. The measurement of thyroglobulin makes it possible to demonstrate metastatic tissue provided that it is a papillary or follicular cancer. Mutations of the proto-oncogene RET can be identified in familial forms of medullary cancer. It is a rare form, aggressive and with poor prognosis. This requires screening of other members of the family [5, 12] In case of type 2 MEN, total thyroidectomy should be proposed in affected patients, even in young children [12].

Conclusion

A cold thyroid nodule in children should clear thyroid cancer and do not hesitate to perform needle aspiration.
Complementary examinations are intended to differentiate a benign formation from a malignant formation. At the present time, the FNA is considered the "gold standard" of the exams. Only needle aspiration does not play a major role in the resolution of the diagnostic dilemma in children with cold thyroid nodules, and should not replace clinical judgment and suspicion as the most important determinants of management.
The extemporaneous examination improves, at best minimally, the diagnostic reliability of the cytopoints: an EE of a thyroid nodule is thus useless if there has been a preoperative cytotoxic contribution. Its place is at best limited to suspicious or ambiguous cases, or even reserved for the identification of metastatic lymph nodes or parathyroids.
A total thyroidectomy or a secondary totalization, after the detection of a thyroid cancer, with a systematic lymph node dissection of principle seems to improve the prognosis which remains good for the young teenager in comparison with that

of the young child.

A well-conducted surgical procedure, followed by an irathatherapy, optimizes the therapeutic efficacy which can be close to 100% (isotopic white card with undetectable thyroglobulin) and even in the presence of metastases and particularly the isotopic miliaire.

Conflict of Interest

All authors declare that they have no conflict of interest.

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