


Cardiothyreosis: Epidemiological, clinical and therapeutic approach

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ABSTRACT

INTRODUCTION: Cardiothyreosis corresponds to the cellular effects of free thyroid hormones on the vascular wall and the myocardium. We aim to describe the clinical, para-clinical and therapeutic aspects of cardiothyreosis and to detail prognostic factors.

METHODS: We conducted a descriptive retrospective study at the Endocrinology-Diabetology Department of the Hedi Chaker University Hospital in Sfax-Tunisia. We collected medical records of 100 patients with cardiothyreosis between January 1999 and December 2019. We included patients with cardiothyreosis who underwent adequate cardiac evaluation. We excluded patients with cardiac abnormalities related to conditions other than hyperthyroidism, patients who died and patients without cardiothyreosis.

RESULTS: We included 100 adult patients (43 men and 57 women). The mean age was 49.3 ± 12.9 years (20–79 years). The diagnosis of cardiothyreosis was concomitant with that of hyperthyroidism in 72% of cases. Weight loss and palpitations were the two most frequently reported signs in 91% of cases each. Hypertension was systolic in 15 patients. The average heart rate was 103.1 beats/min (52–182 bpm). The mean TSH and FT4 levels were $0.042 \mu\text{IU/ml}$ and 59.6 pmol/l , respectively. Rhythm disorders and heart failure were the most common cardiac complications with 81 and 56 cases, respectively. Cardiac ultrasound showed dilatation of the left atrium in 28.3% of patients. Pulmonary arterial hypertension was present in 43% of cases. 57 patients had been treated with benzylthiouracil at a mean dose of 157.45 mg/day. Radical treatment with radioactive iodine was indicated in 81 patients. The evolution of cardiothyreosis was favourable in 58 patients.

CONCLUSION: Cardiothyreosis is a serious complication of hyperthyroidism. Future prospective studies will be of great help to better characterise and manage cardiothyreosis.

KEYWORDS: Cardiothyreosis, hyperthyroidism, atrial fibrillation, heart failure, thromboembolic events

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Introduction

Hyperthyroidism affects 0.8% of the general population.¹ Its incidence and aetiologies vary according to the geographical origin, age and sex.² Thyrotoxicosis is the clinico-biological translation of the increased plasma levels of free thyroid hormones and their effects on various systems (cardiovascular, digestive, neuromuscular, etc.). It causes an enhanced left ventricular function, an elevated heart rate and a decrease in systemic vascular resistance. Those effects on the cardiovascular system may lead to a cardiovascular damage, known as 'cardiothyreosis'. It is the combination of hyperthyroidism and one or more heart complications and corresponds to the cellular effects of free thyroid hormones on the vascular wall and the myocardium. It affects 6.5% of patients with hyperthyroidism.³ Cardiothyreosis is not well defined since there are no diagnostic criteria for the type of cardiac complication. It can include rhythmic disorders, congestive heart failure and coronary insufficiency.³ Cardiothyreosis is the most serious aspect of hyperthyroidism and can be life threatening.⁴ A better knowledge of clinical, para-clinical and therapeutic characteristics of cardiothyreosis is crucial to improve patients' prognosis.

The aim of the study was to describe the clinical, para-clinical and therapeutic aspects of cardiothyreosis and to detail prognosis factors.

Methods

This was a retrospective descriptive study of patients with hyperthyroidism and cardiothyreosis, who were hospitalised in the Endocrinology Department in Hédi Chaker Hospital in Sfax Tunisia during a 20-year period from January 1999 to December 2019. Patients with cardiac abnormalities related to conditions other than hyperthyroidism, patients who died before explorations and patients with hyperthyroidism not complicated by cardiothyreosis were excluded. A pre-established information sheet has been made to collect demographic and socioeconomic data as well as personal and family health history.

Clinical assessment included reasons for hospitalisation, anthropometric, blood pressure and cardiorespiratory measurements such as heart beat, respiratory rate and electrocardiogram data. Signs of hyperthyroidism and cardiothyreosis were also sought and the results of the thyroid examination were



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reported. Thyroid hormone assessment was performed in the biochemistry laboratory in Habib Bourguiba University Hospital in Sfax with the following normal values: Thyroid stimulating hormone (TSH): 0.5 to 4 μ IU/ml; Free fraction of thyroxine (FT4): 9 to 27 pmol/l. Hyperthyroidism was confirmed biologically when the TSH level was $<0.5 \mu$ IU/ml. Hyperthyroidism was said to be frank (clinical) if the FT4 level was high (>27 pmol/l) and frugal (subclinical) if this level was normal. All patients had undergone cervical ultrasound and/or thyroid scintigraphy at the radiology and nuclear medicine departments in the Hedi Chaker and Habib Bourguiba University Hospitals, respectively. The cardiac ultrasound was performed at the cardiology department in Hedi Chaker Hospital.

Results

General characteristics of the study population

There were 673 cases of hyperthyroidism during the study period, of which 110 cases of cardiothyreosis were reported. We collected the data of 100 cases. Patients were predominantly female at 57%. The mean age was 49.3 ± 12.9 years with extremes between 20 and 78 years. Cardiothyreosis mainly affected patients aged between 30 and 50 years (48%). It was rare before the age of 30. Cardiothyreosis occurred in women at a later age than in men. Only 11% of patients smoked and 13% drank alcohol. A family history of dysthyroidism was noted in 21% of patients: 9 cases of hypothyroidism and 12 cases of hyperthyroidism of which 2 had Graves' disease. Previous cardiovascular history was noted in 20% of cases. All of these cardiovascular diseases had been evolving for several years before hyperthyroidism. Graves' disease was the most common aetiology of hyperthyroidism, noted in 61 patients, followed by Hashimoto's thyroiditis and toxic multinodular goitre, in 21 and 11 cases, respectively. Toxic adenoma was noted in four cases and iodine overload following amiodarone use was the cause of hyperthyroidism in three patients. Cardiothyreosis was more frequent in toxic multinodular goitre (28.9%) and Hashitoxicosis (25%) compared to Graves' disease (15%) ($P = .004$).

Clinical study

The diagnosis of cardiothyreosis was concomitant with that of hyperthyroidism in 72 cases, followed it in 21 cases with a mean delay of 18.94 months (extremes: 1-36 months), and preceded it in 7 cases with a mean time interval of 14.28 months (extremes: 2-36 months). The combination of thyrotoxicosis and cardiac signs was the most common revealing circumstance at the time of hospitalisation (54 cases). Cardiac signs were isolated when revealing hyperthyroidism in 18 patients. Weight loss and palpitations were the two most frequently reported signs of thyrotoxicosis, in 91% of cases each. The clinical examination revealed an average waist circumference of 83 cm, 79 cm

in men and 86 cm in women. The average body mass index (BMI) was 22 kg/m^2 . The distribution according to BMI had shown: 60% normal weight, 17% underweight, 14% overweight and 7% obese. Thermophobia and asthenia were noted in 86 and 78% of cases, respectively. Exophthalmos was noted in 40 patients with Graves' disease. Palpebral retraction was noted in 38% of cases. 85 patients had a goitre on clinical examination. The mean values of systolic and diastolic blood pressure were 123 mmHg (range 50-180 mmHg) and 69.7 mmHg (range 30-100 mmHg), respectively. Hypertension was noted in 23 patients: systolic in 15 cases and systolo-diastolic in 8 patients. Shock with hypotension was noted in one patient. The average heart rate was 103.1 beats/min with extremes ranging from 52 to 182 bpm. The rhythm was irregular in 72% of cases. A heart murmur was found in 15 patients. It was a systolic murmur at the mitral focus, related to mitral insufficiency, minimal in more than half of the cases. The electrocardiogram was pathologic in all patients (Table 1).

Pulmonary auscultation was pathological in 14 patients (14% of cases). Crackling rales were found in seven patients, related to acute pulmonary oedema complicating heart failure. Four patients had snoring, related to bronchitis, and three patients had decreased vesicular murmurs on auscultation, related to pleurisy complicating a pulmonary embolism.

Hormonal and biological assessment

Leukopenia was observed in 14 patients. 67 patients had anaemia and 24 patients had thrombocytopenia. Liver cytolysis was noted in 17 cases and 63 patients had cholestasis. A lipid profile was performed in 81 patients, showing hypocholesterolaemia in 85% of them. The mean value of fasting blood sugar, specified in 94 patients, was 5.5 mmol/l. Fasting hyperglycaemia was noted in 16% of cases and new-onset diabetes was identified in 11.7% of patients. The mean TSH level was 0.042μ IU/ml with extremes ranging from 0.001 to 0.37μ IU/ml. TSH was low in all patients. The mean FT4 level was 59.6 pmol/l (range 13.3-279.3 pmol/l). FT4 was elevated in 89 cases, consistent with frank hyperthyroidism, and normal in 11 cases, consistent with subclinical hyperthyroidism.

Trans-thoracic cardiac ultrasound

On chest X-ray, 13 patients had cardiomegaly and 3 patients had pleurisy related to pulmonary embolism. Trans-thoracic cardiac ultrasound was performed in 65 patients. Left ventricular systolic ejection fraction (LVSEF) averaged 44.7% (range 20-86%) and was low ($<55\%$) in 29 patients. The tele-systolic and tele-diastolic diameters averaged 34.6 mm (range 16-57 mm) and 50.95 mm (range 31-65.5 mm), respectively. The tele-systolic diameter was high (>37 mm) in 13 patients (20%) while the tele-diastolic diameter was high (>56 mm) in 11 cases (16.9%). Right and left ventricular dilatation was observed in 22 (33.8%) and 10 (15.4%) patients, respectively.

Table 1. Electrocardiogram data.

ELECTROCARDIOGRAM DATA	EFFECTIF (%)
Rythm disorders	
CA/AF	75 (75)
Atrial extrasystole	3 (3)
Atrial flutter	2 (2)
WPW syndrome	1 (1)
Left ventricular hypertrophy	10 (10)
Bundle branches	
Right	3 (3)
Left	4 (4)
Repolarisation disorders	6 (6)
Sinus tachycardia	3 (3)

Abbreviations: CA/AF, complete arrhythmia by atrial fibrillation; WPW, Wolff Parkinson White syndrome.

The left atrium was dilated in 18 cases (27.7%). Dilated cardiomyopathy was diagnosed in nine patients (13.8%). Disturbances of cardiac kinetics were noted in 14 cases (21.5%). Hypokinesia affected the left ventricle in seven cases and the interventricular septum in four cases. There were global hypokinesia in two patients and left ventricular akinesia in one patient. Pulmonary hypertension was present in 43% of cases (pulmonary arterial pressure >40 mmHg) with a mean pressure of 56.5 mmHg (extremes: 42-100 mmHg).

Types of cardiothyreosis

Cardiac rhythm disorders were found in 81 patients. It was a CA/AF in 75 patients, representing 11% of hyperthyroidism and 75% of cardiothyreosis. CA/AF involved 73.7% of women and 76.7% of men with cardiothyreosis, with an average age of 50.3 years. Graves' disease was the predominant aetiology of hyperthyroidism in 58.7% of cases. In 40 patients, CA/FA was associated with other cardiovascular conditions (53.3%). Only eight patients had a biological profile of subclinical hyperthyroidism (10.6%) while the others had clinico-biological hyperthyroidism.

Heart failure was noted in 56 cases and affected 56.1% of all women and 55.8% of all men with cardiothyreosis. The mean age was 46.9 years, with 5 patients under 30 years of age. A history of hypertension was found in five patients. All the investigations concluded that it was right heart failure in 30 cases (53.6%), left heart failure in 10 cases (17.8%) and congestive heart failure in 16 patients (28.5%). Graves' disease was the most common aetiology of hyperthyroidism found in 37 patients.

Coronary insufficiency was noted in six patients, all male, with a mean age of 44.16 years. The majority of patients were younger than 35 years (four cases). These patients were younger

than those with rhythm disorders and/or heart failure. All patients had low systolic ejection fraction. Coronarographic reports were obtained from four patients, two of whom had a healthy coronary network. The other two patients had thrombotic stenosis of the proximal and distal anterior interventricular artery in the first patient and acute occlusion of a left retroventricular artery in the second. The aetiology of hyperthyroidism for these patients was Graves' disease in two cases, Hashimoto's thyroiditis in two cases, toxic multinodular goitre and iodine overload, in one case each.

Thromboembolic events were found in three male patients with no particular personal history and an average age of 48.3 years. The angio-scanner was performed at the Radiology Department of the Hedi Chaker University Hospital in Sfax in the presence of suspected pulmonary embolism. Perfusion-ventilation scintigraphy was performed at the Nuclear Medicine Department of the Habib Bourguiba University Hospital when there was a strong suspicion of pulmonary embolism with a normal angio-scanner or in patients whose renal function was altered and did not allow the injection of the contrast product. The aetiology of the hyperthyroidism was Graves' disease in two patients, Hashimoto's thyroiditis in the third. All three patients had normal blood pressure. The electrocardiogram showed atrial fibrillation in the first patient and sinus tachycardia in the other two patients. Cardiac ultrasound showed right heart failure with pulmonary hypertension in the first and third patients and congestive heart failure in the second patient. Pulmonary embolism was confirmed in all three cases, proximal in the first patient and distal in the other two.

Therapeutic management

Sixty-five patients had received synthetic antithyroid drugs: 57 patients had been treated with benzylthiouracil at a mean dose of 157.45 mg/day for a mean duration of 15.25 months, while 11 patients had received a mean dose of 28.18 mg of thiamazole for 14.81 months. Benzylthiouracil was changed to thiamazole in three patients. Neutropenia occurred in three patients on benzylthiouracil.

Radical treatment with radioactive iodine (I^{131}) was indicated in 81 patients. 90% of the patients received a single course of irradiation, while the remaining 10% required a second course of irradiation. The average dose received was 7.61 mci (extremes: 4.5-11 mci).

Nine patients underwent surgery after euthyroidism was achieved: six with echographic criteria of malignancy, one with a plunging goitre and one with a bulky goitre. Surgery was indicated in one patient for poor compliance (Table 2).

Monitoring and evolution

Nine patients died in major heart failure and 10 patients were lost to follow-up. The remaining 81 patients were followed for an average of 39.8 months. Clinico-biological euthyroidism

Table 2. Therapeutic management of hyperthyroidism.

THERAPEUTIC MODALITIES	EFFECTIF (%)
Iodine ¹³¹ alone	30 (31.25)
Iodine ¹³¹ + synthetic antithyroid agents	50 (52)
Antithyroid agents	7 (7.3)
Surgery	
With synthetic antithyroid agents	8 (8.3)
With Iodine ¹³¹	1 (1)
Total	96 (100)

was achieved in 16 patients treated with iodine-131 alone after an average of 8.86 months. Hypothyroidism developed in 55 patients treated with synthetic antithyroid drugs and iodine-131 after an average of 27.36 months of treatment, while hyperthyroidism persisted in 10 patients treated with synthetic antithyroid drugs and iodine-131.

For cardiothyreosis, the evolution was favourable in 58 patients, but unfavourable in 25 patients marked by the persistence of rhythm disorders and signs of heart failure. Persistent hyperthyroidism was significantly associated with persistent cardiothyreosis. Toxic multinodular goitre, use of synthetic antithyroid drugs alone, and ventricular dilatation appeared to be predictive of persistent cardiothyreosis. Evolution was assessed in 71 patients with rhythm disorders. Forty of them (56.3%) improved with return to sinus rhythm within a mean time of 8.5 months. The mean time to resolution of rhythm disturbances was less in the absence of associated heart failure: 2.9 months versus 15.8 months. Among patients with heart failure (50), regression of the signs of was noted in 34 cases only after a mean time of 15.3 months. Association with rhythm disorders and surgical treatment were strongly associated with persistence of heart failure in these patients. Two patients with coronary insufficiency died in major heart failure. The evolution was favourable in two patients with pulmonary embolism under anticoagulant treatment, but unfavourable in the patient with global cardiac insufficiency who died in a cardiac decompensation.

The mortality rate was 9%, caused by major heart failure within an average of ten days. The combination of heart failure and rhythm disorder in the same patient, as well as elevated left ventricular tele-systolic and tele-diastolic diameters, were associated with a higher risk of death.

Discussion

Epidemiological data

The prevalence of cardiothyreosis in Africa varied from 1.7% to 46.6% of hyperthyroidism.^{5,6} In our series, it was of 16.3%. In our series, the mean age was 49.3 years. The majority of patients were between 30 and 50 years old (48%). Indeed, 50% of the patients in the series by Jamoussi (these100-11.pdf)

were between 30 and 50 years of age. These findings suggest that the risk of cardiothyreosis increases with age. Toxic multinodular goitre was the most frequent aetiology in hyperthyroidism complicated by cardiothyreosis according to the series of Diaconescu et al.⁷ According to other authors,^{3,8,9} Graves' disease was the most frequent, as in our study where its frequency was 61%. Hypertension was the most frequent subjacent cardiopathy in the context of cardiothyreosis,¹⁰ as was the case in our series where its frequency was 65%.

Clinical data

The most commonly reported situation in the literature is the onset of cardiothyreosis during the course of hyperthyroidism^{3,11,12} with an average interval of 4 to 6 years.^{13,14} This situation was found in only 21% of our patients. Intensity of thyrotoxicosis does not appear to be correlated with the occurrence of cardiothyreosis.¹¹

Biological assessment

Umpierrez et al¹³ noted in his study of thyrotoxic congestive heart failure that a TSH level $<0.05 \mu\text{IU/ml}$ increases myocardial contractility and mass. Mrad et al¹¹ found that increased FT4 levels were predictive of heart failure. However, other studies^{3,15,16} had found that the intensity of biological hyperthyroidism (with FT4 >3 times normal) was associated with a lower risk of cardiothyreosis. In our series, the mean TSH level was $0.042 \mu\text{IU/ml}$ and FT4 was 59.6 pmol/l . Prevalence of anaemia in cardiothyreosis varies from 46% to 72%^{5,6} and was 72% in our series. Its hyperkinetic effect complements that of hyperthyroidism and increases the haemodynamic disturbances (these100-11.pdf). It was significantly more frequent in patients with heart failure than in those with an isolated rhythm disorder ($P=0.0001$) (these100-11.pdf) as well as in our series (81% vs 52.2%). Hepatic cytolysis and cholestasis are most common in hyperthyroidism complicated by cardiothyreosis.^{17,18} Hepatic cholestasis was significantly more prevalent in patients with heart failure ($P=0.03$) (these100-11.pdf). In contrast, in our series, it was significantly more frequent in patients with a rhythm disorder (61.3% vs 73%).

Cardiac ultrasound data

According to the literature, ultrasound anomalies concern the different cardiac cavities (Table 3).

Types of cardiothyreosis

Rhythm disorders and heart failure are the most common clinical presentations. Coronary insufficiency and conduction disorders are rarely reported (Table 4). In our series, rhythm disorders and heart failure were the most frequent cardiac disorders (81% and 56% respectively)

Table 3. Cardiac ultrasound data in cardiothyreosis.

	DIALLO ET AL ⁹ (%)	EL HATTAOUI ET AL ¹⁹ (%)	TSYMBALIUK ET AL ²⁰ (%)	DIÉDHIYOU ET AL ⁸ (%)	ELLEUCH ET AL (%)
Low LVSEF	26	33.3	–	18.5	44.6
DLV	23	37	–	21.7	15.4
DLA	51	29.6	–	48.3	27.7
DRV	–	–	–	37.1	33.8
Dilated cardiomyopathy	–	27.7	77	–	13.8
PH	–	–	21	57	43
Pericarditis	4	–	–	3.2	4.6

Abbreviations: DLA, dilated left atrium; DLV, dilated left ventricle; DRV, dilated right ventricle; LVSEF, left ventricular systolic ejection fraction; PH, pulmonary hypertension.

Table 4. Types of cardiothyreosis reported in the literature.

	RHYTHM DISORDERS (%)	HEART FAILURE (%)	CORONARY INSUFFICIENCY (%)
Diallo et al ⁹	44	44	12
Jamoussi (these100-11.pdf)	82	47	1.4
Chbakou ²¹	67.2	75	8.6

According to the literature, subclinical hyperthyroidism can induce rhythm disorders including CA/FA.²² In our series, CA/FA was noted in 72.7% of the patients with subclinical hyperthyroidism. CA/FA complicating cardiothyreosis is also known to be associated with a high risk of thromboembolic events, particularly of the central nervous system.²³ Only one patient with CA/FA had a proximal left pulmonary embolism in our series. Wolff Parkinson White syndrome (WPW) in cardiothyreosis is rarely reported in the literature.²⁴ In our series, only one patient had WPW syndrome (1%). Advanced age, pre-existing heart disease and the development of atrial fibrillation during hyperthyroidism are predictive factors for HF.¹⁵ In our series, however, the mean age of patients with HF was relatively younger (46.9 years). The association of a rhythm disorder, notably atrial fibrillation, is classic in the literature (these100-11.pdf),^{15,25} found in 62.5% of cases in our series. Umpierrez et al¹³ in his study of thyrotoxic congestive heart failure found a TSH level <0.03 µIU/ml in all patients and pointed out that a TSH level <0.05 µIU/ml increased contractility and myocardial mass. In our series, the mean TSH level was 0.048 µIU/ml, 37 patients (66.1%) had a level <0.05 µIU/ml of which 34 (60.7%) <0.03 µIU/ml. Although increased FT4 levels were predictive of HF in hyperthyroid patients according to Mrad et al,¹¹ this was not retained by Siu et al.¹⁵ LVSEF in thyrotoxic HF may be preserved or decreased.²⁶ In our study, 48.8% of patients had a reduced LVSEF. DLV was present in thyrotoxic HF in 18% to 39% of cases (these100-11.pdf),¹⁹ and in 19.5% of patients in our study. DRV was also frequently reported in the literature,¹³ present in 40% of our patients. PH was often found in the literature²⁷ and was noted in 51.2% of our patients. Coronary insufficiency during

cardiothyreosis is rare. Its prevalence was 1.4% for Jamoussi (these100-11.pdf) and 6% in our series. Indeed, myocardial infarction without coronary stenosis in hyperthyroidism may be related to coronary artery stenosis caused by hyper-reactivity of vascular smooth muscle to norepinephrine.²⁸ Inadequate myocardial oxygen supply secondary to increased cardiac oxygen consumption may also be involved.²⁹

Treatment

Etiological treatment. Synthetic antithyroid drugs are prescribed until radical treatment is available in cases of cardiothyreosis. Iodine-131 isotopic treatment can control excess thyroid hormones in 80% to 90% of patients within 8 weeks.³⁰⁻³² It is also the treatment of choice in case of cardiothyreosis.^{10,33} (SFE recommendation). The dose delivered is around 0.15 to 0.2 mci/gram of thyroid tissue.³¹ A second cure is sometimes necessary.¹⁵ In our series, 81 patients (84.3%) had received treatment with iodine-131, 10% of whom required a second cure. Thus, 22% to 58% of patients treated with I¹³¹ develop hypothyroidism after 5 to 8 years.³¹ In our study, 58% of the patients developed hypothyroidism after a mean duration of 2.28 years. Surgical treatment is an alternative option for cardiothyreosis.³¹ It can only be performed after euthyroidism has been achieved, requiring the use of synthetic antithyroid drugs and lugol (these100-11.pdf)³¹ as well as symptomatic treatment of cardiac impairment in the case of cardiothyreosis. In our series, surgery was indicated in nine patients according to the literature. Hypothyroidism is the most common post-operative complication.³² In our series, it occurred in 77.7% of patients.

Evolution of cardiothyreosis. The persistence of hyperthyroidism was significantly associated with the persistence of cardiac disorders ($P = .018$). Return to sinus rhythm is achieved in 39% to 68% of cases (these100-11.pdf).^{19,34,35} However, these disorders may persist in 35% to 50% of cases, despite control of the hyperthyroidism.³⁶⁻³⁸ In our series, the evolution of rhythm disorders was marked by remission in 56.3% of cases, whereas 32.4% of patients kept an irregular rhythm until the last consultation. According to a study by Wong et al,³⁵ low FT4 on admission and dilated left atrium on cardiac ultrasound were significantly associated with persistence of the rhythm disorder. In this study, the evolution of heart failure was favourable in 68% of patients. This frequency was close to that reported by Jamoussi (these100-11.pdf) (64%). Diaconescu et al⁷ reported an improvement of heart failure in 60% of the operated patients, contrary to our study where surgical treatment was significantly correlated with the persistence of heart failure ($P = .022$). This can be explained by the fact that the operated patients had an associated CA/FA whose presence was significantly correlated with the persistence of heart failure in our patients ($P = .004$). Mortality varied between 3.3% and 16% (these100-11.pdf)^{8,9,12} and was 9% in our study. The most frequently described cause of death was major heart failure,^{39,40} as was the case in our series. The elevation of left ventricular diameters on cardiac ultrasound (tele-systolic diameter and/or tele-diastolic diameter), the persistence of hyperthyroidism and the association of heart failure and rhythm disorders in the same patient were considered as factors of worse prognosis.

Conclusion

Cardiothyreosis is a serious complication of hyperthyroidism that can be life-threatening. Clinical presentation is dominated by rhythm disorders and heart failure. Thrombo-embolic complications are also part of the clinical manifestations of cardiothyreosis. Treatment is twofold: etiological treatment of hyperthyroidism and symptomatic treatment of cardiac disorders. The coexistence of heart failure and rhythm disorders in the same patient significantly increased the risk of mortality compared to patients with only one type of cardiothyreosis. Thus, future studies of a prospective nature will be of great help to better characterise and therefore manage cardiothyreosis, especially comparative studies that will include patients unaffected by this complication for a better vision of risk and prognostic factors.

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